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Telephony Services Application Programming Interface (TSAPI) Version 2

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Chapter 1 Abstract

Telephony Services integrates server-based telephony control with desktop (client) or server applications on enterprise-wide networks. More specifically, Telephony Services logically integrates the existing telephones currently on the user's desktop (analog, ISDN, or those specific to a switch) with telephony-enabled applications running in a client or server. Server and client software create and maintain this logical association; no special telephones, special telephone connectors, PC boards, or other hardware are necessary at a client's desktop. Server hardware terminates the physical control link between the server and the switch (typically a Private Branch Exchange, or PBX) that provides telephony services to the user. The link between Telephony Services and the switch is a *Computer Telephony Integration* (**CTI**) link.

Software integration gives customers flexibility in deploying CTI applications in environments as varied as the multimedia desktop and call centers. The Telephony Services Application Programming Interface (**TSAPI**) supports telephony applications for many different environments.

Telephony Services and TSAPI support telephony control capabilities in a generic, switch-independent way (e.g., support PBXs from various vendors). The architecture allows the incorporation of vendor-specific switch drivers to deliver Telephony Services across various switch environments.

The Telephony Services API is based on international standards for CTI telephony services. Specifically, the European Computer Manufacturers Association (**ECMA**) CTI standard definition of *Computer-Supported Telecommunications Application*s (**CSTA**) is the foundation for TSAPI. The CSTA standard is a technical agreement reached by an open, multi-vendor consortium of major switch and computer vendors. Since CSTA Services and

Protocol definitions are the basis for TSAPI, TSAPI provides a generic, switch-independent API.

Various vendors may support a subset of the TSAPI programming interface on their CTI links. Programmers should consult corresponding vendor documentation for application development.

The TSAPI programming interface definition incorporates ECMA CSTA telephony call control services, call/device monitoring services, query services, and services. CSTA services logically integrate the two most common pieces of equipment on users' desktops: the telephone and personal computer.

Security administration for Telephony Services allows administrators to restrict user access to TSAPI features in various ways. For example, an administrator may restrict a user to control and monitoring of the telephone at their desktop. Similarly, an administrator can restrict a user to call control and monitoring of the telephone at any desktop where they log in. Expanded security permissions can increase a user's control in support of work group or departmental telephony applications. Administrators can expand user permissions even further to include any telephone or device that it is possible to control on a CTI link. An administrator might assign an unrestricted security permission level to a server application that processes calls before call delivery to user desktops in a call center environment. Of course, an administrator can assign different users different permissions.

The Telephony Services API is compatible with the following clients: Microsoft® Windows™, Microsoft® Windows 95™, Microsoft® Windows NT™, Novell® NetWare®, IBM® OS/2™, Apple® Macintosh™, UnixWare™, and HP-UX® UNIX™ clients. The Telephony Services API is also compatible with Novell® NetWare® and Microsoft® Windows NT™ server environments. The Telephony architecture permits future growth into other client and server environments while preserving the TSAPI programming interface.

Future releases might extend Telephony Services to include desktop communication services available from non-switch servers. Possible enhancements could provide desktop voice messaging capabilities from a voice messaging server, facsimile capabilities from a fax server, voice response capabilities from a voice response server, etc.

Chapter 2 Introduction

The native network operating systems (NOS) provide APIs that allow client and server applications to offer users a variety of computing services (for example, file and print services). Telephony Services expand the set of NOS services and bring together the two most common pieces of equipment on an end user's desktop, the telephone and personal computer. These two environments are integrated using TSAPI, a switch-independent standards-based API.

Purpose

This document specifies Telephony Services Application Programming Interface (**TSAPI**) services and C programming language syntax. TSAPI is compatible with Microsoft Windows, Microsoft Windows 95, Microsoft Windows NT, Novell NetWare, IBM OS/2, Apple Macintosh, UnixWare, and HP-UX UNIX clients. TSAPI is also compatible with Novell NetWare® and Microsoft Windows NT server environments. The Telephony architecture permits future growth into other client and server environments while preserving the TSAPI programming interface.

The reader should be familiar with telephony and the ECMA Computer-Supported Telecommunications Application (CSTA) service, and protocol definitions, i.e., ECMA-179 and ECMA-180. The ECMA CSTA standard is the basis for TSAPI service and parameter definition. Write to ECMA at the address below to obtain copies of these standards.

European Computer Manufacturers Association
114 Rue du Rhône
CH-1204 Geneva
Switzerland
Telephone: 41 22 735 36 34

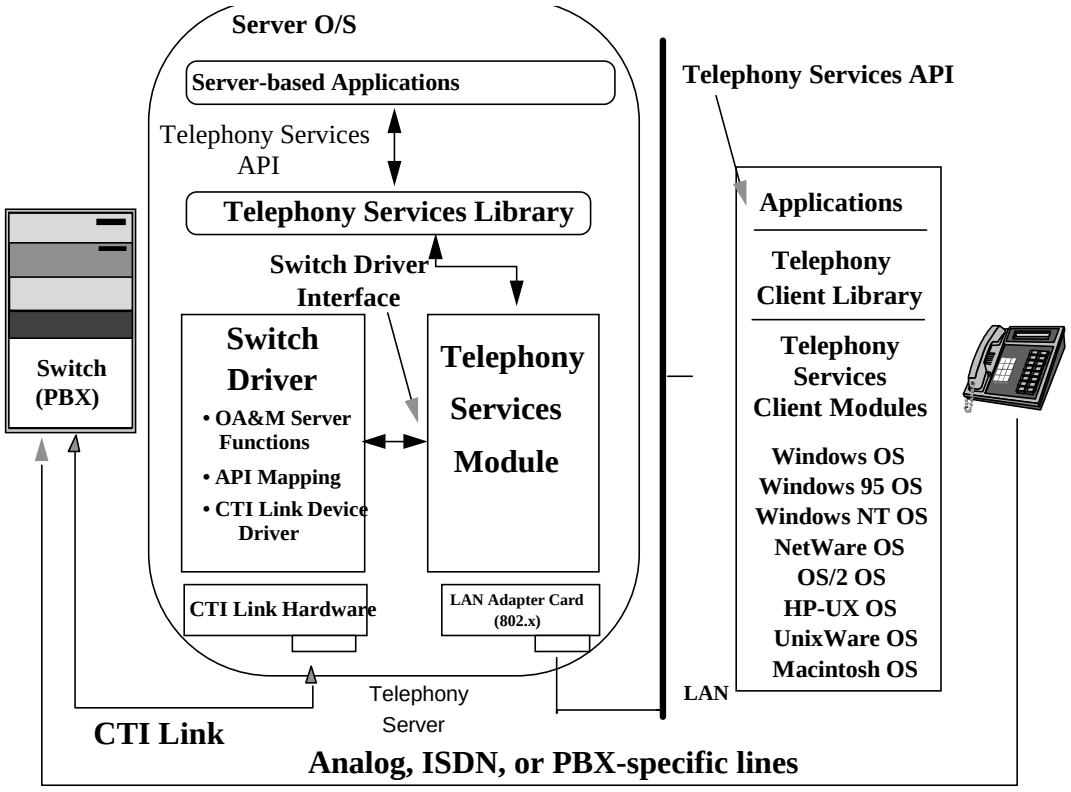
"41" above is the United States International Calling code for Switzerland.

Product Architecture

This NOS environment, along with Telephony Services, supports stand-alone or distributed telephony applications on multiple clients/servers. In the case of a distributed application, client and server platforms contain the appropriate application components. For example, the client platform may embody the user interface and local control of the user's telephone. The server platform may use call information to route calls or look up caller information before the switch delivers calls to users' telephones. The NOS supports the client/server communication and interaction between Telephony Services and the application (client or server based).

Since Telephony Services provides a standard API (TSAPI), it facilitates the development and use of telephony- enabled client and server applications. Figure 2-1 illustrates the architecture of Telephony Services. Note that a switch-specific driver terminates the CTI link, thereby making the other Telephony Services modules switch-independent.

Figure 2-1
Telephony Services Architecture



Telephony Services consists of the following hardware and software components (refer to Figure 2-1):

- **CTI Link** — this link supports the Computer Telephony Integration (**CTI**) protocol that logically integrates the telephone and the client

workstation at users' desktops. A CTI link connects link specific hardware in the server and the switch. It provides sessions between TSAPI applications and the call processing software within the switch. The CTI link is PBX specific.

- **CTI Link Hardware** — is any server hardware that terminates the CTI link to a switch. This hardware is PBX vendor specific.

- **Switch Driver** — a set of software modules which support and terminate the switch-specific CTI link and protocol; map the CTI protocol to the TSAPI (if required); support any Administration and Maintenance capabilities of the switch driver (if any); and support a driver interface to the CTI Link Hardware. The Switch Driver modules are PBX vendor specific.

- **Switch Driver Interface** — a software interface between the Switch Driver and the Telephony Services module that passes messages between applications and the switch driver. Typically, the messages consist of CSTA service requests, responses, and events for TSAPI clients. The messages may also be administration and maintenance requests, responses, and events for an application doing PBX Driver Administration or Maintenance. The Switch Driver Interface is PBX independent and supports any Telephony Services compliant driver.

- **Telephony Services module** — this software module provides communication between multiple telephony-enabled applications and the switch driver. The Telephony Services module routes messages from the Switch Driver to the applications waiting for telephony events and passes the messages received from applications (TSAPI Service Requests) to the Switch Driver. All messages between client applications and a PBX Switch Driver pass across the Switch Driver Interface. The Telephony Services module enforces user restrictions administered in the Telephony Server's security database. This module is switch-independent and supports any Telephony Services compliant driver.

- **Telephony Server** — for convenience, an instance of the Telephony Services module software running on a particular NOS server is referred to as a Telephony Server.

- **Telephony Services API (TSAPI)** — the CSTA-based, C language definition of the functions (services), data types (parameters and

structures), and event messages that telephony-enabled applications use to access Telephony Services. This document specifies TSAPI. TSAPI is switch-independent and supports any Telephony Services compliant driver.

- **Telephony Server Library** — server-based applications use this software module to access TSAPI functions. This library accepts TSAPI Service Requests and delivers responses and events to server applications. This library can run on the same physical NOS server as Telephony Services or on any NOS server in the network. This module is switch-independent and supports any Telephony Services compliant driver.

- **Telephony Client Library** — client-based applications use this software module to access TSAPI functions. This library accepts TSAPI Service Requests and delivers responses and events to client applications. This module is switch-independent and supports any Telephony Services compliant driver.

In summary, the following software modules and interfaces are switch-independent and support any Telephony Services compliant driver:

- Switch Driver Interface
- Telephony Services
- Telephony Services API (TSAPI)
- Telephony Server Library, and the
- Telephony Client Library

The following software/hardware modules are switch specific:

- CTI Link
- CTI Link Hardware, and the
- Switch Driver

Telephony Services Applications

Telephony Services supports a variety of telephony-enabled applications. It can support voice control applications that allow the user to manage and control incoming and outgoing calls at the desktop or more complex applications for the office work group or call center environment. Applications can provide a variety of features to enhance user telephone control from the client workstation. Application features may include:

- call management
- call screening
- call logging
- directory dialing from personal (client), workgroup (server), and corporate directories
- dialing and integration with other applications, and
- integration of message waiting indicator for email or other messaging applications

Telephony-enabled applications can meet customer needs in many markets. For example, a customer service application can allow agents to interact with both the ’’telephony" and "caller database" aspects of the job. An easy-to-use graphical user interface (GUI) application can include the caller information on a "screen pop" at agents’ PCs. Any server on the network (PC, mini-computer, or mainframe) can contain a caller database. The application integrates access to all the different information (voice and data) needed to support an inbound customer service center. Another example of such an application is call routing. Here, the switch requests that the server provide a destination for incoming calls. Applications may also request outbound calls for Outbound Call Management (OCM) applications such as predictive dialing.

Chapter 3 TSAPI Call Model

This chapter describes concepts from the ECMA CSTA standard that are important for TSAPI application programming. The information presented here is summarized from the CSTA specifications. The complete specification is available from ECMA at the address given in Chapter 2.

Terminology

The following sections provide TSAPI definitions and acronyms. For clarity, the ECMA terms begin with capital letters throughout this section.

Definitions

ACD Agent: A telephony user that is a member of an inbound or outbound Automatic Call Distribution (ACD) group. ACD Agents first sign on (Login) to an ACD group and then the ACD will distribute calls to the agent.

Active Call: The call (at a station) that is connected (in a talking state) at that station. More specifically, the Connection (see *Connection*) for the Active Call is in the Connected State (see *TSAPI Connections* section, *Connection State* definition).

Alerting Call: A call that is ringing at a Device. More specifically, the Connection (see *Connection*) for an Alerting Call is in the Alerting State. When the Device is a telephone, the Alerting Call is ringing the telephone instrument.

Application: A cooperative process distributed between a Switching Function (see *Switching Function*) and a Computing Function (see *Computing Function*).

Application Domain: The union of one Switching Sub-Domain (see *Switching Sub-Domain*) and one Computing Sub-Domain (see *Computing Sub-Domain*).

Basic Call: A Call (see *Call*) between exactly two Devices (see *Device*).

Call (TSAPI programming object): A Switching Function communications relationship. Typically, a Call is a communications relationship between two or more Devices. Note, however, during call set-up and release, there may be only one Device on the Call. A Call is a TSAPI programming object.

Call Identifier: A TSAPI programming handle that identifies a Call

Complex Call: A Call connecting more than two Devices.

Computing Domain: Those computers (and their Objects) accessible from a Switching Function. Where a switch has multiple CTI links to multiple computers, the Computing Domain is the union of all computers connected to the switch.

Computing Function: A computer or other resource in a Computing Sub-domain.

Computing Sub-Domain: Those computers (and their Objects) accessible from the Switching Function using a specific CTI link. Where a switch has multiple CTI links to multiple computers, the Computing Sub-Domain is a subset of the Computing Domain. Where the switch has a single CTI link, the Computing Sub-Domain is equivalent to the Computing Domain.

Connection (TSAPI programming object): A relationship between a Call and a Device. A Connection is in one of a number of states (alerting, held, connected, etc.). Note that when a Call connects (for example) three Devices, there are three Connections for the Call. Each Connection reflects the state of the Call at one of the Devices.

Connection Identifier (TSAPI programming handle): A TSAPI programming handle that identifies a Connection. A Call Identifier and a Device Identifier comprise a TSAPI Connection Identifier.

Device (TSAPI programming object): An Object which abstracts the interface between a user and the communications signaling in the Switching Function. A Device can be a single endpoint (such as a telephone), or multiple endpoints that form a group (ACD group or trunk group).

Device Identifier (TSAPI programming handle): A TSAPI programming handle that identifies a Device.

Directory Number: The phone number for a Device. Directory Numbers typically denote telephone station Devices, but ACD groups and other Devices may have Directory Numbers also.

Domain: The union of a Switching Domain and a Computing Domain.

Event: A stimulus of interest to an Application that (typically) causes a change in the state of a Device object.

Event Report: A message from a Switching Sub-Domain to a Computing Sub-Domain indicating that an Event has occurred.

Held Call: A call (at a station) that is held (in a hold state) at that station. More specifically, the Connection (see *Connection*) for a Held Call is in the Hold State (see *TSAPI Connections* section, *Connection State* definition).

Interconnection Service Boundary: An abstraction of the boundary between the Switching Domain and the Computing Domain. In practice, CTI links bridge the Interconnection Service Boundary.

Object: TSAPI programming objects include Connections, Calls, and Devices. Each has a corresponding programming handle, or identifier.

Party: A telephony user. A Party may be a human, application, or other resource (such as a port on a voice response unit).

Service: The benefit provided by an Application to a User.

Service Boundary: A specific CTI interface between a Computing Function and a Switching Function. All Service boundaries cross the Interconnection Service Boundary.

State: An object's current condition. Specifically, TSAPI Connectionshave an associated state.

Switching Domain: Those switches (and their Objects) accessible from a Computing Function. Where a computer has multiple CTI links to multiple switches, the Switching Domain is the union of all switches connected to the computer.

Switching Function: A switch in a Switching Sub-domain.

Switching Sub-Domain: Those switches (and their Objects) accessible from a Computing Function using a specific CTI link. Where a computer has multiple CTI links to multiple switches, the Switching Sub-Domain is a subset of the Switching Domain. Where the computer has a single CTI link, the Switching Sub-Domain is equivalent to the Switching Domain.

User: A person, process or piece of equipment that receives direct benefit (e.g. new feature, improved performance) from an Application's Services.

Acronyms

ACD: Automatic Call Distribution

CSTA: Computer-Supported Telecommunications Applications

ID: Identifier

ISDN: Integrated Services Digital Network

Architecture

This section summarizes the functional architecture underlying ECMA CSTA and TSAPI. CSTA defines the interworking between Computing and Switching Functions in a way that is independent of their physical implementation. This section introduces the concepts of

- distribution of Computing and Switching Functions
- TSAPI Service
- client/server model
- and TSAPI objects

An Application is a cooperative process distributed between a Switching Function (switch) and a Computing Function (computer). This section describes the interactions between them.

Distribution of Computing and Switching Functions

One (or several) computers in a computing network provide the Computing Functions and one (or several) switches provide the Switching Functions for a TSAPI Application. The TSAPI application appears to a User (human or machine) to be a single application, not as two separate functions on two separate networks (as it is, in fact, implemented).

Since the applications use distributed resources, communications must occur between the distributed entities. Figure 3-1 shows an abstract communications model. Note that each of the distributed functions is expanded into:

- a client application component that provides the TSAPI interactions
- a server communications component that exchanges messages
- networking support, or lower layer interconnection

Figure 3-1
Model Showing the Relationship Between TSAPI Elements

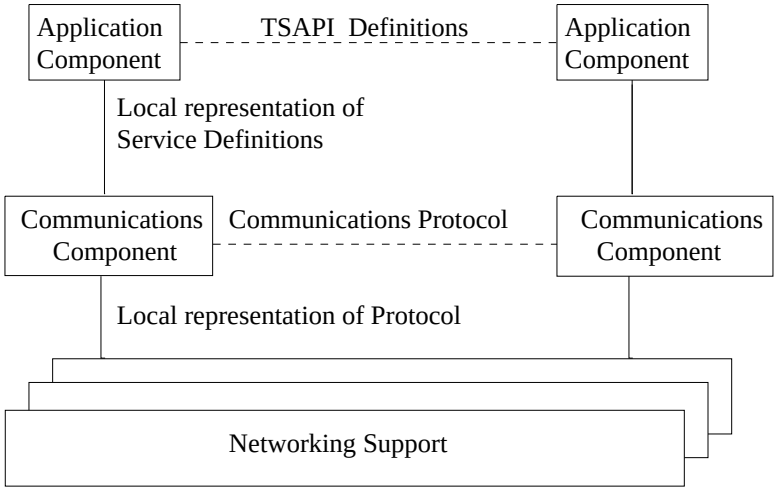


Figure 3-1 shows that distributed Application components use TSAPI definitions to interact with their peers. TSAPI defines the Service descriptions and provides the service interface between the Application functions and the Server providing communications with the switch. TSAPI supports various switches, and as a consequence, some of the TSAPI elements are optional and their use is implementation dependent.

API Services

Unless otherwise qualified, the TSAPI definition uses the term ’Service’ to refer to the benefit that an application server provides to a client application. TSAPI Services are independent of the specific CTI link connecting the switch with the application server. Since TSAPI is independent of the particular telephone terminal types, the Switching Function must determine how to support a given TSAPI request for its specific telephone types. For example, TSAPI does not specify how to provide the Make Call Service for analog or ISDN telephones. A Switching Function will use its existing service

definitions to provide TSAPI Services on telephones where that service already exists.

TSAPI definitions do not embody the specific details of how the Switching Function accomplishes TSAPI Services. The Switching Function does provide an abstraction to the TSAPI Service requester, via Event Reports, of the steps taken to accomplish the Service.

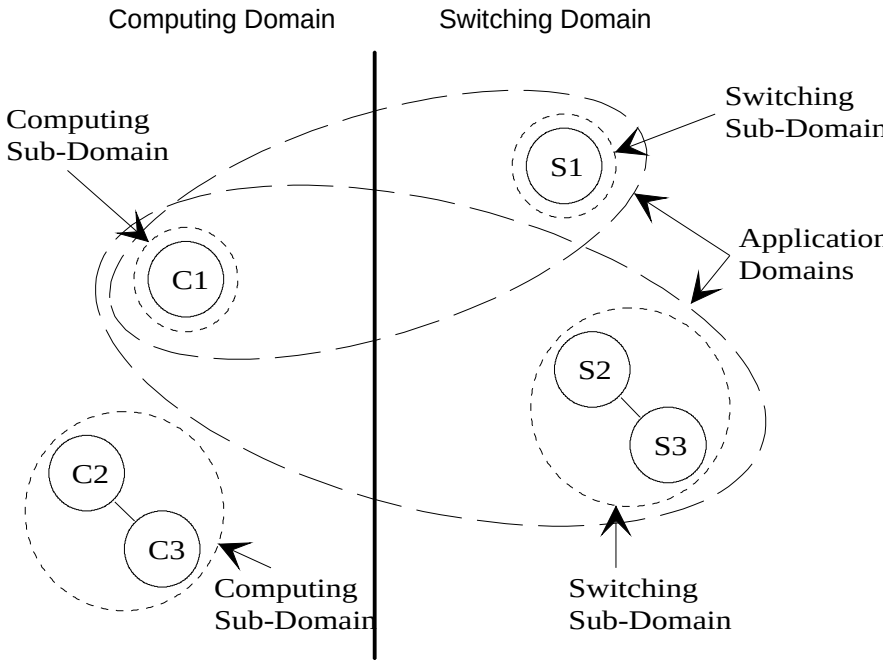
Services and Objects

A server provides services to a client that consist of monitoring and controlling Switching Sub-Domain objects. TSAPI defines the client application interface for monitoring and controlling these objects.

Functions

A Domain is the union of a Switching Domain and a Computing Domain. In other words, it is those switching and computing objects that an application can access. Figure 3-2 shows an example of a Domain. A heavy line divides the Domain into Switching and Computing Domains. The Switching Domain consists of Switching Functions S1, S2, and S3. Similarly, the Computing Domain consists of Computing Functions C1, C2, and C3. Each Function has a view of the Domain where it resides. Note that if multiple Functions provide an application with the same view, then the Functions are in the same Sub-Domain. TSAPI Applications (shown in Figure 3-2 as "Application Domains") are distributed across at least one Switching Sub-Domain and at least one Computing Sub-Domain.

Figure 3-2
Domains and Sub-Domains



TSAPI Switching Sub-Domain Model

The Switching Sub-Domain Model defines an abstract view of a Switching Function. TSAPI defines several Switching Sub-Domain Model Objects for use in Application programming, Call, and Connection.

TSAPI Device

A TSAPI application can monitor and control Devices of various types (including telephones). However, a TSAPI application may not be able to monitor or control all Devices. In CSTA, a Device can refer to either a physical device (such as buttons, lines, trunks, and stations) or a logical device (such as groups of devices, pilot numbers, and ACDs). Devices have associated attributes, which allow applications to monitor and control them.

TSAPI Device attributes are:

1. **Device Type** - A Device has one of the following types:

   - ***ACD*** - An Automatic Call Distributor (ACD) is a Switching Function mechanism that distributes calls to ACD agents. An ACD (as opposed to ACD-group) consists only of the distribution mechanism and not the ACD agents (or their Devices) to which the mechanism can distribute calls.

   - ***ACD group*** - An Automatic Call Distributor (ACD) group is the mechanism that distributes calls within a Switching Function as well as the ACD agent Devices to which that mechanism distributes calls.

   - ***Button*** - is an instance of a call manipulation point at an individual station. Simple analog stations often have no physical buttons but behave as if they had one. Some advanced stations can emulate several analog stations and often represent those stations with several buttons. In some situations it is desirable to identify a given button on a multi-button station. Note that a station with several line appearance buttons could have either the same telephone number or different telephone numbers assigned to those buttons.

   - ***Button group*** - is two or more instances of a Button at an individual station.

   - ***Line*** - is a communications interface to one or more stations typically associated with a directory number. In some situations it may be impossible to identify individual stations that share a line (a single directory number).

   - ***Line group*** - is a set of communications interfaces to one or more stations.

   - ***Operator*** - also known as Attendant, is a device that is used to interact with a party to assist in call setup or to provide other telecommunications service. This device is different from other devices in that it is often involved in setting up other calls, and is usually not part of the call after the call is connected.

- ***Operator group*** - two or more operator devices used interchangeably or addressed identically.

- ***Station*** - is the traditional telephone device. A station is a physical unit of one or more buttons and one or more lines.

- ***Station group*** - is two or more stations used interchangeably or addressed identically.

- ***Trunk*** - a device that spans switching sub-domains. In order to monitor and control calls that cross switching sub-domains it may be desirable to address the point at which the call crosses the boundary. This point is generally a trunk or trunk group.

- ***Trunk group*** - often, many trunks connect to the same place. These trunks are often placed in groups and accessed using a single identifier. In such a configuration the individual trunks are used interchangeably.

2. **Device Class** - An application may monitor or control TSAPI Devices in the various Device Classes in different ways. A Device must belong to one, and may belong to more than one, of the following classes:

   - ***Data*** - a device that is used to make digital data calls (either circuit switched or packet switched). This class includes computer interfaces and G4 facsimile machines.

   - ***Image*** - a device that is used to make digital data calls involving imaging, or high-speed circuit-switched data in general. This class includes video telephones and CODECs.

   - ***Voice*** - a device that is used to make audio calls. This class includes all normal telephones, as well as computer modems and G3 facsimile machines.

   - ***Other*** - a type of device not covered by data, image, or voice.

3. **Device Identifier** - a TSAPI programming handle for a Device that allows an application to identify uniquely each device at the API. Devices are identified using static and/or dynamic identifiers:

- ***Static Device Identifier*** - A Static Device Identifier is stable over time. It remains constant and unique over calls. A Static Device Identifier is typically the dialed number for the Device known by both the Computing and Switching Functions.

  It is sometimes useful for the Switching Function to convert long phone number identifiers to another, usually shorter, static form for subsequent use in service interaction. An example of this would be the transformation of a Public Directory Number to a Private Directory Number.

  This transformation allows service interactions to be independent of the identification mechanism and allows reduction in the amount of data exchanged. This transformed number is known as a Short Form Static Device Identifier.

  Some Switching Functions allow the same dialed number to be assigned to Devices of different types. Thus, a TSAPI application may also need to use the Device Type to uniquely address the Device.

- ***Dynamic Device Identifier*** - A Switching Function may not always make a Static Device Identifier available for every Device on a call. This may occur because a static identifier may not be available (there is no dialed number identifier for the device), or because a dialed number does not unambiguously refer to a single device (i.e. a group identifier). In these cases, the Switching Function assigns a Dynamic Device Identifier as a handle for the Device for the duration of the call. Management of the Dynamic Device Identifier is discussed in a later section, *Dynamic Identifier Management.*

4. **Device State** - is a list of the Connection States for all the calls which are associated with the Device. For information about Connection states see *TSAPI Connections* later in this chapter.

Call

TSAPI applications can monitor and control calls (including call establishment and release). In certain operations, such as conference and transfer, one Device in a Call is replaced with another Device or two Calls merged into a

single Call. In these situations, the TSAPI Call object is maintained as long as the communications relationship remains across each operation (i.e., the call survives transfer, conference, and forwarding operations). TSAPI Call object attributes are:

1. **Call Identifier** - a Call Identifier is a TSAPI programming handle that the Switching Function assigns to each Call. The Call ID may or may not be unique among all calls within a Switching Sub-Domain, but coupled with a Device ID, the pair will form a unique Connection ID within a Switching Sub-Domain. To allow reference to a nascent call, the switch will assign a Call ID before a call is fully established. For example, a switch will assign a Call ID to an incoming call when the called Device is Alerting (the assignment is done before the call is answered).

   Certain Services merge multiple calls into a single call. Examples of such TSAPI Services are Transfer and Conference. During operations of Services that merge multiple calls, the call identifier may change, but the call continues as a TSAPI object. The management of the call identifier is described in a later section, *Dynamic Identifier Management.*

2. **Call state** - is a list of the Connection states for all the Devices that are a part of the Call.

   For simplicity, common call states for two-party calls have been given a single descriptive name. For example, a two-party call with a Connection State of "Connected" at one station and a Connection State of "Alerting" at the other has a Call State of "Delivered". Table 3-1 gives the mapping of descriptive names to Connection State lists for two-party calls. Simple call states are provided as single values, whereas uncommon call states are provided as a list. For more information on Connection States, see the following section, *TSAPI Connections*. The *Call States* section of this chapter gives further information about Call States.

TSAPI Connections

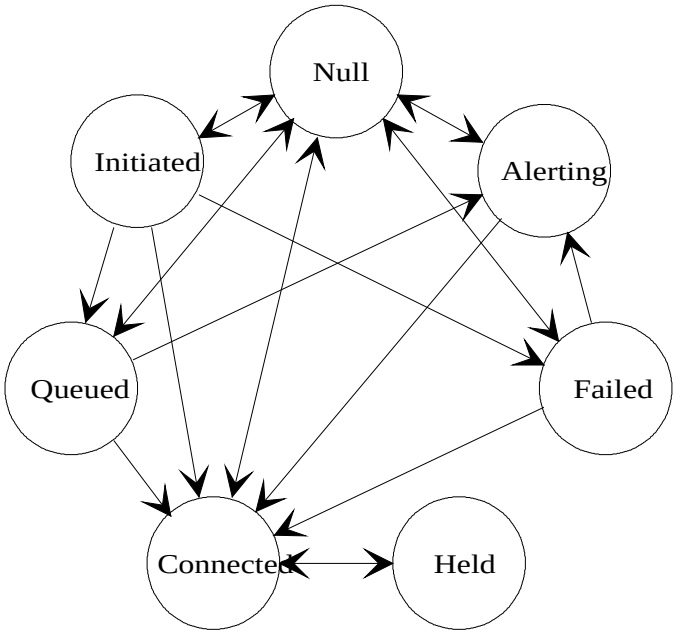
A Connection is a relationship between a Call and a Device. A TSAPI application can monitor or control a Connection. For example TSAPI Services

Hold Call, Reconnect Call, and Clear Call all control Connections. Connections are TSAPI programming objects with the following attributes:

1. **Connection Identifier** – is a TSAPI handle that is made up of a Call Identifier and Device Identifier. For a call, there are as many Connection identifiers as there are associated devices. Similarly, for a device there are as many Connection identifiers as there are associated calls. The Connection Identifier is unique within a Switching Sub-Domain and within a single TSAPI server. A TSAPI application cannot use a Connection Identifier until it has received the identifier from the Switching Function.

2. **Connection State** - is the state of a call at a Device. The Connection state always refers to a single Call/Device relationship. Snapshot Services report Connection States for Calls and Devices. Monitors report Events, which are changes in Connection States for the monitored entity. Figure 3-3 shows a sample Connection state model. Note that since TSAPI is switch-independent, and since switch features vary from switch to switch (and therefore interact differently on different switches), there is no definitive TSAPI Connection State model to which all switches comply.

Figure 3-3
Sample Connection State Model



The transitions between states, shown by arrows, form the basis for providing Event Reports.

The TSAPI Connection states are defined as follows.

- ***Null*** - the state where there is no relationship between the call and device.
- ***Initiated*** - the state where the device is requesting service. Usually this results in the creation of a call. Often this is thought of as the "dialing" state.
- ***Alerting*** - the state where a device is alerting (ringing).
- ***Connected*** - the state where a device can communicate with other Devices on a call (cannot be a held call).

- ***Held*** - the call is "on hold" at the Device.
- ***Queued*** - the state where normal state progression has been stalled. For example, a call being processed by an ACD that is waiting for an ACD agent to become available is "queued".
- ***Failed*** - the state where normal state progression has been aborted. A "Failed" state can result because of failure to connect to the calling (originator) device, failure to connect the called (destination) device, failure to create the call, and other reasons.

Call Status Event Reports

The Switching Sub-Domain model is an abstract view of call states and events. This abstract view is probably more detailed than most applications require, but it introduces a precise language for describing Event Reports, Call States, and Service functional descriptions. Connection state changes correspond to telecommunications signaling at a Device.

ISDN specifications model network access as a distributed state machine. ECMA CSTA borrows from this ISDN model. One part of this access state machine resides in the Device. There is another similar distributed access state machine which resides across the ISDN network at the egress device.

Thus, a call can be modeled as a collection of Connection state machines. Network signaling causes changes in the state machines across the network. When signaling occurs, a state change occurs at the affected Connection.

Many simple Connection events are of interest to applications. Certain telecommunications operations involve changes to many Connections. TSAPI reports these compound events (such as Transfer, Conference and Clear Call) in a single Event Report. Each TSAPI Event Report defines which Connections have changed state.

TSAPI Call States

A Call State is defined as the list of Connection states for all the Devices involved in the call. This list is also called the **Compound Call State**. Listing the Connection states can describe any possible call state. However, most calls are often in a small number of widely recognized states.

TSAPI defines those states as the **Simple Call States** shown in Table 3-1. Note that Simple Call States can differ by the order of the Connection state list. Alerting-Connected is not equal to Connected-Alerting. The first is the Simple Call State "Received" and the second is "Delivered".

Null can be a known Connection state, so for a "newly created" call it is possible to have a Call state with only one non-Null Connection (see Table 3-1).

For calls with two Connections, Table 3-1 summarizes the Simple Call States assigned to the combinations of Connection States. If there is no entry in Table 3-1 for the combination of Connection states, then TSAPI provides the list.

For calls with more than two non-Null Connection states, The Call State is a compound call state. TSAPI (at times) simplifies the compound call state by relating it to a particular device. The Connection State related to a particular device in this way is called the **Local Connection State**. Other Connection States are not differentiated from one another. A three-party conference call that is on hold at a given Device and connected to the other two devices has a Local Connection State of "Held" at that given Device.

Table 3-1
TSAPI Simple Call States

Local Connection State	Other Connection State	Simple Call state
Alerting	Connected	Received
Alerting	Hold	Received-On Hold
Connected	Alerting	Delivered
Connected	Connected	Established
Connected	Failed	Failed
Connected	Hold	Established-On Hold
Connected	Null	Originated
Connected	Queued	Queued
Hold	Alerting	Delivered-Held
Hold	Connected	Established-Held
Hold	Failed	Failed-Held
Hold	Queued	Queued-Held
Initiated	Null	Pending
Null	Null	Null

Dynamic Identifier Management

Since Connection Identifiers comprise a Device ID and a Call ID, proper management of Connection Identifiers will, in turn, provide proper management of Dynamic Device Identifiers and Call Identifiers.

The Switching Function provides Connection Identifiers when either a new Call or Device Identifier is needed. When a call is made the switch provides a Connection Identifier. The switch then provides the Connection ID in any following Event Reports that pertain to that call. Similarly, the switch provides Connection IDs containing a Device ID for a device involved in a call.

The switch updates identifiers when needed. If a Conference or Transfer (merging two calls) changes a Call ID, then the switch provides Event Reports containing Connection IDs that link the old call identifier to the new identifier. Similarly, if a Dynamic Device Identifier is changed, the switch -provides new Connection Identifiers for the devices in the call. Both Service Acknowledgments and Event Reports may contain information necessary to manage identifiers.

Identifiers cease to be valid when their context vanishes. If a call ends, its call identifier is no longer valid. Similarly, if a device is removed from service or from a call, its dynamic device identifier becomes invalid. Many Event Reports and Services specify when a Connection Identifier has lost or will lose its context.

Identifiers can be reused. Once an identifier has lost its context it may be re-used to identify another object. Most implementations will not reuse identifiers immediately.

Call and Device Identifiers can be, but are not guaranteed to be, globally unique. The TSAPI server ensures that the combination of Call and Device Identifier is globally unique within a Switching Sub-Domain. To accomplish this, compliant PBX drivers ensure that either the call identifier or the device identifier (or both) is globally unique. In many cases, the Connection Identifier requires the use of both the Call and Device Identifiers to uniquely refer to Connections in a call.

Chapter 4 Control Services

TSAPI provides two kinds of control services: API[1] Control Services, or ACS, and CSTA Control Services. Applications use ACS to manage their interactions with Telephony Services. While most applications will use ACS to access CSTA services, applications that administer PBX drivers use ACS to interface to the PBX Driver. ACS functions manage the interface, while CSTA functions (chapters 5 through 9) provide the CSTA services. Applications use ACS to:

- Open an ACS stream for CSTA services
- Open an ACS stream to do PBX Driver administration
- Close an ACS stream
- Block or poll for events
- Initialize an operating system event notification facility. On a Windows, Windows NT, OS/2, Macintosh, or NetWare client, this initializes an Event Service Routine (ESR)
- Get a list of available advertised services (PBX Driver Services and PBX Driver administration services)
- Select the TSAPI version for use on the stream.
- Select a private data version for use on the stream

[1] An API is an Application Programming Interface.

Applications use the CSTA Control Services, discussed in the later sections of this chapter, to:

- Query for the CSTA Services available on an open ACS Stream
- Query for a list of Devices that CSTA Services can monitor, control or route for on an open ACS Stream
- Query to determine if CSTA Call/Call Monitoring is available on an open ACS Stream.

Opening, Closing and Aborting an ACS Stream

To obtain Telephony Services, an application must open an ACS stream (or session). This stream establishes a logical link between the application and call processing software on the switch. The application requests CSTA services (such as making a call) over the stream. Within a Telephony Server, the Telephony Server module and the PBX Driver module cooperate to provide ACS Streams. The Telephony Server also does security checking to ensure that an application receives CSTA services only for permitted Devices. Each application must open an ACS Stream before it requests any services.

An application should only open one stream per advertised service. An application may open multiple ACS streams to multiple advertised services. As PBX drivers initialize, they register the services that they offer (administrative as well as CSTA) with a Telephony Server. . The system then advertises these services to applications. An application opens an ACS Stream to use an advertised service. Each stream carries messages for the application to one advertised service. Since the PBX Drivers are switch specific, some drivers may provide services on a single CTI link, while others provide services on multiple CTI links. An application cannot correlate advertised telephony services with underlying physical CTI links.

Opening an ACS Stream

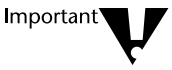
1. **The application calls** acsOpenStream( ).

   acsOpenStream( ) is a request to establish an ACS Stream with a Telephony Server. The **acsOpenStream( )** function returns an ***acsHandle*** to the application. The application will use this ***acsHandle*** to access the ACS Stream (make requests and receive events).

2. **The application receives an** ACSOpenStreamConfEvent **event message that corresponds to the** acsOpenStream(**) request.**

   The application monitors the *acsHandle* (returned from the **acsOpenStream**( ) request) for the corresponding **ACSOpenStreamConfEvent**. The application should not request services on the ACS Stream until it receives this corresponding **ACSOpenStreamConfEvent**.

After an application successfully receives the **ACSOpenStreamConfEvent**, it may request CSTA Services such as Device (telephone) monitoring.



The application should always check the **ACSOpenStreamConfEvent** to ensure that the ACS Stream has been successfully established before making any CSTA Service requests.

An application is responsible for releasing its ACS Stream(s). To release the system resources associated with an ACS Stream, the application may either close the stream or abort the stream. Failing to release the resources may corrupt the client system, resulting in client failure.

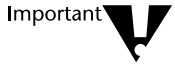
An ***acsHandle*** is a local process identifier and should not be shared across processes.

Closing an ACS Stream

1. **The application calls acsCloseStream( ) to initiate the orderly shutdown of an ACS Stream.**

   After the application calls **acsCloseStream**( ) to close an ACS Stream, the application may not request any further services on that Stream. The

acsCloseStream( ) function is a non-blocking call. The application passes an *acsHandle* indicating which ACS Stream to close. Although the application cannot make requests on that Stream, the *acsHandle* remains valid until the application receives the corresponding **ACSCloseStreamConfEvent.**



After an application calls **acsCloseStream**( ), it may still receive events on the *acsHandle* for that ACS Stream. The application must continue to poll until it receives the **ACSCloseStreamConfEvent** so that the system releases all stream resources. The stream remains open until the application receives the **ACSCloseStreamConfEvent**.

2. The application receives an ACSCloseStreamConfEvent **event message that corresponds to the** acsCloseStream( ) **request.**

An **ACSCloseStreamConfEvent** indicates that the *acsHandle* for the Stream is no longer valid and that the system has freed all system resources associated with the ACS Stream. The last event the application will receive on the ACS Stream is the **ACSCloseStreamConfEvent**. Closing an ACS Stream terminates any CSTA call control sessions on that Stream. Terminating CSTA call control sessions in this way does not affect the switch processing of controlled calls. The application can no longer control them on this Stream.

Aborting an ACS Stream

1. The application calls acsAbortStream( ).

An application may use **acsAbortStream**( ) to unilaterally (and synchronously) terminate an ACS Stream when

- it does not require confirmation of successful Stream closure, and
- it does not need to receive any events that may be queued for it on that Stream.

The application passes an ***acsHandle*** indicating which ACS Stream to abort. The **acsAbortStream**( ) function is non-blocking and returns to the application immediately. When **acsAbortStream**( ) returns, the *acsHandle* is invalid (unlike **acsCloseStream**( )). The system frees all resources associated with the aborted ACS Stream, including any events queued on this Stream. Aborting an ACS Stream terminates any CSTA

call control on that Stream. Aborting CSTA call control in this way does not affect the switch processing of controlled calls. It terminates the application's control of them on this Stream. There is no confirmation event for an **acsAbortStream**( ) call.

Sending CSTA Requests and Responses

After an application opens an ACS Stream (including reception of the **ACSOpenStreamConfEvent)** it may request CSTA services and receive events. In each service request, the application passes the *acsHandle* of the Stream over which it is making the request.

Each service request requires an *invokeID* that the system will return in the confirmation event (or failure event) for the function call. Since applications may have multiple requests for the same service outstanding within the same ACS Stream, *invokeIDs* provide a way to match the confirmation event (or failure event) to the corresponding request. When an application opens an ACS Stream, it specifies (for that Stream) whether it will:

- specify whether it will generate and manage *invokeID*s internally, or
- have the TSAPI library generate unique *invokeID* for each service request.

Once an application specifies this *invokeID* type for an ACS stream, the application cannot change *invokeID* type for the stream.

In general, having the TSAPI library generate unique *invokeID*s simplifies application design. However, when service requests correspond to entries in a data structure, it may simplify application design to use indexes into the data structure as *invokeID*s. Application-generated *invokeIDs* might also point to window handles. Application-generated *invokeIDs* may take on any 32-bit value.

Receiving Events

When an application successfully opens an ACS Stream, the TSAPI Library queues the **ACSOpenStreamConfEvent** event message for the application. To receive this event, and subsequent event messages, the application must use one of two event reception methods:

- a blocking mode, which blocks the application from executing until an event becomes available. Blocking is appropriate in threaded or preemptive operating system environments only (NetWare, UnixWare, OS/2).
- a non-blocking mode that returns control to the application regardless of whether an event is available.

Blocking on event reports may be appropriate for applications that monitor a Device and only require processing cycles when an event occurs. However, there may be operating system specific implications. For example, if a Windows application blocks waiting for CSTA events, then it cannot process events from its Windows event queue.

Regardless of the mode that an application uses to receive events, it may elect to receive an event either from a designated ACS Stream (that it opened) or from any ACS Stream (that it has opened). TSAPI gives the application the events in chronological order from the selected Stream(s). Thus, if the application receives events from all ACS Streams, then it receives the events in chronological order from all the Streams.

Blocking Event Reception

1. The application calls acsGetEventBlock( )

acsGetEventBlock( ) function gets the next event or blocks if no events are available. The application passes an ***acsHandle*** parameter containing the handle of an open ACS Stream or a zero value (indicating that it desires events from any open ACS Stream).

2. acsGetEventBlock( ) **returns when an event is available.**

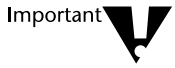
Non-Blocking Event Reception

1. The application calls acsGetEventPoll( )

Applications use **acsGetEventPoll( )** to get poll for events at their own pace. An application calls **acsGetEventPoll**( ) any time it wants to process an event. The application passes an *acsHandle* containing the handle of an open ACS Stream or a zero value (indicating that it desires events from any open ACS Stream). In addition, the *numevents* parameter tells the application how many events are on the queue.

2. acsGetEventPoll( ) **returns immediately**

a. If one or more events are available on the ACS Stream, **acsGetEventPoll**( ) returns the next event from the specified Stream (or from any Stream, if the application selected that option).
b. When the event queue is empty, the function returns immediately with a "no message" indication.



The application must receive events (using either the blocking or polling method) frequently enough so that the event queue does not overflow. TSAPI will stop acknowledging messages from the Telephony Server when the queue fills up, ultimately resulting in a loss of the stream. When a message is available, it does not matter which function an application uses to retrieve it.

In some operating system environments (Windows, Windows NT, OS/2, Macintosh, NetWare), an application can use an ***Event Service Routine*** **(ESR)** to receive asynchronous notification of arriving events. The ESR mechanism *notifies* the application of arriving events. It does not remove the events from the event queue. The application must use **acsGetEventBlock**( )**, acsGetEventPoll**( ), or **eventNotify**( ) to *receive* the message. The application can use an ESR to trigger a specific action when an event arrives in the event queue (i.e. post a Windows™ message for the application, or signal a semaphore in the NetWare® environment). See the manual page for **acsSetESR**( ) for more information about ESR use in specific operating system environments.

TSAPI makes one other event handling function available to applications: **acsFlushEventQueue( )**. An application uses **acsFlushEventQueue( )** to flush all events from an ACS Stream event queue (or, if the application selects, from all ACS Stream event queues).

TSAPI Version Control

As TSAPI evolves over time to support more services, TSAPI will include new functions and event reports. Similarly, PBX driver manufacturers will enhance their private data over time. To ensure that applications written to earlier versions of the system will continue to operate with newer TSAPI libraries and newer PBX drivers, TSAPI provides Version Control.

An application provides a list of the TSAPI versions that it is willing to accept in the ***apiVer*** parameter of the **acsOpenStream( )** function. This parameter contains a string beginning with the characters "TS" followed by an ASCII encoding of one or more version numbers. An application may use the "-" (hyphen) character to specify a range of versions and the ":" (colon) character to separate a list of versions. For example, the string "TS1-3:5" specifies that the application is willing to accept TSAPI versions 1, 2, 3, or 5.

As the system processes the open stream request, each system component checks to see which of the requested versions it supports. If a component cannot support a requested version, it removes that version from the list before passing the request on to the next component. The system opens the stream using the highest (latest) TSAPI version remaining and returns that version to the application in the **ACSOpenStreamConfEvent**. Once a stream is opened, the version is fixed for the duration of the stream. If the system cannot find a suitable version, the open stream request fails and the application receives an **ACSUniversalFailureConfEvent**.

The system returns the selected TSAPI version in the ***apiVer*** field of the **ACSOpenStreamConfEvent**. The version begins with the letters "ST" (the "S" and the "T" are intentionally reversed) followed by a single TSAPI version number. If the contents of the ***apiVer*** field do not begin with the letters "ST", then the application should assume TSAPI version 1.

A set of function calls and events comprise a TSAPI version. New TSAPI functions are given new names, and new events are assigned new event type values. It is the programmer's responsibility to ensure that the program uses only TSAPI functions from the appropriate version set.

Releases 2.10 and 2.21 of Telephony Services provide two TSAPI versions: "TS1" and "TS2".

Versions also exist on a stream-type basis. In Releases 2.10 and 2.21, while there are two TSAPI stream versions ("TS1" and "TS2"), there is a single OAM stream version, version "TS1".

Private Data Version Control

Private Data versions allow an application to request specific version(s) of a specific vendor(s) private data. The application can also specify that a PBX Driver is not to provide any private data and thereby save the LAN bandwidth that the private data will consume.

Although similar in format to the TSAPI version negotiation, the Private Data version negotiation is independent.

To request specific version(s) of specific vendor(s) private data, an application passes negotiation information in the private data of **acsOpenStream( ).** To indicate that the private data is to negotiate the version, the application sets the vendor field in the Private Data structure to the null-terminated string "VERSION". The application specifies the acceptable vendor(s) and version(s) in the data field of the private data. The data field contains a one byte manifest constant PRIVATE_DATA_ENCODING followed by a null terminated ASCII string containing a list of vendors and versions. The string contains vendor/version pairs with the "#" character separating the vendor and version. The "#" character also delimits the vendor/version pairs. The ":" and "-" characters are used as they are for TSAPI version negotiation. For example, the string "VENDORA#1-3#VENDORB#1:3-5" indicates that the application requests VENDORA private data versions 1, 2, or 3; or, VENDORB private data versions 1, 3, 4, or 5.

The Private Data in the **ACSOpenStreamConfEvent** indicates what vendor and version Private Data the PBX driver will provide on the stream. In the Private Data, the ***vendor*** field will contain the vendor name and the ***data*** field in the Private_Data_t structure contains a one byte discriminator PRIVATE_DATA_ENCODING followed by an ASCII string identifying the version of the private data that will be supplied.

An application that does not use Private Data should not pass any private data to the **acsOpenStream( )** request. Drivers that do private data version negotiation interpret the lack of private data in the open stream request to mean that the application does not want private data. They will then refrain from sending private data on that stream, thereby saving the LAN bandwidth that the private data would otherwise consume. Applications that do not send any private data in **acsOpenStream( )** must be prepared to receive private data since they may request service from a PBX Driver that does not do private data version negotiation.

Querying for Available Services

Applications can use the **acsEnumServerNames( )** function to obtain a list of the advertised service names. The presence of an advertised service name in the list does not mean that it is available.

API Control Services (ACS) Functions and Confirmation Events

This section defines the ACS function calls and their confirmation events. Applications use these functions to open ACS streams and to and manage events on ACS Streams between client workstations and the Telephony Server.

acsOpenStream ( )

An application uses **acsOpenStream**( ) to open an ACS stream to an advertised service. An application needs an ACS stream to access other ACS Control Services or CSTA Services. Thus, an application must call **acsOpenStream**( ) before requesting any other ACS or CSTA service. **acsOpenStream**( ) immediately returns an *acsHandle*; a confirmation event arrives later.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t acsOpenStream(
    ACSHandle_t*acsHandle,    /* RETURN */
    InvokeIDType_t    invokeIDType,  /* INPUT  */
    InvokeID_t invokeID,      /* INPUT  */
    StreamType_t      streamType,    /* INPUT  */
    ServerID_t *serverID,     /* INPUT  */
    LoginID_t  *loginID,      /* INPUT  */
    Passwd_t   *passwd,       /* INPUT  */
    AppName_t  *applicationName,      /* INPUT  */
    Level_t    acsLevelReq    /* INPUT  */
    Version_t  *apiVer,       /* INPUT  */
    unsigned short    sendQSize,     /* INPUT  */
    unsigned short    sendExtraBufs, /* INPUT  */
    unsigned short    recvQSize,     /* INPUT  */
    unsigned short    recvExtraBufs  /* INPUT  */
    PrivateData_t     *privateData); /* INPUT  */
```

Parameters

acsHandle
acsOpenStream( ) returns this value that identifies the ACS Stream that was opened. TSAPI sets this value so that it is unique to the ACS Stream. Once **acsOpenStream**( ) is successful, the application must use this *acsHandle* in all other function calls to TSAPI on this stream. If **acsOpenStream**( ) is successful, TSAPI guarantees that the application has a valid *acsHandle*. If **acsOpenStream**( ) is not successful, then the function return code gives the cause of the failure.

invokeIDType
The application sets the type of invoke identifiers used on the stream being opened.

The possible types are: Application-Generated invokeIDs (**APP_GEN_ID**) or Library generated invokeIDs (**LIB_GEN_ID**).

When **APP_GEN_ID** is selected then the application will provide an invokeID with every TSAPI function call that requires an *invokeID.* TSAPI will return the supplied invokeID value to the application in the confirmation event for the service request. Application-generated *invokeID* values can be any 32-bit value.

When **LIB_GEN_ID** is selected, the ACS Library will automatically generate an *invokeID* and will return its value upon successful completion of the function call. The value will be the return from the function call (RetCode_t). Library-generated invoke IDs are always in the range 1 to 32767.

invokeID
The application supplies this handle for matching the **acsOpenStream**( ) service request with its confirmation event. An application supplies a value for *invokeID* only when the *invokeIDtype* parameter is set to **APP_GEN_ID**. TSAPI ignores the *invokeID* parameter when *invokeIDtype* parameter is set to **LIB_GEN_ID**.

streamType
The application provides the type of stream in *streamType*. The possible values are:

> **ST_CSTA** - requests a CSTA call control stream. This stream can be used for TSAPI service requests and responses which begin with the prefix "csta" or "CSTA".
>
> **ST_OAM** - requests an OAM stream.

serverID
The application provides a null-terminated string of maximum size **ACS_MAX_SERVICEID**. This string contains the name of an advertised service (in ASCII format). The application must ensure that the *serverID* provides services of the type given in the *streamType* parameter.

loginID
The application provides a pointer to a null terminated string of maximum size **ACS_MAX_LOGINID**. This string contains the login ID of the user requesting access to the advertised service given in the *serviceID* parameter.

passwd
The application provides a pointer to a null terminated string of maximum size **ACS_MAX_PASSWORD**. This string contains the password of the user given *loginID*.

applicationName
The application provides a pointer to a null terminated string of maximum size **ACS_MAX_APPNAME**. This string contains an application name. The system uses the application name on certain administration and maintenance status displays.

acsLevelReq
This version of TSAPI ignores this parameter.

apiVer
An application gives the version of TSAPI that it desires in *apiVer*.

This parameter contains a string beginning with the characters “TS” followed by an ASCII encoding of one or more version numbers. An application may use the “-” (hyphen) character to specify a range of versions and the “:” (colon) character to separate a list of versions. For example, the string “TS1-3:5” specifies that the application is willing to accept TSAPI versions 1, 2, 3, or 5. See the preceding *TSAPI Version Control* section for more information about version negotiation.

Releases 2.10 and 2.21 of Telephony Services support versions “TS1” and “TS2” on CSTA streams and version “TS1” on OAM streams.

Release 1 applications should supply the Version 1 value for **CSTA_API_VERSION** in the Version 1 *csta.h* header file in ***apiVer***.

sendQSize
The application specifies in *sendQSize* the maximum number of outgoing messages the TSAPI Client Library will queue before returning **ACSERR_QUEUE_FULL**. If the application supplies a zero (0) value, then a default queue size will be used. The UnixWare TSAPI client library does not use the ***sendQSize*** parameter.

sendExtraBufs
The application specifies the number of additional packet buffers TSAPI allocates for the send queue. If *sendExtraBufs* is set to zero (0), the number of buffers is equal to the queue size (i.e., one buffer per message). If messages will exceed the size of a network packet, as in the case where private data is used extensively, or the application frequently sees the **ACSERR_NOBUFFERS** error, then the application does not use *sendExtraBuf* to allocate enough buffers. The UnixWare TSAPI client library does not use the ***sendExtraBufs*** parameter.

recvQSize
The application specifies the maximum number of incoming messages the TSAPI Client Library queues before it ceases acknowledgment to the Telephony Server. TSAPI uses a default queue size when *recvQSize* is set to zero (0). The UnixWare TSAPI client library does not use the ***recvQSize*** parameter.

recvExtraBufs
The application specifies the number of additional packet buffers that TSAPI allocates for the receive queue. If *recvExtraBufs* is set to zero (0), the number of buffers is equal to the queue size (i.e., one buffer per message). If messages will exceed the size of a network packet, as in the case where private data is used extensively, or the application frequently sees **ACSERR_STREAM_FAILED**, then the application does not use *recvExtraBufs* to allocate enough buffers. The UnixWare TSAPI client library does not use the ***recvExtraBufs*** parameter.

privateData
The application may provide a pointer to a data structure that contains any implementation-specific (PBX Driver specific) initialization. TSAPI does not interpret the data in this structure. Some PBX Drivers may use Private Data as an "escape mechanism" to provide implementation specific information between the application and the PBX Driver. An application gives a NULL pointer when Private Data is not present.

In an open stream request, an application may use the private data to negotiate a specific version(s) of a specific vendor(s) private data on the stream.

To indicate that the private data is to negotiate the version, the application sets the vendor field in the PrivateData structure to the null-terminated string "VERSION". The application specifies the acceptable vendor(s) and version(s) in the data field of the private data. The data field contains a one byte manifest constant PRIVATE_DATA_ENCODING followed by a null terminated ASCII string containing a list of vendors and versions. The string contains vendor/version pairs with the "#" character separating the vendor and version. The "#" character also delimits the vendor/version pairs. The ":" and "-" characters are used as they are for TSAPI version negotiation. For example, the string "VENDORA#1-3#VENDORB#1:3-5" indicates that the application requests VENDORA private data versions 1, 2, or 3; or, VENDORB private data versions 1, 3, 4, or 5. No private data on an open stream request is a request to the PBX driver not to send any private data. Only those PBX drivers that support private data version negotiation will honor this request.

See the preceding *Private Data Version Control* section for information on private data version negotiation.

Return Values

acsOpenStream( ) returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated invokeIDs - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated invokeIDs - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

An application should always check the **ACSOpenStreamConfEvent** message to ensure that the Telephony Server has acknowledged the **acsOpenStream**( ) request.

acsOpenStream( ) returns the negative error conditions below:

ACSERR_APIVERDENIED
The requested API version (*apiVer*) is invalid or the client library does not support it.

ACSERR_BADPARAMETER
One or more of the parameters is invalid.

ACSERR_NODRIVER
No TSAPI Client Library Driver was found or installed on the system.

ACSERR_NOSERVER
The advertised service (*serverID*) is not available in the network.

ACSERR_NORESOURCE
There are insufficient resources to open a ACS Stream.

Comments

An application uses **acsOpenStream**( ) to open a network or local communication channel (ACS Stream) with an advertised service (PBX Driver). The stream will establish an ACS client/server session between the application and the server. The application can use the ACS stream to access all the server-provided services (e.g. for a typical PBX Driver this would include **cstaMakeCall**, **cstaTransferCall**, etc.). **acsOpenStream**( ) returns an *acsHandle* for the stream. The application uses the *acsHandle* to wait for a **ACSOpenStreamConfEvent.** The application uses the **ACSOpenStreamConfEvent** to determine whether the stream opened successfully. The application then uses the *acsHandle* in any further requests that it sends over the stream. An application should only open one stream for any advertised service.

When an application calls **acsOpenStream**( ) the call may block for up to ten (10) seconds while TSAPI obtains names and addresses from the network Name Server.

Applications should not open multiple streams to the same advertised service since this results in inefficient use of system resources.

The UnixWare TSAPI client library does not use the ***sendQsize***, ***sendExtraBufs***, ***recvQsize***, or ***recvExtraBufs*** parameters.

Application Notes

A Telephony Server advertises services for each registered PBX Driver. A PBX Driver may support a single CTI link or multiple CTI links. Each advertised service name is unique on the network.

TSAPI guarantees that the **ACSOpenStreamConfEvent** is the first event the application will receive on ACS Stream if no errors occurred during the ACS Stream initialization process.

The application is responsible for terminating ACS streams. To do so, an application either calls **acsCloseStream**( ) (and receives the **ACSCloseStreamConfEvent),** or calls **acsAbortStream**( ). It is imperative that an application close all active stream(s) during its exit or cleanup routine in order to free resources in the client and server for other applications on the network.

The application must be prepared to receive an **ACSUniversalFailureConfEvent** (for any stream type)**, CSTAUniversalFailureConfEvent** (for a CSTA stream type) or an **ACSUniversalFailureEvent** (for any stream type) anytime after the **acsOpenStream**( ) function completes. These events indicate that a failure has occurred on the stream.

ACSOpenStreamConfEvent

This event is generated in response to the **acsOpenStream**( ) function and provides the application with status information regarding the requested open of an ACS Stream with the Telephony Server. The application may only perform the ACS functions **acsEventNotify**( )**, acsSetESR**( ), **acsGetEventBlock**( )**, acsGetEventPoll**( ), and **acsCloseStream**( ) on an *acsHandle* until this confirmation event has been received.

Syntax

The following structure shows only the relevant portions of the unions for this message. See section ***4.3, ACS Data Types*** and ***4.6, CSTA Data Types*** for a more complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        ACSOpenStreamConfEvent_t      acsopen;
                } u;
        }  acsConfirmation;
    } event;
} CSTAEvent_t;

typedef struct ACSOpenStreamConfEvent_t
{
    Version_t  apiVer;
    Version_t  libVer;
    Version_t  tsrvVer;
    Version_t  drvrVer;
} ACSOpenStreamConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **ACSCONFIRMATION**, which identifies this message as an ACS confirmation event.

eventType
This is a tag with the value **ACS_OPEN_STREAM_CONF**, which identifies this message as an ACSOpenStreamConfEvent.

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific function request with its confirmation events.

apiVer
This parameter indicates which version of the API was granted. The version begins with the letters "ST" (the "S" and the "T" are intentionally reversed. Note that the application supplies string had the letters in the order "TS") followed by a single TSAPI version number. If the contents of the ***apiVer*** field do not begin with the letters "ST", then the application should assume TSAPI version 1. See the preceding *Private Data Version Control* section for information on private data version negotiation.

libVer
This parameter indicates which version of the Library is running.

tsrvVer
This parameter indicates which version of the TSERVER is running.

drvrVer
This parameter indicates which version of the Driver is running.

Comments

This message is an indication that the ACS Stream requested by the application via the **acsOpenStream**( ) function is available to provide communication with the Telephony Server. The application may now request call control services from the Telephony Server on the acsHandle identifying this ACS Stream. This message contains the Level of the stream opened, the identification of the server that is providing service, and any Private data returned by the Telephony Server.

The Private Data in the **ACSOpenStreamConfEvent** indicates what vendor and version Private Data the PBX driver will provide on the stream. In the Private Data, the ***vendor*** field will contain the vendor name and the ***data*** field in the Private_Data_t structure contains a one byte discriminator PRIVATE_DATA_ENCODING followed by an ASCII string identifying the version of the private data that will be supplied.

Application Notes

The **ACSOpenStreamConfEvent** is guaranteed to be the first event on the ACS Stream the application will receive if no errors occurred during the ACS Stream initialization.

acsCloseStream( )

This function closes an ACS Stream to the Telephony Server. The application will be unable to request services from the Telephony Server after the **acsCloseStream**( ) function has returned. The *acsHandle* is valid on this stream after the **acsCloseStream**( ) function returns, but can only be used to receive events via the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) functions. The application must receive the **ACSCloseStreamConfEvent** associated with this function call to indicate that the ACS Stream associated with the specified *acsHandle* has been terminated and to allow stream resources to be freed.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t acsCloseStream (
    ACSHandle_t acsHandle,      /* INPUT */
    InvokeID_t invokeID,        /* INPUT */
    PrivateData_t      *privateData); /* INPUT */
```

Parameters

acsHandle
This is the handle for the active ACS Stream which is to be closed. Once the confirmation event associated with this function returns, the handle is no longer valid.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the acsOpenStream( ). The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

privateData
This points to a data structure which defines any implementation-specific information needed by the server. The data in this structure is not interpreted by the API Client Library and can be used as an escape mechanism to provide implementation specific commands between the application and the Telephony Server.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **ACSCloseStreamConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

acsCloseStream( ) returns the negative error conditions below:

ACSERR_BADHDL
This indicates that the ***acsHandle*** being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

Once this function returns, the application must also check the **ACSCloseStreamConfEvent** message to ensure that the ACS Stream was closed properly and to see if any Private Data was returned by the server.

No other service request will be accepted to the specified *acsHandle* after this function successfully returns. The handle is an active and valid handle until the application has received the **ACSCloseStreamConfEvent**.

Application Notes

The Client is responsible for receiving the **ACSCloseStreamConfEvent** which indicates resources have been freed.

The application must be prepared to receive multiple events on the ACS Stream after the **acsCloseStream**( ) function has completed, but the **ACSCloseStreamConfEvent** is guaranteed to be the last event on the ACS Stream.

The **acsGetEventBlock**( ) and **acsGetEventPoll**( ) functions can only be called after the **acsCloseStream**( ) function has returned successfully.

ACSCloseStreamConfEvent

This event is generated in response to the **acsCloseStream**( ) function and provides information regarding the closing of the ACS Stream The *acsHandle* is no longer valid after this event has been received by the application, so the **ACSCloseStreamConfEvent** is the last event the application will receive for this ACS Stream.

Syntax

The following structure shows only the relevant portions of the unions for this message. See section ***4.2 ACS Data Types*** and ***4.6 CSTA Data Types*** for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
        InvokeID_t     invokeID;
                union
                {
                        ACSCloseStreamConfEvent_t   acsclose;
                } u;
        } acsConfirmation;
    } event;
} CSTAEvent_t;

typedef struct ACSCloseStreamConfEvent_t
    {
    Nulltype   null;
} ACSCloseStreamConfEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **ACSCONFIRMATION**, which identifies this message as an ACS confirmation event.

eventType
This is a tag with the value **ACS_CLOSE_STREAM_CONF**, which identifies this message as an **ACSCloseStreamConfEvent**.

invokeID
This parameter specifies the requested instance of the function. It is used to match a specific **acsCloseStream**( ) function request with its confirmation event.

Comments

This message indicates that the ACS Stream to the Telephony Server has closed and that the associated *acsHandle* is no longer valid. This message contains any Private data returned by the Telephony Server.

ACSUniversalFailureConfEvent

This event can occur at any time in place of a confirmation event for any of the CSTA functions which have their own confirmation event and indicates a problem in the processes of the requested function. It does not indicate a failure or loss of the ACS Stream with the Telephony Server. If the ACS Stream has failed, then an ACSUniversalFailureEvent (unsolicited version of this confirmation event) is sent to the application.

Syntax

The following structure shows only the relevant portions of the unions for this message. See section ***ACS Data Types and CSTA Data Types*** for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                union
                {
                ACSUniversalFailureConfEvent_t       failureEvent;
                } u;
        } acsConfirmation;
    } event;
} CSTAEvent_t;

    typedef struct
    {
        ACSUniversalFailure_t                        error;
    } ACSUniversalFailureConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **ACSCONFIRMATION**, which identifies this message as an ACS confirmation event.

eventType
This is a tag with the value **ACS_UNIVERSAL_FAILURE_CONF**, which identifies this message as an **ACSUniversalFailureConfEvent**.

error
This parameter indicate the cause value for the failure of the original Telephony request. These cause values are the same set as those shown for **ACSUniversalFailureEvent**.

Comments

This event will occur anytime when a non-telephony problem (no memory, Tserver Security check failed, etc.) in processing a Telephony request in encountered and is sent in place of the confirmation event that would normally be received for that function (i.e., **CSTAMakeCallConfEvent** in response to a **cstaMakeCall**( ) request). If the problem which prevents the telephony function from being processed is telephony based, then a **CSTAUniversalFailureConfEvent** will be received instead.

acsAbortStream( )

This function unilaterally closes an ACS Stream to the Telephony Server. The application will be unable to request services from the Telephony Server or receive events after the **acsAbortStream**( ) function has returned. The *acsHandle* is invalid on this stream after the **acsAbortStream**( ) function returns. There is no associated confirmation event for this function.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t acsAbortStream (
    ACSHandle_tacsHandle,     /* INPUT */
    PrivateData_t      *privateData); /* INPUT */
```

Parameters

acsHandle
This is the handle for the active ACS Stream which is to be closed. There is no confirmation event for this function. Once this function returns success, the ACS Stream is no longer valid.

privateData
This points to a data structure which defines any implementation-specific information needed by the server. The data in this structure is not interpreted by the API Client Library and can be used as an escape mechanism to provide implementation specific commands between the application and the Telephony Server.

Return Values

This function always returns zero (0) if successful.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This indicates that the ***acsHandle*** being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

Once this function returns, the ACS stream is dismantled and the *acsHandle* is invalid

acsGetEventBlock( )

This function is used when an application wants to receive an event in a **Blocking** mode. In the **Blocking** mode the application will be blocked until there is an event from the ACS Stream indicated by the *acsHandle.* If the *acsHandle* is set to zero (0), then the application will block until there is an event from ***any*** ACS stream opened by this application. The function will return after the event has been copied into the applications data space.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t              acsGetEventBlock (
    ACSHandle_t       acsHandle,       /* INPUT */
    void              *eventBuf,       /* INPUT */
    unsigned short    *eventBufSize,   /* INPUT/RETURN */
    PrivateData_t     *privateData,    /* RETURN */
    unsigned short    *numEvents);     /* RETURN */
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream. If a handle of zero (0) is given, then the next message on any of the open ACS Streams for this application is returned.

eventBuf
This is a pointer to an area in the application address space large enough to hold one incoming event that is received by the application. This buffer should be large enough to hold the largest event the application expected to receive. Typically the application will reserve a space large enough to hold a CSTAEvent_t.

eventBufSize
This parameter indicates the size of the user buffer pointed to by *eventBuf*. If the event is larger the *eventBuf*, then this parameter will be returned with the size of the buffer required to receive the event. The application should call this function again with a larger buffer.

privateData
This parameter points to a buffer which will receive any private data that accompanies this event. The *length* field of the PrivateData_t structure must be set to the size of the *data* buffer. If the application does not wish to receive private data, then *privateData* should be set to NULL.

numEvents
The library will return the number of events queued for the application on this ACS Stream (not including the current event) via the *numEvents* parameter. If this parameter is NULL, then no value will be returned.

On a UnixWare client, ***numEvents*** will have a value of 0 or 1 indicating that the event queue is empty or non-empty (respectively); this value on a UnixWare client does not indicate the number of events in the queue. On a UnixWare client when ***acsHandle*** is 0, the ***numEvents*** value refers only to the stream for which the event was retrieved (and is not an aggregate count).

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application, and an event has been copied to the application data space. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

ACSERR_UBUFSMALL
The user buffer size indicated in the *eventBufSize* parameter was smaller than the size of the next available event for the application on the ACS stream. The *eventBufSize* variable has been reset by the API Library to the size of the next message on the ACS stream. The application should call

acsGetEventBlock( ) again with a larger buffer. The ACS event is still on the API Library queue.

Comments

The **acsGetEventBlock**( ) and **acsGetEventPoll**( ) functions can be intermixed by the application. For example, if bursty event message traffic is expected an application may decide to block initially for the first event and wait until it arrives. When the first event arrives the blocking function returns, at which time the application can process this event quickly and poll for the other events which may have been placed in queue while the first event was being processed. The polling can be continued until a **ACSERR_NOMESSAGE** is returned by the polling function. At this time the application can then call the blocking function again and start the whole cycle over again.

There is no confirmation event for this function.

Application Notes

The application is responsible for calling the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function frequently enough that the API Client Library does not overflow its receive queue and refuse incoming events from the Telephony Server.

acsGetEventPoll( )

This function is used when an application wants to receive an event in a **Non-Blocking** mode. In the **Non-Blocking** mode the oldest outstanding event from any active ACS Stream will be copied into the applications data space and control will be returned to the application. If no events are currently queued for the application, the function will return control immediately to the application with an error code indicating that no events were available.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t             acsGetEventPoll (
    ACSHandle_t       acsHandle,         /* INPUT */
    void              *eventBuf,         /* INPUT */
    unsigned short    *eventBufSize,     /* INPUT/RETURN */
    PrivateData_t     *privateData,      /* RETURN */
    unsigned short    *numEvents;        /* RETURN */
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream. If a handle of zero (0) is given, then the next message on any of the open ACS Streams for this application is returned.

eventBuf
This is a pointer to an area in the application address space large enough to hold one incoming event that is received by the application. This buffer should be large enough to hold the largest event the application expected to receive. Typically the application will reserve a space large enough to hold a CSTAEvent_t.

eventBufSize
This parameter indicates the size of the user buffer pointed to by *eventBuf*. If the event is larger the *eventBuf*, then this parameter will be returned with the size of the buffer required to receive the event. The application should call this function again with a larger buffer.

privateData
This parameter points to a buffer which will receive any private data that accompanies this event. The *length* field of the PrivateData_t structure must be set to the size of the *data* buffer. If the application does not wish to receive private data, then *privateData* should be set to NULL.

numEvents
The library will return the number of events queued for the application on this ACS Stream (not including the current event) via the *numEvents* parameter. If this parameter is NULL, then no value will be returned.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application, and an event has been copied to the application data space. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

ACSERR_NOMESSAGE
There were no messages available to return to the application.

ACSERR_UBUFSMALL
The user buffer size indicated in the *eventBufSize* parameter was smaller than the size of the next available event for the application on the ACS stream. The *eventBufSize* variable has been reset by the API Library to the size of the next message on the ACS stream. The application should call **acsGetEventPoll**( ) again with a larger buffer. The ACS event is still on the API Library queue.

Comments

When this function is called, it returns immediately, and the user must examine the return code to determine if a message was copied into the user's data space. If an event was available, the function will return **ACSPOSITIVE_ACK**.

If no events existed on the ACS Stream for the application, this function will return **ACSERR_NOMESSAGE**.

The **acsGetEventBlock**( ) and **acsGetEventPoll**( ) functions can be intermixed by the application. For example, if bursty event message traffic is expected an application may decide to block initially for the first event and wait until it arrives. When the first event arrives the blocking function returns, at which time the application can process this event quickly and poll for the other events which may have been placed in queue while the first event was being processed. The polling may continue until the **ACSERR_NOMESSAGE** is returned by the polling function. At this time the application can then call the blocking function again and start the whole cycle over again.

There is no confirmation event for this function.

Application Notes

The application is responsible for calling the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function frequently enough that the API Client Library does not overflow its receive queue and refuse incoming events from the Telephony Server.

acsGetFile( ) (UnixWare and HP-UX)

The **acsGetFile**( ) function returns the Unix file descriptor associated with an ACS stream. This is to enable multiplexing of input sources via, for example, the `poll()` system call.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t acsGetFile (ACSHandle_t acsHandle);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream whose Unix file descriptor is to be returned.

Return Values

This function returns either a Unix file descriptor greater than or equal to zero(0), or ***ACSERR_BADHDL*** if the ***acsHandle*** being used is not a valid handle for an active ACS Stream.

Application Notes

The **acsGetFile**() function returns the UNIX file descriptor used by an ACS stream. This enables an application to simultaneously block on the stream and any other file-oriented input sources by using `poll()`, `select()`, `XtAddInput()` or similar multiplexing functions. The application should never perform any direct I/O operations on this file descriptor.

There is no confirmation event for this function.

acsSetESR( ) (Windows)

The **acsSetESR**( ) function also allows the application to designate an Event Service Routine (***ESR***) that will be called when an incoming event is available.

Syntax

```
#include <acs.h>
#include <csta.h>

#typedef void (*EsrFunc)(unsigned short esrParam)

RetCode_t      acsSetESR (
    ACSHandle_tacsHandle,
    EsrFunc    esr,
    unsigned short    esrParam,
    Boolean    notifyAll);
```

Parameters

acsHandle
This is the value of the unique handle to the opened Stream for which this ESR routine will apply. Only one ESR is allowed per active acsHandle.

esr
This is a pointer to the ESR (the address of a function). An application passes a NULL pointer indicates to clear an existing ESR**.**

esrParam
This is a user-defined parameter which will be passed to the ESR when it is called**.**

notifyAll
If this parameter is **TRUE** then the ESR will be called for every event**.** If it is **FALSE** then the ESR will only be called each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

The ESR mechanism can be used by the application to receive an asynchronous notification of the arrival of an incoming event from the ACS Stream. The ESR routine will receive one user-defined parameter. Windows calls the ESR function with interrupts disabled (not normal application context). The ESR should **not** call ACS functions, TSAPI functions, and many of the Windows APIs or the results will be indeterminate. The ESR should note the arrival of the incoming event, and complete its operation as quickly as possible. The application must still call **acsGetEventBlock( )** or **acsGetEventPoll( )** to retrieve the event from the Client API Library queue.

If there are already events in the receive queue waiting to be retrieved when **acsSetESR( )** is called, the ***esr*** will be called for each of them.

The ***esr*** in the **acsSetESR( )** function will replace the current ESR maintained by the API Client Library. A NULL ***esr*** will disable the current ESR mechanism.

There is no confirmation event for this function.

Application Notes

The application can use the ESR mechanism to trigger platform specific events (e.g. post a Windows™ message for the application, or signal a semaphore in the NetWare® environment).

The application may use the ESR mechanism for asynchronous notification of the arrival of incoming events, but most API Library environments provide other mechanisms for receiving asynchronous notification.

The application should not call ACS functions from within the ESR**.**

The application should complete its ESR processing as quickly as possible.

The ESR function *may* be called while (some level of) interrupts are disabled. This is API implementation specific, so the application programmer should consult the API documentation. Under Windows ™, the ESR function must be exported and its address obtained from **MakeProcInstance**( ).

Windows Client Note:

Use **acsSetESR**( ) with care. ESR code and data must be immune to swapping (i.e., fixed and page locked). The ESR must reside in a DLL so as to be fixed. Interrupts are disabled when an ESR is called. Within the ESR, do not call any function that may enable interrupts (including most Windows APIs) or which is not “nailed down”.

acsSetESR( ) (Win32)

The **acsSetESR**( ) function also allows the application to designate an Event Service Routine (***ESR***) that will be called when an incoming event is available.

Syntax

```
#include <acs.h>
#include <csta.h>

typedef void (*EsrFunc)(unsigned long esrParam)

RetCode_t acsSetESR (
    ACSHandle_t      acsHandle,
    EsrFunc          esr,
    unsigned long    esrParam,
    Boolean          notifyAll);
```

Parameters

acsHandle
This is the value of the unique handle to the opened Stream for which this ESR routine will apply. Only one ESR is allowed per active acsHandle.

esr
This is a pointer to the ESR (the address of a function). An application passes a NULL pointer indicates to clear an existing ESR**.**

esrParam
This is a user-defined parameter which will be passed to the ESR when it is called**.**

notifyAll
If this parameter is **TRUE** then the ESR will be called for every event**.** If it is **FALSE** then the ESR will only be called each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

The ESR mechanism can be used by the application to receive an asynchronous notification of the arrival of an incoming event from the ACS Stream. The ESR routine will receive one user-defined parameter. The ESR should **not** call TSAPI functions, or the results will be indeterminate. The ESR should note the arrival of the incoming event, and complete its operation as quickly as possible. The application must still call **acsGetEventBlock( )** or **acsGetEventPoll( )** to retrieve the event from the Client API Library queue.

Use **acsSetESR**( ) with care. The ESR code will be executed in the context of a background thread created by the API Client Library, **not** an application thread.

If there are already events in the receive queue waiting to be retrieved when **acsSetESR( )** is called, the ***esr*** will be called for each of them.

The ***esr*** in the **acsSetESR( )** function will replace the current ESR maintained by the API Client Library. A NULL ***esr*** will disable the current ESR mechanism.

There is no confirmation event for this function.

acsSetESR( ) (Macintosh)

The **acsSetESR**( ) function allows application to designate an Event Service Routine (***ESR***) that will be called when an incoming event is available.

Syntax

```
#include <acs.h>
#include <csta.h>

typedef pascal void (*EsrFunc)(unsigned long esrParam)

enum {
    uppESRFuncProcInfo = kPascalStackBased
        | RESULT_SIZE(SIZE_CODE(0))
        | STACK_ROUTINE_PARAMETER(1, SIZE_CODE(sizeof(long))
};

#if USESROUTINEDESCRIPTORS
typedef UniversalProcPtr EsrFuncUPP;

#define NewEsrFuncProc(userRoutine)
    (EsrFuncUPP) NewRoutineDescriptor((ProcPtr)(userRoutine),
        uppEsrFuncProcInfo, GetCurrentISA())
#else
typedef EsrFunc       EsrFuncUPP;
#define NewEsrFuncProc(userRoutine)
    (EsrFuncUPP)(userRoutine)
#endif

RetCode_t      acsSetESR (    ACSHandle_t           acsHandle,
    EsrFuncUPP         esr,
    unsigned long      esrParam,
    Boolean                   notifyAll );
```

Parameters

acsHandle
This is the value of the unique handle to the opened Stream for which this ESR routine will apply. Only one ESR is allowed per active acsHandle.

esr
This is a universal procedure pointer to the ESR (the address of a 680x0 function or routine descriptor). An application passes a NULL pointer indicates to clear an existing ESR**..**

esrParam
This is a user-defined parameter which will be passed to the ESR when it is called**.**

notifyAll
If this parameter is **TRUE** then the ESR will be called for every event**.** If it is **FALSE** then the ESR will only be called each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

The ESR mechanism can be used by the application to receive an asynchronous notification of the arrival of an incoming event from the ACS Stream. The ESR routine will receive one user-defined parameter. The ESR should **not** call ACS functions, otherwise the results will be indeterminate. The ESR should note the arrival of the incoming event, and complete its operation as quickly as possible. The application must still call **acsGetEventBlock( )** or **acsGetEventPoll( )** to retrieve the event from the Client API Library queue.

If there are already events in the receive queue waiting to be retrieved when **acsSetESR( )** is called, the ***esr*** will be called for each of them.

The ***esr*** in the **acsSetESR( )** function will replace the current ESR maintained by the API Client Library. A NULL ***esr*** will disable the current ESR mechanism.

There is no confirmation event for this function.

Application Notes

The application may use the ESR mechanism for asynchronous notification of the arrival of incoming events, particularly when rapid notification is desired. By using the ESR to set an application global, the application may determine whether events have arrived by examining that global rather than using **acsGetEventPoll**( ) or **acsGetEventBlock**( ).

The ESR function is defined as a universal procedure pointer. Under PPC, providing a native or fat routine descriptor will result in the best performance as there will be no mode switch involved when calling the ESR.

The application may not call ACS functions from within the ESR.

The application should complete its ESR processing as quickly as possible.

The ESR function *may* be called while (some level of) interrupts are disabled; refer to Inside Macintosh for information about programming with interrupts disabled. Ensure that the ESR function — and routine descriptor under PPC — remain loaded and page-locked in memory. In particular, do not make synchronous I/O calls or access memory that is not page-locked.

On Macintosh — as with other interrupt service routines — the ESR is prohibited from using the Macintosh memory manager — directly or indirectly. In addition, the ESR must set any global context it needs. On the 680x0 Macintosh, this means that the ESR must set A5 or A4 before accessing application globals or making inter-segment jumps; before returning, the ESR *must* restore A5 or A4 to its value on entry. On a PowerPC, the runtime model automatically manages this context. See references [3]and [5] for more information.

acsSetESR( ) (OS/2)

The **acsSetESR( )** function allows the application to designate an Event Service Routine (***ESR***) that will be called when an incoming event is available.

Syntax

```
#include <os2.h>
#include <acs.h>
#include <csta.h>

typedef void (*EsrFunc)(unsigned long esrParam)

TSAPI
acsSetESR ( ACSHandle_t     acsHandle,
    EsrFunc                 esr,
    unsigned long           esrParam,
    unsigned char           notifyAll);
```

Parameters

acsHandle
This is the value of the unique handle to the opened Stream for which this ESR routine will apply. Only one ESR is allowed per active acsHandle.

esr
This is a pointer to the ESR (the address of a function). The calling convention for this function should be specified as _System (or _syscall). A multi-threaded application that registers the same ESR for multiple open streams needs to ensure that this function is reentrant. A NULL pointer is used to disable the current ESR mechanism.

esrParam
This is a user-defined parameter which will be passed to the ESR when it is called**.**

notifyAll
If this parameter is **TRUE** then the ESR will be called for every event**.** If it is **FALSE** then the ESR will only be called each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

The ESR mechanism can be used by the application to receive an asynchronous notification of the arrival of an incoming event from the Open ACS Stream. The application can use the ESR mechanism to trigger specific events (e.g. post an event semaphore). The ESR routine will receive one user-defined parameter. The ESR should **not** call ACS functions, otherwise the results will be indeterminate. The application must still call **acsGetEventBlock()** or **acsGetEventPoll( )** to actually retrieve the event from the Client API Library queue.

If there are already events in the receive queue waiting to be retrieved when **acsSetESR( )** is called, the ***esr*** will be called for each event if ***notifyAll*** has been set to **TRUE** or only once if ***notifyAll*** has been set to **FALSE**.

The ***esr*** in the **acsSetESR( )** function will replace the current ESR maintained by the API Client Library. A NULL ***esr*** will disable the current ESR mechanism.

There is no confirmation event for this function.

acsEventNotify( ) (Windows 3.1)

The **acsEventNotify**( ) function allows a Windows application to request that a message be posted to its application queue when an incoming ACS event is available.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      acsEventNotify (
    ACSHandle_t acsHandle,
    HWND        hwnd,
    UINT        msg,
    Boolean     notifyAll);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream for which event notification messages will be posted.

hwnd
This is the handle of the window which is to receive event notification messages. If this parameter is NULL, event notification is disabled**.**

msg
This is the user-defined message to be posted when an incoming event becomes available**.** The *wParam* and *lParam* parameters of the message will contain the following members of the ACSEventHeader_t structure:

```
wParam      acsHandle
HIWORD(lParam)     eventClass
LOWORD(lParam)     eventType
```

notifyAll
If this parameter is **TRUE** then a message will be posted for every event**.** If it is **FALSE** then a message will only be posted each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification, or the likelihood of overflowing the application's message queue (see below).

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Application Notes

This function only enables *notification* of an incoming event. Use **acsGetEventPoll**( ) to actually retrieve the complete event structure.

If there are already events in the receive queue waiting to be retrieved when **acsEventNotify**( ) is called, a message will be posted for each of them.

Applications which process a high volume of incoming events may cause the default application queue (8 messages max) to overflow. In this case, use the Windows API call SetMessageQueue( ) to increase the size of the application queue. Also, the rate of notifications may be reduced by setting ***notifyAll*** to **FALSE**.

There is no confirmation event for this function.

Example

This example uses the **acsEventNotify** function to enable event notification.

```
#define WM_ACSEVENT WM_USER + 99
    // or use RegisterWindowMessage()

long FAR PASCAL
WndProc (HWND hwnd, UINT msg, WPARAM wParam, LPARAM lParam)
{
    // declare local variables...

    switch (msg)
    {
    case WM_CREATE:

        // post WM_ACSEVENT to this window
        // whenever an ACS event arrives

        acsEventNotify (acsHandle, hwnd, WM_ACSEVENT,
                        TRUE);

        // other initialization, etc...
        return 0;

    case WM_ACSEVENT:

        // wParam contains an ACSHandle_t
        // HIWORD(lParam) contains an EventClass_t
        // LOWORD(lParam) contains an EventType_t

        // dispatch the event to user-defined
        // handler function here

        return 0;

    // process other window messages...

    }
    return DefWindowProc (hwnd, msg, wParam, lParam);
}
```

acsEventNotify( ) (Win32)

The **acsEventNotify**( ) function allows a Win32 application to request that a message be posted to its application queue when an incoming ACS event is available.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t acsEventNotify (
    ACSHandle_t  acsHandle,
    HWND         hwnd,
    UINT         msg,
    Boolean      notifyAll);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream for which event notification messages will be posted.

hwnd
This is the handle of the window which is to receive event notification messages. If this parameter is NULL, event notification is disabled**.**

msg
This is the user-defined message to be posted when an incoming event becomes available**.** The *wParam* and *lParam* parameters of the message will contain the following members of the ACSEventHeader_t structure:

```
wParam           acsHandle
HIWORD(lParam)   eventClass
LOWORD(lParam)   eventType
```

notifyAll
If this parameter is **TRUE** then a message will be posted for every event**.** If it is **FALSE** then a message will only be posted each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification, or the likelihood of overflowing the application's message queue (see below).

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Application Notes

This function only enables *notification* of an incoming event. Use **acsGetEventPoll**( ) to actually retrieve the complete event structure.

If there are already events in the receive queue waiting to be retrieved when **acsEventNotify**( ) is called, a message will be posted for each of them.

The rate of notifications may be reduced by setting ***notifyAll*** to **FALSE**.

There is no confirmation event for this function.

Example

This example uses the **acsEventNotify** function to enable event notification.

```
#define WM_ACSEVENT WM_USER + 99
    // or use RegisterWindowMessage()

long FAR PASCAL
WndProc (HWND hwnd, UINT msg, WPARAM wParam, LPARAM lParam)
{
    // declare local variables...

    switch (msg)
    {
    case WM_CREATE:

        // post WM_ACSEVENT to this window
        // whenever an ACS event arrives

        acsEventNotify (acsHandle, hwnd, WM_ACSEVENT,
                        TRUE);

        // other initialization, etc...
        return 0;

    case WM_ACSEVENT:

        // wParam contains an ACSHandle_t
        // HIWORD(lParam) contains an EventClass_t
        // LOWORD(lParam) contains an EventType_t

        // dispatch the event to user-defined
        // handler function here

        return 0;

    // process other window messages...

    }
    return DefWindowProc (hwnd, msg, wParam, lParam);
}
```

acsEventNotify( ) (Macintosh)

The **acsEventNotify**( ) function allows a Macintosh application to request that it receive an Apple Event when an incoming ACS event is available.

Syntax

```
#include <acs.h>
#include <csta.h>
#include <EPPC.h>     /* for Apple Event types */

RetCode_t acsEventNotify (ACSHandle_t acsHandle,
    AEAddressDesc            *targetAddr,
    Boolean                  notifyAll );
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream for which event notification messages will be posted.

targetAddr
This is a pointer to an AEAddressDesc data structure. The event notification Apple Events will be sent to the address specified by the AEAddressDesc. A NULL **targetAddr** indicates no notification.

notifyAll
If this parameter is **TRUE** then a message will be posted for every event**.** If it is **FALSE** then a message will only be posted each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification (see below).

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Application Notes

The Apple Events posted as the result of calling **acsEventNotify**( ) have the following attributes:

Event Class	`kTSAPIEventClass`
Event ID	`kTSAPIEventArrived`
Required Parameter	
Keyword:	`keyTSAPIEventClass`
Descriptor Type:	`typeShortInteger`
Data:	The EventClass_t corresponding to the incoming TSAPI event.
Required Parameter	
Keyword:	`keyTSAPIEventType`
Descriptor Type:	`typeShortInteger`
Data:	The EventType_t corresponding to the incoming TSAPI event.
Required Parameter	
Keyword:	`keyStreamHandle`
Descriptor Type:	`typeLongInteger`
Data:	The ACSHandle_t that may be used to retrieve the incoming TSAPI event.

See reference [4] for information on how to create an AEAddressDesc and extract information from the notification Apple Events.

After calling **acsEventNotify**( ), properly dispose of the AEAddressDesc specified by **targetAddr**.

This function only enables *notification* of an incoming event. Use **acsGetEventPoll**( ) to actually retrieve the complete event structure.

If there are already events in the receive queue waiting to be retrieved when **acsEventNotify**( ) is called, an Apple Event will be sent for each of them.

Applications which process a high volume of incoming events should either set ***notifyAll*** to **TRUE** or use **acsSetESR**( ); the current theoretical upper bound on sending Apple Events is sixty messages per second. In practice — depending on processor speed and available memory — this number may be significantly lower.

There is no confirmation event for this function.

Example

This example uses the **acsEventNotify** function to enable event notification.

```
/*
 * handleTSAPIEvent - install as AppleEvent handler (callback)
 *    before using acsEventNotify()
 */

pascal OSErr
handleTSAPIEvent(     const AppleEvent      *theAppleEvent,
       const AppleEvent      *reply,
       long    handlerRefcon)
{
    EventClass_t       theTSAPIClass;
    EventType_t theTSAPIType;
    ACSHandle_t theStream;
    DescType   actualType;    /* scratch */
    Size       actualSize;    /* scratch */
    OSErr      myErr;
    /*
     * other local variables
     */

    /* extract TSAPI event class */

    myErr = AEGetParamPtr ( theAppleEvent, keyTSAPIEventClass,
        typeShortInteger, &actualType,
        &theTSAPIClass,
        sizeof(theTSAPIClass),
        &actualSize );
    if ( myErr != noErr )
            return myErr;

    /* extract TSAPI event type */

    myErr = AEGetParamPtr ( theAppleEvent, keyTSAPIEventType,
        typeShortInteger, &actualType,
        &theTSAPIType, sizeof(theTSAPIType),
        &actualSize );
    if ( myErr != noErr )
            return myErr;

    /* extract stream handle */

    myErr = AEGetParamPtr ( theAppleEvent, keyStreamHandle,
        typeLongInteger, &actualType,
        &theStream, sizeof(theStream),
        &actualSize );
    if ( myErr != noErr )
            return myErr;
    /*
     * Dispatch event to user-defined handler function here
     */
    return noErr;
}
```

```
/* example - cont. */

OSErr
InstallTSAPIEventHandler ( void )
{
    /*
     * This code only works when compiled for 68K; it needs a
     * routine descriptor for handleTSAPIEvent to work with the
     * Mixed Mode manager.
     */

    return AEInstallEventHandler (
                                        kTSAPIEventClass,
                                        kTSAPIEventArrived

                                        (AEEventHandlerUPP)handl
    eTSAPIEvent,
                                        0,
                                        FALSE );
}
```

acsEventNotify( ) (OS/2)

The **acsEventNotify**( ) function allows an OS/2 PM application to request that a message be posted to its application queue when an incoming ACS event is available.

Syntax

```
#include <os2.h>
#include <acs.h>
#include <csta.h>

RetCode_t   acsEventNotify (
    ACSHandle_t acsHandle,
    HWND        hwnd,
    ULONG       msg,
    Boolean     notifyAll);
```

Parameter

acsHandle
This is the value of the unique handle to the opened ACS Stream for which event notification messages will be posted.

hwnd
This is the handle of the window which is to receive event notification messages. If this parameter is NULL, event notification is disabled**.**

msg
This is the user-defined message to be posted when an incoming event becomes available**.** The *mp1* and *mp2* parameters of the message will contain the following members of the ACSEventHeader_t structure:

```
mp1                     acsHandle
SHORT2FROMMP(mp2)       eventClass
SHORT1FROMMP(mp2)       eventType
```

notifyAll
If this parameter is **TRUE** then a message will be posted for every event**.** If it is **FALSE** then a message will only be posted each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification, or the likelihood of overflowing the application's message queue (see below).

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.
Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Application Notes

This function only enables *notification* of an incoming event. Use **acsGetEventPoll**( ) to actually retrieve the complete event structure.

If there are already events in the receive queue waiting to be retrieved when **acsEventNotify**( ) is called, a message will be posted for each of them if ***notifyAll*** has been set to **TRUE** or a single message will be posted if ***notifyAll*** has been set to **FALSE**.

Applications which process a high volume of incoming events may cause the default application queue (10 messages max) to overflow. In this case, increase the size of the application queue that is created by specifying a larger size in the WinCreateMsgQueue() function. (This may not be possible if an application framework is generating the message queue for you). Also, the rate of notifications may be reduced by setting ***notifyAll*** to **FALSE**.

There is no confirmation event for this function.

Example

This example uses the **acsEventNotify** function to enable event notification.

```
#define WM_ACSEVENT WM_USER + 99

MRESULT EXPENTRY
WndProc (HWND hwnd, ULONG msg, MPARAM mp1, MPARAM mp2)
{
    // declare local variables...

    switch (msg)
    {
    case WM_CREATE:

    // post WM_ACSEVENT to this window
    // whenever an ACS event arrives

    acsEventNotify (acsHandle, hwnd, WM_ACSEVENT, TRUE);

    // other initialization, etc...
    return 0;

    case WM_ACSEVENT:

    // mp1 contains an ACSHandle_t
    // SHORT2FROMMP(mp2) contains an EventClass_t
    // SHORT1FROMMP(mp2) contains an EventType_t

    // dispatch the event to user-defined
    // handler function here

    return 0;

    // process other window messages...

    }
    return WinDefWindowProc (hwnd, msg, mp1, mp2);
}
```

acsFlushEventQueue( )

This function removes all events for the application on a ACS Stream associated with the given handle and maintained by the API Client Library. Once this function returns the application may receive any new events that arrive on this ACS Stream.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t ACSFlushEventQueue (ACSHandle_t acsHandle);
```

Parameters

acsHandle
This is the handle to an active ACS Stream. If the *acsHandle* is zero (0), then TSAPI will flush all active ACS Streams for this application.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

Once this function returns the API Client Library will not have any events queued for the application on the specified ACS Stream. The application is ready to start receiving new events from the Telephony Server.

There is no confirmation event for this function.

Application Notes

The application should exercise caution when calling this function, since all events from the switch on the associated ACS Stream have been discarded. The application has no way to determine what kinds of events have been destroyed, and may have lost events that relay important status information from the switch.

This function does not delete the **ACSCloseStreamConfEvent**, since this function can not be called after the **acsCloseStream**( ) function.

The **acsFlushEventQueue**( ) function will delete all other events queued to the application on the ACS Stream. The **ACSUniversalFailureEvent** and the **CSTAUniversalFailureConfEvent**, in particular, will be deleted if they are currently queued to the application.

acsEnumServerNames( )

This function is used to enumerate the names of all the advertised services of a specified stream type. This function is a synchronous call and has no associated confirmation event.

Syntax

```
#include <acs.h>

typedef Boolean (*EnumServerNamesCB) (
    char       *serverName,
    unsigned long      lParam);

RetCode_t      acsEnumServerNames    (
    StreamType_t       streamType,
    EnumServerNamesCB  callback ,
    unsigned long      lParam);
```

Parameters

streamType
indicates the type of stream requested. The currently defined stream types are **ST_CSTA** and **ST_OAM**.

callback
This is a pointer to a callback function which will be invoked for *each* of the enumerated server names, along with the user-defined parameter ***lParam***. If the callback function returns **FALSE** (0), enumeration will terminate.

lParam
A user-defined parameter which is passed on each invocation of the callback function.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

The following are possible negative error conditions for this function:

ACSERR_UNKNOWN
The request has failed due to unknown network problems.

ACSERR_NOSERVER
The request has failed because the client is using TCP/IP and IP addresses are not configured properly.

Comments

This function enumerates all the known advertised services, invoking the callback function for each advertised service name. The ***serverName*** parameter points to automatic storage; the callback function must make a copy if it needs to preserve this data. Under Windows™, the callback function must be exported and its address obtained from **MakeProcInstance**( ).

An active ACS Stream is ***NOT*** required to call this function.

acsEnumServerNames( ) (Macintosh)

This function is used to enumerate the names of all the advertised services of a specified stream type. This function is a synchronous call and has no associated confirmation event.

Syntax

```
#include <acs.h>

#if USESROUTINEDESCRIPTORS
enum
{
    uppEnumServerNamesProcInfo = kPascalStackBased
        | RESULT_SIZE(SIZE_CODE(2))
        | STACK_ROUTINE_PARAMETER(1, SIZE_CODE(sizeof(unsigned
    long)))
        | STACK_ROUTINE_PARAMETER(2, SIZE_CODE(sizeof(char *)))

typedef UniversalProcPtr       EnumServerNamesCB;

#define NewEnumServerNamesProc(userRoutine) \
    (EnumServerNamesCB) \
        NewRoutineDescriptor((ProcPtr)(userRoutine) \
        uppEnumServerNamesProcInfo, GetCurrentISA())
#else
typedef pascal Boolean (*EnumServerNamesCB)  (
    char       *serverName,
    unsigned long      lParam);

#endif

RetCode_t      acsEnumServerNames    (
    StreamType_t       streamType,
    EnumServerNamesCB  callback ,
    unsigned long      lParam);
```

Parameters

streamType
indicates the type of stream requested. The currently defined stream types are **ST_CSTA** and **ST_OAM**.

callback
This is a universal procedure pointer to the callback function (the address of a 680x0 function or routine descriptor). which will be invoked for *each* of the enumerated server names, along with the user-defined parameter ***lParam***. If the callback function returns **FALSE** (0), enumeration will terminate.

lParam
A user-defined parameter which is passed on each invocation of the callback function.

Return Values

This function returns a positive acknowledgment or a negative error condition (< 0). There is no confirmation event for this function. The positive return value is:

ACSPOSITIVE_ACK
The function completed successfully as requested by the application. No errors were detected.

The following are possible negative error conditions for this function:

ACSERR_UNKNOWN
The request has failed due to unknown network problems.

Comments

This function enumerates all the known advertised services, invoking the callback function for each advertised service name. The ***serverName*** parameter points to automatic storage; the callback function must make a copy if it needs to preserve this data

An active ACS Stream is ***NOT*** required to call this function.

acsQueryAuthInfo( )

Use **acsQueryAuthInfo**( ) to determine the login and password requirements when opening an ACS stream to a particular advertised CSTA service. This function call places the result of a query in a user-provided structure before returning; there is no confirmation event.

Syntax

```
#include <acs.h>

RetCode_t acsQueryAuthInfo(
    ServerID_t              *serverID,       /* INPUT  */
    ACSAuthInfo_t           *authInfo);      /* RETURN */
```

Parameters

serverID
The application provides a null-terminated string of maximum size **ACS_MAX_SERVICEID**. This string contains the name of an advertised CSTA service (in ASCII format).

authInfo
The application provides a pointer to a pre-allocated structure into which the **acsQueryAuthInfo**( ) returns authentication information about the CSTA service named in ***serverID***. The ACSAuthInfo_t structure is defined as follows:

```
typedef enum
{
    REQUIRES_EXTERNAL_AUTH = -1,
    AUTH_LOGIN_ID_ONLY = 0,
    AUTH_LOGIN_ID_IS_DEFAULT = 1,
    NEED_LOGIN_ID_AND_PASSWD = 2,
    ANY_LOGIN_ID = 3

} ACSAuthType_t;

typedef struct
{
    ACSAuthType_t         authType;
    LoginID_t             authLoginID;

} ACSAuthInfo_t;
```

Return Values

acsQueryAuthInfo( ) returns the negative error conditions below:

ACSERR_BADPARAMETER
One or more of the parameters is invalid.

ACSERR_NODRIVER
No TSAPI Client Library Driver was found or installed on the system.

ACSERR_NOSERVER
The advertised service (***serverID***) is not available in the network.

ACSERR_NORESOURCE
There are insufficient resources to query the advertised service.

Background

The Telephony Services architecture allows network administrators to grant telephony privileges to users. Depending on the implementation of a telephony server and its client libraries, a user may convince telephony servers of his or her identity — authenticate — by different means.

Version 1 of TSAPI required applications to supply a login name and password when calling **acsOpenStream**( ) — the point at which a telephony server must be convinced of a user's identity.

Version 2 and future versions offer support for multiple types of authentication. A telephony service may still require — or simply accept — a login and password, or it may rely on an external authentication service to establish a user's identity.

The Telephony Services architecture offers support for both methods in any combination.

Usage

Call **acsQueryAuthInfo**( ) to determine the authentication requirements for an advertised service (PBX Driver). The caller must provide the name of the advertised service and a pointer to storage into which **acsQueryAuthInfo**( ) will place the query results.

When an application calls **acsQueryAuthInfo**( ), the application may block while the telephony services library queries the specified service.

Examine ***authInfo.authType*** upon return from **acsQueryAuthInfo**( ) to determine what ***loginID*** and ***passwd*** parameters to supply to **acsOpenStream**( ) for the service queried.

REQUIRES_EXTERNAL_AUTH:

The service specified in the query requires the user to authenticate with an external authentication service before opening a stream. If ***authInfo.authType*** contains this value, **acsOpenStream**( ) will fail for the service queried.

AUTH_LOGIN_ID_ONLY:

The application can only open a stream using the ***loginID*** returned in ***authInfo.authLoginID***.

acsOpenStream( ) will ignore ***passwd*** for the queried service. The ***loginID*** must contain the same value as ***authInfo.authLoginID***. An application should not collect a password from its user for this service.

AUTH_LOGIN_ID_IS_DEFAULT:

The ***loginID*** returned in ***authInfo.authLoginID*** is the default user for this service. If the application subsequently specifies this ***loginID*** or a NULL pointer as ***loginID*** to **acsOpenStream**( ), ***passwd*** will be ignored and may be NULL.

Alternatively, to open a stream as a different user than ***authInfo.authLoginID***, the application must supply ***loginID*** and ***passwd*** to **acsOpenStream( )**.

An application should take care to not collect a password if its user wants to be identified as ***authInfo.authLoginID***. If an application does not remember the last ***loginID*** selected by its user in a preferences file or other persistent storage, the application should use ***authInfo.authLoginID*** as the default ***loginID*** when prompting its user for login information.

NEED_LOGIN_ID_AND_PASSWD:

The application must supply ***loginID*** and ***passwd*** to **acsOpenStream**( ).

ANY_LOGIN_ID:

The application may supply any ***loginID*** to **acsOpenStream**( ); ***passwd*** should not be collected and will be ignored. Applications should default to ***authInfo.authLoginID*** if it is non-empty.

ACS Unsolicited Events

This section describes unsolicited ACS Status Events.

ACSUniversalFailureEvent

This event can occur at any time (unsolicited) and can indicate, among other things, a failure or loss of the ACS Stream with the Telephony Server.

Syntax

The following structure shows only the relevant portions of the unions for this message. See the ***ACS Data Types*** and ***CSTA Data Types*** sections for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                union
                {
                  ACSUniversalFailureEvent_t failureEvent;
                } u;
        } acsUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ACSUniversalFailure_t error;
}
ACSUniversalFailureEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **ACSUNSOLICITED**, which identifies this message as an ACS unsolicited event.

eventType
This is a tag with the value **ACS_UNIVERSAL_FAILURE**, which identifies this message as an **ACSUniversalFailureEvent**.

error
This parameter contains a Tserver operation error (or "cause value"), Tserver security database error, or driver error for the ACS Stream given in *acsHandle*.

Not all of the errors listed below will occur in an ACS Universal Failure message. Some of the errors occur only in error logs generated by the Tserver.

The possible values are:

```
typedef enum ACSUniversalFailure_t {
        TSERVER_STREAM_FAILED = 0,
        TSERVER_NO_THREAD = 1,
        TSERVER_BAD_DRIVER_ID = 2,
        TSERVER_DEAD_DRIVER = 3,
        TSERVER_MESSAGE_HIGH_WATER_MARK = 4,
        TSERVER_FREE_BUFFER_FAILED = 5,
        TSERVER_SEND_TO_DRIVER = 6,
        TSERVER_RECEIVE_FROM_DRIVER = 7,
        TSERVER_REGISTRATION_FAILED = 8,
        TSERVER_SPX_FAILED = 9,
        TSERVER_TRACE = 10,
        TSERVER_NO_MEMORY = 11,
        TSERVER_ENCODE_FAILED = 12,
        TSERVER_DECODE_FAILED = 13,
        TSERVER_BAD_CONNECTION = 14,
        TSERVER_BAD_PDU = 15,
        TSERVER_NO_VERSION = 16,
        TSERVER_ECB_MAX_EXCEEDED = 17,
        TSERVER_NO_ECBS = 18,
        TSERVER_NO_SDB = 19,
        TSERVER_NO_SDB_CHECK_NEEDED = 20,
        TSERVER_SDB_CHECK_NEEDED = 21,
        TSERVER_BAD_SDB_LEVEL = 22,
        TSERVER_BAD_SERVERID = 23,
        TSERVER_BAD_STREAM_TYPE = 24,
        TSERVER_BAD_PASSWORD_OR_LOGIN = 25,
        TSERVER_NO_USER_RECORD = 26,
        TSERVER_NO_DEVICE_RECORD = 27,
        TSERVER_DEVICE_NOT_ON_LIST = 28,
        TSERVER_USERS_RESTRICTED_HOME = 30,
        TSERVER_NO_AWAYPERMISSION = 31,
        TSERVER_NO_HOMEPERMISSION = 32,
        TSERVER_NO_AWAY_WORKTOP = 33,
        TSERVER_BAD_DEVICE_RECORD = 34,
        TSERVER_DEVICE_NOT_SUPPORTED = 35,
        TSERVER_INSUFFICIENT_PERMISSION = 36,
        TSERVER_NO_RESOURCE_TAG = 37,
```

```
TSERVER_INVALID_MESSAGE = 38,
TSERVER_EXCEPTION_LIST = 39,
TSERVER_NOT_ON_OAM_LIST = 40,
TSERVER_PBX_ID_NOT_IN_SDB = 41,
TSERVER_USER_LICENSES_EXCEEDED = 42,
TSERVER_OAM_DROP_CONNECTION = 43,
TSERVER_NO_VERSION_RECORD = 44,
 TSERVER_OLD_VERSION_RECORD = 45,
TSERVER_BAD_PACKET = 46,
TSERVER_OPEN_FAILED = 47,
TSERVER_OAM_IN_USE = 48,
TSERVER_DEVICE_NOT_ON_HOME_LIST = 49,
TSERVER_DEVICE_NOT_ON_CALL_CONTROL_LIST = 50,
TSERVER_DEVICE_NOT_ON_AWAY_LIST = 51,
TSERVER_DEVICE_NOT_ON_ROUTE_LIST = 52,
TSERVER_DEVICE_NOT_ON_MONITOR_DEVICE_LIST = 53,
TSERVER_DEVICE_NOT_ON_MONITOR_CALL_DEVICE_LIST = 54,
TSERVER_NO_CALL_CALL_MONITOR_PERMISSION = 55,
TSERVER_HOME_DEVICE_LIST_EMPTY = 56,
TSERVER_CALL_CONTROL_LIST_EMPTY = 57,
TSERVER_AWAY_LIST_EMPTY = 58,
TSERVER_ROUTE_LIST_EMPTY = 59,
TSERVER_MONITOR_DEVICE_LIST_EMPTY = 60,
TSERVER_MONITOR_CALL_DEVICE_LIST_EMPTY = 61,
TSERVER_USER_AT_HOME_WORKTOP = 62,
TSERVER_DEVICE_LIST_EMPTY = 63,
TSERVER_BAD_GET_DEVICE_LEVEL = 64,
TSERVER_DRIVER_UNREGISTERED = 65,
TSERVER_NO_ACS_STREAM = 66,
TSERVER_DROP_OAM = 67,
TSERVER_ECB_TIMEOUT = 68,
TSERVER_BAD_ECB = 69,
TSERVER_ADVERTISE_FAILED = 70,
TSERVER_NETWARE_FAILURE = 71,
TSERVER_TDI_QUEUE_FAULT = 72,
TSERVER_DRIVER_CONGESTION = 73,
TSERVER_NO_TDI_BUFFERS = 74,
TSERVER_OLD_INVOKEID = 75,
TSERVER_HWMARK_TO_LARGE = 76,
TSERVER_SET_ECB_TO_LOW = 77,
TSERVER_NO_RECORD_IN_FILE = 78,
TSERVER_ECB_OVERDUE = 79,
TSERVER_BAD_PW_ENCRYPTION = 80,
TSERVER_BAD_TSERV_PROTOCOL = 81,
TSERVER_BAD_DRIVER_PROTOCOL = 82,
TSERVER_BAD_TRANSPORT_TYPE = 83,
TSERVER_PDU_VERSION_MISMATCH = 84,
TSERVER_VERSION_MISMATCH = 85,
TSERVER_LICENSE_MISMATCH = 86,
TSERVER_BAD_ATTRIBUTE_LIST = 87,
TSERVER_BAD_TLIST_TYPE = 88,
TSERVER_BAD_PROTOCOL_FORMAT = 89,
TSERVER_OLD_TSLIB = 90,
TSERVER_BAD_LICENSE_FILE = 91,
TSERVER_NO_PATCHES = 92,
TSERVER_SYSTEM_ERROR = 93,
TSERVER_OAM_LIST_EMPTY = 94,
TSERVER_TCP_FAILED = 95,
TSERVER_SPX_DISABLED = 96,
```

```
        TSERVER_TCP_DISABLED = 97,
        TSERVER_REQUIRED_MODULES_NOT_LOADED = 98,
        TSERVER_TRANSPORT_IN_USE_BY_OAM = 99,
        TSERVER_NO_NDS_OAM_PERMISSION = 100,
        TSERVER_OPEN_SDB_LOG_FAILED = 101,
        TSERVER_INVALID_LOG_SIZE = 102,
        TSERVER_WRITE_SDB_LOG_FAILED = 103,
        TSERVER_NT_FAILURE = 104,
        TSERVER_LOAD_LIB_FAILED = 105,
        TSERVER_INVALID_DRIVER = 106,
        TSERVER_REGISTRY_ERROR = 107,
        TSERVER_DUPLICATE_ENTRY = 108,
        TSERVER_DRIVER_LOADED = 109,DRIVER_DUPLICATE_ACSHANDLE =
1000,
        DRIVER_INVALID_ACS_REQUEST = 1001,
        DRIVER_ACS_HANDLE_REJECTION = 1002,
        DRIVER_INVALID_CLASS_REJECTION = 1003,
        DRIVER_GENERIC_REJECTION = 1004,
        DRIVER_RESOURCE_LIMITATION = 1005,
        DRIVER_ACSHANDLE_TERMINATION = 1006,
        DRIVER_LINK_UNAVAILABLE = 1007
        DRIVER_OAM_IN_USE = 1008

} ACSUniversalFailure_t;
```

Tserver Operation errors

Tserver operation errors indicate that there is an error in the Service Request. These include the following specific error values:

TSERVER_STREAM_FAILED
The Client Library detected that the ACS Stream failed.

TSERVER_NO_THREAD
One or more the threads (processes) that make up the Tserver could not be created.

TSERVER_BAD_DRIVER_ID
One of the threads (processes) that make up the Tserver encountered a bad Driver Identification number during processing.

TSERVER_DEAD_DRIVER
A Driver has not sent a heart beat messages to the Tserver form the last three minutes. The Driver may be in an inoperable state.

TSERVER_MESSAGE_HIGH_WATER_MARK
The message rate between a client and the Tserver or the Tserver and a Driver has exceeded the high water mark rate.

TSERVER_FREE_BUFFER_FAILED
The Tserver was unable to free Tserver Driver Interface (TDI) memory.

TSERVER_SEND_TO_DRIVER
The Tserver was unable to send a message to a Driver.

TSERVER_RECEIVE_FROM_DRIVER
The Tserver was unable to receive a message from a Driver.

TSERVER_REGISTRATION_FAILED
A Driver's attempt to register with the Tserver failed.

TSERVER_SPX_FAILED
A NetWare SPX call failed in the Tserver.

TSERVER_TRACE
Used by the Tserver for debugging purposes only.

TSERVER_NO_MEMORY
The Tserver was unable to allocate a piece of memory.

TSERVER_ENCODE_FAILED
The Tserver was unable to encode a message for shipment to a client workstation.

TSERVER_DECODE_FAILED
The Tserver was unable to decode a message from a client workstation.

TSERVER_BAD_CONNECTION
The Tserver tried to process a request with a bad client connection ID number.

TSERVER_BAD_PDU
The Tserver's internal table of Protocol Descriptor Units is corrupted.

TSERVER_NO_VERSION
The Tserver processed a ACSOpenStreamConfEvent from a Driver in which one or more the version fields was not set.

TSERVER_ECB_MAX_EXCEEDED
The Tserver can not process a message from the driver because the message is larger than the sum of the ECBs allocated for this driver.

TSERVER_NO_ECBS
The Tserver has no available ECBs to send events to the client.

TSERVER_NO_RESOURCE_TAG
The Tserver was unable to get a resource tag for the purpose of allocating memory.

TSERVER_INVALID_MESSAGE
The Tserver received an invalid Tserver OAM message.

TSERVER_ECB_OVERDUE
The Telephony Server uses this error code in the log file. An application will not receive it.

TSERVER_BAD_PW_ENCRYPTION
The Telephony Server uses this error code in the log file. An application will not receive it.

TSERVER_BAD_TRANSPORT_TYPE
The Telephony Server uses this error code in the log file. An application will not receive it.

TSERVER_BAD_TSERV_PROTOCOL
The application has requested a TSAPI protocol version that the Telephony Server does not provide.

TSERVER_BAD_DRIVER PROTOCOL
The application has requested a TSAPI protocol version that the Telephony Server provides but the PBX Driver does not provide.

TSERVER_PDU_VERSION_MISMATCH
The application has invoked a service that the stream version does not support. This resulted in the client library sending the Telephony Server a Protocol Data Unit (PDU) that is not supported in the TSAPI version on that stream.

TSERVER_BAD_PROTOCOL_FORMAT
The *apiVer* parameter value is not in the proper syntax.

TSERVER_OLD_TSLIB
The application is using a TSLIB library of an earlier vintage than the version it is requesting in an open stream call.

TSERVER_REQUIRED_MODULES_NOT_LOADED

TSERVER_TRANSPORT_IN_USE_BY_OAM

TSERVER_NO_NDS_OAM_PERMISSION

TSERVER_OPEN_SDB_LOG_FAILED

TSERVER_INVALID_LOG_SIZE,

TSERVER_WRITE_SDB_LOG_FAILED

TSERVER_NT_FAILURE,

TSERVER_LOAD_LIB_FAILED

TSERVER_INVALID_DRIVER

TSERVER_REGISTRY_ERROR

TSERVER_DUPLICATE_ENTRY

TSERVER_DRIVER_LOADED

Tserver Security Data Base errors

Error values in this category indicate that there is an error in the process of an event which requires a check against the Security Data Base. This type includes one of the following specific error values:

TSERVER_NO_SDB
One or more the files that makeup the Security Data Base is not present on the server or can not be opened.

TSERVER_NO_SDB_CHECK_NEEDED
The requested service event does not require a Security Data Base check.

TSERVER_SDB_CHECK_NEEDED
The requested service event does require a Security Data Base check.

TSERVER_BAD_SDB_LEVEL
The Tserver's internal table of API calls indicating which level of security to perform on the request is corrupted.

TSERVER_BAD_SERVERID
The Tserver rejected an ACSOpenStream request because the Server ID in the message did not match a Driver supported by this Tserver.

TSERVER_BAD_STREAM_TYPE
The stream type an ACSOpenStream request was invalid.

TSERVER_BAD_PASSWORD_OR_LOGIN
The Password or Login or both from an ACSOpenStream request did not match an entry in the Bindery on the server the Tserver is running on.

TSERVER_NO_USER_RECORD
No user record was found in the Security Data Base for the login specified in the ACSOpenStream request.

TSERVER_NO_DEVICE_RECORD
No device record was found in the Security Data Base for the device specified in the API call.

TSERVER_DEVICE_NOT_ON_LIST
The specified device in an API call was not found on any device list administered for this user.

TSERVER_USERS_RESTRICTED_HOME
The Tserver is administered to restrict users to home worktops so no checking is done against away worktop devices.

TSERVER_NO_AWAYPERMISSION
The Tserver rejected a service request because the device did not match a device associated with an away worktop.

TSERVER_NO_HOMEPERMISSION
The Tserver rejected a service request because the device did not match a device associated with a home worktop.

TSERVER_NO_AWAY_WORKTOP
The away worktop the user is working from is not administered in the Security Data Base.

TSERVER_BAD_DEVICE_RECORD
The Tserver read a device record from the Security Data Base that contained corrupted information.

TSERVER_DEVICE_NOT_SUPPORTED
The device in the API call is administered to be supported by a different Tserver.

TSERVER_INSUFFICIENT_PERMISSION
The device in the API call is at the users away worktop and the device has a higher permission level than the user, preventing the user from controlling the device.

TSERVER_EXCEPTION_LIST
The device in the API call is on an exception list which is administered as part of the information for this user.

Driver Errors

Error values in this category indicate that the driver detected an error. This type includes one of the following specific error values:

DRIVER_DUPLICATE_ACSHANDLE
The acsHandle given for an ACSOpenStream request is already in use for a session. The already open session with the acsHandle is remains open.

DRIVER_INVALID_ACS_REQUEST
The ACS message contains an invalid or unknown request. The request is rejected.

DRIVER_ACS_HANDLE_REJECTION
A CSTA request was issued with no prior ACSOpenStream request. The request is rejected.

DRIVER_INVALID_CLASS_REJECTION
The driver received a message containing an invalid or unknown message class. The request is rejected.

DRIVER_GENERIC_REJECTION
The driver detected an invalid message for something other than message type or message class. This is an internal error and should be reported.

DRIVER_RESOURCE_LIMITATION
The driver did not have adequate resources (i.e. memory, etc.) to complete the requested operation. This is an internal error and should be reported.

DRIVER_ACSHANDLE_TERMINATION
Due to problems with the link to the switch the driver has found it necessary to terminate the session with the given acsHandle. The session will be closed, and all outstanding requests will terminate.

DRIVER_LINK_UNAVAILABLE
The driver was unable to open the new session because no link was available to the PBX. The link may have been placed in the BLOCKED state, or it may have been taken off-line.

DRIVER_OAM_IN_USE
There is already an open OAM-type stream to the PBX driver. A driver can only have a single OAM stream open at any time.

ACS Data Types

This section defines all the data types which are used with the ACS functions and messages and may repeat data types already shown in the ACS Control Functions. Refer to the specific commands for any operational differences in these data types. The ACS data types are type defined in the **acs.h** header file.

The definition for ACSHandle_t is client platform specific.

ACS Common Data Types

This section specifies the common ACS data types.

```
typedef int RetCode_t;

#define ACSPOSITIVE_ACK 0 /* Successful function return */

/* Error Codes */

#define ACSERR_APIVERDENIED             -1  /* The API Version
                                             * requested is invalid
                                             * and not supported by
                                             *the API Client Library
                                             */

#define ACSERR_BADPARAMETER             -2  /* One or more of the
                                            .* parameters is invalid
                                             */

#define ACSERR_DUPSTREAM                -3  /* This return indicates
                                             * that an ACS Stream is
                                             * already established
                                             * with the requested
                                             * Server.
                                             */

#define ACSERR_NODRIVER                 -4  /* This error return
                                             * value indicates that
                                             * no API Client Library
                                             * Driver was found or
                                             *installed on the system
                                             */

#define ACSERR_NOSERVER                 -5  /* the requested Server
                                             * is not present in the
                                             * network.
```

```
                                        */

#define ACSERR_NORESOURCE               -6  /* there are insufficient
                                             * resourcesto open a
                                             * ACS Stream.
                                             */

#define ACSERR_UBUFSMALL                -7  /* The user buffer size
                                             * was smaller than the
                                             * size of  the next
                                             * available event.
                                             */

#define ACSERR_NOMESSAGE                -8  /* There were no messages
                                             *available to return to
                                             * the application.
                                             */

#define ACSERR_UNKNOWN                  -9  /* The ACS Stream has
                                             * encounteredan
                                             * unspecified error.
                                             */

#define ACSERR_BADHDL                   -10 /* The ACS Handle is
                                               * invalid
                                               */

#define ACSERR_STREAM_FAILED            -11 /* The ACS Stream has
                                             * failed due to
                                             * network problems.
                                             * No further
                                             * operations are
                                             * possible on this
                                               * stream.
                                             */

#define ACSERR_NOBUFFERS                -12 /* There were not
                                             * enough buffers
                                             * available to place
                                             * an outgoing message
                                             * on the send queue.
                                             * No message has been
                                             * sent.
                                             */

#define ACSERR_QUEUE_FULL               -13 /* The send queue is
                                             * full. No message
                                             *has been sent.
                                             */

typedef unsigned long     InvokeID_t;

typedef enum {
    APP_GEN_ID,        // application will provide invokeIDs;
                       // any 4-byte value is legal
    LIB_GEN_ID         // library will generate invokeIDs in
                       // the range 1-32767
} InvokeIDType_t;
```

```
typedef unsigned short    EventClass_t;

// defines for ACS event classes

#define    ACSREQUEST            0
#define    ACSUNSOLICITED        1
#define    ACSCONFIRMATION       2

typedef unsigned short EventType_t;             // event types are
                                                // defined in acs.h
                                                // and csta.h

typedef char Boolean;
typedef char Nulltype;

#define          ACS_OPEN_STREAM  1
#define          ACS_OPEN_STREAM_CONF    2
#define          ACS_CLOSE_STREAM 3
#define          ACS_CLOSE_STREAM_CONF   4
#define          ACS_ABORT_STREAM 5
#define          ACS_UNIVERSAL_FAILURE_CONF     6
#define          ACS_UNIVERSAL_FAILURE   7

typedef enum StreamType_t {
    ST_CSTA = 1,
    ST_OAM = 2,
} StreamType_t;

typedef char ServerID_t[49];

typedef char LoginID_t[49];

typedef char Passwd_t[49];

typedef char AppName_t[21];

typedef enum Level_t {
    ACS_LEVEL1 = 1,
    ACS_LEVEL2 = 2,
    ACS_LEVEL3 = 3,
    ACS_LEVEL4 = 4
} Level_t;

typedef char Version_t[21];
```

ACS Event Data Types

This section specifies the ACS data types used in the construction of generic *ACSEvent_t* structures (see section 4.6).

```
typedef struct
    {
        ACSHandle_t        acsHandle;
        EventClass_t       eventClass;
        EventType_t        eventType;
    } ACSEventHeader_t;

typedef struct
    {
        union
        {
        ACSUniversalFailureEvent_t failureEvent;
        } u;
    } ACSUnsolicitedEvent;

typedef struct
    {
        InvokeID_t                              invokeID;
        union
        {
        ACSOpenStreamConfEvent_t                acsopen;
        ACSCloseStreamConfEvent_t               acsclose;
        ACSUniversalFailureConfEvent_t          failureEvent;
        } u;
    } ACSConfirmationEvent;
```

CSTA Control Services and Confirmation Events

This section defines the CSTA functions associated with the Telephony Server's Services. These functions are used to determine types and capabilities of Telephony Servers and Drivers connected to Telephony Servers and to determine the set of devices an application can control, monitor and query.

cstaGetAPICaps( )

cstaGetAPICaps( ) obtains the CSTA API function and event capabilities which are supported on an open CSTA stream. The stream could be a local PBX driver or a remote PBX Driver on a network. If a stream provides a CSTA service then it also provides the corresponding CSTA confirmation event.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaGetAPICaps(
    ACSHandle_t acsHandle,
    InvokeID_t invokeID);
```

Parameters

acsHandle
This is the handle to an active ACS Stream. This service will return in its confirmation information about the CSTA services available on this stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAGetAPICapsConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

Comments

If this function returns with a POSITIVE_ACK, the request has been forwarded to the Telephony Server, and the application will receive an indication of the extent of CSTA service support in the **CSTAGetAPICapsConfEvent**. An active ACS Stream is required to the server before this function is called.

The application may use this command to determine which functions and events are supported on an open CSTA stream. This will avoid unnecessary negative acknowledgments from the Telephony Server when a specific API function or event is not supported.

CSTAGetAPICapsConfEvent

This event is in response to the cstaGetAPICaps( ) function and it indicates which CSTA services are available on the CSTA stream.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***CSTA Data Types*** for a complete description of the event structure.

```
typedef struct
{   ACSHandle_tacsHandle;
    EventClass_t       eventClass;
    EventType_teventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
        {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        CSTAGetAPICapsConfEvent_t getAPIcaps;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAGetAPICapsConfEvent_t {
    short           alternateCall;
    short           answerCall;
    short           callCompletion;
    short           clearCall;
    short           clearConnection;
    short           conferenceCall;
    short           consultationCall;
    short           deflectCall;
    short           pickupCall;
    short           groupPickupCall;
    short           holdCall;
    short           makeCall;
    short           makePredictiveCall;
    short           queryMwi;
    short           queryDnd;
    short           queryFwd;
    short           queryAgentState;
    short           queryLastNumber;
    short           queryDeviceInfo;
    short           reconnectCall;
```

```
short           retrieveCall;
short           setMwi;
short           setDnd;
short           setFwd;
short           setAgentState;
short           transferCall;
short           eventReport;
short           callClearedEvent;
short           conferencedEvent;
short           connectionClearedEvent;
short           deliveredEvent;
short           divertedEvent;
short           establishedEvent;
short           failedEvent;
short           heldEvent;
short           networkReachedEvent;
short           originatedEvent;
short           queuedEvent;
short           retrievedEvent;
short           serviceInitiatedEvent;
short           transferredEvent;
short           callInformationEvent;
short           doNotDisturbEvent;
short           forwardingEvent;
short           messageWaitingEvent;
short           loggedOnEvent;
short           loggedOffEvent;
short           notReadyEvent;
short           readyEvent;
short           workNotReadyEvent;
short           workReadyEvent;
short           backInServiceEvent;
short           outOfServiceEvent;
short           privateEvent;
short           routeRequestEvent;
short           reRoute;
short           routeSelect;
short           routeUsedEvent;
short           routeEndEvent;
short           monitorDevice;
short           monitorCall;
short           monitorCallsViaDevice;
short           changeMonitorFilter;
short           monitorStop;
short           monitorEnded;
short           snapshotDeviceReq;
short           snapshotCallReq;
short           escapeService;
short           privateStatusEvent;
short           escapeServiceEvent;
short           escapeServiceConf;
short           sendPrivateEvent;
short           sysStatReq;
short           sysStatStart;
short           sysStatStop;
short           changeSysStatFilter;
short           sysStatReqEvent;
short           sysStatReqConf;
short           sysStatEvent;
```

```
} CSTAGetAPICapsConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as a CSTA confirmation event.

eventType
This is a tag with the value **CSTA_GETAPI_CAPS_CONF** , which identifies this message as an **CSTAGetAPICapsConfEvent.**

getAPIcaps
This structure contains an integer for each possible CSTA capability which indicates whether the capability is supported. A value of 0 indicates the capability is not supported, a positive value indicates that it is supported. Note that different capabilities are supported on different stream versions. This parameter shows what capabilities are supported on the stream where the confirmation has been received. Streams using other versions may support a different capability set.

Comments

This event will provide the application with compatibility information for a specific Telephony Server on a command/event basis. All the commands and events supported by a Telephony Server must be supported as defined in this document.

cstaGetDeviceList( )

This is used to obtain the list of Devices that can be controlled, monitored, queried or routed for the ACS Stream indicated by the acsHandle.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaGetDeviceList(
    ACSHandle_t acsHandle,
    InvokeID_t  invokeID,
    long        index,
    CSTALevel_t level)
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream().** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

index
The security data base could contain a large number of devices that a user has privilege over, so this API call will return only **CSTA_MAX_GETDEVICE** devices in any one **CSTAGetDeviceListConfEvent,** which means several calls to cstaGetDeviceList() may be necessary to retrieve all the devices**.** ***Index*** should be set of -1 the first time this API is called and then set to the value of ***Index*** returned in the confirmation event. ***Index*** will be set back to -1 in the **CSTAGetDeviceListConfEvent** which contains the last batch of devices.

level
This parameter specifies the class of service for which the user wants to know the set of devices that can be controlled via this ACS stream. ***level*** must be set to one of the following:

```
typedef enum CSTALevel_t {
    CSTA_HOME_WORK_TOP = 1,
    CSTA_AWAY_WORK_TOP = 2,
    CSTA_DEVICE_DEVICE_MONITOR = 3,
    CSTA_CALL_DEVICE_MONITOR = 4,
    CSTA_CALL_CONTROL = 5,
    CSTA_ROUTING = 6,
    CSTA_CALL_CALL_MONITOR = 7
} CSTALevel_t;
```

The ***level*** CSTA_CALL_CALL_MONITOR is not supported by the **CSTAGetDeviceList()** call. To determine if an ACS stream has permission to do call/call monitoring, use the API call **CSTAQueryCallMonitor( ).**

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAGetDeviceListConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

CSTAGetDeviceListConfEvent

This event is in response to the cstaGetDeviceList( ) function and it provide a list of the devices which can be controlled for the indicated ACS Level. It is also possible to receive an **ACSUniversalFailureConf** event in response to a cstaGetDeviceList() call.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types and CSTA Data Types*** for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
    struct
        {
                InvokeID_t     invokeID;
                union
                {
                   CSTAGetDeviceListConfEvent_t getDeviceList;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef enum SDBLevel_t {
    NO_SDB_CHECKING = -1,
    ACS_ONLY = 1,
    ACS_AND_CSTA_CHECKING = 0
} SDBLevel_t;

typedef struct CSTAGetDeviceList_t {
    long            index;
    CSTALevel_t     level;
} CSTAGetDeviceList_t;

typedef struct DeviceList {
    short           count;
    DeviceID_t      device[20];
} DeviceList;
```

```
typedef struct CSTAGetDeviceListConfEvent_t {
    SDBLevel_t      driverSdbLevel;
    CSTALevel_t     level;
    long            index;
    DeviceList      devList;
} CSTAGetDeviceListConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an ACS confirmation event.

eventType
This is a tag with the value **CSTA_GET_DEVICE_LIST_CONF**, which identifies this message as an **CSTAGetDeviceListConfEvent**.

invokeID
This parameter specifies the requested instance of the function. It is used to match a specific function request with its confirmation events.

driverSdbLevel
This parameter indicates the Security Level with which the Driver registered. Possible values are:

NO_SDB_CHECKING	Not Used.
ACS_ONLY	Check ACSOpenStream requests only
ACS_AND_CSTA_CHECKING	Check ACSOpenStream and all applicable CSTA messages

index
This parameter indicates to the client application the current index the Tserver is using for returning the list of devices. The client application should return this value in the next call to CSTAGetDeviceList to continue receiving devices. A value of (-1) indicates there are no more devices in the list.

devlist
This parameter is a structure which contains an array of ***DeviceID_t*** which contain the devices for this stream.

cstaQueryCallMonitor( )

This is used to determine the if a given ACS stream has permission to do call/call monitoring in the security database.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaQueryCallMonitor(
    ACSHandle_t acsHandle,
    InvokeID_t  invokeID)
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream().** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAQueryCallMonitor-ConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This indicates that the acsHandle being used is not a valid handle for an active ACS Stream. No changes occur in any existing streams if a bad handle is passed with this function.

CSTAQueryCallMonitorConfEvent

This event is in response to the cstaQueryCallMonitor( ) function and it provide a list of the devices which can be controlled for the indicated ACS Level.

Syntax

The following structure shows only the relevant portions of the unions for this message. See the ***ACS Data Types*** and ***CSTA Data Types*** sections for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        CSTAQueryCallMonitorConfEvent_t  queryCallMonitor;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAQueryCallMonitorConfEvent_t {
    Boolean         callMonitor;
} CSTAQueryCallMonitorConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an ACS confirmation event.

eventType
This is a tag with the value **CSTA_QUERY_CALL_MONITOR_-CONF**, which identifies this message as an **CSTAQueryCallMonitorConfEvent**.

invokeID
This parameter specifies the requested instance of the function. It is used to match a specific function request with its confirmation events.

callMonitor
This parameter indicates whether or not (TRUE or FALSE) the ACS Stream has call/call monitoring privilege.

CSTA Event Data Types

This section defines all the event data types which are used with the CSTA functions and messages and may repeat data types already shown in the CSTA Control Functions. Refer to the specific commands for any operational differences in these data types. The complete set of CSTA data types is given in ***- CSTA Data Types***. The CSTA data types are type defined in the **CSTA.H** header file.

An application always receives a generic *CSTAEvent_t* event structure. This structure contains an *ACSEventHeader_t* structure which contains information common to all events. This common information includes:

- *acsHandle:* Specifies the ACS Stream the event arrived on.
- *eventClass:* Identifies the event as an ACS confirmation, ACS unsolicited, CSTA confirmation, or CSTA unsolicited event.
- *eventType*: Identifies the specific type of message (MakeCall, confirmation event, HoldCall event, etc.)
- *privateData:* Private data defined by the specified driver vendor.

The *CSTAEvent_t* structure then consists of a union of the four possible *eventClass* types; ACS confirmation, ACS unsolicited, CSTA confirmation or CSTA unsolicited event. Each *eventClass* type itself consists of a union of all the possible *eventTypes* for that class. Each eventClass may contain common information such as *invokeID* and *monitorCrossRefID.*

```
/* CSTA Control Services Header File <CSTA.H> */

    #include <acs.h>
// defines for CSTA event classes

    #define    CSTAREQUEST    3
    #define    CSTAUNSOLICITED       4
    #define    CSTACONFIRMATION      5
    #define    CSTAEVENTREPORT       6
```

```
typedef struct {
               InvokeID_t                          invokeID;
               union
               {
                      CSTARouteRequestEvent_t      routeRequest;
                      CSTARouteRequestExtEvent_t   routeRequestExt;
                      CSTAReRouteRequest_t         reRouteRequest;
                      CSTAEscapeSvcReqEvent_t      escapeSvcReqeust;
                      CSTASysStatReqEvent_t        sysStatRequest;
               } u;
   } CSTARequestEvent;

typedef struct {
    union
    {
               CSTARouteRegisterAbortEvent_t       registerAbort;
               CSTARouteUsedEvent_t                routeUsed;
               CSTARouteUsedExtEvent_t             routeUsedExt;
               CSTARouteEndEvent_t                 routeEnd;
               CSTAPrivateEvent_t                  privateEvent;
               CSTASysStatEvent_t                  sysStat;
               CSTASysStatEndedEvent_t             sysStatEnded;
               }u;
   } CSTAEventReport;
```

```
typedef struct {
    CSTAMonitorCrossRefID_t     monitorCrossRefId;
    union
    {
                CSTACallClearedEvent_t              callCleared;
                CSTAConferencedEvent_t              conferenced;
                CSTAConnectionClearedEvent_t        connectionCleared;
                CSTADeliveredEvent_t                delivered;
                CSTADivertedEvent_t                 diverted;
                CSTAEstablishedEvent_t              established;
                CSTAFailedEvent_t                   failed;
                CSTAHeldEvent_t                     held;
                CSTANetworkReachedEvent_t           networkReached;
                CSTAOriginatedEvent_t               originated;
                CSTAQueuedEvent_t                   queued;
                CSTARetrievedEvent_t                retrieved;
                CSTAServiceInitiatedEvent_t         serviceInitiated;
                CSTATransferredEvent_t              transferred;
                CSTACallInformationEvent_t          callInformation;
                CSTADoNotDisturbEvent_t             doNotDisturb;
                CSTAForwardingEvent_t               forwarding;
                CSTAMessageWaitingEvent_t           messageWaiting;
                CSTALoggedOnEvent_t                 loggedOn;
                CSTALoggedOffEvent_t                loggedOff;
                CSTANotReadyEvent_t                 notReady;
                CSTAReadyEvent_t                    ready;
                CSTAWorkNotReadyEvent_t             workNotReady;
                CSTAWorkReadyEvent_t                workReady;
                CSTABackInServiceEvent_t            backInService;
                CSTAOutOfServiceEvent_t             outOfService;
                CSTAPrivateStatusEvent_t            privateStatus;
                CSTAMonitorEndedEvent_t             monitorEnded;
                } u;
    } CSTAUnsolicitedEvent;
```

```
typedef struct
    {
    InvokeID_t    invokeID;
    union
    {
                CSTAAlternateCallConfEvent_t          alternateCall;
                CSTAAnswerCallConfEvent_t             answerCall;
                CSTACallCompletionConfEvent_t         callCompletion;
                CSTAClearCallConfEvent_t              clearCall;
                CSTAClearConnectionConfEvent_t        clearConnection;
                CSTAConferenceCallConfEvent_t         conferenceCall;
                CSTAConsultationCallConfEvent_t       consultationCall;
                CSTADeflectCallConfEvent_t            deflectCall;
                CSTAPickupCallConfEvent_t             pickupCall;
                CSTAGroupPickupCallConfEvent_t        groupPickupCall;
                CSTAHoldCallConfEvent_t               holdCall;
                CSTAMakeCallConfEvent_t               makeCall;
                CSTAMakePredictiveCallConfEvent_t     makePredictiveCall;
                CSTAQueryMwiConfEvent_t               queryMwi;
                CSTAQueryDndConfEvent_t               queryDnd;
                CSTAQueryFwdConfEvent_t               queryFwd;
                CSTAQueryAgentStateConfEvent_t        queryAgentState;
                CSTAQueryLastNumberConfEvent_t        queryLastNumber;
                CSTAQueryDeviceInfoConfEvent_t        queryDeviceInfo;
                CSTAReconnectCallConfEvent_t          reconnectCall;
                CSTARetrieveCallConfEvent_t           retrieveCall;
                CSTASetMwiConfEvent_t                 setMwi;
                CSTASetDndConfEvent_t                 setDnd;
                CSTASetFwdConfEvent_t                 setFwd;
                CSTASetAgentStateConfEvent_t          setAgentState;
                CSTATransferCallConfEvent_t           ransferCall;
                CSTAUniversalFailureConfEvent_t       universalFailure;
                CSTAMonitorConfEvent_t                monitorStart;
                CSTAChangeMonitorFilterConfEvent_t    changeMonitorFilter;
                CSTAMonitorStopConfEvent_t            monitorStop;
                CSTASnapshotDeviceConfEvent_t         snapshotDevice;
                CSTASnapshotCallConfEvent_t           snapshotCall;
                CSTARouteRegisterReqConfEvent_t       routeRegister;
                CSTARouteRegisterCancelConfEvent_t    routeCancel;
                CSTAEscapeSvcConfEvent_t              escapeService;
                CSTASysStatReqConfEvent_t             sysStatReq;
                CSTASySStatStartConfEvent_t           sysStatStart;
                CSTASysStatStopConfEvent_t            sysStatStop;
                CSTAChangeSysStatFilterConfEvent_t    changeSysStatFilter;
                CSTAGetAPICapsConfEvent_t             getAPICaps;
                CSTAGetDeviceListConfEvent_t          getDeviceList;
                CSTAQueryCallMonitorConfEvent_t       queryCallMonitor;
                } u;
    } CSTAConfirmationEvent;

#define CSTA_MAX_HEAP 1024
```

```
typedef struct
    {
    ACSEventHeader_t   eventHeader;
    union
    {
                ACSUnsolicitedEvent                 acsUnsolicited;
                ACSConfirmationEvent                acsConfirmation;
                CSTARequestEvent                    cstaRequest;
                CSTAUnsolicitedEvent                cstaUnsolicited;
                CSTAConfirmationEvent               cstaConfirmation;
                } event;
    char   heap[CSTA_MAX_HEAP];
    } CSTAEvent_t
```

Chapter 5 Switching Function Services

This section describes Telephony Services. Applications use Telephony Services to control calls and activate switch features. Switching Functions Services are divided into ***Basic Call Control Services*** and ***Telephony Supplementary Services***.

Basic Call Control Services

Basic Call Control Services allows applications to:

- establish, control, and "tear-down" calls at a device or within the switch,
- answer incoming calls at a device, and
- activate/de-activate switch features.

Each Basic Call Control Service request has an associated confirmation event message. The confirmation message returns the status and other service-specific information to the application. TSAPI always returns confirmation event messages for successful function calls. If TSAPI cannot successfully process a function call then

- TSAPI does not send the service request to the PBX Driver
- TSAPI does not generate a confirmation event

As noted in Chapter 4, section ***Sending CSTA Requests and Responses***, the application sets the invokeID type (when it opens the stream) to either library generated or application generated. As described in that section, applications may use application generated invokeIDs to index into data structures in various ways. The application may also use the *invokeID* to match results with specific service requests.

When TSAPI successfully processes an application request, TSAPI sends the application a confirmation event. This conformation means that TSAPI has successfully processed the request, not that the PBX driver or PBX has successfully processed the request. For example, TSAPI will send an application a **CSTAMakeCallConfEvent** after TSAPI (not the PBX) successfully processes a **cstaMakeCall**( ) request. Further information from the PBX Driver or PBX will arrive in call events or unsolicited status events. An application interested in the results of a request should check for a function confirmation event and any applicable unsolicited status events (see ***Status Reporting Services***).

To receive events, an application must have an active ACS Stream and an implement an event handling mechanism. Further, the reception of unsolicited events requires an active monitor. See the ***Control Services*** and ***Status Reporting Services*** sections for more information on events.

Not every Driver implementation will support all Telephony functions. The application should use the cstaGetAPICaps function to determine which Telephony Services are supported.

CSTAUniversalFailureConfEvent

The CSTA universal failure confirmation event provides a generic negative response from the server/switch for a previous requested service. The CSTAUniversalFailureConfEvent will be sent in place of any confirmation event described in this section when the requested function fails. The confirmation events defined for each Switching Function in this section are only sent when that function completes successfully.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Chapter 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
        ACSEventHeader_t      eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                CSTAUniversalFailureConfEvent universalFailure;
                } u;
        }  cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct
{
    UniversalFailure_t error;
} CSTAUniversalFailureConfEvent_t;

typedef enum CSTAUniversalFailure_t {
    GENERIC_UNSPECIFIED = 0,
    GENERIC_OPERATION = 1,
    REQUEST_INCOMPATIBLE_WITH_OBJECT = 2,
    VALUE_OUT_OF_RANGE = 3,
    OBJECT_NOT_KNOWN = 4,
    INVALID_CALLING_DEVICE = 5,
    INVALID_CALLED_DEVICE = 6,
    INVALID_FORWARDING_DESTINATION = 7,
```

```
PRIVILEGE_VIOLATION_ON_SPECIFIED_DEVICE = 8,
PRIVILEGE_VIOLATION_ON_CALLED_DEVICE = 9,
PRIVILEGE_VIOLATION_ON_CALLING_DEVICE = 10,
INVALID_CSTA_CALL_IDENTIFIER = 11,
INVALID_CSTA_DEVICE_IDENTIFIER = 12,
INVALID_CSTA_CONNECTION_IDENTIFIER = 13,
INVALID_DESTINATION = 14,
INVALID_FEATURE = 15,
INVALID_ALLOCATION_STATE = 16,
INVALID_CROSS_REF_ID = 17,
INVALID_OBJECT_TYPE = 18,
SECURITY_VIOLATION = 19,
GENERIC_STATE_INCOMPATIBILITY = 21,
INVALID_OBJECT_STATE = 22,
INVALID_CONNECTION_ID_FOR_ACTIVE_CALL = 23,
NO_ACTIVE_CALL = 24,
NO_HELD_CALL = 25,
NO_CALL_TO_CLEAR = 26,
NO_CONNECTION_TO_CLEAR = 27,
NO_CALL_TO_ANSWER = 28,
NO_CALL_TO_COMPLETE = 29,
GENERIC_SYSTEM_RESOURCE_AVAILABILITY = 31,
SERVICE_BUSY = 32,
RESOURCE_BUSY = 33,
RESOURCE_OUT_OF_SERVICE = 34,
NETWORK_BUSY = 35,
NETWORK_OUT_OF_SERVICE = 36,
OVERALL_MONITOR_LIMIT_EXCEEDED = 37,
CONFERENCE_MEMBER_LIMIT_EXCEEDED = 38,
GENERIC_SUBSCRIBED_RESOURCE_AVAILABILITY = 41,
OBJECT_MONITOR_LIMIT_EXCEEDED = 42,
EXTERNAL_TRUNK_LIMIT_EXCEEDED = 43,
OUTSTANDING_REQUEST_LIMIT_EXCEEDED = 44,
GENERIC_PERFORMANCE_MANAGEMENT = 51,
PERFORMANCE_LIMIT_EXCEEDED = 52,
UNSPECIFIED_SECURITY_ERROR = 60
SEQUENCE_NUMBER_VIOLATED = 61,
TIME_STAMP_VIOLATED = 62,
PAC_VIOLATED = 63,
SEAL_VIOLATED = 64
GENERIC_UNSPECIFIED_REJECTION = 70
GENERIC_OPERATION_REJECTION = 71
DUPLICATE_INVOCATION_REJECTION = 72
UNRECOGNIZED_OPERATION_REJECTION = 73
MISTYPED_ARGUMENT_REJECTION = 74
RESOURCE_LIMITATION_REJECTION = 75
ACS_HANDLE_TERMINATION_REJECTION = 76
SERVICE_TERMINATION_REJECTION = 77
REQUEST_TIMEOUT_REJECTION = 78
REQUESTS_ON_DEVICE_EXCEEDED_REJECTION = 79
UNRECOGNIZED_APDU_REJECTION = 80,
MISTYPED_APDU_REJECTION = 81,
BADLY_STRUCTURED_APDU_REJECTION = 82,
INITIATOR_RELEASING_REJECTION = 83,
UNRECOGNIZED_LINKEDID_REJECTION = 84,
LINKED_RESPONSE_UNEXPECTED_REJECTION = 85,
UNEXPECTED_CHILD_OPERATION_REJECTION = 86,
MISTYPED_RESULT_REJECTION = 87,
UNRECOGNIZED_ERROR_REJECTION = 88,
```

```
    UNEXPECTED_ERROR_REJECTION = 89,
    MISTYPED_PARAMETER_REJECTION = 90,
    NON_STANDARD = 100
} CSTAUniversalFailure_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This tag with a value, CSTA_UNIVERSAL_FAILURE_CONF, identifies this message as an CSTAUniversalFailureConfEvent.

invokeID
This parameter specifies the function service request instance that has failed at the server or at the switch. This identifier is provided to the application when a service request is made.

error
This parameter contains an error value from one of the following classes: Unspecified, Operation, State Incompatibility, System Resource, Subscribed Resource, Performance Management, or Security. The headings the follow contain the specific errors in these classes.

Unspecified Errors

Error values in this category indicate that an error has occurred that is not among the other error types. This type includes the following specific error value:

GENERIC_UNSPECIFIED

GENERIC_UNSPECIFIED_REJECTION

Operation errors

Error values in this category indicate that there is an error in the Service Request. This type includes one of the following specific error values:

GENERIC_OPERATION

GENERIC_OPERATION_REJECTION
This error indicate that the server has detected an error in the operation class, but that it is not one of the defined errors, or the server cannot be any more specific

REQUEST_INCOMPATIBLE_WITH_OBJECT
The request is not compatible with the object.

DUPLICATE_INVOCATION
The invokeID violates X.208 or X.209 assignment rules.

UNRECOGNIZED_OPERATION_REJECTION
The operation is not defined in TSAPI.

VALUE_OUT_OF_RANGE
The parameter has a value that is not in the range defined for the server.

OBJECT_NOT_KNOWN
The parameter has a value that is not known to the server.

INVALID_CALLING_DEVICE
The calling device is not valid.

INVALID_CALLED_DEVICE
The called device is not valid.

PRIVILEGE_VIOLATION_ON_SPECIFIED_DEVICE
The request cannot be provided because the specified device is not authorized for the Service.

INVALID_FORWARDING_DESTINATION
The request cannot be provided because the forwarding destination device is not valid.

PRIVILEGE_VIOLATION_ON_CALLED_DEVICE
The request cannot be provided because the called device is not authorized for the Service.

PRIVILEGE_VIOLATION_ON_CALLING_DEVICE
The request cannot be provided because the calling device is not authorized for the Service.

INVALID_CSTA_CALL_IDENTIFIER
The call identifier is not valid.

INVALID_CSTA_DEVICE_IDENTIFIER
The Device Identifier is not valid.

INVALID_CSTA_CONNECTION_IDENTIFIER
The Connection identifier is not valid.

INVALID_DESTINATION
The Service Request specified a destination that is not valid.

INVALID_FEATURE
The Service Request specified a feature that is not valid.

INVALID_ALLOCATION_STATE
The Service Request indicated an allocation condition that is not valid.

INVALID_CROSS_REF_ID
The Service Request specified a Cross-Reference Id that is not in use at this time.

INVALID_OBJECT_TYPE
The Service Request specified an object type that is outside the range of valid object types for the Service.

SECURITY_VIOLATION
The request violates a security requirement.

State incompatibility errors

Error values in this category indicate that the Service Request was not compatible with the condition of a related CSTA object. This type includes the following specific error values:

GENERIC_STATE_INCOMPATIBILITY
The server is unable to be any more specific.

INVALID_OBJECT_STATE
The object is in the incorrect state for the Service. This general error value may be used when the server isn't able to be any more specific.

INVALID_CONNECTION_ID_FOR_ACTIVE_CALL
The Connection identifier specified in the Active Call parameter of the request is not in the correct state.

NO_ACTIVE_CALL
The requested Service operates on an active call, but there is no active call.

NO_HELD_CALL
The requested Service operates on a held call, but the specified call is not in the Held state.

NO_CALL_TO_CLEAR
There is no call associated with the CSTA Connection identifier of the Clear Call request.

NO_CONNECTION_TO_CLEAR
There is no Connection for the CSTA Connection identifier specified as Connection To Be Cleared.

NO_CALL_TO_ANSWER
There is no call active for the CSTA Connection identifier specified as Call To Be Answered.

NO_CALL_TO_COMPLETE
There is no call active for the CSTA Connection identifier specified as Call To Be Completed.

System resource availability errors

Error values in this category indicate that the Service Request cannot be completed because of a lack of system resources within the serving sub-domain. This type includes one of the following specific error values:

GENERIC_SYSTEM_RESOURCE_AVAILABILITY
The server is unable to be any more specific.

SERVICE_BUSY
The Service is supported by the server, but is temporarily unavailable.

RESOURCE_BUSY
An internal resource is busy. There is high probability that the Service will succeed if retried.

RESOURCE_OUT_OF_SERVICE
The Service requires a resource that is Out Of Service. A Service Request that encounters this condition could initiate system problem determination actions (e.g. notification of the network administrator).

NETWORK_BUSY
The server sub-domain is busy.

NETWORK_OUT_OF_SERVICE
The server sub-domain is Out Of Service.

OVERALL_MONITOR_LIMIT_EXCEEDED
This request would exceed the server's overall limit of monitors.

CONFERENCE_MEMBER_LIMIT_EXCEEDED.
This request would exceed the server's limit on the number of members of a conference.

Subscribed resource availability errors

Error values in this category indicate that the Service Request cannot be completed because a required resource must be purchased or contracted by the client system. This type includes the following specific error values:

GENERIC_SUBSCRIBED_RESOURCE_AVAILABILITY
The server is unable to be any more specific.

OBJECT_MONITOR_LIMIT_EXCEEDED
This request would exceed the server's limit of monitors for the specified object.

EXTERNAL_TRUNK_LIMIT_EXCEEDED
The limit of external trunks would be exceeded by this request.

OUTSTANDING_REQUEST_LIMIT_EXCEEDED
The limit of outstanding requests would be exceeded by this request.

Performance management errors

Error values in this category indicate that an error has been returned as a performance management mechanism. This type includes the following specific error values:

GENERIC_PERFORMANCE_MANAGEMENT
The server is unable to be any more specific.

PERFORMANCE_LIMIT_EXCEEDED
A performance limit is exceeded.

Security errors

Error values in this category indicate that there is a security error. This type includes the following specific error values:

UNSPECIFIED_SECURITY_ERROR
The server is unable to be any more specific.

SEQUENCE_NUMBER_VIOLATED
This error indicates that the server has detected an error in the Sequence Number of the operation.

TIME_STAMP_VIOLATED
This error indicates that the server has detected an error in the Time Stamp of the operation.

PAC_VIOLATED
This error indicates that the server has detected an error in the PAC of the operation.

SEAL_VIOLATED
This error indicates that the server has detected an error in the Seal of the operation.

CSTA Driver Interface Errors

These errors derive from the Remote Operations CCITT Specification X.219 and may occur when a PBX Driver uses the CSTA interface to the Telephony Services.

UNRECOGNIZED_APDU_REJECTION
The given type of the APDU is not defined in the protocol.

MISTYPED_APDU_REJECTION
The structure of the APDU does not conform to the protocol.

BADLY STRUCTURED_APDU_REJECTION
APDU does not conform to X.208 or X.209 standard encoding.

INITIATOR RELEASING_REJECTION
The requester is not willing to do the invoked operation because it is about to release the stream.

UNRECOGNIZED_LINKEDID_REJECTION
There is no operation in progress with an invoke ID equal to the specified link ID.

LINKED_RESPONSE_UNEXPECTED_REJECTION
The invoked operation that the linked ID refers to is not a parent operation.

UNEXPECTED_CHILD_OPERATION_REJECTION
The linked ID refers to a parent operation that does not allow the invoked operation.

MISTYPED_RESULT_REJECTION
The type of the Result parameter does not conform to the protocol.

UNRECOGNIZED_ERROR_REJECTION
The reported error is not in the protocol definition.

UNEXPECTED_ERROR_REJECTION
The reported error is not one that the operation may report.

MISTYPED_ARGUMENT_REJECTION

MISTYPED_PARAMETER_REJECTION
The type of a supplied error parameter is not consistent with the protocol specification

TSAPI

The error codes below can occur within the TSAPI implementation of the ECMA CSTA standards. The ECMA standards do not define these errors.

RESOURCE_LIMITATION_REJECTION
A Telephony Server or PBX Driver resource limitation prevents the system from processing the application request

ACS_HANDLE_TERMINATION_REJECTION

SERVICE_TERMINATION_REJECTION

REQUEST_TIMEOUT_REJECTION

REQUESTS_ON_DEVICE_EXCEEDED_REJECTION

Private Data

If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaAlternateCall( )

The Alternate Call Service provides a higher-level, compound action of the Hold Call Service followed by Retrieve Call Service. This function will place an existing active call on hold and then either retrieves a previously held call or connects an alerting call at the same device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaAlternateCall(
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    ConnectionID_t             *activeCall,
    ConnectionID_t             *otherCall,
    PrivateData_t              *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

activeCall
This parameter points to the connection identifier for the "Connected" or active call which is to be alternated.

otherCall
This parameter points to the connection identifier for the "Alerting" or "Held" call which is to be alternated.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAAlternateCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

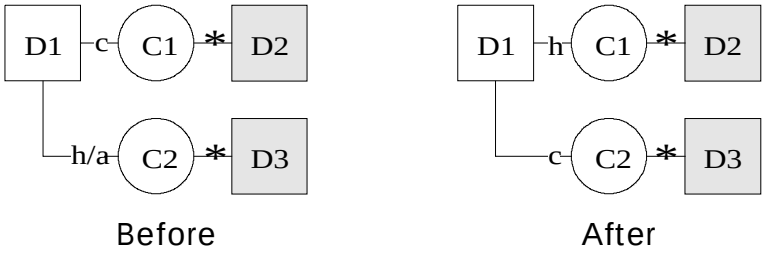
Comments

A successful call to this function will causes the held-or-delivered call to be swapped with the active call

As shown in the figure below, the Alternate Call Service places the user's active call to device D2 on hold and, in a combined action, establishes or retrieves the call between device D1 and device D3 as the active call. Device D2 can be considered as being automatically placed on hold immediately prior to the retrieval/establishment of the held/active call to device D3.

Figure 5-1 shows the operation of the Alternate Call Service.

Figure 5-1
Alternate Call Service



CSTAAlternateCallConfEvent

The Alternate Call confirmation event provides the positive response from the server for a previous alternate call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        CSTAAlternateCallConfEvent_t    alternateCall;
                        } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAAlternateCallConfEvent_t {
    Nulltype        null;
} CSTAAlternateCallConfEvent_t;
```

Parameters

acsHandle

This is the handle for the newly opened ACS Stream.

eventClass

This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_ALTERNATE_CALL_CONF**, which identifies this message as an **CSTAAlternateCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaAnswerCall( )

The Answer Call function will connect an alerting call at the device which is alerting. The call must be associated with a device that can answer a call without requiring physical user manipulation.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaAnswerCall (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    ConnectionID_t             *alertingCall,
    PrivateData_t              *privateData);
```

Parameters

acsHandle

This is the value of the unique handle to the opened ACS Stream.

invokeID

A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

alertingCall

This parameter points to the connection identifier of the call to be answered.

privateData

This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAAnswerCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

The Answer Call Service works for an incoming call that is alerting a device. In the following figure the call C1 is delivered to device D1. The **cstaAnswerCall**( ) is typically used with telephones that have attached speakerphone units to establish the call in a hands-free operation.

Figure 5-2
Answer Call Service

CSTAAnswerCallConfEvent

The Answer Call confirmation event provides the positive response from the server for a previous answer call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        CSTAAnswerCallConfEvent_t     answerCall;
                        } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAAnswerCallConfEvent_t {
    Nulltype        null;
} CSTAAnswerCallConfEvent_t;
```

Parameters

acsHandle

This is the handle for the newly opened ACS Stream.

eventClass

This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_ANSWER_CALL_CONF**, which identifies this message as an **CSTAAnswerCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaCallCompletion( )

The Call Completion Service invokes specific switch features that may complete a call that would otherwise fail. The feature to be activated is passed as a parameter to the function.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaCallCompletion (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    Feature_t          feature,
    ConnectionID_t             *call,
    PrivateData_t              *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

feature
Specifies the call completion feature that is desired. These include:

`CAMP_ON` - queues the call until the device is available.

`CALL_BACK` - requests the called device to return the call when it returns to idle.

`INTRUDE` - adds the caller to an existing active call at the called device. This feature requires the appropriate user security level at the server.

```
typedef enum Feature_t {
    FT_CAMP_ON = 0,
    FT_CALL_BACK = 1,
    FT_INTRUDE = 2
} Feature_t;
```

call
This is a pointer to a connection identifier for the call to be completed.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTACallCompletionConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

Generally this Service is invoked when a call is established and it encounters a busy or no answer at the far device.

The Camp On feature allows queuing for availability of the far end device. Generally, Camp On makes the caller wait until the called party finishes the current call and any previously camped on calls. Call Back allows requesting the called device to return the call when it returns to idle. Call Back works much like Camp On, but the caller is allowed to hang up after invoking the service, and the CSTA Switching Function calls both parties when the called party becomes free. Intrude allows the caller to be added into an existing call at the called device.

CSTACallCompletionConfEvent

The Call Completion confirmation event provides the positive response from the server for a previous call completion request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                               CSTACallCompletionConfEvent_t    callCompletion;
                }u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTACallCompletionConfEvent_t {
    Nulltype        null;
} CSTACallCompletionConfEvent_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_CALL_COMPLETION_CONF**, which identifies this message as an **CSTACallCompletionConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaClearCall( )

The Clear Call Service releases all of the devices from the specified call, and eliminates the call itself. The call ceases to exist and the connection identifiers used for observation and manipulation are released.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaClearCall (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    ConnectionID_t            *call,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream( ).** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

call
This is a pointer to the connection identifier for the call to be cleared.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAClearCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

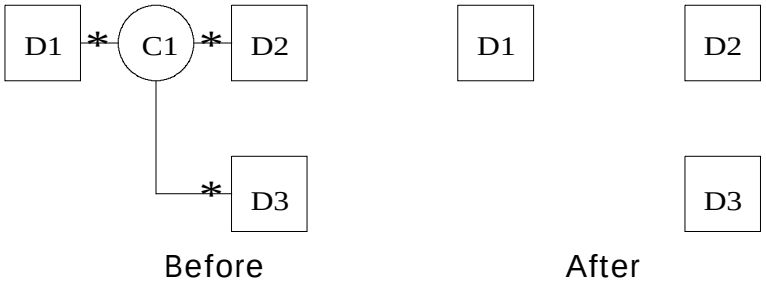
ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

This function will cause each device associated with a call to be released and the CSTA Connection Identifiers (and their components) are freed.

Figure 5-3 illustrates the results of a Clear Call (CSTA Connection ID = C1,D1), where call C1 connects devices D1, D2 and D3.

Figure 5-3
Clear Call Service



CSTAClearCallConfEvent

The Clear Call confirmation event provides the positive response from the server for a previous clear call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                               CSTAClearCallConfEvent_t
clearCall;
                }u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAClearCallConfEvent_t {
    Nulltype        null;
} CSTAClearCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_CLEAR_CALL_CONF**, which identifies this message as an **CSTAClearCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This confirmation indicates that all instances of the ACS Connection Identifiers for all the endpoints in the call and in the current association have become invalid. The instances of identifiers should not be used to request additional services of the Telephony Server.

cstaClearConnection( )

The Clear Connection Service releases the specified device from the designated call. The Connection is left in the Null state. Additionally, the CSTA Connection Identifier provided in the Service Request is released.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaClearConnection (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    ConnectionID_t     *call,
    PrivateData_t      *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

call
This is a pointer to the connection identifier for the connection to be cleared.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

acsHandle
This is the value of the unique handle to the opened ACS Stream.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAClearConnectionConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

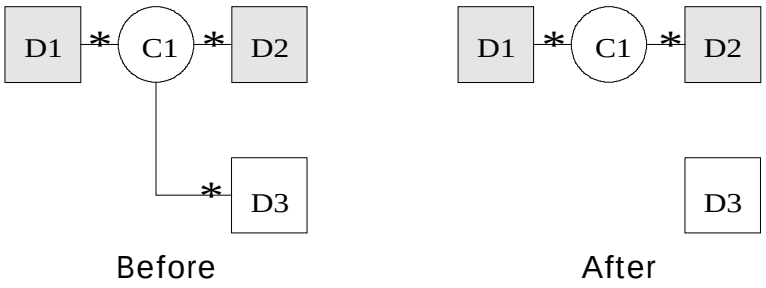
ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

This Service releases the specified Connection and CSTA Connection Identifier instance from the designated call. The result is as if the device had hung up on the call. It is interesting to note that the phone may not be physically returned to the switch hook, which may result in silence, dial tone, or some other condition. Generally, if only two Connections are in the call, the effect of **cstaClearConnection**( ) function is the same as **cstaClearCall**( ).

Figure 5-4 is an example of the results of a Clear Connection (CSTA Connection Id = C1,D3), where call C1 connects devices D1, D2 and D3. Note that it is likely that the call is not cleared by this Service if it is some type of conference.

Figure 5-4
Clear Connection Service



CSTAClearConnectionConfEvent

The Clear Connection confirmation event provides the positive response from the server for a previous clear connection request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                        union
                        {
                                 CSTAClearConnectionConfEvent_t  clearConnection;
                        } u;

        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAClearConnectionConfEvent_t {
    Nulltype        null;
} CSTAClearConnectionConfEvent_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This tag with the value CSTA_CLEAR_CONNECTION_CONF identifies this message as an CSTAClearConnectionConfEvent.

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This confirmation event indicates that the instance of the ACS Connection Identifier for the cleared Connection is released. The identifier should not be used to request additional services of the Telephony Server.

cstaConferenceCall( )

This function provides the conference of an existing held call and another active call at a device. The two calls are merged into a single call and the two Connections at the conferencing device resolve into a single Connection in the Connected state. The pre-existing CSTA Connection Identifiers associated with the device creating the conference are released, and a new CSTA Connection Identifier for the resulting conferenced Connection is provided.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaConferenceCall (
    ACSHandle_t              acsHandle,
    InvokeID_t               invokeID,
    ConnectionID_t           *heldCall,
    ConnectionID_t           *activeCall,
    PrivateData_t            *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

heldCall
This is a pointer to the connection identifier for the call which is on hold and is to be conferenced with an active call.

activeCall
This is a pointer to the connection identifier for the call which is active or proceeding and is to be conferenced with the held call.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAConferenceCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch. The following are possible negative error conditions for this function:

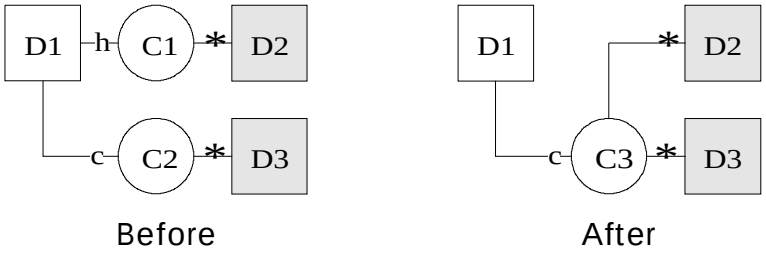
ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

Figure 5-5 is an example of the starting conditions for the **cstaConferenceCall**( ) function, which are: the call C1 from D1 to D2 is in the held state. A call C2 from D1 to D3 is in progress or active.

Figure 5-5
Conference Call Service



D1, D2 and D3 are conferenced or joined together into a single call, C3. The value of the Connection identifier (D1,C3) may be that of one of the CSTA Connection Identifiers provided in the request (D1,C1 or D1,C2).

CSTAConferenceCallConfEvent

The Conference Call confirmation event provides the positive response from the server for a previous conference call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                  CSTAConferenceCallConfEvent_t  conferenceCall;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct Connection_t {
    ConnectionID_t  party;
    SubjectDeviceID_t      staticDevice;
} Connection_t;

typedef struct ConnectionList {
    int             count;
    Connection_t    *connection;
} ConnectionList_t;

typedef struct CSTAConferenceCallConfEvent_t {
    ConnectionID_t  newCall;
    ConnectionList_t  connList;
} CSTAConferenceCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_CONFERENCE_CALL_CONF**, which identifies this message as an **CSTAConferenceCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

newCall
This parameter specifies the resulting connection identifier for the calls which were conferenced at the Conferencing device. This connection identifier replaces the two previous connection identifier at that device.

connList
Specifies the resulting number of known devices in the conference. This field contains a count ***(count)*** of the number of devices in the conference and a pointer ***(*connection)*** to an array of Connection_t structures which define each connection in the call.

Each `Connection_t` record contains the following:

Party - indicates the Connection ID of the party in the conference.

Device - provides the static reference for the party in the conference. This parameter may have a value that indicates the static identifier is not known.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaConsultationCall( )

The **cstaConsultationCall**( ) function will provide the compound or combined action of the Hold Call service followed by Make Call service. This service places an existing active call at a device on hold and initiates a new call from the same device using a single function call.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaConsultationCall (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    ConnectionID_t            *activeCall,
    DeviceID_t                *calledDevice,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

activeCall
This is a pointer to the connection identifier for the active call which is to be placed on hold before the new call is established.

calledDevice
This is a pointer to the destination device address for the new call to be established.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e., the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAConsultationCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

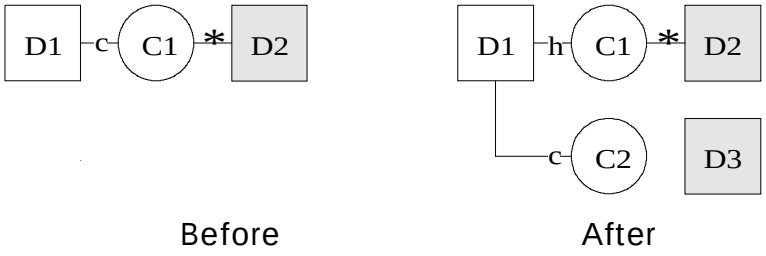
ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

This compound service allows the application to place an existing call on hold and at the same time establish a new call to another device. In this case an active call C1 exists at D1 (see Figure 5.7) and a consultative call is desired to D3. After this function is called, the original active call (C1) is placed on hold and a new call, C2, is placed to device D3.

Figure 5-6
Consultation Call Service



CSTAConsultationCallConfEvent

The Consultation Call confirmation event provides the positive response from the server for a previous consultation call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
            struct
            {
                    InvokeID_t     invokeID;
                    union
                    {
                      CSTAConsultationCallConfEvent_t consultationCall;
                    } u;
            } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAConsultationCallConfEvent_t {
            ConnectionID_t  newCall;
} CSTAConsultationCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This tag with the value **CSTA_CONSULTATION_CALL_CONF**, identifies this message as an CSTAConsultationCallConfEvent.

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

newCall
Specifies the Connection ID for the originating connection of the new call originated by the Consultation Call request.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaDeflectCall( )

The **cstaDeflectCall**( ) service takes an alerting call at a device and redirects the call to a given number.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaDeflectCall (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    ConnectionID_t            *deflectCall,
    DeviceID_t                *calledDevice,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

deflectCall
This is a pointer to the connection identifier of the call which is to be deflected to another device within the switch.

calledDevice
A pointer to the device identifier where the original call is to be deflected.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTADeflectCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

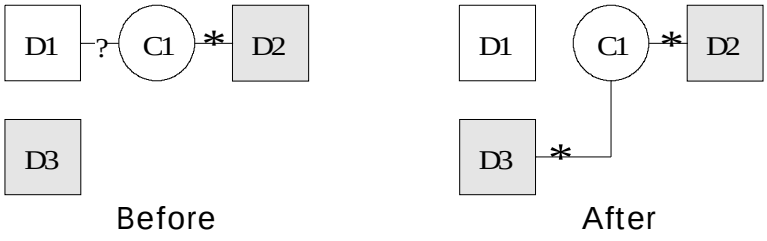
ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

The Deflect Call Service takes a ringing (alerting) call at a device (D1) and sends it to a new destination (D3). This function replaces the original called device, as specified in the ***deflectCall*** parameter, with a different device within the switch, as specified in the ***calledDevice*** parameter.

Figure 5-7
Deflect Call Service



CSTADeflectCallConfEvent

The Deflect Call confirmation event provides the positive response from the server for a previous deflect call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                  CSTADeflectCallConfEvent_t  deflectCall;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTADeflectCallConfEvent_t {
    Nulltype        null;
} CSTADeflectCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_DEFLECT_CALL_CONF**, which identifies this message as an **CSTADeflectCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaGroupPickupCall( )

The **cstaGroupPickupCall**( ) service moves an alerting call (at one or more devices in a device pickup group) to a specified device.

Group Pickup is a PBX feature where a "Pickup Group" is defined on the PBX (independent of Telephony Service Device Groups). When a call rings at a station in the pickup group, a pickup group member may invoke the PBX's "Group Pickup" feature and thereby redirect the ringing call to their phone. The application does not specify the call that is to be redirected.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaGroupPickupCall (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    ConnectionID_t     *deflectCall,  /* Version 1 Stream Only*/
    DeviceID_t         *pickupDevice,
    PrivateData_t      *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

deflectCall
TSAPI Version 1 Stream: Pointer to the call being picked up.

TSAPI Version 2 Stream: This parameter is ignored.

pickupDevice
This is a pointer to the device which is picking up calls from the group.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e., the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAGroupPickupConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch. The following are possible negative error conditions for this function:

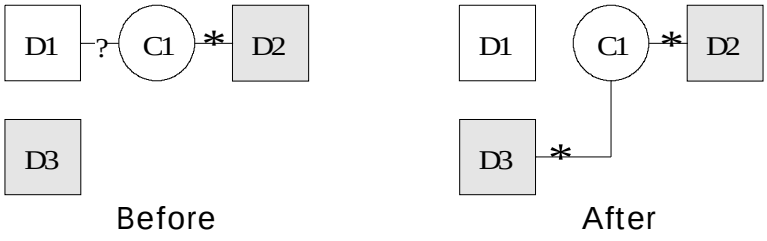
ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

The cstaGroupPickupCall( ) service redirects an alerting call (at one of more devices in a device pickup) to a specified device, the ***pickupDevice***.

Figure 5-8
Group Pickup Call Service



CSTAGroupPickupCallConfEvent

The Group Pickup Call confirmation event provides the positive response from the server for a previous Group Pickup call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                   CSTAGroupPickupCallConfEvent_t  groupPickupCall;
                }u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAGroupPickupCallConfEvent_t {
    Nulltype        null;
} CSTAGroupPickupCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the newly opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_GROUP_PICKUP_CALL_-CONF**, which identifies this message as an **CSTAGroupPickup-CallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaHoldCall( )

The **cstaHoldCall**( ) service places an existing Connection in the held state.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaHoldCall (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    ConnectionID_t            *activeCall,
    Boolean                   reservation,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the acsOpenStream( ). The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

activeCall
A pointer to the connection identifier for the active call to be placed on hold.

reservation
Reserves the facility for reuse by the held call. This option is not appropriate for most non-ISDN telephones. The default is no connection reservation.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAHoldCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

A call to this function will interrupt communications for an existing call at a device. The call is usually, but not always, in the active state. A call may be placed on hold by the user some time after completion of dialing. The associated connection for the held call is made available for other uses, depending on the reservation option (ISDN-case). As shown in Figure 5-9, if the Hold Call service is invoked for device D1 on call C1, then call C1 is placed on hold at device D1. The hold relationship is affected at the holding device.

Figure 5-9
Hold Call Service

The **cstaHoldCall**( ) service maintains a relationship between the holding device and the held call that lasts until the call is retrieved from the hold status, or until the call is cleared.

CSTAHoldCallConfEvent

The Hold Call confirmation event provides the positive response from the server for a previous Hold call request

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                               CSTAHoldCallConfEvent_t
holdCall;
                }u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAHoldCallConfEvent_t {
    Nulltype        null;
} CSTAHoldCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_HOLD_CALL_CONF**, which identifies this message as an **CSTAHoldCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaMakeCall( )

The **cstaMakeCall**( ) service originates a call between two devices. The originator must be on the switch. The service attempts to create a new call and establish a connection between the calling device (originator) and the called device (destination). The Make Call service also provides a CSTA Connection Identifier that indicates the Connection of the originating device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaMakeCall (
    ACSHandle_t             acsHandle,
    InvokeID_t              invokeID,
    DeviceID_t              *callingDevice,
    DeviceID_t              *calledDevice,
    PrivateData_t           *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

callingDevice
A pointer to the device identifier of the device which is to originate the new call.

calledDevice
A pointer to the device identifier for the destination device for the new call.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e., the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAMakeCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

The **cstaMakeCall**( ) service originates a call between two application designated devices. When the service is initiated, the calling device is prompted (if necessary), and, when that device acknowledges, a call to the called device is originated. Figure 5-11 illustrates the results of a Make Call service request (Calling device = D1, Called device = D2). A call is established as if D1 had called D2, and the client is returned the Connection id: (C1,D1).

Figure 5-11
Make Call Service

The establishment of a complete call connection can be a multi-stepped process depending on the destination of the call. Call status event reports (see *Status Reporting Service*) may be sent by the Telephony Server to the service requesting client application as the connection establishment progresses. These events are in addition to the standard confirmation events (e.g. **CSTAMakeCallConfEvent)** which only indicates that the switch is attempting to establish a connection between the two devices. The application should be aware that the requested call is not guaranteed to succeed even after a successful Make Call service confirmation event has been received. The application must monitor status events to be informed of the call status as it progresses. Status event reports can be established by using the **cstaMonitorStart**( ) service (see *Status Reporting Services*).

CSTAMakeCallConfEvent

The Make Call confirmation event provides the positive response from the server for a previous Make Call service request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                   CSTAMakeCallConfEvent_t           makeCall;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

    typedef struct
    {
        ConnectionID_t         newCall;
    } CSTAMakeCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_MAKE_CALL_CONF**, which identifies this message as an **CSTAMakeCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

newCall
Specifies the Connection ID for the originating connection of the new call originated by the Make Call request.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaMakePredictiveCall( )

The **cstaMakePredictiveCall**( ) service originates a call between a group of devices or a logical device on behalf of an originating (calling) device. The service creates a new call and establishes a Connection with the terminating (called) device. The Make Predictive Call service also provides a CSTA Connection Identifier that indicates the Connection of the terminating (called) device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaMakePredictiveCall (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *callingDevice,
    DeviceID_t                *calledDevice,
    AllocationState_t  allocationState;
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

callingDevice
A pointer to the device identifier of the device which is to originate the new call.

calledDevice
A pointer to the device identifier of the device being call, i.e. the destination device.

allocationState
This parameter specifies under which condition the connection with the destination is to be connected to the calling or originating device. If this parameter is not specified by the application, the Call Delivered state will be the default. This parameter may be one of the following values:

Call Delivered: this value specifies that the switch should attempt to connect the call to the caller (originating device), if the Alerting or Connected state is determined at the called party (destination device).

Call Established: this value specifies that the switch should attempt to connect the call to the caller (originating device), if the Connected state is determined at the called party (destination device).

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAMakePredictiveCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

This service is often used to initiate a call to a called device (destination) from a group of devices or a logical device without first establishing a connection with a calling device (originator). This service allocates the call to a particular device within that group at some time during the progress of the call.

The **cstaMakePredictiveCall**( ) service first initiates a call to the called device (destination). Depending on the call's progress, the call may be connected with the calling device (originator) during the progress of the call. The point at which the switch will attempt to connect the call to the originating device is determined by the ***allocation State*** parameter. If the allocation parameter is set to Call Delivered, then the call is allocated upon detection of an Alerting (or Connected) Connection state at the destination. If the allocation parameter is set to Call Established, then the call is allocated upon detection of a Connected Connection state at the recipient. In other words, the call is connected to the originating device if the call state is either alerting or connected at the far end or connected, respectively.

Figure 5-12 illustrates the results of a Make Predictive Call (Calling device = group device D1, Called device = D2.

Figure 5-12
Make Predictive Call Service

CSTAMakePredictiveCallConfEvent

The Make Predictive Call confirmation event provides the positive response from the server for a previous **cstaMakePredictiveCall**( ) request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        CSTAMakePredictiveConfEvent_t makePredictiveCall;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

    typedef struct
    {
        ConnectionID_t         newCall;
    } CSTAMakePredictiveConfEvent_t;
```

Parameters

acsHandle

This is the handle for the ACS Stream.

eventClass

This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **MAKE_PREDICTIVE_CALL_CONF**, which identifies this message as an **CSTAMakePredictiveConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

newCall
Specifies the Connection ID for the far-end connection of the new call originated by the Make Predictive Call request.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaPickupCall( )

The cstaPickupCall( ) service takes a ringing (alerting) call at a device and redirects the call to a specified device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaPickupCall (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    ConnectionID_t            *deflectCall,
    DeviceID_t                *calledDevice,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

deflectCall
This is a pointer to the connection identifier of the call which is to be picked up from another device within the switch.

calledDevice
A pointer to the device identifier of the device which is picking up the original call.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAPickupCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

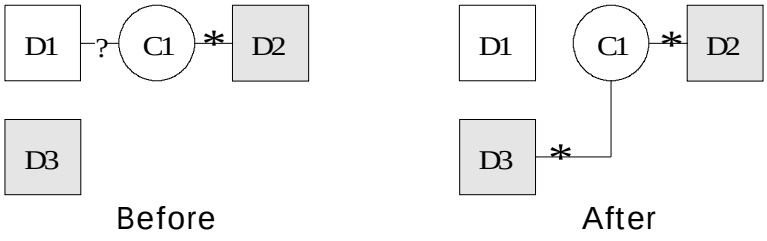
ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

The **cstaPickupCall**( ) service takes an alerting call at a device within the switch and brings it to a local device destination. This function picks up a call, ***deflectCall,*** at the device specified in the ***calledDevice*** parameter.

Figure 5-13
Pickup Call Service



CSTAPickupCallConfEvent

The Pickup Call confirmation event provides the positive response from the server for a previous pickup call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                   CSTAPickupCallConfEvent_t    pickupCall;
                }u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAPickupCallConfEvent_t {
    Nulltype        null;
} CSTAPickupCallConfEvent_t;
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_PICKUP_CALL_CONF**, which identifies this message as an **CSTAPickupCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaReconnectCall( )

The **cstaReconnectCall**( ) service provides the compound action (combination) of the **cstaClearConnection**( ) service followed by the **cstaRetrieveCall**( ) service. The service clears an existing Connection and then retrieves a previously Held Connection at the same device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaReconnectCall (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    ConnectionID_t             *activeCall,
    ConnectionID_t             *heldCall,
    PrivateData_t              *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

activeCall
A pointer to the connection identifier of the active call which is to be cleared.

heldCall
A pointer to the connection identifier of the held call which is to be retrieved.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAReconnectCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

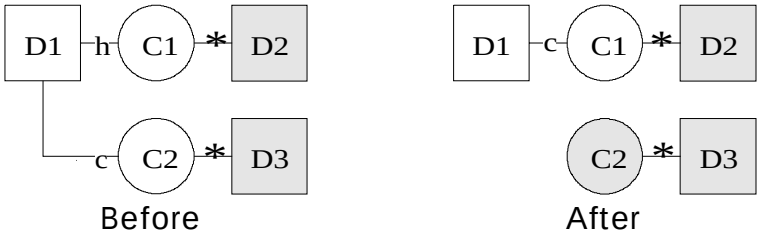
ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

A successful request of this service will cause an existing active call to be dropped. Once the active call has been dropped, the specified held call at the device is retrieved and becomes active. This service is typically used to drop an active call and return to a held call; however, it can also be used to cancel of a consultation call (because of no answer, called device busy, etc.) followed by returning to a held call.

Figure 5-14
Reconnect Call Service



CSTAReconnectCallConfEvent

The Reconnect Call confirmation event provides the positive response from the server for a previous Reconnect call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                               CSTAReconnectCallConfEvent_t
reconnectCall;
                }u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAReconnectCallConfEvent_t {
    Nulltype        null;
} CSTAReconnectCallConfEvent_t;
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_RECONNECT_CALL_CONF**, which identifies this message as an **CSTAReconnectCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaRetrieveCall( )

The **cstaRetrieveCall**( ) service connects an existing Held Connection. The state of the specified call changes from held to active.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaRetrieveCall (
    ACSHandle_t              acsHandle,
    InvokeID_t               invokeID,
    ConnectionID_t           *heldCall,
    PrivateData_t            *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( ). The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

heldCall
A pointer to the connection identifier of the held call which is to be retrieved.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e., the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTARetrieveCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

The indicated held Connection is restored to the Connected state (active). The call state can change depending on the actions of far end endpoints. If the **cstaHoldCall**( ) service reserved the Held Connection and the **cstaRetrieveCall**( ) service is requested for the same call, then the Retrieve Call service uses the reserved Connection.

Figure 5-15
Retrieve Call Service

CSTARetrieveCallConfEvent

The Retrieve Call confirmation event provides the positive response from the server for a previous Retrieve call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        CSTARetrieveCallConfEvent_t   retrieveCall;
                }u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTARetrieveCallConfEvent_t {
    Nulltype        null;
} CSTARetrieveCallConfEvent_t;
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_RETRIEVE_CALL_CONF**, which identifies this message as an **CSTARetrieveCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaTransferCall( )

The **cstaTransferCall**( ) service provides the transfer of a held call with an active call at the same device. The transfer service merges two calls with Connections to a single common device. Also, both of the Connections to the common device become Null and their Connections Identifiers are released.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaTransferCall (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    ConnectionID_t             *heldCall,
    ConnectionID_t             *activeCall,
    PrivateData_t              *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

heldCall
A pointer to the connection identifier of the held call which is to be transferred.

activeCall
A pointer to the connection identifier of the active call to which the held call is to be transferred.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTATransferCallConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

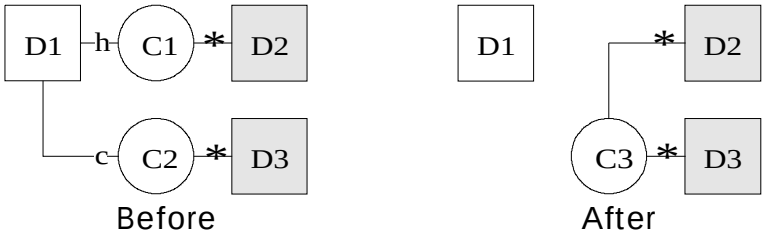
ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

Referring to Figure 5-16, the starting conditions for the **cstaTransferCall**( ) service are: the call C1 from D1 to D2 is in held state (***heldCall***). A call C2 from D1 to D3 is in progress or active (***activeCall***). This service transfers the existing (held) call between devices D1 and D2 into a new call with a new call identifier from device D2 to a device D3.

Figure 5-16
Transfer Call Service



The request is used in the situation where the call from D1 to D3 is established (active) or if the call is in any state other than Failed or Null state. The Transfer Call service successfully completes, and D1 is released from the call.

CSTATransferCallConfEvent

The Transfer Call confirmation event provides the positive response from the server for a previous transfer call request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID;
                union
                {
                        CSTATransferCallConfEvent_t   transferCall;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct Connection_t {
    ConnectionID_t  party;
    SubjectDeviceID_t      staticDevice;  /* NULL for not present */
} Connection_t;

typedef struct ConnectionList {
    int             count;
    Connection_t    *connection;
} ConnectionList_t;

typedef struct {
    ConnectionID_t  newCall;
    ConnectionList_t  connList;
} CSTATransferCallConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_TRANSFER_CALL_CONF**, which identifies this message as an **CSTATransferCallConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

newCall
Specifies the resulting Connection Identifier for the transferred call.

connList
Specifies the resulting number of known devices in the transferred call. This field contains a count ***(count)*** of the number of devices in the transferred call and a pointer ***(*connection)*** to an array of pointers that point to ConnectionID_t structures which define each connection in the call.

Each ConnectionID_t record contains the following:

Party - indicates the Connection ID of the party in the transferred call.

Device - provides the static reference for the party in the transferred call. This parameter may have a value that indicates the static identifier is not known.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Telephony Supplementary Services

This section describes those CSTA telephony services that switches typically provide as "features".

Not all switches support all these functions and events.

Applications can use the Telephony Supplementary Services (defined in this section) to manipulate telephony objects.. As with other TSAPI services already described, these function will generate associated confirmation events from the Telephony Server. Similarly (as described in Chapter 4, ***Sending CSTA Requests and Responses***) applications can use the *invokeID* to match a specific confirmation event with the specific function call, or they may use application-generated *invokeID*s to index into a data structure.

To receive events, an application must have an active ACS Stream and an implement an event handling mechanism. Further, the reception of unsolicited events requires an active monitor. See the ***Control Services*** and ***Status Reporting Services*** sections for more information on events.

cstaSetMsgWaitingInd( )

The **cstaSetMsgWaitingInd**( ) service provides the application with the ability to turns on and off a message waiting indicator on a telephony device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaSetMsgWaitingInd (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *device,
    Boolean                   messages,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which to set the message waiting indicator. .

messages
This parameter identifies whether to turn on or off the message waiting indicator at the device specified by ***device*** parameter. A value of TRUE indicates that the message waiting indicator should be tuned on, FALSE indicates that the indicator should be turn off.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTASetMsgWaitingIndConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTASetMsgWaitingIndConfEvent

The Set Message Waiting Indicator confirmation event provides the positive response from the Telephony Server for a previous Set Message Waiting Indicator service request. When the application receives this event the message waiting indicator has been set as requested by the application.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
    typedef struct
{
        ACSHandle_t             acsHandle;
        EventClass_t    eventClass;
        EventType_t             eventType;
} ACSEventHeader_t;

typedef struct
{
        ACSEventHeader_t        eventHeader;
    union
    {
        struct
        {
                InvokeID_t      invokeID;
                union
                {
                        CSTASetMwiConfEvent_t   setMwi;
                }u;
        } cstaConfirmation;
        } event;
} CSTAEvent_t;

typedef struct CSTASetMwiConfEvent_t {
    Nulltype        null;
} CSTASetMwiConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_SET_MWI_CONF**, which identifies this message as an **CSTASetMessageWaitingIndConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaSetDnd( )

The **cstaSetDnd**( ) service activates the switch feature that prevents calls from alerting at a specified device by deflecting the calls from the original destination to other devices.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaSetDnd (
    ACSHandle_t             acsHandle,
    InvokeID_t              invokeID,
    DeviceID_t              *device,
    Boolean                         doNotDisturb,
    PrivateData_t           *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which the Do Not Disturb feature is to be activated. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

doNotDisturb
This parameter identifies whether to turn on or off the Do Not Disturb feature at the device specified by ***device*** parameter. A value of TRUE indicates that the Do Not Disturb feature should be tuned on, FALSE indicates that the feature should be turn off.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTASetDndConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTASetDndConfEvent

The Set Do Not Disturb confirmation event provides the positive response from the Telephony Server for a previous Set Do Not Disturb request. When the application receives this event the Do Not Disturb feature has been set as requested by the application.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
        ACSEventHeader_t       eventHeader;
        union
        {
                struct
                {
                        InvokeID_t     invokeID;
                        union
                        {
                                CSTASetDndConfEvent_t   setDnd;
                        }u;
                } cstaConfirmation;
        } event;
} CSTAEvent_t;

typedef struct CSTASetDndConfEvent_t {
    Nulltype        null;
} CSTASetDndConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_SET_DND_CONF**, which identifies this message as an **CSTASetDndConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaSetFwd( )

The **cstaSetFwd**( ) service activates and deactivates several types of forwarding features on a specified device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaSetFwd (

    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *device,
    ForwardingType_t   forwardingType,
    Boolean                   forwardingOn,
    DeviceID_t                *forwardingDestination,
    PrivateData_t             *privateData);

typedef enum ForwardingType_t {
    FWD_IMMEDIATE = 0,
    FWD_BUSY = 1,
    FWD_NO_ANS = 2,
    FWD_BUSY_INT = 3,
    FWD_BUSY_EXT = 4,
    FWD_NO_ANS_INT = 5,
    FWD_NO_ANS_EXT = 6
} ForwardingType_t;
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which forwarding is to be set. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

forwardingType
This parameter specifies the type of forwarding to set or clear at the requested device. The possible types include:

Immediate	Forwarding all calls
Busy	Forwarding when busy
No Answer	Forwarding after no answer
Busy Internal	Forwarding when busy for an internal call
Busy External	Forwarding when busy for an external call
No Answer Internal	Forwarding after no answer for an internal call
No Answer External	Forwarding after no answer for an external call.

forwardingOn
This parameter identifies whether to turn on or off the forwarding feature at the device specified by ***device*** parameter. A value of TRUE indicates that the forwarding feature should be tuned on, FALSE indicates that the feature should be turn off.

forwardingDestination
This is a pointer to the device identifier for the device to which the calls are to be forwarded.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will

be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTASetFwdConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTASetFwdConfEvent

The Set Forwarding confirmation event provides the positive response from the server for a previous Set Forwarding service request. When this event is received by the application the forwarding feature has been set as requested.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
        ACSEventHeader_t       eventHeader;
        union
        {
                struct
                {
                        InvokeID_t     invokeID;
                        union
                        {
                                CSTASetFwdConfEvent_t   setFwd;
                        }u;
                } cstaConfirmation;
        } event;
} CSTAEvent_t;

typedef struct CSTASetFwdConfEvent_t {
    Nulltype        null;
} CSTASetFwdConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_SET_FWD_CONF**, which identifies this message as an **CSTASetFwdConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaSetAgentState( )

The **cstaSetAgentState**( ) service changes an ACD agents work mode to one specified by this service.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaSetAgentState (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    DeviceID_t         *device,
    AgentMode_t        agentMode,
    AgentID_t          *agentID,
    AgentGroup_t              *agentGroup,
    AgentPassword_t    *agentPassword,
    PrivateData_t             *privateData);

typedef enum AgentMode_t {
    AM_LOG_IN = 0,
    AM_LOG_OUT = 1,
    AM_NOT_READY = 2,
    AM_READY = 3,
    AM_WORK_NOT_READY = 4,
    AM_WORK_READY = 5
} AgentMode_t;

typedef char            AgentID_t[32];
typedef DeviceID_t      AgentGroup_t;
typedef char            AgentPassword_t[32];
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter points to the device identifier for the ACD agent for which the work mode is to be changed. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

agentMode
This parameter specifies the work mode state which the agent will be moved to. This could be one of the following:

LOG_IN
LOG_OUT
NOT_READY
READY
WORK_NOT_READY
WORK_READY

agentID
A pointer to the agent identifier of the ACD Agent whose work mode is to be changed.

agentGroup
A pointer to the agent group identifier for the ACD group or split in which the agent will be logged into or out of. This parameter is only required when the ***agentMode*** parameter is set for the **LOG_IN** and **LOG_OUT** work modes.

agentPassword
A pointer to a password that allows the agent to log into an ACD split or group. This parameter is only required when the ***agentMode*** parameter is set for the **LOG_IN** and **LOG_OUT** work modes.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTASetAgentStateConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTASetAgentStateConfEvent

The Set Agent State confirmation event provides the positive response from the server for a previous Set Agent State service request. When this event is received by the application the agent state has been set as requested.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
       ACSEventHeader_t      eventHeader;
       union
       {
              struct
              {
                     InvokeID_t     invokeID;
                     union
                     {
                            CSTASetAgentStateConfEvent_t
setAgentState;
                     }u;
              } cstaConfirmation;
              } event;
} CSTAEvent_t;

typedef struct CSTASetAgentStateConfEvent_t {
    Nulltype        null;
} CSTASetAgentStateConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_SET_AGENT_STATE_CONF**, which identifies this message as an **CSTASetAgentStateConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaQueryMsgWaitingInd( )

The **cstaQueryMessageWaitingInd**( ) service provides the current state of the message waiting indicator of a specified device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaQueryMsgWaitingInd (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *device,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which the message waiting indicator is being queried. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAQueryMsgWaitingIndConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTAQueryMsgWaitingIndConfEvent

The Query Message Waiting Indicator confirmation event provides the positive response from the server for a previous Query Message Waiting Indicator service request. This event informs the application whether there are any messages waiting, i.e. whether the message waiting indicator is turned on or off.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
       ACSEventHeader_t      eventHeader;
       union
       {
              struct
              {
                     InvokeID_t     invokeID;
                     union
                     {
                            CSTAQueryMwiConfEvent_t   queryMwi;
                     } u;
              } cstaConfirmation;
       } event;
} CSTAEvent_t;

typedef struct CSTAQueryMwiConfEvent_t {
       Boolean         messages;
} CSTAQueryMwiConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_QUERY_MWI_CONF**, which identifies this message as an **CSTAQueryMwiConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

messages
This parameter specifies whether there are any messages waiting at the requested device. TRUE indicates that there are messages waiting, FALSE indicates that there are none.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaQueryDoNotDisturb( )

The **cstaQueryDoNotDisturb**( ) service provides the current state of the do not disturb feature on a specific device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaQueryDoNotDisturb (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *device,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which the Do Not Disturb feature is being queried. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAQueryDoNotDisturbConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTAQueryDoNotDisturbConfEvent

The Query Do Not Disturb confirmation event provides the positive response from the server for a previous Query Do Not Disturb service request. This event informs the application whether the feature is turned on or off.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
            struct
            {
                InvokeID_t     invokeID;
                union
                {
                        CSTAQueryDndConfEvent_t   queryDnd;
                } u;
            } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct
{
        Boolean_t                     doNotDisturb;
    } CSTAQueryDndConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_QUERY_DND_CONF**, which identifies this message as an **CSTAQueryDndConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

doNotDisturb
This parameter specifies whether the Do Not Disturb feature is active at the requested device. TRUE indicates that the feature is turned on. FALSE indicates that the feature is turned off.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaQueryFwd ( )

The **cstaQueryFwd**( ) service provides the current state of the forwarding feature(s) on a specific device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaQueryFwd (
    ACSHandle_t             acsHandle,
    InvokeID_t              invokeID,
    DeviceID_t              *device,
    PrivateData_t           *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which the forwarding feature is being queried. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAQueryFwdConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTAQueryFwdConfEvent

The Query Forwarding confirmation event provides the positive response from the server for a previous Query Forwarding service request. The event also informs the application of the forwarding type, whether forwarding is on or off, and the forwarding destination for each device requested.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
       ACSHandle_t           acsHandle;
       EventClass_t   eventClass;
       EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
       ACSEventHeader_t      eventHeader;
       union
       {
              struct
              {
                            InvokeID_t     invokeID;
                            union
                            {
                                   CSTAQueryFwdConfEvent_t
queryFwd;
                            } u;
                     } cstaConfirmation;
              } event;
} CSTAEvent_t;

typedef enum ForwardingType_t {
       FWD_IMMEDIATE = 0,
       FWD_BUSY = 1,
       FWD_NO_ANS = 2,
       FWD_BUSY_INT = 3,
       FWD_BUSY_EXT = 4,
       FWD_NO_ANS_INT = 5,
       FWD_NO_ANS_EXT = 6
} ForwardingType_t;

typedef struct ForwardingInfo_t {
       ForwardingType_t      forwardingType;
       Boolean                      forwardingOn;
       DeviceID_t                   forwardDN;
} ForwardingInfo_t;
```

```
typedef struct ListForwardParameters_t {
       short                        count;
       ForwardingInfo_t       param[7];
} ListForwardParameters_t;

typedef struct CSTAQueryFwdConfEvent_t {
       ListForwardParameters_t       forward;
} CSTAQueryFwdConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_QUERY_FWD_CONF**, which identifies this message as an **CSTAQueryFwdConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

queryFwd
This parameter is a ***ListForwardParameters_t*** structure which contains the following:

count
This parameter indicates how many forwarding list entries are provided. Each entry corresponds to a different device.

param
An array of ForwardingInfo_t structures, each of which is composed of the following elements.

forwardingType
Specifies the type of forwarding set. The types include:

Immediate	Forwarding all calls
Busy	Forwarding when busy
No Answer	Forwarding after no answer
Busy Internal	Forwarding when busy for an internal call
Busy External	Forwarding when busy for an external call
No Answer Internal	Forwarding after no answer for an internal call
No Answer External	Forwarding after no answer for an external call.

forwardingOn
Indicates whether forwarding is active or inactive. TRUE indicates forwarding is active. FALSE indicates forwarding is inactive.

forwardingDN
Specifies the forward-to destination device for the type of forwarding listed.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaQueryAgentState( )

The **cstaQueryAgentState**( ) service will provide the application with the current agent state at a device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaQueryAgentState (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *device,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which the agent state is being queried. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAQueryAgentStateConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTAQueryAgentStateConfEvent

The Query Agent State confirmation event provides the positive response from the server for a previous Query Agent State service request. This event will provide the application with the current agent state.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
            struct
            {
                InvokeID_t     invokeID;
                union
                {
                   CSTAQueryAgentStateConfEvent_t queryAgentState;
                } u;
            } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef enum AgentState_t {
    AG_NOT_READY = 0,
    AG_NULL = 1,
    AG_READY = 2,
    AG_WORK_NOT_READY = 3,
    AG_WORK_READY = 4
} AgentState_t;

typedef struct CSTAQueryAgentStateConfEvent_t {
    AgentState_t    agentState;
} CSTAQueryAgentStateConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_QUERY_AGENT_STATE_CONF**, which identifies this message as an **CSTAQueryAgentStateConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

agentState
This parameter specifies the current work mode state of the agent. The possible agent states are:

Null - This indicates that an agent is logged out of the group or device that they serve.

Not Ready - This state indicates that an agent is occupied with some task other than that of serving a call.

Ready - This state indicates that an agent is ready to accept calls.

Work/Not Ready - This state indicates that an agent is occupied with after call work. It also implies that the agent should not receive additional ACD calls.

Work/Ready - This state indicates that an agent is occupied with after call work. It also implies that the agent may receive additional ACD calls.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaQueryLastNumber( )

The **cstaQueryLastNumber**( ) service provides the last number dialed by a specified device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaQueryLastNumber (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *device,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device on which the last number is being queried. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAQueryLastNumberConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTAQueryLastNumberConfEvent

The Query Last Number confirmation event provides the positive response from the server for a previous Query Last Number request. This event provides the last number that was dialed from the requested device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
            struct
            {
                InvokeID_t     invokeID;
                union
                {
                   CSTAQueryLastNumberConfEvent_t   queryLastNumber;
                } u;
            } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct
{
        DeviceID_t             lastNumber,
    } CSTAQueryLastNumberConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_QUERY_LAST_NUMBER_CONF**, which identifies this message as an **CSTAQueryLastNumberConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

lastNumber
This parameter indicates the last number dialed at the requested device.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

cstaQueryDeviceInfo( )

The **cstaQueryDeviceInfo**( ) service provides general information about a device. The confirmation event for this service will include information on the class and type of device being queried.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaQueryDeviceInfo (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *device,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
This parameter is a pointer to the device identifier of the device for which information is being requested. This parameter may be different than the originating device depending on the security level defined for the originating device in the Telephony Server.

privateData
This is a pointer to the private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAQueryDeviceInfoConfEvent** message to ensure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

CSTAQueryDeviceInfoConfEvent

The Query Device Info confirmation event provides the positive response from the server for a previous Query Device Info request. This event provides the application with type and class of the requested device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
    struct
    {
        InvokeID_t     invokeID;
        union
        {
          CSTAQueryDeviceInfoConfEvent_t queryDeviceInfo;
        } u;
    } cstaConfirmation;

    } event;
} CSTAEvent_t;

typedef enum DeviceType_t {
    DT_STATION = 0,
    DT_LINE = 1,
    DT_BUTTON = 2,
    DT_ACD = 3,
    DT_TRUNK = 4,
    DT_OPERATOR = 5,
    DT_STATION_GROUP = 16,
    DT_LINE_GROUP = 17,
    DT_BUTTON_GROUP = 18,
    DT_ACD_GROUP = 19,
    DT_TRUNK_GROUP = 20,
    DT_OPERATOR_GROUP = 21,
    DT_OTHER = 255
} DeviceType_t;
```

```
typedef unsigned char   DeviceClass_t;
#define                     DC_VOICE 0x80
#define                     DC_DATA 0x40
#define                     DC_IMAGE 0x20
#define                     DC_OTHER 0x10

typedef struct CSTAQueryDeviceInfoConfEvent_t {
    DeviceID_t      device;
    DeviceType_t    deviceType;
    DeviceClass_t   deviceClass;
} CSTAQueryDeviceInfoConfEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_QUERY_DEVICE_INFO_CONF**, which identifies this message as an **CSTAQueryDeviceInfoConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

deviceIdentifier
May provide an alternate short-form static device identifier for the device requested.

deviceType
This parameter indicates the type of device being queried. The possible device types are:

ACD - Automatic Call Distributor (ACD)

ACD group - Automatic Call Distributor (ACD) group

Button - is one instance of a call manipulation point at an individual station.

Button group - is two or more instances of a call manipulation point at an individual station.

Line - is a communications interface to one or more stations.

Line group - is a set of communications interfaces to one or more stations.

Operator - also known as Attendant

Operator group - two or more operator devices used interchangeably or addressed identically.

Other - is any other type for which there is no enumeration defined.

Station - is the traditional telephone device, either simple or featured.

Station group - is two or more stations used interchangeably or addressed identically.

Trunk - a device used to access other switching sub-domains.

Trunk group - typically, two or more trunks providing connections to the same place.

See the ***Functional Call Model*** section of this document for more information on device types. Not all switch implementations will support all the device types listed.

deviceClass
This parameter indicates the class of device being queried. The possible device classes are:

Voice - a device that is used to make audio calls. This class includes all normal telephones, as well as computer modems and G3 facsimile machines.

Data - a device that is used to make digital data calls (either circuit switched or packet switched). This class includes computer interfaces and G4 facsimile machines.

Image - a device that is used to make digital data calls involving imaging, or high speed circuit switched data in general. This class includes video telephones and CODECs.

Other - a type of device not covered by data, image, or voice.

See the *Functional Call Model* section of this document for more information on device classes. Not all switch implementations will support all the device classes listed.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Chapter 6 Status Reporting Services

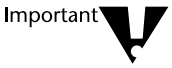
TSAPI Status Services are those function calls and events that are related to unsolicited TSAPI event messages. External telephony activity on the switch, External telephony activity at a device, or human user activity can all cause unsolicited TSAPI events. Such events messages are asynchronous in nature. An application typically cannot anticipate their arrival. For example, an event informing the application of an incoming call to a device (e.g. a telephone station) is an unsolicited, asynchronous TSAPI event (since the application did not initiate the call and such a call can arrive at any time).

Applications use the status reporting request function to turn-on or turn-off status event reporting for a CSTA device (e.g. a desktop telephone). An application can use this function to turn-on/turn-off status reporting for any stations on the switch where monitoring is required (assuming proper access permissions are administered at the Telephony Server).

Status Reporting Functions and Confirmation Events

Applications may use Event reporting to determine the changes in the state of a call or a connection associated with a device which is of interest to the application. This section describes the functions that an application uses to request unsolicited event reports for a telephony device or for calls. In the case of calls, the application must first control the calls.

Events provide the application with information about the state of calls or connection. The application may keep track of device or call states. If the application needs to maintain call state information for a specific device or call within the switch, it must establish a device or call "monitor" to keep track of the real-time state information for the call or device.



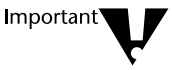
Applications should always be "event driven" and use events received from the Telephony Server to react to changes in call or connection state rather than using a specific switch implementation's call state mode. Following this guideline will simplify the support of applications across various switch implementations of TSAPI.

An application calls the **cstaMonitorDevice**( )**, cstaMonitorCall**( )**,** or **cstaMonitorCallsViaDevice**( ) function to initiate event reporting for a specific device or call. Event reporting can be provided for a device, a call, or for calls at a monitored device. An application can request two different types of event monitors using these functions. The monitor types are:

- **Call-type monitor** - call-type monitors provide monitoring (event reporting) for unsolicited events about a specific call from "cradle-to-grave". In other words, a call-type monitor provides events for a specific call regardless of the devices at which the call may appear for the duration of the call.

  Using call-type monitoring, an application can determine the current state of the call using the TSAPI events. For example, if a call monitor exists for a specific call and that call transfers or forwards to other devices, the sending device ceases to participate in the call, but event reporting continues (telling the application about the new devices

participating in the call). Thus, a call-type monitor will provide call state information as the switch, other applications, and human users interact to route a call.



A switch may assign a new call identifier to a call as it is transferred or conferenced. The new call identifier will be provided in the event report associated with the conference or transfer function being requested by the controller of the call.

- **Device-type monitor** - device-type monitors provide the application with call or connection state information about calls at a specific device (the monitored device). TSAPI reports any events about the calls at the monitored device on a device-type monitor. If a call is transfers drops, or forwards from the monitored device, TSAPI stops reporting events for that call.

  If an application begins monitoring a device when call(s) are already in progress at the monitored device, TSAPI may not provide events for those calls (this is switch specific). TSAPI will provide events for calls that arrive at the device after it sends the confirmation event for the device monitor request.

Each monitor must be either a call monitor, a device monitor, or monitor calls via device. An application may request multiple monitors, with various monitors being of various types. An application must setup multiple monitors if it wants to monitor multiple devices or calls at the same time. The switch may impose limitations on the maximum number of simultaneous monitors which can exist for any given switch, call, or device. TSAPI does not place any such restrictions on the application.

When an application requests a device or call monitor, it can also specify an event filter. An event filter causes TSAPI to discard those events which the application is not interested in. An application may specify a filter when it establishes the monitor for a device or call. An application may also use the **cstaChangeMonitorFilter**( ) to change the filter after the monitor is active.

To receive events, an application must have an active ACS Stream and an implement an event handling mechanism. Further, the reception of unsolicited events requires an active monitor. See the ***Control Services*** and ***Status Reporting Services*** sections for more information on events.

cstaMonitorDevice( )

The Monitor Start service is used to initiate unsolicited event reporting for a device type monitoring on a device object. The unsolicited event reports will be provided for all endpoints within a CSTA switching sub-domain and optionally for endpoints outside of the CSTA switching sub-domain (implementation specific) which are involved with a monitored device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaMonitorDevice (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *deviceID;
    CSTAMonitorFilter_t              *monitorFilter,
    PrivateData_t                    *privateData),
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

deviceID
Device ID of the device to be monitored.

monitorFilter
This parameter is used to specify a filter type to be used with the object being monitored. Setting a bit to **true** in the ***monitorFilter*** structure causes the specific event to be **filtered out,** so the application will never see this event. Initialize the structure to all 0's to receive all types of monitor events. See cstaMonitorDeviceConfEvent for a definition of a monitorFilter structure.

privateData
Private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAMonitorConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

This function is used to start a device monitor on a CSTA device . The confirmation event for this function, i.e. **CSTAMonitorConfEvent** will provide the application with the CSTA association handle to the monitored device or call, i.e., the Monitor Cross-Reference Identifier (***monitorCrossRefID***) which defines the CSTA association on which the monitor will exist.

cstaMonitorCall( )

The Monitor Start service is used to initiate unsolicited event reporting for a call type monitoring on a call object. The unsolicited event reports will be provided for all endpoints within a CSTA switching sub-domain and optionally for endpoints outside of the CSTA switching sub-domain (implementation specific) which are involved with a monitored device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaMonitorCall (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    ConnectionID_t                   *call,
    CSTAMonitorFilter_t              *monitorFilter,
    PrivateData_t                    *privateData),
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

call
Connection ID of the call to be monitored.

monitorFilter
This parameter is used to specify a filter type to be used with the object being monitored. Setting a bit to **true** in the ***monitorFilter*** structure causes the specific event to be **filtered out,** so the application will never see this event. Initialize the structure to all 0's to receive all types of monitor events. See **CSTAMonitorConfEvent** for a definition of a monitorFilter structure.

privateData
Private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAMonitorConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

This function is used to start a call monitor on a CSTA device . The confirmation event for this function, i.e. **CSTAMonitorConfEvent** will provide the application with the CSTA association handle to the monitored device or call, i.e., the Monitor Cross-Reference Identifier (***monitorCrossRefID***) which defines the CSTA association on which the monitor will exist.

cstaMonitorCallsViaDevice( )

The Monitor Start service is used to initiate unsolicited event reporting for a call type monitoring on a device object. The unsolicited event reports will be provided for all endpoints within a CSTA switching sub-domain and optionally for endpoints outside of the CSTA switching sub-domain (implementation specific) which are involved with a monitored device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaMonitorCallsViaDevice (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *deviceID,
    CSTAMonitorFilter_t              *monitorFilter,
    PrivateData_t                    *privateData),
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

device
The deviceID of the device for which call monitoring should be started.

monitorFilter
This parameter is used to specify a filter type to be used with the object being monitored. Setting a bit to **true** in the ***monitorFilter*** structure causes the specific event to be **filtered out,** so the application will never see this event. Initialize the structure to all 0's to receive all types of monitor events. See cstaMonitorDeviceConfEvent for a definition of a monitorFilter structure.

privateData
Private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAMonitorConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

This function is used to start a monitor on a CSTA object (a device or a call). The confirmation event for this function, i.e. **CSTAMonitorConfEvent** will provide the application with the CSTA association handle to the monitored device or call, i.e. the Monitor Cross-Reference Identifier (***monitorCrossRefID***) which defines the CSTA association on which the monitor will exist. There are two-types of Monitor Service: call-type and device-type.

CSTAMonitorConfEvent

This event is in response to the **cstaMonitorDevice( ), cstaMonitorCall or cstaMonitorCallsViaDevice** function and contains the association handle being assigned to the CSTA association being used for status reporting.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types and CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                        InvokeID_t     invokeID;
                union
                {
                                CSTAMonitorConfEvent_t
monitorStart;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAMonitorConfEvent_t {
    CSTAMonitorCrossRefID_t          monitorCrossRefID;
    CSTAMonitorFilter_t              monitorFilter;
} CSTAMonitorConfEvent_t;

typedef long                  CSTAMonitorCrossRefID_t;

typedef unsigned short  CSTACallFilter_t;
#define                      CF_CALL_CLEARED 0x8000
#define                      CF_CONFERENCED 0x4000
#define                      CF_CONNECTION_CLEARED 0x2000
#define                      CF_DELIVERED 0x1000
#define                      CF_DIVERTED 0x0800
#define                      CF_ESTABLISHED 0x0400
#define                      CF_FAILED 0x0200
#define                      CF_HELD 0x0100
#define                      CF_NETWORK_REACHED 0x0080
```

```
#define                     CF_ORIGINATED 0x0040
#define                     CF_QUEUED 0x0020
#define                     CF_RETRIEVED 0x0010
#define                     CF_SERVICE_INITIATED 0x0008
#define                     CF_TRANSFERRED 0x0004

typedef unsigned char   CSTAFeatureFilter_t;
#define                     FF_CALL_INFORMATION 0x80
#define                     FF_DO_NOT_DISTURB 0x40
#define                     FF_FORWARDING 0x20
#define                     FF_MESSAGE_WAITING 0x10

typedef unsigned char   CSTAAgentFilter_t;
#define                     AF_LOGGED_ON 0x80
#define                     AF_LOGGED_OFF 0x40
#define                     AF_NOT_READY 0x20
#define                     AF_READY 0x10
#define                     AF_WORK_NOT_READY 0x08
#define                     AF_WORK_READY 0x04

typedef unsigned char   CSTAMaintenanceFilter_t;
#define                     MF_BACK_IN_SERVICE 0x80
#define                     MF_OUT_OF_SERVICE 0x40

typedef struct CSTAMonitorFilter_t {
    CSTACallFilter_t          call;
    CSTAFeatureFilter_t       feature;
    CSTAAgentFilter_t         agent;
    CSTAMaintenanceFilter_t   maintenance;
    long                      privateFilter;
} CSTAMonitorFilter_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_MONITOR_CONF**, which identifies this message as an **CSTAMonitorConfEvent.**

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific functions call request with its confirmation events. Unsolicited events will have this parameter set to zero.

monitorCrossRefID
This parameter contains the handle to the CSTA association for which the requested monitor has been established. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

monitorFilter
This parameter is used to specify the filter type which is active on the object being monitored by the application. Possible classes of values are: CALL_FILTER, FEATURE_FILTER, AGENT_FILTER, MAINTENANCE_FILTER, and PRIVATE_FILTER.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

The application should check this confirmation event to obtain the monitorCrossRefID being assigned by the switch and to ensure that the event filter requested has been activated. The event informs the application which filters are active on the given CSTA association.

cstaMonitorStop( )

The Monitor Stop Service is used to cancel a previously registered Monitor Service on an existing CSTA monitor association, i.e. an active ***monitorCrossRefID***.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaMonitorStop (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    CSTAMonitorCrossRefID_t   monitorCrossRefID,
    PrivateData_t                     *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

monitorCrossRefID
This parameter identifies the original CSTA monitor association for which unsolicited event monitoring is to be canceled. This identifier is provided as a result of a monitor start service request in a **CSTAMonitorConfEvent** for a call or device monitor within the switching domain.

privateData
Private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAMonitorStopConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

cstaMonitorStop( ) cancels a previously registered monitor association on a CSTA object (a device or a call object). Once a confirmation event is issued for this function, i.e. a **CSTAMonitorStopConfEvent;** TSAPI terminates the previously active monitoring association and thus end event reporting for the monitored call or device.

CSTAMonitorStopConfEvent

This event is in response to the **cstaMonitorStop**( ) function and provides the application with a confirmation that the monitor association has been canceled. Once this confirmation event is issued all event reporting for the specific monitoring association will be discontinued.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types and CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID;
                  union
                  {
                         CSTAMonitorStopConfEvent
                                monitorStop;
                  } u;
           } cstaConfirmation;
    } event;
} CSTAEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_MONITOR_STOP_CONF**, which identifies this message as an **CSTAMonitorStopConfEvent.**

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific functions call request with its confirmation events. Unsolicited events will have this parameter set to zero.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This confirmation event indicates a cancellation of a CSTA monitoring association. After this event is issued by the Telephony Server, no further events will be sent to the application on the monitoring association (***monitorCrossRefID***) which was canceled.

cstaChangeMonitorFilter( )

This function is used to request a change in the filter options for CSTA event reporting for a specific CSTA association. It allows the application to specify for which event category the application wishes to receive events.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t      cstaChangeMonitorFilter (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    CSTAMonitorCrossRefID_t   monitorCrossRefID,
    CSTAMonitorFilter_t       *filterlist,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the value of the unique handle to the opened ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

monitorCrossRefID
This parameter identifies the CSTA association (association handle) for which a change in event filtering is required. The association identifier is provided by the server/switch when the association is established.

filterlist
This parameter identifies the filter type being requested. Possible classes of values are CALL_FILTER, FEATURE_FILTER, AGENT_FILTER, MAINTENANCE_FILTER, and PRIVATE_FILTER. This parameter also identifies the events to be filtered.

privateData
Private data extension mechanism. Setting this parameter is optional. If the parameter is not used, the pointer should be set to NULL.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAChangeMonitorFilterConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

An application uses **cstaChangeMonitorFilter**( ) to inform the API Client Library and the server that application wishes to receive only certain events. The server filters out all other events.

CSTAChangeMonitorFilterConfEvent

This event occurs as a result of the **cstaChangeMonitorFilter**( ) function and informs the application which event filter was set by the server.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types and CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t      acsHandle;
    EventClass_t     eventClass;
    EventType_t      eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                InvokeID_t     invokeID_t;
                union
                {
                        CSTAChangeMonitorFilterConfEvent_t
                                changeMonitorFilter;
                } u;
        } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAChangeMonitorFilterConfEvent_t
{
    CSTAMonitorFilter_t             monitorfilter;
}  CSTAChangeMonitorFilterConfEvent_t
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTAConfirmation event.

eventType
This is a tag with the value **CSTA_CHANGE_MONITOR_FILTER_CONF**, which identifies this message as an **CSTAChangeMonitorFilterConfEvent.**

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific function's call request with its confirmation events. Unsolicited events will have this parameter set to zero.

monitorFilter
This parameter identifies the filter type being requested. Possible classes of values are CALL_FILTER, FEATURE_FILTER, AGENT_FILTER, MAINTENANCE_FILTER, and PRIVATE_FILTER.

This parameter also identifies the events to be filtered.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This confirmation event should be checked by the application to insure that the event filter requested has been activated and which filters are already active on the given CSTA association.

CSTAMonitorEndedEvent

This unsolicited indication is sent by the driver/switch to indicate to the application that the monitor associated with the ***monitorCrossRefID*** has been stopped.

Syntax

The following structure shows only the relevant portions of the unions for this message. See Sections *ACS Data Types* and *CSTA Data Types* for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                CSTAMonitorCrossRefID_t       monitorCrossRefID;
                union
                {
                        CSTAMonitorEnded_t  monitorEnded;
                } u;

        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct CSTAMonitorEndedEvent_t {
    CSTAEventCause_t cause;
} CSTAMonitorEndedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_MONITOR_ENDED**, which identifies this message as an **CSTAMonitorEndedEvent.**

monitorCrossRefID,
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

cause
The cause code indicating the reason the monitor was stopped.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is provided by the driver/switch when it can no longer provided the requested events associated with the monitorCrossRefId.

Call Event Reports (Unsolicited)

This section defines the unsolicited TSAPI Event Reports that result from call activity at the Device or the switch. These events provide an application with call status information. Applications, users, and switch administrators may also use switch features that interact with monitored devices and calls, resulting in additional call events. One example of such a feature is call coverage paths.

CSTACallClearedEvent

This event report indicates when a call is torn down. This can occur when the last device has disconnected from the call or when a call is dissolved by another party to the call - like a conference call being dissolved by the conference controller.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                CSTAMonitorCrossRefID_t  monitorCrossRefID;
                union
                {
                        CSTACallClearedEvent  callCleared;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef enum LocalConnectionState_t {
    CS_NULL = 0,
    CS_INITIATE = 1,
    CS_ALERTING = 2,
    CS_CONNECT = 3,
    CS_HOLD = 4,
    CS_QUEUED = 5,
    CS_FAIL = 6
} LocalConnectionState_t;

typedef enum CSTAEventCause_t {
    ACTIVE_MONITOR = 1,
    ALTERNATE = 2,
    BUSY = 3,
    CALL_BACK = 4,
    CALL_CANCELLED = 5,
    CALL_FORWARD_ALWAYS = 6,
```

```
    CALL_FORWARD_BUSY = 7,
    CALL_FORWARD_NO_ANSWER = 8,
    CALL_FORWARD = 9,
    CALL_NOT_ANSWERED = 10,
    CALL_PICKUP = 11,
    CAMP_ON = 12,
    DEST_NOT_OBTAINABLE = 13,
    DO_NOT_DISTURB = 14,
    INCOMPATIBLE_DESTINATION = 15,
    INVALID_ACCOUNT_CODE = 16,
    KEY_CONFERENCE = 17,
    LOCKOUT = 18,
    MAINTENANCE = 19,
    NETWORK_CONGESTION = 20,
    NETWORK_NOT_OBTAINABLE = 21,
    NEW_CALL = 22,
    NO_AVAILABLE_AGENTS = 23,
    OVERRIDE = 24,
    PARK = 25,
    OVERFLOW = 26,
    RECALL = 27,
    REDIRECTED = 28,
    REORDER_TONE = 29,
    RESOURCES_NOT_AVAILABLE = 30,
    SILENT_MONITOR = 31,
    TRANSFER = 32,
    TRUNKS_BUSY = 33,
    VOICE_UNIT_INITIATOR = 34
} CSTAEventCause_t;

typedef struct
{
       ConnectionID_t               clearedCall;
       LocalConnectionState_t       localConnectionInfo;
       CSTAEventCause_t             cause;
   } CSTACallClearedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_CALL_CLEARED**, which identifies this message as an **CSTACallClearedEvent.**

monitorCrossRefID,
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

clearedCall
This parameter identifies the call which has been cleared.

localConnectionInfo
This parameter defines the local connection state of the call after it has been cleared. This could be null, initiated, alerting, connected, held, queued, or failed.

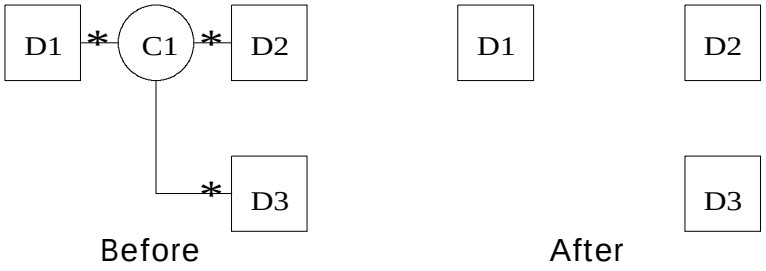
cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is usually provided after the **cstaClearCall**( ) function has been called by the application. It can also occur, unsolicited, when another endpoint (device) clears a call and the device being monitored by the API is part of the call cleared by the another endpoint. The event is also generated when the last remaining device has disconnected from the call.

Figure 6-17
Call Cleared Event Report



CSTAConferencedEvent

This event report provides indication that two separate calls have been conferenced (merged) into a single call. This occurs without either party being removed from the resulting call.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types and CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
                CSTAMonitorCrossRefID_t   monitorCrossRefID;
                union
                {
                        CSTAConferencedEvent_t  conferenced;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  primaryOldCall;
    ConnectionID_t                  secondaryOldCall;
    SubjectDeviceID_t         confController;
    SubjectDeviceID_t         addedParty;
    ConnectionList_t          conferenceConnections;
    LocalConnectionState_t    localConnectionInfo;
    CSTAEventCause_t          cause;
} CSTAConferencedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_CONFERENCED**, which identifies this message as an **CSTAConferencedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

primaryOldCall
This parameter identifies the primary known call to be conferenced. This is usually the held call pending the conference.

secondaryOldCall
This parameter identifies the secondary call (e.g. the consultative call) which is to be conferenced. This is usually the active call which is to be conferenced to the held call pending the conference.

confController
This structure identifies the device which is controlling the conference. This is the device which setup the conference. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

addedParty
This parameter identifies the device which is being added to the conference. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

conferenceConnections
This is a list of connections (parties) on the call which resulted from the conference. The call ID may be different from either the primary or secondary old call (or both).

localConnectionInfo
This parameter defines the local connection state of the call after it has been conferenced. This could be null, initiated, alerting, connected, held, queued, or failed.

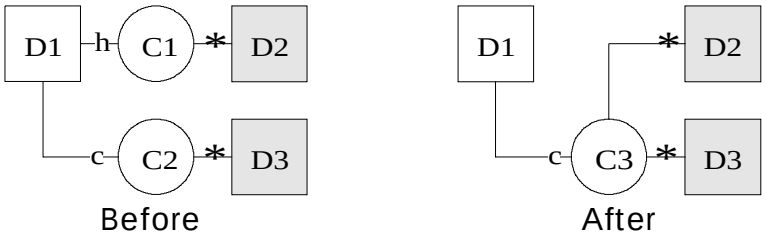
cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event provides information regarding a conference after is has been requested by the application using the **CSTAConferenceCall**( ) function or other endpoints on the switch. The changes in the call states are as follows:

Figure 6-18
Conferenced Event Report



CSTAConnectionClearedEvent

This event report indicates that a device associated with a call disconnects from the call or is dropped from the call. The event does not indicate that a transferring device has left a call through the act of transferring that call.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types and CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t eventHeader;
    union
    {
      struct
      {
        CSTAMonitorCrossRefID_t       monitorCrossRefID;
        union
        {
          CSTAConnectionClearedEvent_t connectionCleared;
         } u;
      } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                    droppedConnection;
    SubjectDeviceID_t          releasingDevice;
    LocalConnectionState_t     localConnectionInfo;
    CSTAEventCause_t           cause;
} CSTAConnectionClearedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_CONNECTION_CLEARED**, which identifies this message as an **CSTAConnectionClearedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

droppedConnection
This parameter identifies the Connection which was dropped from the call as a result of a device dropping from the call.

releasingDevice
This parameter identifies the device which dropped the call.

localConnectionInfo
This parameter defines the local connection state of the call after the connection has been cleared. This could be null, initiated, alerting, connected, held, queued, or failed.

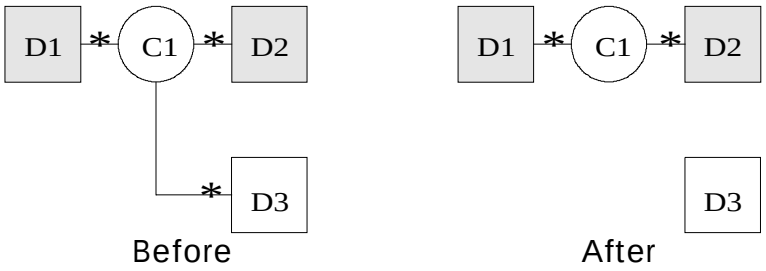
cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the acsGetEventBlock( ) or acsGetEventPoll( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is used to determine which device disconnects from a multi-party call. The deviceID identifies the devices which disconnected or was disconnected from the call. The LocalConnectionInfo defines the state of the call at the monitored device after the device has been dropped from the call.

Figure 6-19
Connection Cleared Event Report



CSTADeliveredEvent

This event report indicates that a call is alerting (e.g. ringing) at a specific device or that the server has detected that a call is alerting at a specific device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See Chapter 4 ***Data Types*** and ***CSTA Data Types*** for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
          CSTAMonitorCrossRefID_t     monitorCrossRefID;
                union
                {
                        CSTADeliveredEvent_t  delivered;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  connection;
    SubjectDeviceID_t         alertingDevice;
    CallingDeviceID_t         callingDevice;
    CalledDeviceID_t          calledDevice;
    RedirectionDevice_t             lastRedirectionDevice;
    LocalConnectionState_t    localConnectionInfo;
    CSTAEventCause_t          cause;
} CSTADeliveredEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_DELIVERED**, which identifies this message as an **CSTADeliveredEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

connection
This parameter identifies the Connection which is alerting

alertingDevice
This parameter indicates which device is alerting. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

callingDevice
This parameter identifies the calling device. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required

calledDevice
This parameter identifies the originally called device. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required

lastRedirectionDevice
This parameter will identify the previously alerted device in cases where the call was redirected or diverted to the alerting device. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

localConnectionInfo
This parameter defines the local connection state of the call after the Connection has alerted. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event provides all the necessary information required when a new call arrives at a device. This will include the calling and called numbers.

Figure 6-20
Delivered Event Report

CSTADivertedEvent

This event report identifies a call which has been deflected or diverted from a monitored device. The call is no longer present or associated with the device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types and CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTADivertedEvent_t  diverted;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  connection;
    SubjectDeviceID_t         divertingDevice;
    CalledDeviceID_t          newDestination;
    LocalConnectionState_t    localConnectionInfo;
    CSTAEventCause_t          cause;
} CSTADivertedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_DIVERTED**, which identifies this message as an **CSTADivertedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

connection
This parameter indicates the Connection which was previously alerting. This can be the intended Connection for the call before it was diverted.

divertingDevice
This parameter indicates the device from which the call was diverted. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

newDestination
This parameter indicates the device to which the call was diverted. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

localConnectionInfo
This parameter defines the local connection state of the device being monitored. This could be null, initiated, alerting, connected, held, queued, or failed.

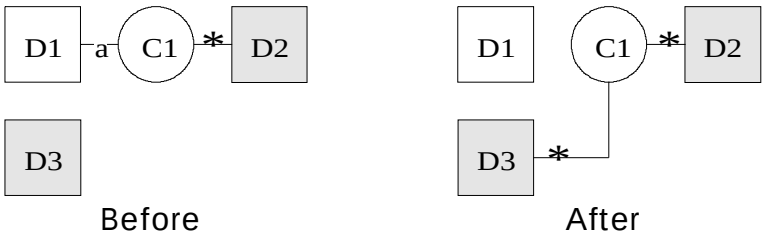
cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is used to determine information about a call which has been diverted from a monitored device. This includes information on which device the call is being diverted.

Figure 6-21
Diverted Event Report



CSTAEstablishedEvent

This event report indicates that a device connects to a call.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types and CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTAEstablishedEvent_t  established;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t
        establishedConnection;
    SubjectDeviceID_t                  answeringDevice;
    CallingDeviceID_t                  callingDevice;
    CalledDeviceID_t                   calledDevice;
    RedirectionDeviceID_t              lastRedirectionDevice;
    LocalConnectionState_t             localConnectionInfo;
    CSTAEventCause_t                   cause;
} CSTAEstablishedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_ESTABLISHED**, which identifies this message as an **CSTAEstablishedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

establishedConnection
This parameter identifies the Connection which joined the call as a result of answering the call.

answeringDevice
This parameter indicates the device which has joined the call, i.e. the answering device. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

callingDevice
This indicates which device made the call, i.e. the calling device. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

calledDevice
This parameter indicates the originally called device. This may not always be the device answering a call as is the case with call forwarding or coverage, i.e. call redirection. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

lastRedirectionDevice
This parameter indicates the previously alerted device in cases where a call is redirected. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

localConnectionInfo
This parameter defines the local connection state of the device for the call which has been established. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is typically used to determined when a call is answered by an endpoint being called by the application. This includes the calling and called number identification.

Figure 6-22
Established Event Report

CSTAFailedEvent

This event report indicates that a call cannot be completed. The event applies only to a single Connection.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTAFailedEvent_t  failed;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  failedConnection;
    SubjectDeviceID_t         failingDevice;
    CalledDeviceID_t          calledDevice;
    LocalConnectionState_t    localConnectionInfo;
    CSTAEventCause_t          cause;
} CSTAFailedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_FAILED**, which identifies this message as an **CSTAFailedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

failedConnection
This parameter indicates which Connection has failed.

failingDevice
This parameter indicates which device has failed. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

calledDevice
This parameter indicates which device was called when the call failed. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

localConnectionInfo
This parameter defines the local connection state of the call after the Connection has failed. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event occurs anytime a call cannot be completed for any reason (e.g. Stations Busy, Reorder Tone, Trunks Busy, etc.). The **cause** parameter contains the reason why the call failed.

Figure 6-23
Failed Event Report

CSTAHeldEvent

This event report indicates that the server has detected that communications on a particular Connection has be interrupted (i.e. put on hold) by one of the devices on the call. This event is usually associated with a call being placed on hold at a device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
            CSTAMonitorCrossRefID_t   monitorCrossRefID;
                union
                {
                        CSTAHeldEvent_t  held;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                          heldConnection;
    SubjectDeviceID_t                holdingDevice;
    LocalConnectionState_t           localConnectionInfo;
    CSTAEventCause_t                 cause;
} CSTAHeldEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_HELD**, which identifies this message as an **CSTAHeldEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

heldConnection
This parameter identifies the Connection which was put on hold by the device.

holdingDevice
This parameter identifies the device which placed the connection on hold. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

localConnectionInfo
This parameter defines the local connection state of the call after the Connection has been put on hold. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event occurs after a call has been placed on hold at a specific device. This informs the application what device placed the connection on hold.

Figure 6-24
Held Event Report

CSTANetworkReachedEvent

This event report informs the application that a call has left the switch on an outbound trunk and is being routed through the telephone network.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                   CSTANetworkReachedEvent_t  networkReached;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                          connection;
    SubjectDeviceID_t                  trunkUsed;
    CalledDeviceID_t                   calledDevice;
    LocalConnectionState_t             localConnectionInfo;
    CSTAEventCause_t                   cause;
} CSTANetworkReachedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_NETWORK_REACHED**, which identifies this message as an **CSTANetworkReachedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

connection
This parameter specifies the Connection ID for the outbound connection associated with the trunk and its connection to the network (see figure below).

trunkUsed
This parameter specifies the trunk that was used to establish the Connection with the telephone network. If the device (i.e. the trunk) is not specified, then the parameter will indicate that the device was not known or that it was not required.

calledDevice
This parameter indicates the destination device for the call. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

localConnectionInfo
This parameter defines the local connection state of the call after the Connection has cut-through into the telephone network. This could be null, initiated, alerting, connected, held, queued, or failed.

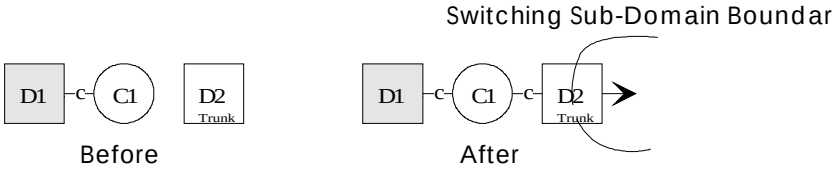
cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

Once this event occurs the level of call related status information may decrease depending on the type of trunk being used to route the call to it's destination across the telephone network. The amount of call related status information provided by the network will depend on the type of trunk and telephone network being used to complete the call. Call status information may be limited to the disconnect or drop event. This only applies for calls to other network endpoints and not to calls within the switch being controlled by the server.

Figure 6-25
Network Reached Event Report



CSTAOriginatedEvent

This event report informs the application that the switch is attempting to establish a call as a result of a completed request from the application.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTAOriginatedEvent_t  orginated;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  orginatedConnection;
    SubjectDeviceID_t         callingDevice;
    CalledDeviceID_t          calledDevice;
    LocalConnectionState_t    localConnectionInfo;
    CSTAEventCause_t          cause;
} CSTAOrginatedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_ORGINATED**, which identifies this message as an **CSTAOriginatedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

originatedConnection
This parameter identifies the Connection where a call has been originated.

callingDevice
This parameter identifies the device from which the call has been originated. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

calledDevice
This parameter identifies the device for which the originated call is intended. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

localConnectionInfo
This parameter defines the local connection state of the call after the Connection has been originated. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event indicates that a call is being launched by the switch on behalf of the request from the application. The event only indicates that the switch is attempting to make the call. The application should check for additional events to determine the status of the call as it proceeds either through the switch or out to the telephone network.

Figure 6-26
Originated Event Report

CSTAQueuedEvent

This event report indicates that a call has been queued to an ACD Split, a hunt group, or others devices which support call queues. Call can also be queued during network re-routing without specifying a device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
            CSTAMonitorCrossRefID_t   monitorCrossRefID;
                union
                {
                        CSTAQueuedEvent_t  queued;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  queuedConnection;
    SubjectDeviceID_t          queue;
    SubjectDeviceID_t          callingDevice;
    CalledDeviceID_t           calledDevice;
    RedirectionDeviceID_t      lastRedirectionDevice;
    int                                numberQueued;
    LocalConnectionState_t     localConnectionInfo;
    CSTAEventCause_t           cause;
} CSTAQueuedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_QUEUED**, which identifies this message as an **CSTAQueuedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

queuedConnection
This indicates the Connection was queued to the device.

queue
This parameter specifies the device to which the call has been queued. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

callingDevice
This parameter indicates the device who queued the call. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

calledDevice
This parameter indicates the device which was called (the intended recipient of the call). If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

lastRedirectionDevice
This parameter identifies the last device which redirected the call, if the call has been redirected. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

numberQueued
This parameter indicates how many calls are queued to the queuing device.

localConnectionInfo
This parameter defines the local connection state of the call after the call has been queued. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the privateData pointer in the **acsGetEventBlock( )** or **acsGetEventPoll( )** function. If the privateData pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event usually occurs when an application is monitoring a call, a Vector Directory Number (VDN), an ACD Split, or a hunt group. The event also provides information pertaining to the number of calls that have been queued to a device. This information can be useful to applications managing the queue at the device.

Figure 6-27
Queued Event Report

CSTARetrieveEvent

This event report identifies a call which was previously on hold and has been retrieved at a device. This is equivalent to taking the call off the hold state and into the active state.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTARetrievedEvent_t  retrieved;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  retrievedConnection;
    SubjectDeviceID_t          retrievingDevice;
    LocalConnectionState_t     localConnectionInfo;
    CSTAEventCause_t           cause;
} CSTARetrievedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_RETRIEVED**, which identifies this message as an **CSTARetrievedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

retrievedConnection
This parameter specifies the Connection for which the call has been taken off the hold state.

retrievingDevice
This specifies the device which de-activated the call from the hold state.

localConnectionInfo
This parameter defines the local connection state of the call after the call has been retrieved from the hold state. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event informs the application that a call is no longer on hold. This can occur if the end-user physically takes the call off the hold state or in response to the **cstaRetrieveCall**( ) function request.

Figure 6-12
Retrieved Event Report

CSTAServiceInitiatedEvent

This event report indicates to the application that telephony service was initiated at a device. The switch sends this event when it provides “dial tone”. Note that the user may be going off hook to invoke a feature using a feature access code, so call setup events do not necessarily follow.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in Section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t       eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
       struct
       {
          CSTAMonitorCrossRefID_t     monitorCrossRefID;
           union
           {
             CSTAServiceInitiatedEvent_t  serviceInitiated;
           }u ;
       } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                    initiatedConnection;
    LocalConnectionState_t            localConnectionInfo;
    CSTAEventCause_t          cause;
} CSTAServiceInitiatedEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_SERVICE_INITIATED**, which identifies this message as an **CSTAServiceInitiatedEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

initiatedConnection
This parameter indicates the Connection for which service (dial tone) has been established or a feature is invoked. The same Connection identifier will continue to be used if a call is eventually established by the device.

localConnectionInfo
This parameter defines the local connection state of the call after the service has been initiated. This could be null, initiated, alerting, connected, held, queued, or failed.

cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

CSTA-179 states that switches are not required to send the service initiated event for calls that are originated from functional type devices (e.g. ISDN BRI devices that do *en bloc* dialing) or for calls that other applications originate using **cstaMakeCall**( ). Thus, some PBX drivers may not provide this event in these circumstances.

Figure 6-13
Service Initiated Event Report

CSTATransferredEvent

This event report indicates that an existing call was transferred to another device and that the device which transferred the call is no longer part of the call, i.e. the transferring device has dropped from the call.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTATransferEvent_t  transferred;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    ConnectionID_t                  primaryOldCall;
    ConnectionID_t                  secondaryOldCall;
    SubjectDeviceID_t         transferringDevice;
    SubjectDeviceID_t         transferredDevice;
    ConnectionList_t          transferredConnections;
    LocalConnectionState_t    localConnectionInfo;
    CSTAEventCause_t          cause;
} CSTATransferredEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_TRANSFERRED**, which identifies this message as an **CSTATransferredEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

primaryOldCall
This parameter identifies the primary known call that was transferred.

secondaryOldCall
This parameter identifies the secondary call that was transferred. This would identify the consultative call used to make the transfer, after the primary call was placed on hold.

transferringDevice
This indicates which device transferred the call. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

transferredDevice
This indicates to which device the call was transferred. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

transferredConnections
This is a list of connections (parties) on the call which resulted from the transfer. The call ID may be different from either the primary or secondary old call (or both).

localConnectionInfo
This parameter defines the local connection state of the call after the calls have been transferred from the device which performed the transfer. This could be null, initiated, alerting, connected, held, queued, or failed.

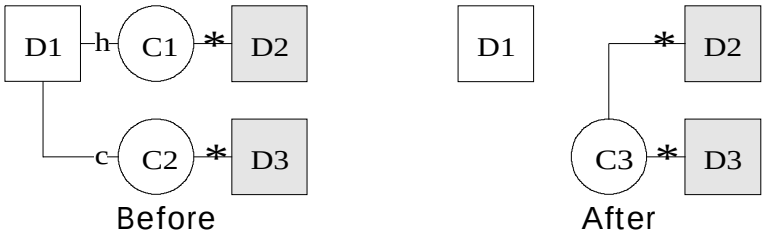
cause
This parameter contains the cause value which indicates the reason or explanation for the occurrence of this event. The possible events are defined by **CSTAEventCause_t**.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event provides the application with all the information it needs regarding a call which was transferred from one device to another.

Figure 6-14
Transferred Event Report



Feature Event Reports (Unsolicited)

TSAPI feature event reports indicate a change in the state of a specific feature operating on a call or a device on the switch. Each feature event gives the current state of the feature regardless of what the state of the feature was before an application receives a feature event.

CSTACallInfoEvent

This event report is provided when a user account code feature has collected data for a party on the call. The event includes the account code and authorization information which was collected by the switch feature.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTACallInfoEvent_t  callInformation;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
    {
        ConnectionID_t         connection;
        SubjectDeviceID_t      device;
        AccountInfo_t          accountInfo;
        AuthCode_t                     authorisationCode;
    } CSTACallInfoEvent_t;

    typedef char            AccountInfo_t[32];

    typedef char            AuthCode_t[32];
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_CALL_INFORMATION**, which identifies this message as an **CSTACallInfoEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

connection
This parameter identifies the party that has entered the account code.

device
Indicates from which device was the account code information entered. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

accountInfo
Specifies the account code which was entered at the device.

authorizationCode
Specifies the authorization code which was entered at the device.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event informs the application when an account code feature has been activated and what information was collected by the switch as a result of the feature being activated.

CSTADoNotDisturbEvent

This event report indicates a change in the status of the Do Not Disturb feature for a specific device. The Do Not Disturb event will result in all calls to a device to be automatically forwarded to the device coverage path.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                   CSTADoNotDisturbEvent_t  doNotDisturb,
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    SubjectDeviceID_t  device;
    Boolean                          doNotDisturbOn;
} CSTADoNotDisturbEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_DO_NOT_DISTURB**, which identifies this message as an **CSTADoNotDisturbEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

device
Specifies the device for which the DO Not Disturb feature has been activated/deactivated. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

doNotDisturbON
Specifies whether the DO Not Disturb feature is on (1) or off (0).

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

CSTAForwardingEvent

This event report will indicate a change in the state of the Forwarding feature for a specific device. The event will also indicate the type of forwarding being invoked when the feature is activated.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ACS Data Types and CSTA Data Types in section 4 for a complete description of the event structure.

```
typedef struct
{
       ACSHandle_t           acsHandle;
       EventClass_t   eventClass;
       EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
       ACSEventHeader_t      eventHeader;
       union
       {
              struct
              {
                 CSTAMonitorCrossRefID_t    monitorCrossRefID;
                      union
                      {
                             CSTAForwardingEvent_t  forwarding;
                      } u;
              } cstaUnsolicited;
       } event;
} CSTAEvent_t;

typedef struct
{
       SubjectDeviceID_t     device;
       ForwardingInfo_t      forwardingInformation;
} CSTAForwardingEvent_t;

typedef enum ForwardingType_t {
       FWD_IMMEDIATE = 0,
       FWD_BUSY = 1,
       FWD_NO_ANS = 2,
        FWD_BUSY_INT = 3,
       FWD_BUSY_EXT = 4,
        FWD_NO_ANS_INT = 5,
        FWD_NO_ANS_EXT = 6
} ForwardingType_t;
```

```
typedef struct ForwardingInfo_t {
       ForwardingType_t forwardingType;
       Boolean forwardingOn;
       DeviceID_t      forwardDN;    /* NULL for not present */
} ForwardingInfo_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_FORWARDING** which identifies this message as an **CSTAForwardingEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

device
Specifies the device for which the Forwarding feature has been activated/deactivated. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

forwardingType
Specifies the type of forwarding being invoked for the specific device. This may include one of the following:

Immediate	Forwarding all calls
Busy	Forwarding when busy
No Answer	Forwarding after no answer
Busy Internal	Forwarding when busy for an internal call

Busy External	Forwarding when busy for an external call
No Answer Internal	Forwarding after no answer for an internal call
No Answer External	Forwarding after no answer for an external call.

forwardingON
Specifies whether the Forward feature is on (1) or off (0).

forwardDN
Specifies the destination device to which the calls are being forwarded. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

The application should be aware that the ***forwardingInfo*** parameter can indicate any of the defined values depending on the switch implementation of the forwarding feature.

CSTAMessageWaitingEvent

This event report is used to indicate whether the Message Waiting feature has been activated/deactivated.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
            CSTAMonitorCrossRefID_t   monitorCrossRefID;
                union
                {
                    CSTAMessageWaitingEvent_t  messageWaiting;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    CalledDeviceID_t   deviceForMessage;
    SubjectDeviceID_t  invokingDevice;
    Boolean                          messageWaitingOn;
} CSTAMessageWaitingEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_MESSAGE_WAITING** which identifies this message as an **CSTAMessageWaitingEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

deviceForMessage
Indicates the device where the message is waiting (i.e. address of device where the message waiting feature was activated). If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

invokingDevice
Specifies which device invoked the message waiting feature (i.e. address of the device who activated the message waiting feature). If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

messageWaitingOn
Specifies whether the Message Waiting feature is on (1) or off (0).

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event can occur for both a device or a call association.

Agent Status Event Reports (Unsolicited)

This section covers event reports which pertain to the use of ACD agent features. The agent feature event reports indicate a change in the state of a specific agent. Each event defines the current state of the agent feature regardless of the state of the feature before the event. Typically, applications in the call center or message center environment use agent status event reports.

CSTALoggedOnEvent

This event report informs the application that an agent has logged into a device (usually an ACD Split).

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
            CSTAMonitorCrossRefID_t   monitorCrossRefID;
               union
               {
                       CSTALoggedOnEvent_t  loggedOn,
               } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    SubjectDeviceID_t  agentDevice;
    AgentID_t          agentID;
    AgentGroup_t               agentGroup;
    AgentPassword_t    password;
} CSTALoggedOnEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_LOGGED_ON** which identifies this message as an **CSTALoggedOnEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

agentDevice
Specifies the device from which the agent is logged on to the system. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

agentID
This parameter specifies the agent identifier of the agent who logged into the system.

agentGroup
Specifies the group or ACD Split to which the agent is logging into.

password
This parameter specifies the agent's password used to log into the system.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

In most cases, when an agent logs into a device it usually means that the agent is ready to start receiving calls at the device. This may not be true for some implementations.

CSTALoggedOffEvent

This event report indicates that an agent has logged out of the device/ACD Split for which the agent had previously logged in and was providing service.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
           CSTAMonitorCrossRefID_t    monitorCrossRefID;
                union
                {
                        CSTALoggedOffEvent_t  loggedOff;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    SubjectDeviceID_t         agentDevice;
    AgentID_t                         agentID;
    AgentGroup_t                      agentGroup;
} CSTALoggedOffEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_LOGGED_OFF** which identifies this message as an **CSTALoggedOffEvent.**

agentDevice
Specifies the device from which the agent is logged off the system. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

agentID
This parameter specifies the agent identifier of the agent who logged off the system.

agentGroup
Specifies the group or ACD Split from which the agent is logging out.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

CSTANotReadyEvent

This event report indicates that an agent is busy with tasks other than servicing an ACD call at the device. In most cases this will imply that the agent is not ready to receive a call or that the agent is taking a break.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
            CSTAMonitorCrossRefID_t   monitorCrossRefID;
                union
                {
                        CSTANotReadyEvent_t  notReady;
                } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    SubjectDeviceID_t  agentDevice;
    AgentID_t                  agentID;
} CSTANotReadyEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_NOT_READY** which identifies this message as an **CSTANotReadyEvent.**

agentDevice
Specifies the device from which the agent is logged on to the system. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

agentID
This parameter specifies the identifier of the agent who in not ready to receive calls.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

CSTAReadyEvent

This event report indicates that an agent is ready to receive calls at the device. This event can occur even if the agent is busy on an active call at the device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
            CSTAMonitorCrossRefID_t   monitorCrossRefID;
               union
               {
                       CSTAReadyEvent_t  ready;
               } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    SubjectDeviceID_t  agentDevice;
    AgentID_t                  agentID;
} CSTAReadyEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_READY** which identifies this message as an **CSTAReadyEvent.**

agentDevice
Specifies the device which is ready to receive calls from the ACD. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

agentID
This parameter specifies the identifier of the agent who in ready to receive calls.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

CSTAWorkNotReadyEvent

This event report indicates that the agent is in after call work mode completing the tasks involved in servicing a call after the connection has been disconnected. This will implies that the agents is no longer on the call but is completing the servicing of the last call and the agent ***should not*** receive any additional calls.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
       ACSHandle_t    acsHandle;
       EventClass_t   eventClass;
       EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
       ACSEventHeader_t      eventHeader;
       union
       {
              struct
              {
                   CSTAMonitorCrossRefID_t  monitorCrossRefID;
                     union
                     {
                         CSTAWorkNotReadyEvent_t  workNotReady;
                     } u;
              } cstaUnsolicited;
       } event;
} CSTAEvent_t;

typedef struct
{
       SubjectDeviceID_t     agentDevice;
       AgentID_t                    agentID;
} CSTAWorkNotReadyEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_WORK_NOT_READY** which identifies this message as an **CSTAWorkNotReadyEvent.**

agentDevice
Specifies the device which has invoked the Work Not Ready mode. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

agentID
This parameter specifies the identifier of the agent who is in the Work Not Ready mode.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

In the case of this event the agent is still working on completing the after call work for the last call. The difference between this event and the **CSTAWorkReadyEvent** is that the agent has indicated that he/she is not ready to receive additional calls.

CSTAWorkReadyEvent

This event report indicates that the agent is in "after call work mode" completing the tasks involved in servicing a call after the connection has been disconnected. This implies that the agents is no longer on the call but is completing the servicing of the last call and the agent ***may*** receive any additional calls.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t        acsHandle;
    EventClass_t       eventClass;
    EventType_t        eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t   eventHeader;
    union
    {
        struct
        {
            CSTAMonitorCrossRefID_t   monitorCrossRefID;
               union
               {
                       CSTAWorkReadyEvent_t  workReady;
               } u;
        } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    SubjectDeviceID_t  agentDevice;
    AgentID_t                  agentID;
} CSTAWorkReadyEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_WORK_READY** which identifies this message as an **CSTAWorkReadyEvent.**

agentDevice
Specifies the device which has invoked the Work Ready mode. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

agentID
This parameter specifies the identifier of the agent who is in the Work Ready mode.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

In the case of this event the agent is still working on completing the after call work for the last call. The difference between this event and the CSTAWorkNotReadyEvent is that the agent has indicated that he/she is ready to receive additional calls.

Event Report Data Types (Unsolicited)

This section defines the data structures associated with the CSTA Event Reports defined in the ***Status Reporting Services*** section of this document.

CSTAMonitorFilter_t

This structure is used to identify the event type filters requested or available on a monitored CSTA association.

```
typedef unsigned short  CSTACallFilter_t;
#define                     CF_CALL_CLEARED 0x8000
#define                     CF_CONFERENCED 0x4000
#define                     CF_CONNECTION_CLEARED 0x2000
#define                     CF_DELIVERED 0x1000
#define                     CF_DIVERTED 0x0800
#define                     CF_ESTABLISHED 0x0400
#define                     CF_FAILED 0x0200
#define                     CF_HELD 0x0100
#define                     CF_NETWORK_REACHED 0x0080
#define                     CF_ORIGINATED 0x0040
#define                     CF_QUEUED 0x0020
#define                     CF_RETRIEVED 0x0010
#define                     CF_SERVICE_INITIATED 0x0008
#define                     CF_TRANSFERRED 0x0004

typedef unsigned char   CSTAFeatureFilter_t;
#define                     FF_CALL_INFORMATION 0x80
#define                     FF_DO_NOT_DISTURB 0x40
#define                     FF_FORWARDING 0x20
#define                     FF_MESSAGE_WAITING 0x10

typedef unsigned char   CSTAAgentFilter_t;
#define                     AF_LOGGED_ON 0x80
#define                     AF_LOGGED_OFF 0x40
#define                     AF_NOT_READY 0x20
#define                     AF_READY 0x10
#define                     AF_WORK_NOT_READY 0x08
#define                     AF_WORK_READY 0x04

typedef unsigned char   CSTAMaintenanceFilter_t;
#define                     MF_BACK_IN_SERVICE 0x80
#define                     MF_OUT_OF_SERVICE 0x40

typedef struct CSTAMonitorFilter_t {
    CSTACallFilter_t call;
    CSTAFeatureFilter_t feature;
    CSTAAgentFilter_t agent;
    CSTAMaintenanceFilter_t maintenance;
    Boolean         private;
} CSTAMonitorFilter_t;
```

CALL_FILTERS

These values indicate that a call event filter should be used for processing events. The provided filter may be different than the one requested.

FEATURE_FILTERS
These values indicate that a feature event filter should be used for processing events. The provided filter may be different than the one requested.

AGENT_FILTERS
These values indicate that a agent event filter should be used for processing events. The provided filter may be different than the one requested.

MAINTENANCE_FILTERS
These values indicate that a maintenance event filter should be used for processing events. The provided filter may be different than the one requested.

PRIVATE_FILTER
This value indicates that a private filter should be used for processing events. The provided filter may be different than the one requested.

CSTAEventCause_t

This structure contains an enumerated list of all the possible event causes which can occur with different events. The definitions of these event cause codes are also provided.

```
typedef enum CSTAEventCause_t {
    EC_NONE = -1,
    EC_ACTIVE_MONITOR = 1,
    EC_ALTERNATE = 2,
    EC_BUSY = 3,
    EC_CALL_BACK = 4,
    EC_CALL_CANCELLED = 5,
    EC_CALL_FORWARD_ALWAYS = 6,
    EC_CALL_FORWARD_BUSY = 7,
    EC_CALL_FORWARD_NO_ANSWER = 8,
    EC_CALL_FORWARD = 9,
    EC_CALL_NOT_ANSWERED = 10,
    EC_CALL_PICKUP = 11,
    EC_CAMP_ON = 12,
    EC_DEST_NOT_OBTAINABLE = 13,
    EC_DO_NOT_DISTURB = 14,
    EC_INCOMPATIBLE_DESTINATION = 15,
    EC_INVALID_ACCOUNT_CODE = 16,
    EC_KEY_CONFERENCE = 17,
    EC_LOCKOUT = 18,
    EC_MAINTENANCE = 19,
    EC_NETWORK_CONGESTION = 20,
    EC_NETWORK_NOT_OBTAINABLE = 21,
    EC_NEW_CALL = 22,
    EC_NO_AVAILABLE_AGENTS = 23,
    EC_OVERRIDE = 24,
    EC_PARK = 25,
    EC_OVERFLOW = 26,
    EC_RECALL = 27,
    EC_REDIRECTED = 28,
    EC_REORDER_TONE = 29,
    EC_RESOURCES_NOT_AVAILABLE = 30,
    EC_SILENT_MONITOR = 31,
    EC_TRANSFER = 32,
    EC_TRUNKS_BUSY = 33,
    EC_VOICE_UNIT_INITIATOR = 34
} CSTAEventCause_t;
```

Certain cause codes will appear in events only if they make sense. The Table 6-1 gives cause code definitions. Table 6-2 illustrates which cause codes are possible for the each of the call events.

Table 6-1
Cause Code Definitions

Cause Code	Definition
Active Monitor	an Active Monitor Feature has occurred. This feature typically allows intrusion by a supervisor into an agent call with the ability to speak and listen. The resultant call can be considered as a conference so this cause code may be supplied with the Conferenced Event Report.
Alternate	the call is in the process of being exchanged. This feature is typically found on single-line telephones, where the human interface puts one call on hold and retrieves a held call or answers a waiting call in an atomic action.
Busy	the call encountered a busy tone or device
Call Back	Call Back is a feature invoked (by a user or via CSTA) in an attempt to complete a call that has encountered a busy or no answer condition. As a result of invoking the feature, the failed call is cleared and the call can be considered as queued. The switch may subsequently automatically retry the call (normally when the called party next becomes free). Consequently, this cause code may appear in Event Reports related to the feature invocation (Call Cleared, Connection Cleared and Queued) or related to the subsequent, retried call (Service Initiated, Originated, Delivered, and Established).
Call Canceled	the user has terminated a call without going on-hook.
Call Forward	the call has been redirected via a Call Forwarding feature set for general, unknown, or multiple conditions.
Call Fd. - Immediate	the call has been redirected via a Call Forwarding feature set for all conditions.
Call Fd. - Busy	the call has been redirected via a Call Forwarding feature set for a busy endpoint.
Call Fd. - No Answer	the call has been redirected via a Call Forwarding feature set for an endpoint that does not answer.
Call Not Answered	the call was not answered because a timer has elapsed.
Call Pickup	the call has been redirected via a Call Pickup feature.
Camp On	a Camp On feature has been invoked or has matured.

Dest. Not Obtainable	the call could not obtain the destination.
Do Not Disturb	the call encountered a Do Not Disturb condition.

Table 6-1 *continued*

Cause Code Definitions

Cause Code	Definition
Incompatible Destination	the call encountered an incompatible destination.
Invalid Account Code	the call has an invalid account code.
Key Operation[1]	indicates that the Event Report occurred at a bridged or twin device.
Lockout	the call encountered inter-digit time-out while dialing.
Maintenance	the call encountered a facility or endpoint in a maintenance condition.
Net Congestion	the call encountered a congested network. In some circumstances this cause code indicates that the user is listening to a "No Circuit" Special Information Tone (SIT) from a network that is accompanied by a statement similar to "All circuits are busy..."
Net Not Obtainable	the call could not reach a destination network.
Resources not Available	resources were not available
Silent Monitor	the event was caused by the invocation of a feature that allows a third party, such as an ACD agent supervisor, to join the call. The joining party can hear the entire conversation, but cannot be heard by either original party. The feature, sometimes called *silent intrusion*, may provide a tone to one or both parties to indicate that they are being monitored. This feature is not the same as a CSTA Monitor request. This cause shall not indicate that a CSTA Monitor has been initiated.
Transfer	a Transfer is in progress or has occurred
Trunks Busy	the call encountered Trunks Busy

[1] *Telephone numbers associated primarily with one device often appear also on a second device. One example is a secretary who's phone has mirrored or bridged lines of a boss's phone.*

Voice Unit Initiator	indicates that the event was the result of action by automated equipment (voice mail device, voice response unit, announcement) rather than the result of action by a human user.

Table 6-2
CSTA Event Report - Cause Relationships

Cause	Call Clr.	Conf	Con. Clr.	Dlv.	Div.	Est.	Fail	Held	Net. Rch.	Orig.	Q-ed	Retr.	Svc. Init.	Tran
Active Monitor		y												
Alternate						y	y	y				y		
Busy							y				y			
Call Back	y		y	y						y	y		y	
Call Canceled	y		y				y						y	
Call Forward				y	y		y	y	y		y			
Call Fd. - Immediate				y	y		y		y		y			
Call Fd. - Busy				y	y		y		y		y			
Call Fd. - No Answer				y	y		y	y	y		y			
Call Not Answered	y		y		y		y							
Call Pickup					y	y								
Camp On				y			y				y			
Dest. not Obtainable			y				y				y			
Do Not Disturb			y		y		y				y			
Incpt. Destination	y		y		y		y							
Invalid Account Code	y						y							

Key Operation	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Lockout							y							

Table 6-2 *continued*

CSTA Event Report - Cause Relationships

Cause	Call Clr.	Conf	Con. Clr.	Dlv.	Div.	Est.	Fail	Held	Net. Rch.	Orig.	Q-ed	Retr.	Svc. Init.	Tran
Maintenance	y						y							
Net Congestion							y				y			
Net Not Obtainable							y				y			
New Call		y		y		y				y				y
No Available Agents				y	y		y				y			
Overflow	y		y	y	y		y		y		y			
Override	y	y	y	y		y	y			y			y	
Park			y								y			
Recall		y		y	y	y	y	y			y	y		y
Redirected				y	y		y		y		y			y
Reorder Tone							y							
Resrcs. not Available	y		y				y		y		y			
Silent Monitor		y								y				
Transfer				y		y	y	y	y		y	y		y
Trunks Busy							y				y			
Voice Unit Initiator					y									y

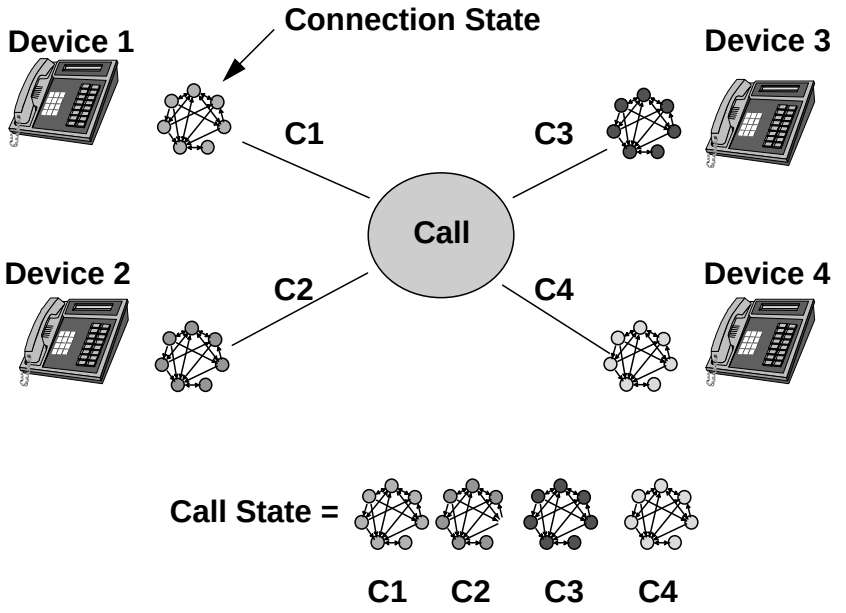
Chapter 7 Snapshot Services

An application uses CSTA Snapshot Services to query the current state of a CSTA Call or a Device object. Snapshot services query the switch to provide an application with information about the object. The information is a "*snapshot*" since the state of the Call or Device object changes over time.

The Call Snapshot Services return a list of the Devices and Connections associated with a given Call, and the Connection States for each of those Devices. As Figure 7-1 illustrates, the union of the Connection States for the Call defines the overall Call State. Also refer to the definition of Call State in Chapter 3.

Figure 7-1 shows a Call that has four associated devices. Recall from Chapter 3 that the relationship between a CSTA Call and a CSTA Device is a CSTA Connection (C1, C2, C3, and C4 are Connections). Each Connection has an associated Connection State. The Call Snapshot Services inform an application of each Device that is on a given Call and the associated Connection State for those Devices. The Call State is the union of all the Connection States associated with the Call. The application can use snapshot information to control Connections. For example, if Figure 7-1 shows a four-party conference call, then an application can use the Call Snapshot Services together with the **cstaClearConnection**( ) service to disconnect any party from the conference. To disconnect connection C4, an application uses the Call Snapshot Services to obtain a Connection Identifier (for C4) that it then passes to the **cstaClearConnection**( ) service.

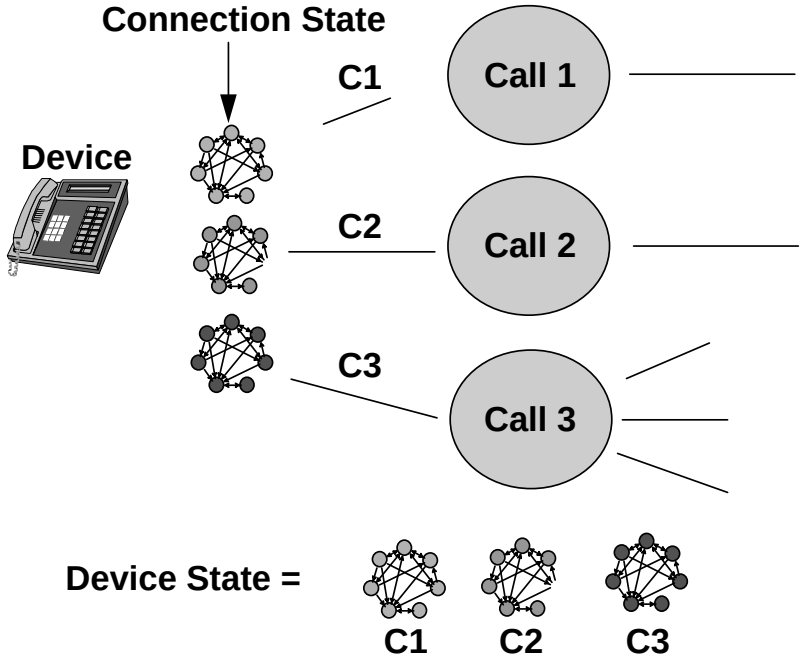
Figure 7-15
Call Snapshot Service



Device Snapshot Services return information about Calls that are associated with a given CSTA Device object. The information includes a list of Calls associated with the given Device and the Connection State of each Call (at that Device). Note the duality here: Call Snapshot Services return information about Connections at all Devices associated with a given Call, while Device Snapshot Services return information about all Connections at a given Device. Applications use the Device Snapshot Services when they need to know what is happening at a specific Device. As Figure 7-2 shows, Device Snapshot Services do not provide information about the other parties on those Calls connected to the given Device.

An application can use Device Snapshot information to manipulate any Connection, (C1, C2, or C3 in Figure 7-2) at the given Device.

Figure 7-16
Device Snapshot Service



Note

Before an application requests the Call or Device Snapshot Services, it must have previously obtained a Call or Device identifier (that it will use as a parameter to request those services). The identifier specifies a Call or Device in the switching domain. Depending on the implementation, Snapshot Services may not provide information about devices or connections outside of that switching domain (devices not attached to that switch) .

Call Snapshot Services

This section defines the Call Snapshot Services that query the switch for the status of calls within the switching domain. Call Snapshot Services return information about all Devices and Connections associated with a specified CSTA Call object.

cstaSnapshotCallReq( )

The **cstaSnapshotCallReq**( ) service provides information about a Call object in the switching domain. The service will return the Devices associated with a given Call and the Connection State for each Device. The Call State is the union of the Connection States.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaSnapshotCallReq (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    ConnectionID_t            *snapshotObj,
    PrivateData_t             *privateData),
```

Parameters

acsHandle
This is the handle to an active ACS Stream over which the request will be made.

invokeID
This is an application provided handle that the application uses to match a specific instance of a service request with its confirmation event. The application supplies this parameter only when the Invoke ID mechanism is set for Application-generated IDs in **acsOpenStream**( ). The ACS Library ignores this parameter when the Stream is set for Library-generated invoke IDs.

snapshotObj
This is a pointer to the Connection Identifier identifying the Call object for which Snapshot information is requested.

privateData
This is an optional pointer to CSTA private data.

Return Values

cstaSnapshotCallReq( ) returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, the invoke identifier. If the call fails it will return a negative error (<0). For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails it will return a negative error (<0). For application-generated identifiers the return is never positive (>0).

An application should always check the **CSTASnapshotCallConfEvent** message to insure that the Telephony Server and switch have acknowledged and processed the **cstaSnapshotCallReq**( ) request.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
The application provided a bad or unknown ***acsHandle.***

ACSERR_STREAM_FAILED
A previously active ACS Stream has been abnormally aborted.

Comments

A call to **cstaSnapshotCallReq**( ) results in a confirmation event, **CSTASnapshotCallConfEvent,** that returns the information about the call. **cstaSnapshotCallReq**( ) provides information about calls that make further monitoring meaningful. For example, when an application requests **cstaMonitorStart**( )**,** there may already be active calls at the Device being monitored. The application can use Call Snapshot information to obtain information about those existing calls process additional events about them in a reasonable way.

cstaSnapshotCallReq( ) is passive and does not affect the state of any object in the switching domain.

CSTASnapshotCallConfEvent

The Call Snapshot confirmation event returns call related information in response to the **cstaSnapshotCallReq**( ) service. The call information includes the static Device Identifiers, the Connection Identifiers, and Connection States for every endpoint in the specified call.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID;
                  union
                  {
                         CSTASnapshotCallConfEvent_t
           snapshotCall;
                  } u;
           } cstaConfirmation
    } event;
} CSTAEvent_t;

typedef struct CSTASnapshotCallConfEvent_t {
    CSTASnapshotCallData_t snapshotData;
} CSTASnapshotCallConfEvent_t;

typedef struct CSTASnapshotCallData_t {
    int                   count;
    struct         CSTASnapshotCallResponseInfo_t *info;
} CSTASnapshotCallData_t;

typedef struct CSTASnapshotCallResponseInfo_t {
    SubjectDeviceID_t                   deviceOnCall;
    ConnectionID_t                      callIdentifier;
    LocalConnectionState_t        localConnectionState;
} CSTASnapshotCallResponseInfoEvent_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream over which the confirmation arrived. This is the same as the ACS Stream over which the request was made.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value CSTA_SNAPSHOT_CALL_CONF, which identifies this message as an CSTASnapshotCallConfEvent.

invokeID
This parameter specifies the service request instance for the **cstaSnapshotCallReq**( ) The application uses this parameter to correlate responses with requests.

snapshotData
Contains all the snapshot information for the Call for which the query was made.

count: A count of the number of *CSTASnapshotCallResponseInfo_t* structures. Each structure contains information about one device on the call.

info*:* A pointer to an array of *CSTASnapshotCallResponseInfo_t* structures, each of which contains the following fields:

deviceOnCall — A pointer to the Device Identifier of a device that is a party on the call for which the query was made.

callIdentifier **—** The Connection Identifier for the Connection between the deviceOnCall and the call for which the query was made.

localConnectionState — The Connection State for the local Connection in the callIdentifier parameter.

privateData
If private data accompanies this event, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTASnapshotCallConfEvent** does not deliver private data to the application.

Comments

The **CSTASnapshotCallConfEvent** returns an array or variable length since the number of devices on a call can be greater than one. Each array element identifies a Device on the call, the Connection between the Device and the Call, and the Connection State (see Figure 7-1). An application should use ***count*** to determine the number of array elements.

Device Snapshot Service

This section defines the Device Snapshot Services that query the switch for the status of Devices within the switching domain. Device Snapshot Services return information about Calls (Connections) associated with a specified Device.

cstaSnapshotDeviceReq( )

The **cstaSnapshotDeviceReq**( ) service returns information about a Device object in the switching domain. The service returns a list of calls associated with the given Device and the Connection State of each of those calls at that Device.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t   cstaSnapshotDeviceReq (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    DeviceID_t                *snapshotObj,
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the handle to an active ACS Stream over which the request will be made.

invokeID
This is an application provided handle that the application uses to match a specific instance of a service request with its confirmation event. The application supplies this parameter only when the Invoke ID mechanism is set for Application-generated IDs in **acsOpenStream**( ). The ACS Library ignores this parameter when the Stream is set for Library-generated invoke IDs.

snapshotObj
This parameter is a pointer to the Device Identifier for the Device object for which Snapshot information is being requested.

privateData
This is an optional pointer to CSTA private data.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, the invoke identifier. If the call fails it will return a negative error (<0). For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails it will return a negative error (<0). For application-generated identifiers the return is never positive (>0).

The application should always check the **CSTASnapshotDeviceConfEvent** message to insure that the Telephony Server and the switch have acknowledged and processed the **cstaSnapshotDeviceReq**( ) request.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_STREAM_FAILED
This return value indicates that a previously active ACS Stream has been abnormally aborted.

Comments

A call to **cstaSnapshotDeviceReq**( ) results in a confirmation event, **CSTASnapshotDeviceConfEvent**, which returns information about the Device. **cstaSnapshotDeviceReq**( ) provides information about Devices that permit an application to synchronize state with the switching domain. For example, an application can call **cstaSnapshotDeviceReq**( ) to find out about the Calls present at a Device, then call **cstaMonitorStart**( ) to monitor the Device. The information from the Device query permits the application to process the monitoring events in a proper context.

The **cstaSnapshotDeviceReq**( ) is passive and does not affect the state of any object within the switching domain.

CSTASnapshotDeviceConfEvent

The Device Snapshot confirmation event returns Device related information in response to the **cstaSnapshotDeviceReq**( ) service. The Device information includes a Connection Identifier for each Call at the Device and the Connection State for each Call at the Device.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
            struct
            {
                    InvokeID_t     invokeID;
                    union
                    {
                            CSTASnapshotDeviceConfEvent_t
            snapshotDevice;
                    } u;
            } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTASnapshotDeviceConfEvent_t {
    CSTASnapshotDeviceData_t snapshotData;
} CSTASnapshotDeviceConfEvent_t;

typedef struct CSTASnapshotDeviceData_t {
    int            count;
    struct  CSTASnapshotDeviceResponseInfo_t *info;
} CSTASnapshotDeviceData_t;

typedef struct CSTASnapshotDeviceResponseInfo_t {
    ConnectionID_t         callIdentifier;
    CSTACallState_t        localcallState;
} CSTASnapshotDeviceResponseInfo_t;
```

```
typedef struct CSTACallState_t {
    int
            count;
    LocalConnectionState_t        *state;
} CSTACallState_t;

typedef enum CSTASimpleCallState_t {
    CALL_NULL = 0,
    CALL_PENDING = 1,
    CALL_ORIGINATED = 3,
    CALL_DELIVERED = 35,
    CALL_DELIVERED_HELD = 36,
    CALL_RECEIVED = 50,
    CALL_ESTABLISHED = 51,
    CALL_ESTABLISHED_HELD = 52,
    CALL_RECEIVED_ON_HOLD = 66,
    CALL_ESTABLISHED_ON_HOLD = 67,
    CALL_QUEUED = 83,
    CALL_QUEUED_HELD = 84,
    CALL_FAILED = 99,
    CALL_FAILED_HELD = 100
} CSTASimpleCallState_t;

/* Used to take a CSTACallState_t which contains only two
 * LocalConnectionState_t and match them to the set of
 */
#define SIMPLE_CALL_STATE(ccs) (ccs.stat[0]+(ccs.state[1] << 4))

typedef struct CSTACallState_t {
            int
    count;
            LocalConnectionState_t        *state;
} CSTACallState_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream over which the confirmation arrived. This is the same as the ACS Stream over which the request was made.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_SNAPSHOT_DEVICE_CONF**, which identifies this message as an **CSTASnapshotDeviceConfEvent.**

invokeID
This parameter specifies the service request instance for the **cstaSnapshotDeviceReq**( ) The application uses this parameter to correlate responses with requests.

snapshotData
Contains all the snapshot information for the Device for which the query was made.

count: A count of the number of *CSTASnapshotDeviceResponseInfo_t* structures. Each contains information about one Call at the Device.

info: A pointer to an array of *CSTASnapshotDeviceResponseInfo_t* structures, each of which contains the following fields:

callIdentifier — A pointer to a Connection Identifier for each call at the device. For some implementations, this parameter points to the device's dynamic device identifier for the call object.

callState — The CSTA Call State. The Call State is returned as a list of local Call States.

privateData
If private data accompanies this event, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTASnapshotDeviceConfEvent** does not deliver private data to the application.

Comments

The **CSTASnapshotDeviceConfEvent** returns a linked list since the number of calls on a device can be greater than one. Each member of the list identifies a call at the device, and the local call state of the Connection for that call at the device (see Figure 7-2). An application should be aware that the number of members on the list is not fixed. The pointer, **next*, will be *NULL* for the last member (call) on the list.

Chapter 8 CSTA Computing Function Services

CSTA Computing Functions are those functions where the switching domain is the client (service requester) and the computing domain is the server. Presently, Application Call Routing is the only CSTA Computing Function. A switch uses application call routing when it needs the application to supply call destinations on a call-by-call basis. Applications can use internal databases together with call information to determine a destination for each call. For Example, an application might use the caller's number, caller-entered digits (provided as private data), or information in an application database to route incoming calls.

TSAPI Version 2 Routing

TSAPI Version 2 more closely aligns with the CSTA standard. Version 2 adds two new TSAPI functions and provides additional information in two event reports. The new function calls are **cstaRouteSelectInv( )** and **cstaRouteEndInv( )**, and the two enhanced events are **CSTARouteRequestEvent** and **CSTARouteUsedEvent**.

The new functions, **cstaRouteSelectInv( )** and **cstaRouteEndInv( ),** allow an application to supply an invoke identifier (***invokeID***) in these requests. Although TSAPI does not define a confirmation event for these services, the CSTA standard does define a negative acknowledgement. By using the Version 2 functions, the application can associate a potential **CSTAUniversalFailureConfEvent** with the original request. This is not

possible with the Version 1 APIs because they did not include an *invokeID* parameter (a PBX Driver may instead send a **CSTARouteEndEvent** to indicate an error, but doing so is not strictly in compliance with the CSTA standard).

The enhancements in the routing event reports, **CSTARouteRequestEvent** and **CSTARouteUsedEvent** allow inclusion of *ExtendedDeviceID_t* type fields for certain event data instead of the currently defined *DeviceID_t* types. In version 2, the ***currentRoute*** and ***callingDevice*** members of **CSTARouteRequestExtEvent** are defined as *CalledDeviceID_t* and *CallingDeviceID_t* types, respectively. The ***routeUsed*** and ***callingDevice*** members of **CSTARouteUsedEvent** are defined as *CalledDeviceID_t* and *CallingDeviceID_t* types, respectively. The version 2 definitions align with the CSTA standard. Note that a routing server application that requests and gets the TSAPI version 2 (i.e., "TS2") will always receive the version 2 events. Existing applications that do not use version control to request the Version 2 API version will continue to receive the Version 1 events.

Application Call Routing

Application call routing requires that the switch be configured to direct calls to a special type of device know as the "routing device". When a call arrives at a routing device, the switch sends a message to the Telephony Server requesting a route for the call.

Before an application can route calls, it must register with the Telephony Server as a routing server. The application may either register as the routing server for a specific routing device or as the default routing server for an advertised service. Recall that a PBX driver advertises its services. Often these services correspond to a CTI link, so an application can, in effect, register to be the default routing server for a CTI link. An application uses **cstaRouteRegisterReq**( ) to register as a routing server**.** This request has an associated confirmation event, **CSTARouteRegisterReqConfEvent**, that contains the routing cross-reference identifier (routingCrossRefID) that the application uses to identify requests that arrive on this registration.

At any one time, one, and only one application can be the routing server for a routing device. Similarly, one, and only one application can be the default routing server for an advertised service.

Routing Procedure

The registration above must occur before this procedure can take place. This procedure description uses the version 2 functions.

1. The switch queues an incoming call at a special device object, the routing device. The routing device may be a "soft" extension on the switch for application-based routing, or similar device defined within the switching domain.

2. When the call arrives at the routing device, the switch and the Telephony Services PBX driver create a CSTA routing dialog

for the call. The PBX driver allocates a *routing cross-reference identifier* (routingCrossRefID**) that references this routing dialog.**

3. The PBX Driver directs the route request to the application registered as the routing server for the routing device. If no application is registered for that specific routing device, then the PBX Driver directs the route request to the default routing server application for its advertised service. The routing application receives an unsolicited *route request* event (CSTARouteRequestEvent**) for the call. This event contains the routing cross-reference identifier and call information (such as calling and called numbers). The application which provides the call routing destination is called the "routing server" for the routing device.**

4. the routing server sends the switch a *route select* message (cstaRouteSelectInv**) containing a destination for the call. The routing server typically uses information from the *route request* event together with information from an application database to determine this destination. The routing server may include an optional flag in the *route select* (***routeUsedReq***) instructing the switch to inform it of the final destination for the call. The final destination may be different than the application-provided destination when switch features such as call forwarding redirect the call.**

5. the switch receives the *route select* message (cstaRouteSelectInv**) and attempts to route the call to the application-provided destination. If the destination is valid, the switch routes the call to that destination and sends the application a *route end* event (**cstaRouteEndInv**). This terminates the routing dialog for that call. If the application-provided destination is not valid (an invalid extension number, the destination is busy, etc.), then the switch may send a *re-route* event (**CSTAReRouteRequestEvent**) to the application to request another route to a different destination.**

6. If the application receives a *re-route* event (CSTAReRouteRequestEvent**) it can select a different destination for the call and send the switch another *route select* message (**cstaRouteSelectInv**). Depending on the switch implementation, the re-routing message exchange can repeat until the application provides a valid route. The routing server application will find out about a successful route if the switch sends a *route end* event (**cstaRouteEndInv**) or if the application included the** *routeUsedReq* **flag in its last *route select* message (**cstaRouteSelectInv**).**

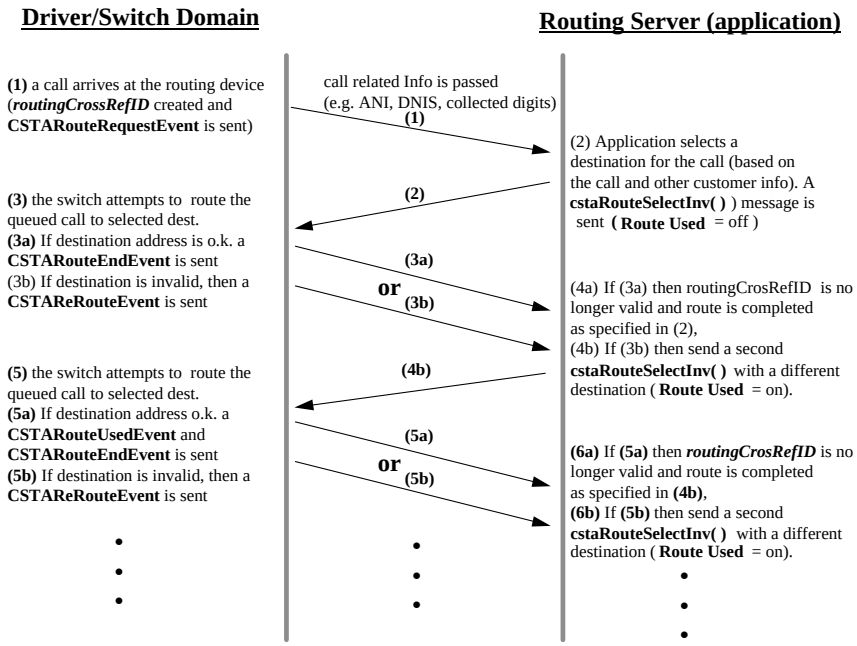
Either the switch or the routing server (application) may send a *route end* event (**cstaRouteEndInv**) to end the routing process and terminate the CSTA routing dialog (this releases the *routing cross-reference identifier*, **routingCrossRefID** for use in the future). Either endpoint may send a route end at any time. This message indicates that the routing server does not want to route the call, or the switch (usually in the absence of a **cstaRouteSelectInv** message) routed the call using some mechanism within the switching domain.

Note

Certain switch implementations may not support the optional flags described above.

Figure 8-17 illustrates the Routing Procedure.

Figure 8-17
Routing Procedure



Routing Registration Functions and Events

This section describes the service requests and events that an application uses to register with the Telephony Server as a call routing server

cstaRouteRegisterReq( )

An application uses **cstaRouteRegisterReq**( ) to register as a routing server for a specific routing device or as a default routing server for an advertised service. The application must register for routing services before it can receive any route requests for a routing device. An application may be a routing server for more than one routing device. However, only one application may be a routing server for any given routing device. Similarly, only one application may register as the default routing server for an advertised service.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t cstaRouteRegisterReq (
    ACSHandle_t              acsHandle,
    InvokeID_t               invokeID,
    DeviceID_t               *routingDevice,
    PrivateData_t            *privateData);
```

Parameters

acsHandle
This is the handle to an active ACS Stream over which the routing dialog will take place.

invokeID
This is an application provided handle that the application uses to match a specific instance of **cstaRouteRegisterReq**( ) request with its **CSTARouteRegisterReqConfEvent** confirmation event. The application supplies this parameter only when the Invoke ID mechanism is set for Application-generated IDs in **acsOpen-Stream**( ). The ACS Library ignores this parameter when the Stream is set for Library-generated invoke IDs.

routingDevice
This is a pointer to a device id for the routing device for which the application requests to be the routing server. The routing device can be any device type which the switch implementation supports as a routing device. A NULL value indicates that the requesting application will be the default routing server for the ***ServerID*** associated with the ***acsHandle*** in the **cstaRouteRegisterReq**( ). The default routing server will receive switch routing requests for any routing devices making routing requests on that advertised service that do not have registered routing servers. Thus, the default routing server will receive route requests when a routing device sends a route request and there is no corresponding registered routing server for that routing device.

privateData
This is an optional pointer to CSTA private data.

Return Values

cstaRouteRegisterReq( ) returns the following values depending on whether the application is using library or application-generated invoke identifiers: *Library-generated Identifiers* - if the function call completes successfully it will return a positive value, the invoke identifier. If the call fails it will return a negative error (<0). For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails it will return a negative error (<0). For application-generated identifiers the return is never positive (>0).

An application should always check the **CSTARouteRegisterReqConfEvent** message to ensure to ensure that the Telephony Server and switch have acknowledged the **cstaRouteRegisterReq**( ).

The following are possible negative error conditions for this function:

ACSERR_BADHDL
The application provided a bad or unknown ***acsHandle.***

ACSERR_STREAM_FAILED
A previously active ACS Stream has been abnormally aborted.

Comments

In order for an application to route calls the application must successfully call **cstaRouteRegisterReq**( ). An application can register as:

- a routing server for the specified routing device, or
- as the default routing server for all routing devices making requests of a specific Telephony Server.

To register as a default routing server, an application sets the ***routingDevice*** parameter to NULL. One, and only one, application is allowed to register as the routing server for a ***routingDevice,*** or as the default routing Server for an advertised service. Applications may register for routing services for a specific device even when a default routing server has registered. A default routing server will not receive any routing requests from any routing device for which there is a registered routing server. Once a routing server is registered, **CSTARouteRequestEvent**s convey the route requests to the routing server.

CSTARouteRegisterReqConfEvent

The **RouteRegisterReqConfEvent** indicates successful registration to an application. That application is now the call routing server for the requested routing device (or is the default routing server for the advertised service).

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID;
                  union
                  {
                    CSTARouteRegisterReqConfEvent_t
    routeRegister;
                  } u;
           } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct {
    RouteRegisterReqID_t  routeRegisterReqID;
} CSTARouteRegisterReqConfEvent_t;

    typedef long            RouteRegisterReqID_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream over which the **RouteRegisterReqConfEvent** confirmation arrived. This is the same as the ACS Stream over which the application made the corresponding **cstaRouteRegisterReq**( ) request.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_ROUTE_REGISTERREQ_CONF**, which identifies this message as an **CSTARouteRegisterReqConfEvent.**

invokeID
This parameter specifies the service request instance for the **cstaRouteRegisterReq**( )**.** The application uses this parameter to correlate **RouteRegisterReqConfEvent** responses with requests.

routeRegisterReqID
This parameter contains a handle to the routing registration session for a specific routing device (or for the default routing server depending on the registration request). All routing dialogs (**routingCrossRefID**s) for a routing device occur over this routing registration session. The PBX Driver selects **routeRegisterReqID**s so that they will be unique within the ***acsHandle***.

privateData
If private data accompanies this event, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTARouteRegisterReqConfEvent** does not deliver private data to the application.

Comments

This event provides the application with a positive confirmation to a request for routing registration.

cstaRouteRegisterCancel( )

Applications (routing servers) use **cstaRouteRegisterCancel**( ) to cancel a previously registered routing server session. This request terminates the routing session and the application receives no further routing messages for that session once it receives the confirmation to the cancel request.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t cstaRouteRegisterCancel (
    ACSHandle_t                         acsHandle,
    InvokeID_t                          invokeID,
    RouteRegisterReqID_t      routeRegisterReqID,
    PrivateData_t                       *privateData);
```

Parameters

acsHandle
This is the handle to an active ACS Stream over which the **cstaRouteRegisterCancel**( ) request will be made.

invokeID
This is an application provided handle that the application uses to match a specific instance of a **cstaRouteRegisterCancel**( ) request with its confirmation event. The application supplies this parameter only when the Invoke ID mechanism is set for Application-generated IDs in **acsOpenStream**( )**.** The ACS Library ignores this parameter when the Stream is set for Library-generated invoke IDs.

routeRegisterReqID
This parameter is the handle to the routing registration session which the application is canceling. The application received this handle in the confirmation event for the route register service request, a **CSTARouteRegisterReqConfEvent**.

privateData
This is an optional pointer to CSTA private data.

Return Values

cstaRouteRegisterCancel( ) returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, the invoke identifier. If the call fails it will return a negative error (<0). For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails it will return a negative error (<0). For application-generated identifiers the return is never positive (>0).

The application should always check the **CSTARouteRegisterCancelConfEvent** message to ensure that the Telephony Server and switch have acknowledged and processed the **cstaRouteRegisterCancel**( ) request.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
The application provided a bad or unknown ***acsHandle.***

ACSERR_STREAM_FAILED
A previously active ACS Stream has been abnormally aborted.

Comments

The application must continue to process outstanding routing requests from the routing device until it receives **CSTARouteRegisterCancelConfEvent**. The Telephony Server will not send any further requests once it has sent this confirmation event.

CSTARouteRegisterCancelConfEvent

CSTARouteRegisterCancelConfEvent confirms a previously issued **cstaRouteRegisterCancel**( ) request for a routing registration. Once tan application receives this event, it invalidates the routing registration session.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t acsHandle;
    EventClass_t     eventClass;
    EventType_t eventType;
} ACSEventHeader_t;

typedef struct
{
          ACSEventHeader_t eventHeader;
    union
    {
          struct
          {
                InvokeID_t invokeID;
                union
                {
                      CSTARouteRegisterCancelConfEvent_t
          routeCancel;
                } u;
          } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct {
    RouteRegisterReqID_t        routeRegisterReqID;
} CSTARouteRegisterCancelConfEvent_t;

    typedef long            RouteRegisterReqID_t;
```

Parameters

acsHandle
This is the handle for the ACS Stream over which the **CSTARouteRegisterCancelConfEvent** confirmation arrived. This is the same as the ACS Stream over which the **cstaRouteRegisterCancel**( ) request was made.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_ROUTE_REGISTER_CANCEL_CONF**, which identifies this message as an **CSTARouteRegisterCancelConfEvent.**

invokeID
This parameter specifies the service request instance for the **cstaRouteRegisterCancel**( ). The application uses this parameter to correlate the **CSTARouteRegisterCancelConfEvent** responses with requests.

routeRegisterReqID
This parameter contains the handle to a routing registration for which the application is providing routing services. The application obtained this handle from a **CSTARouteRegisterReqConfEvent**. This ***routeRegisterReqID*** handle is no longer valid once the Telephony Server sends **CSTARouteRegisterCancelConfEvent**.

privateData
If private data accompanies this event, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTASnapshotCallConfEvent** does not deliver private data to the application.

Comments

CSTARouteRegisterCancelConfEvent confirms an application's **cstaRouteRegisterCancel**( ) service request, which cancels a routing registration session. The Telephony Server will send any further requests from the routing device to the default routing server.

CSTARouteRegisterAbortEvent

The Telephony Server sends an application an unsolicited **CSTARouteRegisterAbortEvent** to cancel an active routing dialog. This event invalidates a routing registration session.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  union
                  {
                         CSTARouteRegisterAbortEvent_t
    registerAbort;
                  } u;
           } cstaEventReport;
    } event;
} CSTAEvent_t;

typedef struct {
    RouteRegisterReqID_t          routeRegisterReqID;
} CSTARouteRegisterAbortEvent_t;

    typedef long            RouteRegisterReqID_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream. The routing dialog being canceled is occurring on this ACS Stream.

eventClass
This is a tag with the value **CSTAEVENTREPORT**, which identifies this message as an CSTA event report.

eventType
This is a tag with the value **CSTA_ROUTE_REGISTER_ABORT**, which identifies this message as an **CSTARouteRegisterAbortEvent.**

routeRegisterReqID
This parameter is the handle to a routing registration for which the application is providing routing services. The application received this handle in a **CSTARouteRegisterReqConfEvent**. The **CSTARouteRegisterAbortEvent** invalidates this handle.

privateData
If private data accompanies **CSTARouteRegisterAbortEvent**, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTARouteRegisterAbortEvent** does not deliver private data to the application.

Comments

CSTARouteRegisterAbortEvent notifies the application that the PBX driver or switch aborted a routing registration session.

Routing Functions and Events

This section defines the CSTA call routing services for application call routing. The switch queues calls at the routing device until the application provides a destination for the call or a time-out condition occurs within the switching domain. Figure 8-17 shows the Application-based call routing dialog between a switch and the routing server (the application).

Once an application registers as a routing server, the application uses the services in this section to route calls. The application receives a **CSTARouteRequestEvent** for each call which requires a routing destination. The application sends the switch a destination in **cstaRouteSelectInv**( ). The switch then attempts to route the call to that application-provided destination. The switch will respond with a **CSTARouteEndEvent** and/or a **CSTARouteUsedEvent**. If the application-provided destination is invalid, the switch may send a **CSTAReRouteRequestEvent** to request an additional destination. See Figure 8-17 for a typical sequence of these events and service requests.

Register Request ID and the Routing Cross-Reference ID

The routing services use two handles (identifiers) to refer to different software objects in the Telephony Server. The register request identifier (**routeRegisterReqID**) identifies a routing session over which an application will receive routing requests. This handle is tied to a routing device on the switch, or it may indicate that the application is the default routing server for an advertised service. When the application uses **cstaRouteRegisterReq**( ) to register for routing services, it receives a **routeRegisterReqID** in the confirmation. The **routeRegisterReqID** is valid until the registration is canceled or aborted.

Within a routing session (**routeRegisterReqID**) the switch may initiate many routing dialogs (shown in Figure 8-17) to route multiple calls. An application uses a routing cross reference-identifier (***routingCrossRefID***) to refer to each routing dialog. The application receives a ***routingCrossRefID*** in each **CSTARouteRequestEvent.** The **CSTARouteRequestEvent** initiates a routing dialog. The ***routingCrossRefID*** is valid for the duration of the call routing dialog.

The routing cross-reference identifier (**routingCrossRefID**) is unique within the routing session (**routeRegisterReqID**). Some switch implementations may provide the additional benefit of a unique routing cross reference-identifier across the entire switching domain. Routing session identifiers (**routeRegisterReqID**s) are unique within an ACS Stream (**acsHandle**).

If a call is not successfully routed by the routing server this does not necessarily mean that the call is cleared or not answered. Most switch implementations will have a default mechanism for handling a call at a routing device when the routing server has failed to provide a valid destination for the call.

CSTARouteRequestEvent

A routing server application receives a **CSTARouteRequestEvent** when the switch requests a route for a call. The application may have registered as the routing server for the routing device on the switch that is making the request, or it may have registered as the default routing server for the advertised service. The **CSTARouteRequestEvent** event includes call related information (such as the called and calling number, when available). A routing server application typically combines the call related information with an application database to determine a destination for the call. A routing server application receives a **CSTARouteRequestEvent** for every call queued at the routing device.

TSAPI Version

Applications using TSAPI Version 1 must use the CSTARouteRequestEvent_t structure; applications using any other version must use the CSTARouteRequestExtEvent_t structure.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct {
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct {
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID;
                  union
                  {
                     CSTARouteRequestEvent_t    routeRequest;

                     /* version 2 union only */
                     CSTARouteRequestExtEvent_t routeRequestExt
                  } u;
           } cstaRequest;
    } event;
} CSTAEvent_t;
```

TSAPI Version 1:

```
    typedef struct {
        RouteRegisterReqID_t   routeRegisterReqID;
        RoutingCrossRefID_t    routingCrossRefID;
        DeviceID_t             currentRoute;
        DeviceID_t             callingDevice;
        ConnectionID_t         routedCall;
        SelectValue_t          routedSelAlgorithm;
        Boolean                priority;
        SetUpValues_t          setupInformation;
    } CSTARouteRequestEvent_t;
```

TSAPI Version 2:

```
    typedef struct {
        RouteRegisterReqID_t   routeRegisterReqID;
        RoutingCrossRefID_t    routingCrossRefID;
        CalledDeviceID_t       currentRoute;          /* V2 */
        CallingDeviceID_t      callingDevice;         /* V2 */
        ConnectionID_t         routedCall;
        SelectValue_t          routedSelAlgorithm;
        Boolean                priority;
        SetUpValues_t          setupInformation;
    } CSTARouteRequestExtEvent_t;     /* V2 */

    typedef enum SelectValue_t {
        SV_NORMAL = 0,
        SV_LEAST_COST = 1,
        SV_EMERGENCY = 2,
        SV_ACD = 3,
         SV_USER_DEFINED = 4
    } SelectValue_t;

    typedef struct SetUpValues_t {
        int            length;
        unsigned char  *value;
    } SetUpValues_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream on which the route request event arrives.

eventClass
This is a tag with the value **CSTAREQUEST**, which identifies this message as an CSTA request message.

eventType
This is a tag with the value **CSTA_ROUTE_REQUEST** (version 1) or **CSTA_ROUTE_REQUEST_EXT** (version 2), which identifies this message as an **CSTARouteRequestEvent.**

routeRegisterReqID
This parameter contains the handle to the routing registration session for which the application is providing routing services. The application received this handle in a **CSTARouteRegisterReqConfEvent** confirmation to a route register service request.

routingCrossRefID
The application receives this new handle for the routing dialog for this call. This identifier has a new, unique value within the scope of the routing session (***routeRegisterReqID).***

currentRoute
This parameter indicates the originally requested destination for the call being application routed. Often, this is the DNIS, or dialed number.

callingDevice
This is the originating device of the call, i.e., the calling party number (when available. If not available, it may be trunk information).

routedCall
This parameter is a CSTA Connection ID that identifies the call being routed.

routedSelAlgorithm
This parameter identifies the routing algorithm being used.

priority
This parameter indicates the priority of the call.

setupInformation
This parameter includes an ISDN call setup message, if available.

privateData
If private data accompanies **CSTARouteRequestEvent**, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTARouteRequestEvent** does not deliver private data to the application.

Comments

CSTARouteRequestEvent informs the routing server (application) that the switch is requesting a destination for a call queued at the routing device. The application uses **cstaRouteSelectInv**( ) or **cstaRouteSelect**( ) to respond with a destination.

CSTA requires that all events contain an invoke ID. During routing, the RouteRegisterReqID and the RoutingCrossRefID identify the routing dialogue. The invokeID is not used.

CSTAReRouteRequestEvent

The switch sends an unsolicited **CSTAReRouteRequestEvent** to request an another destination for a call. Typically, the destination that the application previously sent was invalid or busy. The switch previously sent call related information (such as the called and calling numbers) in the **CSTARouteRequestEvent;** Call related information is not re-sent in the **CSTAReRouteRequestEvent**. The routing server application responds using the **cstaRouteSelectInv**( ) or **cstaRouteSelect**( ) service.

Syntax

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                         InvokeID_t     invokeID;
                  union
                  {
                         CSTAReRouteRequest_t
           reRouteRequest;
                  } u;
           } cstaRequestEvent;
    } event;
} CSTAEvent_t;

typedef struct
{
    RouteRegisterReqID_t          routeRegisterReqID;
    RoutingCrossRefID_t           routingCrossRefID;
} CSTAReRouteRequest_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream on which the re-route request arrives.

eventClass
This is a tag with the value **CSTAREQUEST**, which identifies this message as a CSTA request message.

eventType
This is a tag with the value **CSTA_RE_ROUTE_REQUEST,** which identifies this message as a **CSTAReRouteRequestEvent.**

routeRegisterReqID
This parameter contains the handle to the routing registration session for which the application is providing routing services. The application received this handle in a **CSTARouteRegisterReqConfEvent** confirmation to a route register service request.

routingCrossRefID
This parameter contains the handle to the CSTA call routing dialog for this call. The application previously received this handle in a **CSTARouteRequestEvent** for the call.

privateData
If private data accompanies **CSTAReRouteRequestEvent**, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTAReRouteRequestEvent** does not deliver private data to the application.

Comments

The switch can send **CSTAReRouteRequestEvent** to the routing server application when the application previously sent a destination that was is invalid or other circumstances exist where routing of the call to the destination is not possible (e.g. the destination is busy). The switch uses **CSTAReRouteRequestEvent** to request another destination for the call queued at the routing device. The application uses **cstaRouteSelect**( ) to provide the new destination.

The number of re-route requests that a switch may send depends on the implementation or administration within the switch. The application should be prepared to respond to all re-route requests or terminate the routing dialog by using the **cstaRouteEnd**( ) service request when it cannot provide additional destinations.

CSTA requires that all events contain an invoke ID. During routing, the RouteRegisterReqID and the RoutingCrossRefID identify the routing dialogue. The invokeID is not used.

cstaRouteSelect( ) TSAPI Version 1 Only

The routing server application uses **cstaRouteSelect** to send a routing destination to the switch in response to a **CSTARouteRequestEvent** for a call.

TSAPI Version

Applications using TSAPI Version 1 must use the **CSTARouteSelect( )** function; applications using any other version must use the **CSTARouteSelectInv( )** function.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t cstaRouteSelect (
    ACSHandle_t                     acsHandle,
    RouteRegisterReqID_t      routeRegisterReqID,
    RoutingCrossRefID_t       routingCrossRefID,
    DeviceID_t                      *routeSelected,
    RetryValue_t                    remainRetry,
    SetUpValues_t                   *setupInformation,
    Boolean                                routeUsedReq,
    PrivateData_t                   *privateData);
```

Parameters

acsHandle
This is the handle to the ACS Stream on which the routing dialog for the call is taking place.

routeRegisterReqID
This parameter contains the active handle to the routing registration session for which the application is providing routing services. The application received this handle in the confirmation event for the route register service request,**CSTARouteRegisterReqConfEvent,** for the call.

routingCrossRefID
This parameter contains the handle to the CSTA call routing dialog for this call. The application previously received this handle in the **CSTARouteRequestEvent** for the call.

routeSelected
The application provides this parameter containing a Device ID that specifies the destination for the call.

remainRetry
The application indicates the number of times it is willing to receive a **CSTAReRouteRequestEvent** for this call in the case that the switch needs to request an alternate route. TSAPI provides #define values that an application may use to indicate that it does not keep count, or that there is no limit.

setupInformation
The application provides this optional parameter that contains information for the ISDN call setup message that the switch will use to route the call. Some switches may not support this option.

routeUsedReq
The routing application uses this parameter to request a **CSTARouteUsedEvent** for the call. The route used event informs the application of the final destination of the call once it has been routed.

privateData
This is an optional pointer to CSTA private data.

Return Values

cstaRouteSelect( ) returns a non-zero value if it completes successfully.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
The application provided a bad or unknown ***acsHandle.***

ACSERR_STREAM_FAILED
A previously active ACS Stream has been abnormally aborted.

There is no confirmation event for this service request, however this service request can generate a universal failure event.

Comments

An application should call **cstaRouteSelect** only in response to a **CSTARouteRequestEvent** or **CSTAReRouteRequestEvent**. The **cstaRouteSelect** service request will fail if the application does not provide valid identifiers from a previous **CSTARouteRequestEvent**, (***acsHandle***, ***routeRegisterReqID***, and ***routingCrossRefID).*** The application should check the return value for this function and any resulting universal failure event for errors.

cstaRouteSelectInv( )

The routing server application uses **cstaRouteSelectInv** to send a routing destination to the switch in response to a **CSTARouteRequestEvent** for a call.

The invoke identifier parameter lets the application correlate the route selection with a **CSTAUniversalFailureConfEvent** in the case of a failure.

TSAPI Version

Applications using TSAPI Version 1 must use the **CSTARouteSelect( )** function; applications using any other version must use the **CSTARouteSelectInv( )** function.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t cstaRouteSelectInv (
    ACSHandle_t                     acsHandle,
    InvokeID_t                      invokeID,           /*
    Version 2 */
    RouteRegisterReqID_t      routeRegisterReqID,
    RoutingCrossRefID_t       routingCrossRefID,
    DeviceID_t                      *routeSelected,
    RetryValue_t                    remainRetry,
    SetUpValues_t                   *setupInformation,
    Boolean                                 routeUsedReq,
    PrivateData_t                   *privateData);
```

Parameters

acsHandle
This is the handle to the ACS Stream on which the routing dialog for the call is taking place.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with any resulting **CSTAUniversalFailureConfEvent**. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the acsOpenStream( ). The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

routeRegisterReqID
This parameter contains the active handle to the routing registration session for which the application is providing routing services. The application received this handle in the confirmation event for the route register service request,**CSTARouteRegisterReqConfEvent,** for the call.

routingCrossRefID
This parameter contains the handle to the CSTA call routing dialog for this call. The application previously received this handle in the **CSTARouteRequestEvent** for the call.

routeSelected
The application provides this parameter containing a Device ID that specifies the destination for the call.

remainRetry
The application indicates the number of times it is willing to receive a **CSTAReRouteRequestEvent** for this call in the case that the switch needs to request an alternate route. TSAPI provides #define values that an application may use to indicate that it does not keep count, or that there is no limit.

setupInformation
The application provides this optional parameter that contains information for the ISDN call setup message that the switch will use to route the call. Some switches may not support this option.

routeUsedReq
The routing application uses this parameter to request a **CSTARouteUsedEvent** for the call. The route used event informs the application of the final destination of the call once it has been routed.

privateData
This is an optional pointer to CSTA private data.

Return Values

cstaRouteSelectInv( ) returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated invokeIDs - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated invokeIDs - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The following are possible negative error conditions for this function:

ACSERR_BADHDL
The application provided a bad or unknown ***acsHandle.***

ACSERR_STREAM_FAILED
A previously active ACS Stream has been abnormally aborted.

There is no confirmation event for this service request, however this service request can generate a universal failure event.

Comments

An application should call **cstaRouteSelectInv** only in response to a **CSTARouteRequestEvent** or **CSTAReRouteRequestEvent**. The **cstaRouteSelectInv** service request will fail if the application does not provide valid identifiers from a previous **CSTARouteRequestEvent** or **CSTAReRouteRequestEvent** (***acsHandle***, ***routeRegisterReqID***, and ***routingCrossRefID).*** The application should check the return value for this function and any resulting universal failure event for errors.

CSTARouteUsedEvent

The **CSTARouteUsed** event provides a routing server application with the actual destination of a call for which the application previously sent a **cstaRouteSelect**( ) or **cstaRouteSelectInv**( ). To receive a **CSTARouteUsed,** the application must set the **cstaRouteSelect**( ) or **cstaRouteSelectInv**( ) parameter ***routeUsedReq*** to TRUE.

TSAPI Version

Applications using TSAPI Version 1 must use the **CSTARouteUsedEvent_t** structure; applications using any other version must use the **CSTARouteUsedExtEvent_t** structure.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  union
                  {
                     CSTARouteUsedEvent_t       routeUsed;

                     /* version 2 only */
                     CSTARouteUsedExtEvent_t    routeUsedExt
                  } u;
           } cstaEventReport;
    } event;
} CSTAEvent_t;
```

```
TSAPI Version 1:
    typedef struct
    {
        RouteRegisterReqID_t          routeRegisterReqID;
        RoutingCrossRefID_t           routingCrossRefID;
        DeviceID_t                    routeUsed;
        DeviceID_t                    callingDevice;
        Boolean                       domain;
    } CSTARouteUsedEvent_t;

TSAPI Version 2:
    typedef struct
    {
        RouteRegisterReqID_t          routeRegisterReqID;
        RoutingCrossRefID_t           routingCrossRefID;
        CalledDeviceID_t                     routeUsed;
               /* Version 2 */
        CallingDeviceID_t                    callingDevice; /*
        Version 2 */
        Boolean                                     domain;
    } CSTARouteUsedExtEvent_t;
```

Parameters

acsHandle
This is the handle to the ACS Stream on which the routing dialog for the call is taking place.

eventClass
This is a tag with the value **CSTAEVENTREPORT**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_ROUTE_USED** (version 1) or **CSTA_ROUTE_USED_EXT** (version 2), which identifies this message as an **CSTARouteUsedEvent.**

routeRegisterReqID
This parameter contains the active handle to the routing registration session for which the application is providing routing services. The application received this handle in the confirmation event for the route register service request,**CSTARouteRegisterReqConfEvent,** for the call.

routingCrossRefID
This parameter contains the handle to the CSTA call routing dialog for this call. The application previously received this handle in the **CSTARouteRequestEvent** for the call.routeUsed. This parameter identifies the selected and final destination for the call.

callingDevice
This parameter contains the originating device of the call, i.e. the calling party number (when available).

domain
This parameter will indicate whether the call has left the switching domain accessible to the Telephony Server (the ***ServerID*** defined in the active ***acsHandle***). Typically, a call leaves a switching domain when it is routed to a trunk connected to another switch or to the public switched network.

privateData
If private data accompanies **CSTARouteUsedEvent**, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTARouteUsedEvent** does not deliver private data to the application.

Comments

An application uses **CSTARouteUsedEvent** to determine the final destination of a call that it routed using the **cstaRouteSelect**( ) or **cstaRouteSelectInv**( ). Switch features such as forwarding or routing tables may direct the call to a device other than the application supplied destination. The **CSTARouteUsedEvent** indicates the final destination for the call.

CSTARouteEndEvent

The switch sends **CSTARouteEndEvent** to terminate a routing dialog. The event includes a cause value giving the reason for the dialog termination.

Note that when an application wishes to terminate a routing interaction, it should use **CSTARouteEnd( )** (version 1) or **CSTARouteEndInv( )** (version 2).

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t            acsHandle;
    EventClass_t           eventClass;
    EventType_t            eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t       eventHeader;
    union
    {
            struct
            {
                    union
                    {
                            CSTARouteEndEvent_t  routeEnd,
                    } u;
            } cstaEventReport;
    } event;
} CSTAEvent_t;

typedef struct
{
    RouteRegisterReqID_t   routeRegisterReqID;
    RoutingCrossRefID_t    routingCrossRefID;
    CSTAUniversalFailure_t errorValue;
} CSTARouteEndEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream on which routing dialog is ending.

eventClass
This is a tag with the value **CSTAEVENTREPORT**, which identifies this message as a CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_ROUTE_END**, which identifies this message as a **CSTARouteEndEvent.**

routeRegisterReqID
This parameter contains the handle to the routing registration session for which the application is providing routing services. The application received this handle in a **CSTARouteRegisterReqConfEvent** confirmation to a route register service request.

routingCrossRefID
This parameter contains the handle to the CSTA call routing dialog for this call. The application previously received this handle in the **CSTARouteRequestEvent** for the call.

errorValue
This parameter contains a cause code which giving the reason why the routing dialog ended.

privateData
If private data accompanies **CSTARouteEndEvent**, then the private data would be stored in the location that the application specified as the *privateData* parameter in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) request. If the *privateData* pointer is set to NULL in these requests, then **CSTARouteEndEvent** does not deliver private data to the application.

Comments

The switch sends **CSTARouteEndEvent** when a call has been successfully routed, cleared, or when the routing server has failed to provide a route select within the switch's time limit. This event is unsolicited and can occur at any time.

cstaRouteEnd( ) TSAPI Version 1 Only

A routing application uses **cstaRouteEnd**( ) to cancel an active routing dialog for a call. The service request includes a cause value giving the reason for the routing dialog termination. Note that when the switch terminates an active routing dialog, it uses **cstaRouteEndEvent**.

TSAPI Version

Applications using TSAPI Version 1 must use the **CSTARouteEnd( )** function; applications using any other version must use the **CSTARouteEndInv( )** function.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t cstaRouteEnd (
    ACSHandle_t              acsHandle,
    RouteRegisterReqID_t     routeRegisterReqID,
    RoutingCrossRefID_t      routingCrossRefID,
    CSTAUniversalFailure_t   errorValue;
    PrivateData_t            *privateData);
```

Parameters

acsHandle
This is the handle for the opened ACS Stream on which the application is terminating a routing dialog for a call.

routeRegisterReqID
This parameter contains the handle to the routing registration session for which the application is providing routing services. The application received this handle in a **CSTARouteRegisterReqConfEvent** confirmation to a route register service request.

routingCrossRefID
This parameter contains the handle to the CSTA call routing dialog for a call. The application previously received this handle in the **CSTARouteRequestEvent** for the call. This is the routing dialog that the application is ending.

errorValue
The application supplies this cause code giving the reason why it is ending the routing dialog.

privateData
This is an optional pointer to CSTA private data.

Return Values

cstaRouteEnd( ) returns a non-negative value when successful.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
The application provided a bad or unknown ***acsHandle.***

ACSERR_STREAM_FAILED
A previously active ACS Stream has been abnormally aborted.

Comments

A routing application can use **cstaRouteEnd**( ) when it cannot route a call. This can occur if:

- the application receives a routing request for a call without sufficient call information and it cannot determine a routing destination.
- the application has already routed calls to all available destinations and those calls remain active at those destinations.
- the application does not have access to a database necessary to route the call

In these cases, the application uses **cstaRouteEnd**( ) to inform the switch that it will not route the call in question. **cstaRouteEnd**( ) will terminate the CSTA routing dialog (***routingCrossRefID***) for the call. **cstaRouteEnd**( ) does not clear the call. The switch will continue to process the call using whatever default routing algorithm is available (implementation specific).

Note that when the switch terminates an active routing dialog, it uses **cstaRouteEndEvent**.

cstaRouteEndInv( )

The routing server (application) uses **cstaRouteEnd**( ) to cancel an active routing dialog for a call. The service request includes a cause value giving the reason for the routing dialog termination. Note that when the switch terminates an active routing dialog, it uses **cstaRouteEndEvent**.

TSAPI Version

Applications using TSAPI Version 1 must use the **CSTARouteEnd( )** function; applications using any other version must use the **CSTARouteEndInv( )** function.

Syntax

```
#include <acs.h>
#include <csta.h>

RetCode_t cstaRouteEnd (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID;      /* Version 2 */
    RouteRegisterReqID_t      routeRegisterReqID,
    RoutingCrossRefID_t       routingCrossRefID,
    CSTAUniversalFailure_t    errorValue;
    PrivateData_t             *privateData);
```

Parameters

acsHandle
This is the handle for the opened ACS Stream on which the application is terminating a routing dialog for a call.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with any resulting **CSTAUniversalFailureConfEvent**. This parameter is only used when the Invoke ID mechanism is set for Application-generated IDs in the acsOpenStream( ). The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

routeRegisterReqID
This parameter contains the handle to the routing registration session for which the application is providing routing services. The application received this handle in a **CSTARouteRegisterReqConfEvent** confirmation to a route register service request.

routingCrossRefID
This parameter contains the handle to the CSTA call routing dialog for a call. The application previously received this handle in the **CSTARouteRequestEvent** for the call. This is the routing dialog that the application is ending.

errorValue
The application supplies this cause code giving the reason why it is ending the routing dialog.

privateData
This is an optional pointer to CSTA private data.

Return Values

cstaRouteEndInv( ) returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated invokeIDs - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated invokeIDs - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The following are possible negative error conditions for this function:

ACSERR_BADHDL
The application provided a bad or unknown ***acsHandle.***

ACSERR_STREAM_FAILED
A previously active ACS Stream has been abnormally aborted.

Comments

A routing server application can use **cstaRouteEndInv**( ) when it cannot route a call. This can occur if:

- the application receives a routing request for a call without sufficient call information and it cannot determine a routing destination.
- the application has already routed calls to all available destinations and those calls remain active at those destinations.
- the application does not have access to a database necessary to route the call

In these cases, the application uses **cstaRouteEnd**( ) to inform the switch that it will not route the call in question. **cstaRouteEnd**( ) will terminate the CSTA routing dialog (***routingCrossRefID***) for the call. **cstaRouteEnd**( ) does not clear the call. The switch will continue to process the call using whatever default routing algorithm is available (implementation specific).

An application can use this function to respond to either a route request or a re-route request.

Note that when the switch terminates an active routing dialog, it uses **cstaRouteEndEvent**.

Chapter 9 Escape and Maintenance Services

This chapter describes the CSTA Escape and Maintenance Services.

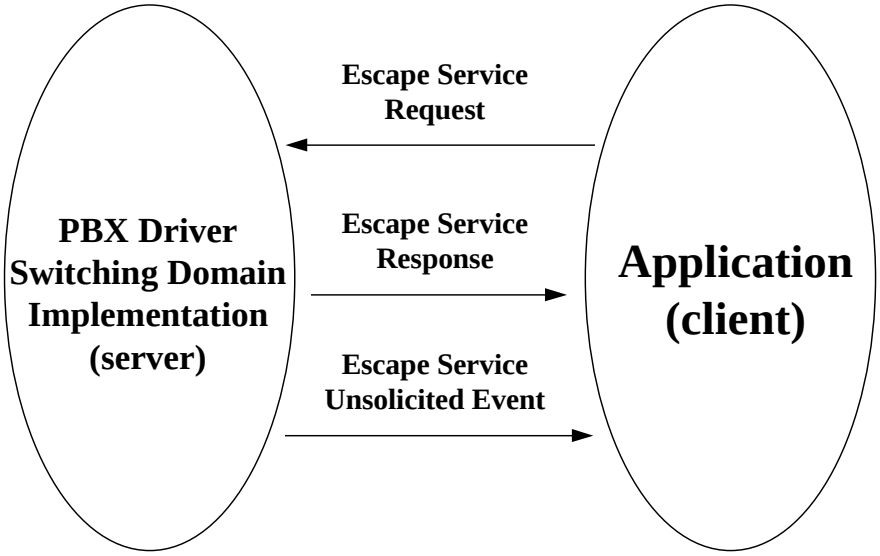
Escape Services

Switching domains use Escape Services to enhance TSAPI functions with "private" services which are specific to the switch or PBX Driver implementation (see Section 2.3). Each switch vendor may define functions within the CSTA private services framework, even though CSTA does not incorporate these services. Although the functions defined within escape services can vary from one implementation to the next, the way the application accesses these functions is consistent. Escape Services use the same programming model as all other CSTA services. Figure 9-18 illustrates this model.

When an application requests an escape service from a server it receives a confirmation event or a Universal Failure in the same fashion as for other TSAPI services. The Escape Service request parameters are an ***acsHandle*** (to the open stream), an ***invokeID*** and a private data parameter. The confirmation event includes the ***acsHandle***, the ***invokeID***, and the private data response.

Escape Services also includes an unsolicited private event which a server can send to an application at any time a CSTA monitor association exists on a CSTA call or device object (see Section 6 - **cstaMonitorStart**( )).

Figure 9-18
Escape Services Model



Applications can also send Escape Services requests to a switch. For most CSTA services the application is always a client in the computing domain. However, an escape service could operate in the opposite direction (such as routing does). Although the client/server role may change, services are always uni-directional where either the switch or application is always the requester for a service.

TSAPI includes escape service definitions for both the "*Application as the Client*" and the "*Switch as the Client*".

See vendor specific documentation for more information on what, if any, Escape Services are supported by a specific vendor. Escape Service Functions are generally not portable across different vendor implementations. Some implementations may support Escape Services either bi-directionally or uni-directionally (one-way only) depending on the needs and capabilities of the switch driver

Maintenance Services

There are two different types of CSTA maintenance services:

- device status maintenance events which provide status information for device objects, and
- bi-directional system status maintenance services which provide information on the overall status of the system.

The device status events inform the application when the switch places a monitored device in or out of service. When a device object is removed from service, the application may monitor the device (e.g. **cstaMonitorStart**( ) or **cstaDevSnapshotReq**( )) but may not request services for that device. For example, an application request for a **cstaMakeCall**( ) returns an error when the device is out of service.

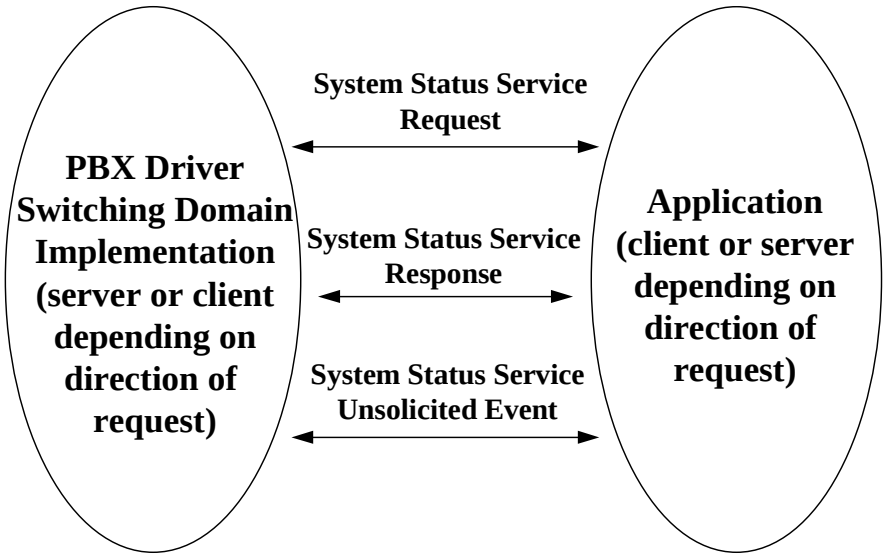
System Status services inform applications or switches about the status of the switching or computing domains, respectively. Table 9-3 shows the System Status Services' system status information (cause codes).

Table 9-3
System Status Cause Codes

System Status Cause Code	Cause Code Definitions
Initializing	the system is re-initializing or restarting. This status indicates that the system is temporarily unable to respond to any requests. If provided, this status message shall be followed by an Enable status message that indicates that the initialization process is completed.
Enabled	request and responses are enabled, usually after a disruption or restart. This status indication shall be sent after an initializing status indicator has been sent and my be sent under other conditions. This status indicates that there are no outstanding monitor requests.
Normal	a System Status Event with this cause value can be sent at any time to indicate that the status is normal. This status has no effect on other services.
Message Lost	this status indicates that a request, response, or event report may have been lost.
Disabled	this cause value indicates that active **cstaMonitorStart**( ) monitor requests via have been disabled. Other requests and responses may also be disabled, but, unlike monitors, reject responses are provided for those.
Overload Imminent	the system (driver, switch, or application) is about to reach an overload condition. The "client" should shed load to remedy the situation.
Overload Reached	the system (driver, switch, or application) has reached an overload condition and may take action to shed load. The server (the application, driver, or switch) may then take action to decrease message traffic. This may include stopping existing monitors or rejecting any new requests sent by the client.
Overload Relieved	the system (driver, switch, or application) has determined that the overload condition has passed and normal application operation may resume.

The System Status services are bi-directional and thus can originate at the application domain or at the driver/switch domain. Figure 9-19 shows System Status Maintenance Services.

Figure 9-19
System Status Maintenance Services



An application can obtain System Status information in one of two different ways :

- the client can ask for the information using a request to the "server" and obtain the information in a confirmation event, or

- the client can register for System Status messages and receive unsolicited events containing system status changes.

A switch or application may issue the System Status request (**cstaSysStatReq**( )) to obtain status information from the "server" (the application or switch, respectively, depending on the direction of the request). A System Status response (**CSTASysStatReqConfEvent**) provides the "client" with the current system status information for the "server". The "server" may send unsolicited events the client if the client used the **cstaSysStatStart**( ) service to register for System Status events. The System Status unsolicited event (**CSTASysStatEvent**) is the same in structure as the confirmation event (**CSTASysStatReqConfEvent**) except that the "server" sends it to the "client" automatically.

Escape Services : Application as Client

This section defines escape services for situation where the application is the service requester in the client/server relationship (see Figure 9-18). The services include an escape service request, a confirmation event to the request, and an unsolicited escape service event that originates at the driver or switching domain.

cstaEscapeService( )

This service allows the application to request a service which is not defined by the CSTA Standard but rather by a switch vendor. A service request made by this function will be specific to an implementation.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t   cstaEscapeService (
    ACSHandle_t        acsHandle,
    InvokeID_t         invokeID,
    PrivateData_t              *privateData);
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only valid when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

privateData
This is a pointer to the CSTA private data extension mechanism. This parameter in NOT optional for this function and must be passed by the application. If the parameter is NULL an error will be returned to the application and the API Client Library Driver will reject the service request.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will

be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAEscapeServiceConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

ACSERR_NULLPARAMETER
This error indicates that the pointer to the CSTA Private Data information is NULL and thus no private data is available to send to the driver/switch. No action is taken by the API Client Library Driver.

Comments

This function is used to send private data information to the driver/switch.

CSTAEscapeServiceConfEvent

This confirmation event is sent in response to the **cstaEscapeService**( ) service and provides the positive acknowledgment to the request. The event includes any private information that is to be provided as part of a confirmation event to the service request.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID;
           } cstaConfirmation;
    } event;
} CSTAEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA confirmation event.

eventType
This is a tag with the value **CSTA_ESCAPE_SERVICE_CONF** which identifies this message as an **CSTAEscapeServiceConfEvent.**

invokeID
This parameter specifies the function service request instance for the service which was processed at the Telephony Server or at the switch. This identifier is provided to the application when a service request is made.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event always occurs as a result of a normal (positive) service request made through the **cstaEscapeService**( ) service. The information contained in the ***privateData*** parameter is implementation specific.

CSTAPrivateEvent

This event report allows for unsolicited, implementation specific event reporting. The informational contents of this event will be defined by a specific implementation.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  union
                  {
                         CSTAPrivateEvent_t  privateData;
                  } u;
           } cstaEventReport;
    } event;
} CSTAEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAEVENTREPORT**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_PRIVATE**, which identifies this message as an **CSTAPrivateEvent.**

monitorCrossRefID
Does not apply to this event.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *private-Data* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is typically used for providing unsolicited, implementation specific event information. This event can occur at any time and does not have be specific to a monitored object. The event can be sent by the driver/switch even though the application does not have a monitored object. When a monitor exists, the **PrivateStatusEvent** is used by the driver/switch to send private status information pertaining to a monitored object. The **PrivateEvent** is used for all other cases of unsolicited private events and is not associated with a monitoring association.

CSTAPrivateStatusEvent

This event report allows for unsolicited, implementation specific event reporting for a monitored object. The informational contents of this event will be defined by a specific implementation.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  CSTAMonitorCrossRefID_t
           monitorCrossRefID;
           } cstaUnsolicited;
    } event;
} CSTAEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_PRIVATE_STATUS**, which identifies this message as an **CSTAPrivateStatusEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is typically used for providing implementation specific event information which is not defined in any other event in the API. The event is always used for private information on a monitoring association. A monitor must be active [**cstaMonitorDevice**( ), **cstaMonitorCall**( ), **cstaMonitorCallsViaDevice**( )] before this event can be sent to the application by the driver/switch. This event is always sent from the driver/switch to the application and it is not bi-directional.

Escape Service : Driver/Switch as the Client

This section defines escape services for cases where the Driver/Switch is the service requester in the client/server relationship (see Figure 9-1). The services include an escape service request event, a confirmation function for the request, and an unsolicited escape service event that originates at the application domain.

CSTAEscapeServiceReq

This unsolicited event is sent by the driver/switch to request a private service from the application. The event includes the service request as private information for which the application must provide a positive or negative acknowledgment.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***4.3 ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t    acsHandle;
    EventClass_t   eventClass;
    EventType_t    eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                         InvokeID_t     invokeID;
                         union
                         {
                                CSTAEscapeSvcReqEvent_t
           escapeSvcReqeust;
                         } u;
           } cstaRequestEvent;
    } event;
} CSTAEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAREQUEST**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_ESCAPE_SVC_REQ**, which identifies this message as an **CSTAEscapeServiceReq**

invokeID
This parameter defines the invoke identifier selected by the driver/switch for the specific private request. This parameter *must* be returned, unchanged, in the response to this request in order for the driver/switch to match a service request with a service response.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is sent by the driver/switch to request an escape or private service when the application is providing the "server" function in the client/server relationship. The response to this event will be accomplished via the **cstaEscapeServiceConf**( ) service.

cstaEscapeServiceConf( )

This service allows the application to respond to a **CSTAEscapeServiceEvent** which originated at the driver/switch. A service response made by this function will be specific to an implementation.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t   cstaEscapeServiceConf (
    ACSHandle_t               acsHandle,
    InvokeID_t                invokeID,
    CSTAUniversalFailure_t            error,         /* negative
    ACK */
    PrivateData_t                     *privateData), /* positive
    ACK */
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
The invoke identifier used in this function *must* be the same value (unchanged) as that provided in the **CSTAEscapeServiceReq** for which this services request is being called. The same ***invokeID*** value must be used in order for the driver/switch to match the instances of a previous service event and the service confirmation to that event provided by this function call.

error
This parameter is used to provide a negative acknowledgment to the **CSTAEscapeServiceReq**. See **CSTAUniversalFailureConfEvent** for a definition of the possible error values for this parameter. If the ***error*** pointer is NULL this will indicates that the event contains a positive acknowledgment.

privateData
This is a pointer to the CSTA private data extension mechanism which contains the positive acknowledgment to the CSTAEscapeServiceEvent. If the private pointer is NULL this will indicate that the event contains a negative acknowledgment.

Return Values

This function never returns an invoke identifier since there is no confirmation event for this service. The function does return errors conditions during the processing of the request by the API Client Library. A return value of zero (0) indicates that the request has been accepted by the Library. This function never returns a positive value.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

ACSERR_NONULL
This error indicates that neither the ***error*** or ***privateData*** pointers are NULL. One of these pointers *must be* NULL to indicate either a positive or negative acknowledgment to the request. No action is taken by the API Client Library.

ACSERR_NORESPONSE
This error indicates that both the ***error*** or the ***privateData*** pointer are NULL. In this case the API Client Library has nothing to send to the driver/switch and rejects the response. The request associated with the invoke identifier from the driver/server will still be outstanding and the application must respond by calling this function with acceptable parameters.

ACSERR_BADINVOKEID
This error indicates that the invoke identifier being returned by the application is not one that is outstanding from the driver/switch. The API Client Library will keep track of the driver/switch-based invoke id's until the application responds to the specific request from the driver/switch.

Comments

This function is used to send a response to a private request from the driver/switch. The event supports both a positive and negative acknowledgment to the request. One of the two pointers (***error*** or ***privateData***) must be NULL in order for the request to be successfully processed by the API Client Library. This would indicate a positive or negative acknowledgment to the request made by the driver/switch.

cstaSendPrivateEvent( )

This service allows the application to send an unsolicited private event to the driver/switch. An event sent by this function will be specific to an implementation.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t   cstaSendPrivateEvent (
    ACSHandle_t              acsHandle,
    PrivateData_t            *privateData),
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

privateData
This is a pointer to the CSTA private data extension mechanism. This parameter in NOT optional for this function and must be passed by the application. If the parameter is NULL an error will be returned to the application and the API Client Library Driver will reject the service request.

Return Values

This function never returns an invoke identifier since there is no confirmation event for this service. The function does return errors conditions during the processing of the request by the API Client Library. A return value of zero (0) indicates that the request has been accepted by the Library. This function never returns a positive value.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

ACSERR_NULLPARAMETER
This error indicates that the pointer to the CSTA Private Data information is NULL and thus no private data is available to send to the driver/switch. No action is taken by the API Client Library Driver.

Comments

This function is used to send unsolicited, private data information to the driver/switch when the application is supporting the "server" role in the client/server relationship.

Maintenance Services: Device Status

This section describes the CSTA Maintenance Services which provide device status information. To receive device status information, an application must monitor the device(e.g. the application must have an active ***monitorCrossRefID*** for the device). These events are unidirectional and always originate in the switch domain.

CSTABackInServiceEvent

This event report indicates that a monitored device object has returned to services and operates normally.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  CSTAMonitorCrossRefID_t
           monitorCrossRefID;
                  union
                  {
                         CSTABackInServiceEvent_t
    backInService;
                  } u;
           } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    DeviceID_t                    device;
    CSTAEventCause_t      cause;
} CSTABackInServiceEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_BACK_IN_SERVICE** , which identifies this message as an **CSTABackInServiceEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

device
Specifies the device which is back in service. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

cause
This parameter indicates the reason or explanation for the occurrence of this event. See Section 6 for more information.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *private-Data* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event indicates that a previously inactive device (a device which is out service) has resumed normal operation. Once this event has occurred the application can then initiate an active service request (e.g. **cstaMakeCall**( )) for that specific device. A passive service request can be done while a device is out of service, i.e. monitoring or Snapshot Services.

CSTAOutOfServiceEvent

This event report indicates that a monitored device object has entered a maintenance state and can no longer accept calls or be actively manipulated by the application.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  CSTAMonitorCrossRefID_t
           monitorCrossRefID;
                  union
                  {
                         CSTAOutOfServiceEvent_t
    outOfService;
                  } u;
           } cstaUnsolicited;
    } event;
} CSTAEvent_t;

typedef struct
{
    DeviceID_t                    device;
    CSTAEventCause_t      cause;
} CSTAOutOfServiceEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_OUT_OF_SERVICE** , which identifies this message as an **CSTAOutOfServiceEvent.**

monitorCrossRefID
This parameter contains the handle to the CSTA association for which this event is associated. This handle is typically chosen by the switch and should be used by the application as a reference to a specific established association.

device
This parameter indicates the device which has been taken out of service. If the device is not specified, then the parameter will indicate that the device was not known or that it was not required.

cause
This parameter indicates the reason or explanation for the occurrence of this event. See Section 6 for more information.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event indicates that a previously active device (a device which is in service) has entered into a maintenance state, i.e. the device has been taken out of service. Once this event has occurred the application *can not* initiate any new active service request (e.g. **cstaMakeCall**( )) for that specific device. A passive service request (e.g. monitoring or Snapshot Services) can be done while a device is out of service.

System Status - Application as the Client

This section defines the services which provide system level status information to the application or the driver/switch. The System Status service is bi-directional and thus the client/server relationship (see Figure 9-2) can be reversed.

cstaSysStatReq( )

This service allows the application to request system status information from the driver/switch domain.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t   cstaSysStatReq (
    ACSHandle_t              acsHandle,
    InvokeID_t               invokeID,
    PrivateData_t            *privateData);
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only valid when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream**( )**.** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

privateData
This is a pointer to the CSTA private data extension mechanism. This is optional.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTASysStatReqConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

Comments

This function is used to request the current overall system status for the driver/switch.

CSTASysStatReqConfEvent

This event is in response to the **cstaSysStatReq**( ) service and informs the application of the overall system status of the driver/switch.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID;
                  union
                  {
                         CSTASysStatReqConfEvent_t
    sysStatReq;
                  } u;
           } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTASysStatReqConfEvent_t (
    SystemStatus_t        systemStatus;
) CSTASysStatStatReqConfEvent_t;

typedef enum SystemStatus_t {
    SS_INITIALIZING = 0,
    SS_ENABLED = 1,
    SS_NORMAL = 2,
    SS_MESSAGES_LOST = 3,
    SS_DISABLED = 4,
    SS_OVERLOAD_IMMINENT = 5,
    SS_OVERLOAD_REACHED = 6,
    SS_OVERLOAD_RELIEVED = 7
} SystemStatus_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_SYS_STAT_REQ_CONF**, which identifies this message as an **CSTASysStatReqConfEvent.**

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific function call request with its confirmation events.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

systemStatus
This parameter provides the application with a cause code defining the overall system status as fin Table 9-4.

Table 9-4
Overall System Status Codes

Cause Code	Definition
Initializing	the driver/switch is re-initializing or restarting. This status indicates that the driver/switch is temporarily unable to respond to any requests. If provided, this status message shall be followed by an Enable status message to indicate that the initialization process is completed.
Enabled	request and responses are re-enabled, usually after a disruption or restart. This status indication shall be sent after an initializing status indicator has been sent and may be sent under other conditions. This status indicates that there are no outstanding monitor request.
Normal	this cause value can be sent at any time by the driver/switch to indicate that the status is normal. This status has no effect on other services.
Message Lost	this status indicates that a request and/or responses may have been lost, including Event Reports.
Disabled	this cause value indicates that existing monitor requests via **cstaMonitorStart**( ) have been disabled. Other requests and responses may also be disabled, but reject responses should be provided.
Overload Imminent	the driver/switch is about to reach a overload condition and the application should shed load to better the situation.
Overload Reached	the driver/switch has reach overload and may take initiative to shed load. This cause may be followed by action on the part of the driver/switch to decrease message traffic. This may include stopping existing or rejecting any new monitor requests sent by the client, and rejections to additional new service requests.
Overload Relieved	the driver/switch has determined that the overload condition has passed and normal application operation may continue.

Comments

This confirmation event provides the application with certain information regarding the state of the overall driver/switch system. This event is important for proper application operation and should be processed accordingly. This is especially important for cause values for the overload condition. If the driver/switch has informed the application that an overload condition is imminent all applications should attempt to decrease the overall traffic to the driver/switch. This can be accomplished, for example, by stopping all non-essential monitors on call or device objects on the switch thus reducing the traffic between the server and the switch. Frequent occurrence of the Overload Imminent cause value can be a symptoms of a poorly engineered system which should reviewed for proper loading.

cstaSysStatStart( )

This services allows the application to register for System Status event reporting. It can be used by an application to automatically receive a **CSTASysStatEvent** each time the status of the driver/switch changes.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t      cstaSysStatStart (
    ACSHandle_t                       acsHandle,
    InvokeID_t                        invokeID,
    SystemStatusFilter_t      statusFilter,
    PrivateData_t                     *privateData),

typedef unsigned char   SystemStatusFilter_t;
#define                     SF_INITIALIZING 0x80
#define                     SF_ENABLED 0x40
#define                     SF_NORMAL 0x20
#define                     SF_MESSAGES_LOST 0x10
#define                     SF_DISABLED 0x08
#define                     SF_OVERLOAD_IMMINENT 0x04
#define                     SF_OVERLOAD_REACHED 0x02
#define                     SF_OVERLOAD_RELIEVED 0x01
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only valid when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream( ).** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

statusFilter
This parameter is used to specify a filter for specific cause values in which the application is not interested. The parameter can be used by the application to filter out unwanted status information (e.g. the Normal status)

privateData
Private data extension mechanism. This is optional.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTASysStatStartConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

Comments

This function is used to start a monitor for system status information. The system status information is provided via the **CSTASysStatEvent**. Only one System Status register is allowed per opened ACS Stream.

CSTASysStatStartConfEvent

This event is in response to the **cstaSysStatStart**( ) function and confirms an active System Status monitor. Once this event is issued the application will start to automatically receive unsolicited System Status events.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID_t;
                  union
                  {
                         CSTASysStatStartConfEvent_t
    sysStatStart;
                  } u;
           } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTASysStatStartConfEvent_t (
    SystemStatusFilter_t          statusFilter;
) CSTASysStatStatStartConfEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_SYS_STAT_START_CONF**, which identifies this message as an **CSTASysStatStartConfEvent.**

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific functions call request with its confirmation events.

statusFilter
This parameter is used to specify the filter type which is active on the System Status monitor requested by the application. The parameter identifies which filter was accepted by the driver/switch. Note that the filter returned by this function may be different than the filter requested in the **cstaSysStatStart**( ) service request. This can occur when the driver/switch rejected the request filter and selected a default filter.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This confirmation event should be checked by the application to insure that the System Status monitor has been activated and that the requested filter is active.

cstaSysStatStop( )

This service is used to cancel a previously registered monitor for System Status information.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t      cstaSysStatStop (
       ACSHandle_t                          acsHandle,
       InvokeID_t                           invokeID,
       PrivateData_t                *privateData),
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only valid when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream( ).** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

privateData
Private data extension mechanism. This is optional.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the

call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTASysStatStopConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

Comments

This function is used to cancel a previously registered System Status monitor. Once a confirmation event is issued for this function, i.e. a **CSTASysStatStopConfEvent**, the driver/switch will terminate automatic System Status event notification. If required, the application can still continue to poll for system status information using the **cstaSysStatReq**( ) service, even after a System Status register is closed.

CSTASysStatStopConfEvent

This event is in response to the **cstaSysStatStop**( ) function and confirms a cancellation of the active System Status monitor. Once this event is issued the application will not continue to receive unsolicited System Status events.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID_t;
           } cstaConfirmation;
    } event;
} CSTAEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_SYS_STAT_STOP_CONF**, which identifies this message as an CSTASysStatStopConfEvent.

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific functions call request with its confirmation events.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *private-Data* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This confirmation event should be checked by the application to insure that the System Status monitor has been deactivated. Once this event is sent, automatic notification of System Status events will be discontinued. The application must poll using the **cstaSysStatReq**( ) service in order to obtain any System Status information.

cstaChangeSysStatFilter( )

This function is used to request a change in the filter options for automatic System Status event reporting for a specific ACS Stream. It allows the application to specify which System Status events it requires.

Syntax

```
#include <csta.h>
#include <acs.h>

RetCode_t      cstaChangeSysStatFilter (
    ACSHandle_t                              acsHandle,
    InvokeID_t                               *invokeID,
    SystemStatusFilter_t              statusFilter,
    PrivateData_t                            *privateData),
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

invokeID
A handle provided by the application to be used for matching a specific instance of a function service request with its associated confirmation event. This parameter is only valid when the Invoke ID mechanism is set for Application-generated IDs in the **acsOpenStream( ).** The parameter is ignored by the ACS Library when the Stream is set for Library-generated invoke IDs.

statusFilter
This parameter identifies the new filter mask to be applied to the existing active System Status monitor. The new mask will replace the existing mask.

privateData
Private data extension mechanism. This is optional.

Return Values

This function returns the following values depending on whether the application is using library or application-generated invoke identifiers:

Library-generated Identifiers - if the function call completes successfully it will return a positive value, i.e. the invoke identifier. If the call fails a negative error (<0) condition will be returned. For library-generated identifiers the return will never be zero (0).

Application-generated Identifiers - if the function call completes successfully it will return a zero (0) value. If the call fails a negative error (<0) condition will be returned. For application-generated identifiers the return will never be positive (>0).

The application should always check the **CSTAChangeSysStatFilterConfEvent** message to insure that the service request has been acknowledged and processed by the Telephony Server and the switch.

The following are possible negative error conditions for this function:

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

Comments

This service is used whenever the application wishes to change a previously defined System Status event filter. Note that application will not receive any System Status message which has its bit mask turned off.

CSTAChangeSysStatFilterConfEvent

This event occurs as a result of the **cstaChangeSysStatFilter**( ) service and informs the application which event filter was set by the server.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  InvokeID_t     invokeID_t;
                  union
                  {
    CSTAChangeSysStatFilterConfEvent_t  changeSysStatFilter;
                  } u;
           } cstaConfirmation;
    } event;
} CSTAEvent_t;

typedef struct CSTAChangeSysStatFilterConfEvent_t (
    SystemStatusFilter_t  statusFilterSelected;
    SystemStatusFilter_t  statusFilterActive;
} CSTAChangeSysStatFilterConfEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTACONFIRMATION**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value CSTA_CHANGE_SYS_STAT_FILTER_CONF , which identifies this message as an CSTAChangeSysStatFilterConfEvent.

invokeID
This parameter specifies the requested instance of the function or event. It is used to match a specific functions call request with its confirmation events.

statusFilterSelected
This parameter specifies the System Status event filters which are active as a result of the **cstaChangeSysStatFilter**( ) service request. This filter may be different than the one requested by the application. This can occur if the implementation rejects a particular filter request.

eventFilterActive
This parameter indicates the filters which are already active on the given CSTA association.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This confirmation event should be check by the application to insure that the event filter requested has been activated and which filters are already active on the given System Status monitor.

CSTASysStatEvent

This unsolicited event informs the application of the overall system status of the driver/switch. The application must register for System Status events before this event is sent to the application.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  union
                  {
                         CSTASysStatEvent_t  sysStat;
                  } u;
           } cstaEventReport;
    } event;
} CSTAEvent_t;

typedef struct
{
    SystemStatus_t        systemStatus;
} CSTASysStatEvent_t;

typedef enum SystemStatus_t {
    SS_INITIALIZING = 0,
    SS_ENABLED = 1,
    SS_NORMAL = 2,
    SS_MESSAGES_LOST = 3,
    SS_DISABLED = 4,
    SS_OVERLOAD_IMMINENT = 5,
    SS_OVERLOAD_REACHED = 6,
    SS_OVERLOAD_RELIEVED = 7
} SystemStatus_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAEVENTREPORT**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_SYS_STAT**, which identifies this message as an **CSTASysStatEvent.**

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

systemStatus
This parameter provides the application with a cause code defining the overall system status. See Table 9-4 for the possible values of this parameter.

Comments

This event provides the application with certain information regarding the state of the overall driver/switch system. This event is important for proper application operation and should be processed accordingly. This is especially important for cause values for the overload condition. If the driver/switch has informed the application that an overload condition is imminent all applications should attempt to decrease the overall traffic to the driver/switch. This can be accomplished, for example, by stopping all non-essential monitors on call or device objects on the switch thus reducing the traffic between the server and the switch. Frequent occurrence of the Overload Imminent event can be a symptoms of a poorly engineered system which should reviewed for proper loading.

PBX drivers that follow driver programming recommendations will send **CSTASysStatEvent** when a CTI link goes up or down. When a link that is in service goes down, the ***systemStatus*** will be "Initializing". When a link enters service, the ***systemStatus*** will be "Enabled". If a driver uses multiple CTI links to provide service, then the driver may only send the "Initializing" message when there are no CTI links in service and may send the "Enabled" when at least one link is in service.

Certain, non-essential cause values can be sent at any time or depending on the driver/switch implementation even at regular intervals (e.g. the Normal cause value) to indicate that the system status is O.K. and operating normally. This can be turned off by the application to avoid the overhead associated with processing these normal messages. This is accomplished by changing the event filter type by using the **cstaChangeSysStatFilter**( ) service. This service can be used to discontinue the delivery of "non-essential" system status events to the application.

CSTASysStatEndedEvent

The driver uses this event to cancel a previously registered monitor for System Status information.

Syntax

The following structure shows only the relevant portions of the unions for this message. See ***ACS Data Types*** and ***CSTA Data Types*** in section 4 for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                  union
                  {
                         CSTASysStatEndedEvent_t
    sysStatEnded;
                  } u;
           } cstaEventReport;
    } event;
} CSTAEvent_t;

typedef struct CSTASysStatEndedEvent_t {
    Nulltype        null;
} CSTASysStatEndedEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAEVENTREPORT**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_SYS_STAT_ENDED**, which identifies this message as a CSTASysStatStopEvent.

monitorCrossRefID
This parameter is unused in this message.

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

System Status : Driver/Switch as the Client

This section defines the services which provide system level status information to the driver/switch form the application. The System Status service is bi-directional and thus the client/server relationship (see Figure 9-2) can be reversed.

CSTASysStatReqEvent

This unsolicited event is sent by the driver/switch to request system status information from the application.

Syntax

The following structure shows only the relevant portions of the unions for this message. See section ***4.3 ACS Data Types*** and ***4.6 CSTA Data Types*** for a complete description of the event structure.

```
typedef struct
{
    ACSHandle_t           acsHandle;
    EventClass_t   eventClass;
    EventType_t           eventType;
} ACSEventHeader_t;

typedef struct
{
    ACSEventHeader_t      eventHeader;
    union
    {
           struct
           {
                         InvokeID_t     invokeID;
                  union
                  {
                         CSTASysStatReqEvent_t
           sysStatRequest;
                  } u;
           } cstaRequestEvent;
    } event;
} CSTAEvent_t;

typedef struct CSTASysStatReqEvent_t {
    Nulltype        null;
} CSTASysStatReqEvent_t;
```

Parameters

acsHandle
This is the handle for the opened ACS Stream.

eventClass
This is a tag with the value **CSTAUNSOLICITED**, which identifies this message as an CSTA unsolicited event.

eventType
This is a tag with the value **CSTA_SYS_STAT_REQ**, which identifies this message as an **CSTASysStatReqEvent.**

InvokeID
This parameter identifies the instance of the request generated by the switch/driver. This same value must be used, unchanged, in the response to this event (**cstaSysStatReqConf**( )).

privateData
If private data accompanied this event, then the private data would be copied to the location pointed to by the *privateData* pointer in the **acsGetEventBlock**( ) or **acsGetEventPoll**( ) function. If the *privateData* pointer is set to NULL in these functions, then no private data will be delivered to the application.

Comments

This event is sent by the driver/switch to request status information pertaining to the application. It is the bi-directional equivalent of the **cstaSysStatReq**( ) function which is issued by the application to request status information from the driver/switch. The application responds to this unsolicited event request utilizing the **cstaSysStatReqConf**( ) function.

cstaSysStatReqConf( )

This service is used to respond to a **CSTASysStatReqEvent** unsolicited event from the driver/switch. It provides the driver/switch with information regarding the status of the application.

Syntax

```
#include <csta.h>

RetCode_t      cstaSysStatReqConf (

       ACSHandle_t                  acsHandle,
       InvokeID_t                   *invokeID,
       SystemStatus_t        systemStatus,
       PrivateData_t         *privateData);

typedef enum SystemStatus_t {
    SS_INITIALIZING = 0,
    SS_ENABLED = 1,
    SS_NORMAL = 2,
    SS_MESSAGES_LOST = 3,
    SS_DISABLED = 4,
    SS_OVERLOAD_IMMINENT = 5,
    SS_OVERLOAD_REACHED = 6,
    SS_OVERLOAD_RELIEVED = 7
} SystemStatus_t;
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

InvokeID
The value of this parameter must be the same (unchanged) as that provided in the **cstaSysStatReqEvent** so that the driver/switch can match an instance of a service request with the response to that request.

systemStatus
This parameter provides the driver/switch with a cause code defining the overall system status. See Table 9-4 for the possible values of this parameter.

privateData
Private data extension mechanism. This is optional.

Return Values

This function never returns an invoke identifier since there is no confirmation event for this service. The function does return errors conditions during the processing of the request by the API Client Library. A return value of zero (0) indicates that the request has been accepted by the Library.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

Comments

This confirmation response provides the driver/switch with certain information regarding the state of the overall application. The information can be used by the driver/switch to determine the overall state of the application. The driver/switch may act on this information in order to insure proper end-to-end system operation and performance. Frequent occurrence of the Overload Imminent cause value can be a symptoms of a poorly engineered application system which should reviewed for proper loading.

cstaSysStatEvent( )

This service is used to send application system status information in the form of an unsolicited event to the driver/switch without a formal request for the information. This status information can be sent at any time.

Syntax

```
#include <csta.h>

RetCode_t      cstaSysStatEvent (
       ACSHandle_t                  acsHandle,
       SystemStatus_t         systemStatus,
       PrivateData_t          *privateData);

typedef enum SystemStatus_t {
    SS_INITIALIZING = 0,
    SS_ENABLED = 1,
    SS_NORMAL = 2,
    SS_MESSAGES_LOST = 3,
    SS_DISABLED = 4,
    SS_OVERLOAD_IMMINENT = 5,
    SS_OVERLOAD_REACHED = 6,
    SS_OVERLOAD_RELIEVED = 7
} SystemStatus_t;
```

Parameters

acsHandle
This is the handle to an active ACS Stream.

systemStatus
This parameter provides the driver/switch with a cause code defining the overall system status. See Table 9-4 for the possible values of this parameter.

privateData
Private data extension mechanism. This is optional.

Return Values

This function never returns an invoke identifier since there is no confirmation event for this service. The function does return errors conditions during the processing of the request by the API Client Library. A return value of zero (0) indicates that the request has been accepted by the Library.

Possible local error returns are (negative returns):

ACSERR_BADHDL
This return value indicates that a bad or unknown ***acsHandle*** was provided by the application.

ACSERR_NOCONN
This return value indicates that a previously active ACS Stream has been abnormally aborted.

ACSERR_REQDENIED
This return value indicates that a ACS Stream is established but a requested capability has been denied by the Client Library Software Driver.

Comments

This unsolicited service event is sent to the driver/switch in order to inform it of the state of the overall application system. The driver/switch may act on this information in order to insure proper end-to-end system operation and performance. Frequent occurrence of the Overload Imminent cause value can be a symptoms of a poorly engineered application system which should reviewed for proper loading.

Chapter 10 Programming Notes

This chapter contains information about using the TSAPI libraries on various operating system platforms.

TSAPI on Macintosh

Macintosh Programming Overview

Read this section for information on developing TSAPI applications on Macintosh. You need not be familiar with the CSTA call model or API before reading further, but you should read Chapter 4, ***ACS Control Services***.

Macintosh Development Platforms

Telephony Services applications may be created in any Macintosh development environment; the TSAPI headers in this SDK contain explicit support for Metrowerks C and C++, Apple's MPW C and PPCC and Symantec C++ and THINK C. Creating applications with other compilers may require you to modify these headers.

You should be aware of the following compiler environment considerations when using TSAPI:

- TSAPI requires enumerated types to be variable sizes

  Many Macintosh C compilers support two different storage classes for the enumerated type. All compilers supported by TSAPI allow enumerated types to be the size of the minimum integral type necessary to store their range of enumerated values. This option is sometimes called "packed enums". Many compilers also support forcing enumerated types to be the same size as `int`.

  Table 10-1 describes compiler settings necessary to enable variable-sized enums.

Table 10-1
Enum Settings in Macintosh Compilers

Compiler	Enum Packing Directive
Apple MPW C 3.2	N/A
Apple PPCC 1.0	-enum min
Metrowerks Codewarrior C & C++, 68k	Language: Enums Always Int **unchecked**
Metrowerks Codewarrior C & C++, PPC	Language: Enums Always Int **unchecked**
Metrowerks mwcPPC	-enum off
Symantec THINK C 6.0, 7.0	Language Settings:enums are always ints **unchecked**
Symantec C++ for Macintosh 6.0, 7.0	Language Settings:enums are always ints **unchecked**

- TSAPI structures require mac68k alignment

  TSAPI requires 68k Macintosh compilers to use two-byte structure alignment. For Macintosh compilers targeting PowerPC, TSAPI declares all structures using the `#pragma options align=mac68k` directive. If your PowerPC compiler does not support this pragma or does not define either `powerc` or `__powerc`, you must manually specify 2-byte alignment.

  Table 10-2 describes compiler settings necessary to enable 2-byte structure alignment:

Table 10-2
Structure Alignment Settings in Macintosh Compilers

Compiler	Structure Alignment Directive
Apple MPW C 3.2	N/A
Apple PPCC 1.0	N/A
Metrowerks Codewarrior C & C++, 68k	Processor: Struct Alignment: 68k
Metrowerks Codewarrior C & C++, PPC	N/A
Metrowerks mwcPPC	N/A
Symantec THINK C 6.0, 7.0	Processor Settings:align arrays of char **checked**
Symantec C++ for Macintosh 6.0, 7.0	Processor Settings:Struct Field Alignment:Align to 2 byte boundary

TSAPI and Gestalt

Call Gestalt with `gestaltTSAPICstaVersion` as the *selector* parameter to find out the current version of the Macintosh Telephony Services client library.

If the library is available, the *response* parameter will point to the library version.

If the library is unavailable, Gestalt will return an error or the *response* parameter will contain zero.

For more information on using the Gestalt manager, see reference [6].

Dynamic Linking

This section describes how to dynamically link with the Telephony Services library on Macintosh.

680x0 Macintosh Dynamic Linking

On other TSAPI platforms, client applications use inherent operating system facilities to dynamically link with the Telephony Services library. The Macintosh 68k runtime model does not provide such a facility. Instead, Apple provides several methods for achieving runtime linking — drivers, the Component Manager and the Apple Shared Library Manager.

The Macintosh Telephony Services library is a faceless background application that exports TSAPI using the Component Manager. The SDK contains static link libraries in MPW .o, THINK/Symantec library and Metrowerks library object formats that translate from TSAPI to the Component Manager calls necessary for using the Telephony Services library's CSTA component.

You need not use Gestalt to determine if the 68k Telephony Services library is running before using any TSAPI functions. If you do not use Gestalt, you should verify that you are running on a 68020 or better processor before making TSAPI calls.

Refer to your compiler documentation for instructions on linking MPW .o format object modules with your 68k code.

PowerPC Macintosh Dynamic Linking

On Power Macintosh, the Telephony Services application is supplemented by an import library that exports TSAPI to PowerPC-native applications. The Telephony Services application is still used to export TSAPI through the Component Manager to 68k applications.

You must use Gestalt as described above to determine if the PowerPC Telephony Services application is running before using any TSAPI functions. Failure to do so may result in crashing the host Macintosh.

The SDK contains the Telephony Services import library in XCOFF format for use with PPCC. Metrowerks projects should include the shared library from the Macintosh Client package.

See reference [7] for more information on the Code Fragment Manager and shared libraries.

Using Application Control Services

This section discusses how to use application control services (ACS) for such tasks as event notification and retrieval on Macintosh. If you are porting code that uses Telephony Services, you should read this section to get an overview of the differences between Macintosh and other platforms.

Event Notification

On Macintosh both `acsEventNotify()` and `acsSetESR()` are available and are analogous to their Windows counterparts.

To use `acsEventNotify()`, you should understand how to receive and interpret Apple Events in your application. You can find information on using Apple Events in reference [4].

As with its counterparts on other platforms, `acsEventNotify()` can post a message to your application whenever any message is received from the Telephony Server (*notifyAll* = TRUE) or simply whenever a previously empty stream receives an event (*notifyAll* = FALSE).

The special feature of `acsEventNotify()` on Macintosh is that the process identifier is an `AEAddressDesc`. This allows your program to specify any legal address for an AppleEvent — network visible PPC entities included. The Telephony Services library will send notification AppleEvents using the `kAENeverInteract` flag; if the target application you specify is on a server to which the Macintosh is not authenticated, notification will fail. All notification events are sent with the `kAENoReply` flag.

If you are using acsEventNotify( ), you should use notifyAll = FALSE. Otherwise, the performance lag caused by processing Apple Events may unacceptably slow your application. The ability to post a message for every received event has been preserved for compatibility with TSAPI on other platforms.

To optimize your application for speed, you should use `acsSetESR()` to increment or set a variable in your application. Examine this variable to determine when to retrieve incoming events.

The following example demonstrates acsSetESR() being used to "preempt" an arbitrary lengthy processing task without polling for events — an important speed optimization. The example uses no global variables under 68k and hence may be easily implemented in any standalone code resource.

```
/*
 * Demonstration of using acsSetESR() to allow compute-bound
 * tasks to handle telephony traffic  w i t h o u t  polling
 * or global variables.
 */

static pascal void esr ( unsigned long esrParam );

#if USESROUTINEDESCRIPTORS
static RoutineDescriptor esrRD =
      BUILD_ROUTINE_DESCRIPTOR ( uppEsrFuncProcInfo, esr );
#endif

/* ESR example */
static pascal void
esr ( unsigned long esrParam )
{
      /* esrParam points to the queuedEvents variable */
      unsigned short *queuedEventsPtr =
                  *(unsigned short)esrParam;

      /* increment global variable */
      *gQueuedEventsPtr++;
}

void
computeWhileWatchingStream ( ACSHandle_t theStream )
{
      RetCode_t  rc;
      short  queuedEvents;.. /* counting "semaphore" that    */
                             /* tracks number of events that */
                             /* have been received but not   */
                             /* processed */

      /* register callback/request notification for each event */
      #if USESROUTINEDESCRIPTORS
      rc = acsSetESR(theStream, &esrRD, &queuedEvents, TRUE );
      #else
      rc = acsSetESR ( theStream, esr, &queuedEvents, TRUE );
      #endif

      if ( rc != ACSPOSITIVE_ACK )
      {
            /* the callback could not be registered, so fail and
                  return */
            return;
      }
```

```
      /* begin iterative computation process */
      while ( SOME_LENGTHY_COMPUTATION_IN_PROGRESS )
      {
            if ( queuedEvents != 0 )
            {
                  /*
                   * Retrieve events here, or break out of loop,
                   * etc.
                   */
            }

            /* process one step of a lengthy computation */
      }

      /* remove ESR before returning since it was using local
       * storage to hold the queue count
       */
      rc = acsSetESR ( theStream, NULL, 0, TRUE );
}
```

Receiving Events

This section discusses event reception using `acsGetEventPoll()` and `acsGetEventBlock()` on Macintosh.

Blocking Versus Polling

Macintosh applications should generally use `acsGetEventPoll()` instead of `acsGetEventBlock()`.

Whereas `acsGetEventBlock()` prevents most system activity from continuing until the calling application receives an event, `acsGetEventPoll()` returns control immediately if no event is waiting for the caller.

Calling `acsGetEventPoll()` frequently — particularly from 68k applications — can unduly consume processor time and resources. Instead of using polling as a method of determining whether messages are waiting in your application's receive queue, consider using event notification to trigger a polling call to receive events.

Neither acsGetEventBlock() nor acsGetEventBlock() may be called from a callback procedure registered with acsSetESR(). See the overview of event notification for an example of implementing a callback procedure to reduce polling.

Receiving Events From Any Stream

An application may specify a NULL stream handle when calling `acsGetEventPoll()` or `acsGetEventBlock()` to request that the Telephony Services library return the first event available on any of that application's streams.

When using a NULL stream handle with `acsGetEventPoll()` or `acsGetEventBlock()`, your application or code resource must have a valid global context. For 68k applications, this requires a valid A5-world. For

68k standalone code, A4 must be valid. No code using the MPW “no globals” .o static link library may use a NULL stream handle.

This restriction does not apply to PowerPC applications and standalone code.

TSAPI Resource Management

The Telephony Services library allocates session resources such as ACS stream memory and network connection resources from the heap active when `acsOpenStream()` is called.

Using TSAPI In Standalone Code

The Telephony Services library may be called from any type of code — applications, drivers, extensions, plug-ins et al. — but there are some precautions to follow when calling TSAPI from non-application code.

- Stream handles are not valid across processes

  A stream handle opened while process A is running may not be used while process B is running. TSAPI calls made using a stream handle in the incorrect "process context" will return `ACSERR_BADHDL`.

- Streams will be closed when the owner process exits

  A stream handle opened while process "TSCLIENT" is running will be closed when process "TSCLIENT" exits. You need to open streams using a persistent process if you are writing a code resource — an extension or Gestalt procedure, for example — that expects to remain alive while the host Macintosh is on.

TSAPI on OS/2

TSAPI is fully supported under OS/2. Application developers can program to TSAPI to develop both Presentation Manager (PM) and non PM OS/2 applications. The IBM CSet++ 2.1, Borland C/C++ 1.5 and Watcom C/C++ 10.0 OS/2 compilers are all supported. Using any other compiler may require user modification or conversion of header files.

Two TSAPI calls ***acsEnumServerNames***() and ***acsSetESR***() require the user to specify a callback function. These callback functions need to be defined with the _System calling convention.

OS/2 applications open ACS streams to the Telephony Server using the standard procedure outlined in this document. Once an ACS stream has been successfully opened, there are two ways for an OS/2 application to be notified that a TSAPI event is available to be retrieved. PM applications can use the ***acsEventNotify***() TSAPI call to designate a user defined message be posted to its application queue when a TSAPI event is available. PM and non-PM applications can use the ***acsSetESR***() TSAPI call to designate an Event Service Routine to be called whenever a TSAPI event is available. Alternatively, both PM and non-PM applications can forego event notification and receive events by creating a separate thread that uses ***acsGetEventBlock***() or ***acsGetEventPoll***() directly, to block until an event is received or to poll for events.

Both ***acsEventNotify***() and ***acsSetESR***() only signal the availability of a TSAPI message. The application must still call **acsGetEventBlock()** or **acsGetEventPoll( )** to actually retrieve the event from the Client API Library queue.

acsEventNotify()

```
#include <os2.h>
#include <acs.h>
#include <csta.h>

RetCode_t acsEventNotify (
    ACSHandle_t acsHandle,
    HWND        hwnd,
    ULONG       msg,
    Boolean     notifyAll);
```

acsHandle
is the value of the unique handle to the opened ACS Stream for which event notification messages will be posted..

hwnd
is the handle of the window which is to receive event notification messages. If this parameter is NULL, event notification is disabled**.**

msg
is the user-defined message to be posted when an incoming event becomes available**.** The *mp1* and *mp2* parameters of the message will contain the following members of the ACSEventHeader_t structure:

`mp1`	acsHandle
`SHORT2FROMMP(mp2)`	eventClass
`SHORT1FROMMP(mp2)`	eventType

notifyAll
specifies whether a message will be posted for every event. If this parameter is **TRUE** then a message will be posted for every event**.** If it is **FALSE** then a message will only be posted each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification, or the likelihood of overflowing the application's message queue.

Example

This example uses the **acsEventNotify** function to enable event notification.

```
#define WM_ACSEVENT WM_USER + 99

MRESULT EXPENTRY
WndProc (HWND hwnd, ULONG msg, MPARAM mp1, MPARAM mp2)
{
    // declare local variables...
```

```
    switch (msg)
    {
    case WM_CREATE:

        // post WM_ACSEVENT to this window
        // whenever an ACS event arrives

        acsEventNotify (acsHandle, hwnd, WM_ACSEVENT, TRUE);

        // other initialization, etc...
        return 0;

    case WM_ACSEVENT:

        // mp1 contains an ACSHandle_t
        // SHORT2FROMMP(mp2) contains an EventClass_t
        // SHORT1FROMMP(mp2) contains an EventType_t

        // dispatch the event to user-defined
        // handler function here

        return 0;

    // process other window messages...

    }
    return WinDefWindowProc (hwnd, msg, mp1, mp2);
}
```

acsSetESR()

The ESR mechanism can be used by the application to receive an asynchronous notification of the arrival of an incoming event from the Open ACS Stream. The application can use the ESR mechanism to trigger specific events (e.g. post an event semaphore). The ESR routine will receive one user-defined parameter. The ESR should **not** call ACS functions, otherwise the results will be indeterminate. The syntax of ***acsSetESR***() is as follows:

```
#include <os2.h>
#include <acs.h>
#include <csta.h>

typedef void (*EsrFunc)(ULONG esrParam)

RetCode_t      acsSetESR (    ACSHandle_t    acsHandle,
                       EsrFunc        esr,
                              ULONG          esrParam,
                              Boolean        notifyAll);
```

acsHandle
is the value of the unique handle to the opened Stream for which this ESR routine will apply. Only one ESR is allowed per active acsHandle.

esr
points to the ESR (the address of a function). This function must use the _System calling convention. A multi-threaded application that registers the same ESR for multiple open streams needs to ensure that this function is reentrant. A NULL pointer is used to disable the current ESR mechanism.

esrParam
defines parameter which will be passed to the ESR when it is called.

notifyAll
specifies whether the ESR will be called for every event. If this parameter is **TRUE** then the ESR will be called for every event. If it is **FALSE** then the ESR will only be called each time the receive queue becomes non-empty, i.e. the queue count changes from zero (0) to one (1). This option may be used to reduce the overhead of notification.

TSAPI on Win32

Programming Overview

Read this section for information on developing TSAPI applications for Windows NT or Windows 95. You do not need to be familiar with the CSTA call model or API before reading further, but you should read Chapter 4, *ACS Control Services.*

Development Platforms

The TSAPI header files and import libraries in this SDK are compatible with the Microsoft Visual C++ Development System. Using another compiler may require you to modify the header files, for example, to account for differences in structure alignment, size of enumerated data types, etc. The Win32 TSAPI library assumes the default 8-byte structure packing and an `enum` size of 4 bytes.

Linking to the TSAPI Library

The TSAPI for Win32 is implemented as a dynamic link library, `CSTA32.DLL`. Specify the `CSTA32.LIB` import library when compiling your application.

Using Application Control Services

This section discusses how to use application control services (ACS) to retrieve events on Win32 platforms. If you are porting code that uses Telephony Services, you should read this section to get an overview of the differences between Win32 and other platforms.

Event Notification

`acsEventNotify()` enables asynchronous notification of incoming events via Windows messages.

`acsSetESR()` enables asynchronous notification of incoming events via an application-defined callback routine. This routine will be called in the context of a background thread created by the TSAPI Library, **not** a thread created by the application. The callback should not invoke TSAPI Library functions.

Receiving Events

This section discusses event reception using `acsGetEventPoll()` and `acsGetEventBlock()` on Win32.

Blocking Versus Polling

`acsGetEventBlock()` suspends the calling thread until it receives an event. `acsGetEventPoll()` returns control immediately if no event is available, allowing the application to query other input sources or events.

Calling `acsGetEventPoll()` repetitively can unduly consume processor time and resources, to the detriment of other applications. Instead of polling, consider creating a separate thread which calls `acsGetEventBlock()`, or use `acsEventNotify()` to receive asynchronous notifications.

Receiving Events From Any Stream

An application may specify a NULL stream handle when calling `acsGetEventPoll()` or `acsGetEventBlock()` to request that the Telephony Services library return the first event available on any of that application's streams.

Sharing ACS Streams Between Threads

The ACS handle value is global to all threads in a given application process. This handle can be accessed in any thread, even threads that did not originally open the handle. For example, one thread can call the `acsOpenStream()` function, which returns an ACS handle. A different thread in the same process can make other TSAPI calls with the returned ACS handle. No special action is required to enable the second thread to use the handle; it just needs to obtain the handle value.

While permitted, it normally does not make sense for more than one thread to retrieve events from a single stream. The TSAPI Library allows calls from different threads to be safely interleaved, but coordination of the resulting actions and events is the responsibility of the application.

Message Trace

The NTSSPY.EXE program may be used to obtain a trace of messages flowing between applications and the Telephony Server.

TSAPI on UnixWare

Programming Overview

Read this section for information on developing TSAPI applications on UnixWare. You do not need to be familiar with the CSTA call model or API before reading further, but you should read Chapter 4, *ACS Control Services.*

Development Platforms

Telephony Services applications must be built with an environment that supports the Executable and Linking Format (ELF) and dynamic linking. The TSAPI header files in this SDK are compatible with the C Optimized Compilation System provided with the UnixWare Software Development Kit. Using another compiler may require you to modify the header files, for example, to account for differences in structure alignment, size of enumerated data types, etc.

TSAPI works with both UnixWare 1.x and UnixWare 2.x, and is thread-safe for 2.x applications.

Linking to the TSAPI Library

The TSAPI for UnixWare is implemented as a shared object library, `libcsta.so`, and follows the standard conventions for library path search and dynamic linking. If `libcsta.so` is installed in one of the standard directories, it is only necessary to include "`-lcsta` " in your link step, for example:

```
cc -o myprog myprog.c -lcsta
```

Note that `libcsta.so` depends upon the Networking Support Library, `libnsl.so`.

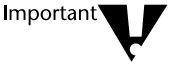
Using Application Control Services

This section discusses how to use application control services (ACS) to retrieve events on UnixWare. If you are porting code that uses Telephony Services, you should read this section to get an overview of the differences between UnixWare and other platforms.

Event Notification

The `acsEventNotify()` and `acsSetESR()` functions are not provided on the UnixWare platform.

Unlike other Telephony Services platforms, UnixWare does not directly promote an event-driven programming model, but rather a file-oriented one. To work most effectively in the UnixWare environment, the TSAPI event stream should appear as a *file*. The `acsGetFile()` function returns the STREAMS file descriptor associated with an ACS stream handle. The returned value may be used like any other file descriptor in an I/O multiplexing call, such as `poll()` or `select()`, to determine the availability of TSAPI events. Alternatively, an application may register to receive the **`SIGPOLL`** signal using the `I_SETSIG ioctl()` call. Refer to *Programming with UNIX System Calls - STREAMS Polling and Multiplexing* in the UnixWare SDK documentation.



Do not perform other I/O or control operations directly on this file descriptor. Doing so may lead to unpredictable results from the TSAPI library.

Receiving Events

This section discusses event reception using `acsGetEventPoll()` and `acsGetEventBlock()` on UnixWare.

Blocking Versus Polling

`acsGetEventBlock()` suspends the calling application until it receives an event. If your application has no other work to perform in the meantime, this is the simplest and most efficient way to receive events from the TSAPI.

Typically, however, an application needs to respond to input from the user or other sources, and cannot afford to wait exclusively for TSAPI events. `acsGetEventPoll()` returns control immediately if no event is available, allowing the application to query other input sources or events.

Calling `acsGetEventPoll()` repetitively can unduly consume processor time and resources, to the detriment of other applications. Instead of polling, consider multiplexing your input sources via the `poll()` system call, or installing a **`SIGPOLL`** handler.

Receiving Events From Any Stream

An application may specify a NULL stream handle when calling `acsGetEventPoll()` or `acsGetEventBlock()` to request that the Telephony Services library return the first event available on any of that application's streams.

Message Trace

To create a log file of TSAPI messages sent to and received from the Telephony Server, set the shell environment variable **`CSTATRACE`** to the pathname of the desired file, prior to starting your application. The log file will be created if necessary, or appended to if it already exists.

Sample Code

The following pseudo-code illustrates the use of the `acsGetFile()` function to set up an asynchronous event handler.

```
int EventIsPending = 0;

/* handleEvent() called when SIGPOLL is received */

void
handleEvent (int sig)
{
       EventIsPending++;
}

void
main (void)
{
       ACSHandle_t    acsHandle;
       int            acs_fd;
              .
              .
              .

       /* install the signal handler */
       signal (SIGPOLL, handleEvent);

       /* open an ACS stream */
       acsOpenStream (&acsHandle, ...etc... );

       /* get its file descriptor */
       acs_fd = acsGetFile (acsHandle);

       /* enable SIGPOLL on normal "read" events */
       ioctl (acs_fd, I_SETSIG, S_RDNORM);

       /* proceed with application processing */
       while (notDone)
       {
              if (EventIsPending > 0)
              {
                     /* retrieve a TSAPI event */
                     acsGetEventPoll (acsHandle, ...etc...);
                     EventIsPending = 0;
                     /* re-enable handler */
                     signal (SIGPOLL, handleEvent);
              }
              /* perform other background processing... */
       }
}
```

TSAPI on HP-UX

Programming Overview

Read this section for information on developing TSAPI applications on HP-UX. You do not need to be familiar with the CSTA call model or API before reading further, but you should read Chapter 4, *ACS Control Services.*

Development Platforms

The TSAPI header files in this SDK are compatible with the HP-UX C Compiler. Using another compiler may require you to modify the header files, for example, to account for differences in structure alignment, size of enumerated data types, etc.

Linking to the TSAPI Library

The TSAPI for HP-UX is implemented as a shared object library, `libcsta.sl`, and follows the standard conventions for library path search and dynamic linking. If `libcsta.sl` is installed in one of the standard directories, it is only necessary to include "`-lcsta`" in your link step, for example:

```
cc -Ae -o myprog myprog.c -lcsta
```

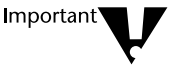
Using Application Control Services

This section discusses how to use application control services (ACS) to retrieve events on HP-UX. If you are porting code that uses Telephony Services, you should read this section to get an overview of the differences between HP-UX and other platforms.

Event Notification

The `acsEventNotify()` and `acsSetESR()` functions are not provided on the HP-UX platform.

Unlike other Telephony Services platforms, HP-UX does not directly promote an event-driven programming model, but rather a file-oriented one. To work most effectively in the HP-UX environment, the TSAPI event stream should appear as a *file*. The `acsGetFile()` function returns the file descriptor associated with an ACS stream handle. The returned value may be used like any other file descriptor in an I/O multiplexing call, such as `poll()` or `select()`, to determine the availability of TSAPI events.



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To create a log file of TSAPI messages sent to and received from the Telephony Server, set the shell environment variable **CSTATRACE** to the pathname of the desired file, prior to starting your application. The log file will be created if necessary, or appended to if it already exists.

Using High Memory on Windows Clients

Windows client application developers need to be aware of interactions between the TSAPI DLL and Windows memory allocation.

The CSTA Telephony Server client library, csta.dll, is required to occupy fixed memory, because it interfaces to NetWare drivers. As a result, when csta.dll loads into memory, Windows memory allocation attempts to place it in the lowest possible memory location by moving all movable memory to higher locations. If the client loads multiple applications with this same behavior, then memory below one megabyte may become exhausted. A symptom is that when the user attempts to start an application Windows displays "insufficient memory to start this application."

Developers can code their programs to force Windows to allocate low memory before the TSAPI DLL loads, then free up the memory after the DLL loads. The C code below illustrates how to do this. Note that if any other application has already loaded csta.dll the following code has no effect, because csta.dll is fixed in memory.

```
for ( i=0; i<20; ++i )
{     // grab as much base memory as possible
      if ( (GlobDret=GlobalDosAlloc(50000L)) != NULL)
            {
            GselectorDos2[i] = LOWORD(GlobDret);
            }
      else if ( (GlobDret=GlobalDosAlloc(10000L)) != NULL)
            {
            GselectorDos2[i] = LOWORD(GlobDret);
            }
      else if ( (GlobDret=GlobalDosAlloc(5000L)) != NULL)
            {
            GselectorDos2[i] = LOWORD(GlobDret);
            }
      else if ( (GlobDret=GlobalDosAlloc(1024L)) != NULL)
            {
            GselectorDos2[i] = LOWORD(GlobDret);
            }
      else break;
      }

for (i = 19; i >= 0; --i)
{     // free some of the grabbed base memory
      if ( GselectorDos2[i] )
            {
            GlobalDosFree(GselectorDos2[i]);
            GselectorDos2[i] = 0;
            break;
            }
}
```

```
// load the .dll or start the application that will load it.

for (i=0; i<20; ++i)
{     // free all the captured base memory
            if ( GselectorDos2[i] )
                        {
                        GlobalDosFree(GselectorDos2[i]);
                        }
            else
                        {
                        break;
                        }
}
```

Chapter 11 CSTA Data Types

This section describes the data types used by the functions and messages defined for the TSAPI. The data type are divided into two categories: CSTA Data Type which are associated with telephony functions and Interface Data Types which are associated with the API itself and the Telephony Services client/server interface.

Device Identifiers

```
typedef char              Nulltype;

typedef char            DeviceID_t[64];

typedef enum ConnectionID_Device_t {
    STATIC_ID = 0,
    DYNAMIC_ID = 1
} ConnectionID_Device_t;

typedef struct ConnectionID_t {
    long            callID;
    DeviceID_t      deviceID;
    ConnectionID_Device_t devIDType;
} ConnectionID_t;
```

Basic Call Control Confirmation Events

CSTAAlternateCallConfEvent structures

```
typedef struct CSTAAlternateCallConfEvent_t {
    Nulltype    null;
} CSTAAlternateCallConfEvent_t;
```

CSTAAnswerCallConfEvent structures

```
typedef struct CSTAAnswerCallConfEvent_t {
    Nulltype    null;
} CSTAAnswerCallConfEvent_t;

typedef enum Feature_t {
    FT_CAMPON = 0,
    FT_CALLBACK = 1,
    FT_INTRUDE = 2
} Feature_t;
```

CSTACallCompletionConfEvent structures

```
typedef struct CSTACallCompletionConfEvent_t {
    Nulltype    null;
} CSTACallCompletionConfEvent_t;
```

CSTAClearCallConfEvent structures

```
typedef struct CSTAClearCallConfEvent_t {
    Nulltype    null;
} CSTAClearCallConfEvent_t;
```

CSTAClearConnectionConfEvent structures

```
typedef struct CSTAClearConnectionConfEvent_t {
    Nulltype    null;
} CSTAClearConnectionConfEvent_t;
```

CSTAConferenceConfEvent structures

```
typedef struct Connection_t {
    ConnectionID_t  party;
    DeviceID_t      staticDevice;  /* NULL for not present */
} Connection_t;

typedef struct ConnectionList {
    int             count;
    Connection_t    *connection;
} ConnectionList;

typedef struct CSTAConferenceCallConfEvent_t {
    ConnectionID_t  activeCall;
    ConnectionList  connList;
} CSTAConferenceCallConfEvent_t;
```

CSTAConsultationCallConfEvent structures

```
typedef struct CSTAConsultationCallConfEvent_t {
    ConnectionID_t  newCall;
} CSTAConsultationCallConfEvent_t;
```

CSTADeflectCallConfEvent structures

```
typedef struct CSTADeflectCallConfEvent_t {
    Nulltype    null;
} CSTADeflectCallConfEvent_t;
```

CSTAGroupPickupCallConfEvent structures

```
typedef struct CSTAGroupPickupCallConfEvent_t {
    Nulltype    null;
} CSTAGroupPickupCallConfEvent_t;
```

CSTAHoldCallConfEvent structures

```
typedef struct CSTAHoldCallConfEvent_t {
    Nulltype    null;
} CSTAHoldCallConfEvent_t;
```

CSTAMakeCallConfEvent structures

```
typedef struct CSTAMakeCallConfEvent_t {
    ConnectionID_t  newCall;
} CSTAMakeCallConfEvent_t;
```

CSTAMakePredicitiveCallConfEvent structures

```
typedef enum AllocationState_t {
    AS_CALL_DELIVERED = 0,
    AS_CALL_ESTABLISHED = 1
} AllocationState_t;

typedef struct CSTAMakePredictiveCallConfEvent_t {
    ConnectionID_t  newCall;
} CSTAMakePredictiveCallConfEvent_t;
```

CSTAPickupCallConfEvent structures

```
typedef struct CSTAPickupCallConfEvent_t {
    Nulltype    null;
} CSTAPickupCallConfEvent_t;
```

CSTAReconnectCallConfEvent structures

```
typedef struct CSTAReconnectCallConfEvent_t {
} CSTAReconnectCallConfEvent_t;
```

CSTARetrieveCallConfEvent structures

```
typedef struct CSTARetrieveCallConfEvent_t {
    Nulltype    null;
} CSTARetrieveCallConfEvent_t;
```

CSTATransferCallConfEvent structures

```
typedef struct CSTATransferCallConfEvent_t {
    ConnectionID_t  resultingCall;
    ConnectionList  connList;
} CSTATransferCallConfEvent_t;
```

CSTAUniversalFailureEvent structures

```
typedef enum CSTAUniversalFailure_t {
    GENERIC_UNSPECIFIED = 0,
    GENERIC_OPERATION = 1,
    REQUEST_INCOMPATIBLE_WITH_OBJECT = 2,
    VALUE_OUT_OF_RANGE = 3,
    OBJECT_NOT_KNOWN = 4,
    INVALID_CALLING_DEVICE = 5,
    INVALID_CALLED_DEVICE = 6,
    INVALID_FORWARDING_DESTINATION = 7,
    PRIVILEGE_VIOLATION_ON_SPECIFIED_DEVICE = 8,
    PRIVILEGE_VIOLATION_ON_CALLED_DEVICE = 9,
    PRIVILEGE_VIOLATION_ON_CALLING_DEVICE = 10,
    INVALID_CSTA_CALL_IDENTIFIER = 11,
    INVALID_CSTA_DEVICE_IDENTIFIER = 12,
    INVALID_CSTA_CONNECTION_IDENTIFIER = 13,
    INVALID_DESTINATION = 14,
    INVALID_FEATURE = 15,
    INVALID_ALLOCATION_STATE = 16,
    INVALID_CROSS_REF_ID = 17,
    INVALID_OBJECT_TYPE = 18,
    SECURITY_VIOLATION = 19,
    GENERIC_STATE_INCOMPATIBILITY = 21,
    INVALID_OBJECT_STATE = 22,
    INVALID_CONNECTION_ID = 23,
    NO_ACTIVE_CALL = 24,
    NO_HELD_CALL = 25,
    NO_CALL_TO_CLEAR = 26,
    NO_CONNECTION_TO_CLEAR = 27,
    NO_CALL_TO_ANSWER = 28,
    NO_CALL_TO_COMPLETE = 29,
    GENERIC_SYSTEM_RESOURCE_AVAILABILITY = 31,
    SERVICE_BUSY = 32,
    RESOURCE_BUSY = 33,
    RESOURCE_OUT_OF_SERVICE = 34,
    NETWORK_BUSY = 35,
    NETWORK_OUT_OF_SERVICE = 36,
    OVERALL_MONITOR_LIMIT_EXCEEDED = 37,
    CONFERENCE_MEMBER_LIMIT_EXCEEDED = 38,
    GENERIC_SUBSCRIBED_RESOURCE_AVAILABILITY = 41,
    OBJECT_MONITOR_LIMIT_EXCEEDED = 42,
    EXTERNAL_TRUNK_LIMIT_EXCEEDED = 43,
    OUTSTANDING_REQUEST_LIMIT_EXCEEDED = 44,
    GENERIC_PERFORMANCE_MANAGEMENT = 51,
    PERFORMANCE_LIMIT_EXCEEDED = 52,
    SEQUENCE_NUMBER_VIOLATED = 61,
    TIME_STAMP_VIOLATED = 62,
    PAC_VIOLATED = 63,
    SEAL_VIOLATED = 64
} CSTAUniversalFailure_t;

typedef struct CSTAUniversalFailureConfEvent_t {
    CSTAUniversalFailure_t error;
} CSTAUniversalFailureConfEvent_t;
```

Telephony Supplementary Confirmation Events

CSTASetMsgWaitingConfEvent structures

```
typedef struct CSTASetMwiConfEvent_t {
    Nulltype    null;
} CSTASetMwiConfEvent_t;
```

CSTASetDndConfEvent structures

```
typedef struct CSTASetDndConfEvent_t {
    Nulltype    null;
} CSTASetDndConfEvent_t;
```

CSTASetFwdConfEvent structures

```
typedef enum ForwardingType_t {
    FWD_IMMEDIATE = 0,
    FWD_BUSY = 1,
    FWD_NO_ANS = 2,
    FWD_BUSY_INT = 3,
    FWD_BUSY_EXT = 4,
    FWD_NO_ANS_INT = 5,
    FWD_NO_ANS_EXT = 6
} ForwardingType_t;

typedef struct ForwardingInfo_t {
    ForwardingType_t forwardingType;
    Boolean          forwardingOn;
    DeviceID_t       forwardDN;  /* NULL for not present */
} ForwardingInfo_t;

typedef struct CSTASetFwdConfEvent_t {
    Nulltype    null;
} CSTASetFwdConfEvent_t;
```

CSTASetAgentStateConfEvent structures

```
typedef enum AgentMode_t {
    AM_LOG_IN = 0,
    AM_LOG_OUT = 1,
    AM_NOT_READY = 2,
    AM_READY = 3,
    AM_WORK_NOT_READY = 4,
    AM_WORK_READY = 5
} AgentMode_t;

typedef char            AgentID_t[32];

typedef DeviceID_t      AgentGroup_t;

typedef char            AgentPassword_t[32];

typedef struct CSTASetAgentStateConfEvent_t {
    Nulltype        null;
} CSTASetAgentStateConfEvent_t;
```

CSTAQueryMsgWaitingIndConfEvent structures

```
typedef struct CSTAQueryMwiConfEvent_t {
    Boolean         messages;
} CSTAQueryMwiConfEvent_t;
```

CSTAQueryDoNotDisturbConfEvent structures

```
typedef struct CSTAQueryDndConfEvent_t {
    Boolean         doNotDisturb;
} CSTAQueryDndConfEvent_t;
```

CSTAQueryFwdConfEvent structures

```
typedef enum ForwardingType_t {
    FWD_IMMEDIATE = 0,
    FWD_BUSY = 1,
    FWD_NO_ANS = 2,
    FWD_BUSY_INT = 3,
    FWD_BUSY_EXT = 4,
    FWD_NO_ANS_INT = 5,
    FWD_NO_ANS_EXT = 6
} ForwardingType_t;

typedef struct ForwardingInfo_t {
    ForwardingType_t forwardingType;
    Boolean         forwardingOn;
    DeviceID_t      forwardDN;
} ForwardingInfo_t;

typedef struct ListForwardParameters_t {
    short           count;
    ForwardingInfo_t param[7];
} ListForwardParameters_t;

typedef struct CSTAQueryFwdConfEvent_t {
    ListForwardParameters_t forward;
} CSTAQueryFwdConfEvent_t;
```

CSTAQueryAgentStateConfEvent structures

```
typedef enum AgentState_t {
    AG_NOT_READY = 0,
    AG_NULL = 1,
    AG_READY = 2,
    AG_WORK_NOT_READY = 3,
    AG_WORK_READY = 4
} AgentState_t;

typedef struct CSTAQueryAgentStateConfEvent_t {
    AgentState_t    agentState;
} CSTAQueryAgentStateConfEvent_t;
```

CSTAQueryLastNumberConfEvent structures

```
typedef struct CSTAQueryLastNumberConfEvent_t {
    DeviceID_t      lastNumber;
} CSTAQueryLastNumberConfEvent_t;
```

CSTAQueryDeviceInfoConfEvent structures

```
typedef enum DeviceType_t {
    DT_STATION = 0,
    DT_LINE = 1,
    DT_BUTTON = 2,
    DT_ACD = 3,
    DT_TRUNK = 4,
    DT_OPERATOR = 5,
    DT_STATION_GROUP = 16,
    DT_LINE_GROUP = 17,
    DT_BUTTON_GROUP = 18,
    DT_ACD_GROUP = 19,
    DT_TRUNK_GROUP = 20,
    DT_OPERATOR_GROUP = 21,
    DT_OTHER = 255
} DeviceType_t;

typedef unsigned char   DeviceClass_t;
#define                     DC_VOICE 0x80
#define                     DC_DATA 0x40
#define                     DC_IMAGE 0x20
#define                     DC_OTHER 0x10

typedef struct CSTAQueryDeviceInfoConfEvent_t {
    DeviceID_t      device;
    DeviceType_t    deviceType;
    DeviceClass_t   deviceClass;
} CSTAQueryDeviceInfoConfEvent_t;
```

Status Reporting Confirmation Events

cstaMonitorDevice structures

```
typedef long            CSTAMonitorCrossRefID_t;

typedef CSTAObject_t    CSTAMonitorObject_t;

typedef unsigned short  CSTACallFilter_t;
                        CF_CALL_CLEARED 0x8000
                        CF_CONFERENCED 0x4000
                        CF_CONNECTION_CLEARED 0x2000
                        CF_DELIVERED 0x1000
                        CF_DIVERTED 0x0800
                        CF_ESTABLISHED 0x0400
                        CF_FAILED 0x0200
                        CF_HELD 0x0100
                        CF_NETWORK_REACHED 0x0080
                        CF_ORIGINATED 0x0040
                        CF_QUEUED 0x0020
                        CF_RETRIEVED 0x0010
                        CF_SERVICE_INITIATED 0x0008
                        CF_TRANSFERRED 0x0004

typedef unsigned char   CSTAFeatureFilter_t;
                        FF_CALL_INFORMATION 0x80
                        FF_DO_NOT_DISTURB 0x40
                        FF_FORWARDING 0x20
                        FF_MESSAGE_WAITING 0x10

typedef unsigned char   CSTAAgentFilter_t;
                        AF_LOGGED_ON 0x80
                        AF_LOGGED_OFF 0x40
                        AF_NOT_READY 0x20
                        AF_READY 0x10
                        AF_WORK_NOT_READY 0x08
                        AF_WORK_READY 0x04

typedef unsigned char   CSTAMaintenanceFilter_t;
                        MF_BACK_IN_SERVICE 0x80
                        MF_OUT_OF_SERVICE 0x40

typedef struct CSTAMonitorFilter_t {
    CSTACallFilter_t call;
    CSTAFeatureFilter_t feature;
    CSTAAgentFilter_t agent;
    CSTAMaintenanceFilter_t maintenance;
    Boolean         private;
} CSTAMonitorFilter_t;

typedef enum CSTAMonitorType_t {
    MT_CALL = 0,
    MT_DEVICE = 1
} CSTAMonitorType_t;
```

cstaMonitorCall structures

See **cstaMonitorDevice structures**.

cstaMonitorCallsViaDevice structures

See **cstaMonitorDevice structures**.

CSTAMonitorConfEvent structures

```
typedef struct CSTAMonitorStartConfEvent_t {
    CSTAMonitorCrossRefID_t monitorCrossRefID;
    CSTAMonitorFilter_t monitorFilter;
} CSTAMonitorStartConfEvent_t;
```

CSTAChangeMonitorFilterConfEvent structures

```
typedef struct CSTAChangeMonitorFilterConfEvent_t {
    CSTAMonitorFilter_t filterList;
} CSTAChangeMonitorFilterConfEvent_t;
```

CSTAMonitorStopConfEvent structures

```
typedef struct CSTAMonitorStopConfEvent_t {
    Nulltype    null;
} CSTAMonitorStopConfEvent_t;
```

CSTAMonitorStopEvent structures

```
typedef struect CSTAMonitorStopEvent_t {
    InvokeID_t        invokeID;
} CSTAMonitorStopEvent_t
```

Call Event Reports

Call Event Report data structures

```
typedef enum LocalConnectionState_t {
    CS_NULL = 0,
    CS_INITIATE = 1,
    CS_ALERTING = 2,
    CS_CONNECT = 3,
    CS_HOLD = 4,
    CS_QUEUED = 5,
    CS_FAIL = 6
} LocalConnectionState_t;

typedef enum CSTAEventCause_t {
    ACTIVE_MONITOR = 1,
    ALTERNATE = 2,
    BUSY = 3,
    CALL_BACK = 4,
    CALL_CANCELLED = 5,
    CALL_FORWARD_ALWAYS = 6,
    CALL_FORWARD_BUSY = 7,
    CALL_FORWARD_NO_ANSWER = 8,
    CALL_FORWARD = 9,
    CALL_NOT_ANSWERED = 10,
    CALL_PICKUP = 11,
    CAMP_ON = 12,
    DEST_NOT_OBTAINABLE = 13,
    DO_NOT_DISTURB = 14,
    INCOMPATIBLE_DESTINATION = 15,
    INVALID_ACCOUNT_CODE = 16,
    KEY_CONFERENCE = 17,
    LOCKOUT = 18,
    MAINTENANCE = 19,
    NETWORK_CONGESTION = 20,
    NETWORK_NOT_OBTAINABLE = 21,
    NEW_CALL = 22,
    NO_AVAILABLE_AGENTS = 23,
    OVERRIDE = 24,
    PARK = 25,
    OVERFLOW = 26,
    RECALL = 27,
    REDIRECTED = 28,
    REORDER_TONE = 29,
    RESOURCES_NOT_AVAILABLE = 30,
    SILENT_MONITOR = 31,
    TRANSFER = 32,
    TRUNKS_BUSY = 33,
    VOICE_UNIT_INITIATOR = 34
} CSTAEventCause_t;
```

CSTACallClearedEvent structures

```
typedef struct CSTACallClearedEvent_t {
    ConnectionID_t  clearedCall;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTACallClearedEvent_t;
```

CSTAConferencedEvent structures

```
typedef enum DeviceIDType_t {
    DEVICE_IDENTIFIER = 0,
    IMPLICIT_PUBLIC = 20,
    EXPLICIT_PUBLIC_UNKNOWN = 30,
    EXPLICIT_PUBLIC_INTERNATIONAL = 31,
    EXPLICIT_PUBLIC_NATIONAL = 32,
    EXPLICIT_PUBLIC_NETWORK_SPECIFIC = 33,
    EXPLICIT_PUBLIC_SUBSCRIBER = 34,
    EXPLICIT_PUBLIC_ABBREVIATED = 35,
    IMPLICIT_PRIVATE = 40,
    EXPLICIT_PRIVATE_UNKNOWN = 50,
    EXPLICIT_PRIVATE_LEVEL3_REGIONAL_NUMBER = 51,
    EXPLICIT_PRIVATE_LEVEL2_REGIONAL_NUMBER = 52,
    EXPLICIT_PRIVATE_LEVEL1_REGIONAL_NUMBER = 53,
    EXPLICIT_PRIVATE_PTN_SPECIFIC_NUMBER = 54,
    EXPLICIT_PRIVATE_LOCAL_NUMBER = 55,
    EXPLICIT_PRIVATE_ABBREVIATED = 56,
    OTHER_PLAN = 60
} DeviceIDType_t;

typedef enum DeviceIDStatus_t {
    PROVIDED = 0,
    NOT_KNOWN = 1,
    NOT_REQUIRED = 2
} DeviceIDStatus_t;

typedef struct ExtendedDeviceID_t {
    DeviceID_t      deviceID;
    DeviceIDType_t  deviceIDType;
    DeviceIDStatus_t deviceIDStatus;
} ExtendedDeviceID_t;

typedef ExtendedDeviceID_t SubjectDeviceID_t;

typedef struct CSTAConferencedEvent_t {
    ConnectionID_t  primaryOldCall;
    ConnectionID_t  secondaryOldCall;
    SubjectDeviceID_t confController;
    SubjectDeviceID_t addedParty;
    ConnectionList  conferenceConnections;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAConferencedEvent_t;
```

CSTAConnectionClearedEvent structures

```
typedef struct CSTAConnectionClearedEvent_t {
    ConnectionID_t  droppedConnection;
    SubjectDeviceID_t releasingDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAConnectionClearedEvent_t;
```

CSTADeliveredEvent structures

```
typedef ExtendedDeviceID_t CallingDeviceID_t;

typedef ExtendedDeviceID_t CalledDeviceID_t;

typedef ExtendedDeviceID_t RedirectionDeviceID_t;

typedef struct CSTADeliveredEvent_t {
    ConnectionID_t  connection;
    SubjectDeviceID_t alertingDevice;
    CallingDeviceID_t callingDevice;
    CalledDeviceID_t calledDevice;
    RedirectionDeviceID_t lastRedirectionDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTADeliveredEvent_t;
```

CSTADivertedEvent structures

```
typedef struct CSTADivertedEvent_t {
    ConnectionID_t  connection;
    SubjectDeviceID_t divertingDevice;
    CalledDeviceID_t newDestination;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTADivertedEvent_t;
```

CSTAEstablishedEvent structures

```
typedef struct CSTAEstablishedEvent_t {
    ConnectionID_t  establishedConnection;
    SubjectDeviceID_t answeringDevice;
    CallingDeviceID_t callingDevice;
    CalledDeviceID_t calledDevice;
    RedirectionDeviceID_t lastRedirectionDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAEstablishedEvent_t;
```

CSTAFailedEvent structures

```
typedef struct CSTAFailedEvent_t {
    ConnectionID_t  failedConnection;
    SubjectDeviceID_t failingDevice;
    CalledDeviceID_t calledDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAFailedEvent_t;
```

CSTAHeldEvent structures

```
typedef struct CSTAHeldEvent_t {
    ConnectionID_t  heldConnection;
    SubjectDeviceID_t holdingDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAHeldEvent_t;
```

CSTANetworkReachedEvent structures

```
typedef struct CSTANetworkReachedEvent_t {
    ConnectionID_t  connection;
    SubjectDeviceID_t trunkUsed;
    CalledDeviceID_t calledDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTANetworkReachedEvent_t;
```

CSTAOrginatedEvent structures

```
typedef struct CSTAOriginatedEvent_t {
    ConnectionID_t  originatedConnection;
    SubjectDeviceID_t callingDevice;
    CalledDeviceID_t calledDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAOriginatedEvent_t;
```

CSTAQueuedEvent structures

```
typedef struct CSTAQueuedEvent_t {
    ConnectionID_t  queuedConnection;
    SubjectDeviceID_t queue;
    CallingDeviceID_t callingDevice;
    CalledDeviceID_t calledDevice;
    RedirectionDeviceID_t lastRedirectionDevice;
    int             numberQueued;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAQueuedEvent_t;
```

CSTARetrievedEvent structures

```
typedef struct CSTARetrievedEvent_t {
    ConnectionID_t  retrievedConnection;
    SubjectDeviceID_t retrievingDevice;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTARetrievedEvent_t;
```

CSTAServiceInitiatedEvent structures

```
typedef struct CSTAServiceInitiatedEvent_t {
    ConnectionID_t  initiatedConnection;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTAServiceInitiatedEvent_t;
```

CSTATransferredEvent structures

```
typedef struct CSTATransferredEvent_t {
    ConnectionID_t  primaryOldCall;
    ConnectionID_t  secondaryOldCall;
    SubjectDeviceID_t transferringDevice;
    SubjectDeviceID_t transferredDevice;
    ConnectionList  transferredConnections;
    LocalConnectionState_t localConnectionInfo;
    CSTAEventCause_t cause;
} CSTATransferredEvent_t;
```

Feature Event Reports

CSTACallInformationEvent structures

```
typedef char            AccountInfo_t[32];

typedef char            AuthCode_t[32];

typedef struct CSTACallInformationEvent_t {
    ConnectionID_t  connection;
    SubjectDeviceID_t device;
    AccountInfo_t   accountInfo;
    AuthCode_t      authorisationCode;
} CSTACallInformationEvent_t;
```

CSTADoNotDisturbEvent structures

```
typedef struct CSTADoNotDisturbEvent_t {
    SubjectDeviceID_t device;
    Boolean         doNotDisturbOn;
} CSTADoNotDisturbEvent_t;
```

CSTAForwardingEvent structures

```
typedef struct CSTAForwardingEvent_t {
    SubjectDeviceID_t device;
    ForwardingInfo_t forwardingInformation;
} CSTAForwardingEvent_t;

typedef struct CSTAMessageWaitingEvent_t {
    CalledDeviceID_t deviceForMessage;
    SubjectDeviceID_t invokingDevice;
    Boolean         messageWaitingOn;
} CSTAMessageWaitingEvent_t;
```

Agent Status Report Events

CSTALoggedOnEvent structures

```
typedef struct CSTALoggedOnEvent_t {
    SubjectDeviceID_t agentDevice;
    AgentID_t       agentID;
    AgentGroup_t    agentGroup;
    AgentPassword_t password;
} CSTALoggedOnEvent_t;
```

CSTALoggedOffEvent structures

```
typedef struct CSTALoggedOffEvent_t {
    SubjectDeviceID_t agentDevice;
    AgentID_t       agentID;
    AgentGroup_t    agentGroup;
} CSTALoggedOffEvent_t;
```

CSTANotReadyEvent structures

```
typedef struct CSTANotReadyEvent_t {
    SubjectDeviceID_t agentDevice;
    AgentID_t       agentID;
} CSTANotReadyEvent_t;
```

CSTAReadyEvent structures

```
typedef struct CSTAReadyEvent_t {
    SubjectDeviceID_t agentDevice;
    AgentID_t       agentID;
} CSTAReadyEvent_t;
```

CSTAWorkNotReadyEvent structures

```
typedef struct CSTAWorkNotReadyEvent_t {
    SubjectDeviceID_t agentDevice;
    AgentID_t       agentID;
} CSTAWorkNotReadyEvent_t;
```

CSTAWorkReadyEvent structures

```
typedef struct CSTAWorkReadyEvent_t {
    SubjectDeviceID_t agentDevice;
    AgentID_t       agentID;
} CSTAWorkReadyEvent_t;
```

Snapshot Services

CSTASnapshotDeviceConfEvent structures

```
typedef struct CSTASnapshotDeviceData_t {
    int             count;
    struct CSTASnapshotDeviceResponseInfo_t *info;
} CSTASnapshotDeviceData_t;

typedef struct CSTASnapshotDeviceConfEvent_t {
    CSTASnapshotDeviceData_t snapshotData;
} CSTASnapshotDeviceConfEvent_t;
```

CSTASnapshotCallConfEvent structures

```
typedef struct CSTASnapshotCallData_t {
    int             count;
    struct CSTASnapshotCallResponseInfo_t *info;
} CSTASnapshotCallData_t;

typedef struct CSTASnapshotCallConfEvent_t {
    CSTASnapshotCallData_t snapshotData;
} CSTASnapshotCallConfEvent_t;
```

CSTASnapshotDeviceConfEvent structures

```
typedef enum CSTASimpleCallState_t {
    CALL_NULL = 0,
    CALL_PENDING = 1,
    CALL_ORIGINATED = 3,
    CALL_DELIVERED = 35,
    CALL_DELIVERED_HELD = 36,
    CALL_RECEIVED = 50,
    CALL_ESTABLISHED = 51,
    CALL_ESTABLISHED_HELD = 52,
    CALL_RECEIVED_ON_HOLD = 66,
    CALL_ESTABLISHED_ON_HOLD = 67,
    CALL_QUEUED = 83,
    CALL_QUEUED_HELD = 84,
    CALL_FAILED = 99,
    CALL_FAILED_HELD = 100
} CSTASimpleCallState_t;

typedef struct CSTACallState_t {
    int             count;
    LocalConnectionState_t *state;
} CSTACallState_t;

/* Used to take a CSTACallState_t which contains only two
 * LocalConnectionState_t and match them to the set of
 * CSTASimpleCallState_t above.
 */
#define SIMPLE_CALL_STATE(ccs)       (ccs.stat[0] + (ccs.state[1]
    << 4))

typedef struct CSTASnapshotDeviceResponseInfo_t {
    ConnectionID_t  callIdentifier;
    CSTACallState_t callState;
} CSTASnapshotDeviceResponseInfo_t;

typedef struct CSTASnapshotCallResponseInfo_t {
    SubjectDeviceID_t deviceOnCall;
    ConnectionID_t  callIdentifier;
    LocalConnectionState_t localConnectionState;
} CSTASnapshotResponseInfoEvent_t;
```

Computing Function Services

cstaRouteRegisterReq structures

```
typdef struct CSTARouteRegisterReq_t {
   DeviceID_t routingDevice;
} CSTARouteRegisterReq_t;
```

cstaRouteRegisterReqConfEvent structures

```
typedef long            RegisterReqID_t;

typedef struct {
    RegisterReqID_t    registerReqID;
} CSTARouteRegisterReqConfEvent_t;
```

cstaRouteRegisterCancel structures

```
typdef struct CSTARouteRegisterCancel_t {
    RegisterRegID_t    routingRegID;
} CSTARouteRegisterCancel_t;
```

cstaRouteRegisterCancelConfEvent structures

```
typedef struct {
    RegisterRegID_t    routingRegID;
} CSTARouteRegisterCancelConfEvent_t;
```

cstaRouteRequestEvent structures

```
typedef enum SelectValue_t {
    SV_NORMAL = 0,
    SV_LEAST_COST = 1,
    SV_EMERGENCY = 2,
    SV_ACD = 3,
    SV_USER_DEFINED = 4
} SelectValue_t;

typedef struct SetUpValues_t {
    int             length;
    unsigned char   *value;
} SetUpValues_t;

typedef struct CSTARouteRequestEvent_t {
    RegisterReqID_t   registerReqID;
    RoutingCrossRefID_t       routingCrossRefID;
    DeviceID_t        currentRoute;
    DeviceID_t        callingDevice;
    ConnectionID_t    routedCall;
    SelectValue_t     routeSelAlgorithm;
    Boolean           priority;
    SetUpValues_t     setupInformation;
} CSTARouteRequestEvent_t;
```

cstaRouteSelect structures

```
typedef int             RetryValue_t;
#define                     noListAvailable -1
#define                     noCountAvailable -2
```

```
typedef struct CSTARouteSelect_t {
    RegisterReqID_t          registerReqID;
    RoutingCrossRefID_t      routingCrossRefID;
    DeviceID_t        routeSelected;
    RetryValue_t      remainRetry;
    SetUpValues_t     setupInformation;
    Boolean           routeUsedReq;
} CSTARouteSelect_t;
```

CSTAReRouteRequestEvent structures

```
typedef struct CSTAReRouteEvent_t {
    RegisterReqID_t          registerReqID;
    RoutingCrossRefID_t      routingCrossRefID;
} CSTAReRouteEvent_t;
```

cstaRouteUsedEvent structures

```
typedef struct CSTARouteUsedEvent_t {
    RegisterReqID_t          registerReqID;
    RoutingCrossRefID_t      routingCrossRefID;
    DeviceID_t        routeUsed;
    DeviceID_t        callingDevice;
    Boolean                  domain;
} CSTARouteUsedEvent_t;
```

cstaRouteEndEvent structures

```
typedef struct CSTARouteEndEvent_t {
    RegisterReqID_t                 registerReqID;
    RoutingCrossRefID_t             routingCrossRefID;
    CSTAUniversalFailure_t    errorValue;
} CSTARouteEndEvent_t;
```

cstaRouteEnd structures

```
typedef struct CSTARouteEnd_t {
    RegisterReqID_t                 registerReqID;
    RoutingCrossRefID_t             routingCrossRefID;
    CSTAUniversalFailure_t    errorValue;
} CSTARouteEnd_t;
```

Escape Services

cstaEscapeService structures

```
typedef struct CSTAEscapeService_t {
    Nulltype    null;
} CSTAEscapeService_t;
```

CSTAEscapeServiceConfEvent structures

```
typedef struct CSTAEscapeServiceConfEvent_t {
    Nulltype    null;
} CSTAEscapeServiceConfEvent_t;
```

PrivateEvent structures

```
typedef struct CSTAPrivateEvent_t {
    int             length;
    unsigned char   *data;
} CSTAPrivateEvent_t;
```

PrivateStatusEvent structures

```
typedef struct CSTAPrivateStatusEvent_t {
    Nulltype   null;
}
```

cstaPrivateStatusEvent structures

```
typedef struct CSTAEscapeServiceEventConf_t
{
    UniversalFailure_t error;
};
```

CSTAEscapeServiceEvent structures

```
typedef struct CSTAEscapeServiceEvent_t {
    Nulltype   null;
};
```

cstaEscapeServiceConf structures

```
typedef struct cstaEscapeServiceConf_t {
    CSTAUniversalFailure_t    error;
};
```

cstaSendPrivateEvent structures

```
typedef struct cstaSendPrivateEvent_t {
    Nulltype   null;
};
```

Maintenance Services

CSTABackInServiceEvent structures

```
typedef struct CSTABackInServiceEvent_t {
    DeviceID_t      device;
    CSTAEventCause_t cause;
} CSTABackInServiceEvent_t;
```

CSTAOutOfServiceEvent structures

```
typedef struct CSTAOutOfServiceEvent_t {
    DeviceID_t      device;
    CSTAEventCause_t cause;
} CSTAOutOfServiceEvent_t;
```

cstaSysStatReq structures

```
typedef struct CSTASysStatReq_t (
    Nulltype     null;
) CSTASysStatReq_t
```

CSTASysStatReqConfEvent structures

```
typedef enum SystemStatus_t {
    SS_INITIALIZING = 0,
    SS_ENABLED = 1,
    SS_NORMAL = 2,
    SS_MESSAGES_LOST = 3,
    SS_DISABLED = 4,
    SS_OVERLOAD_IMMINENT = 5,
    SS_OVERLOAD_REACHED = 6,
    SS_OVERLOAD_RELIEVED = 7
} SystemStatus_t;

typedef struct CSTASysStatReqConfEvent_t (
    SystemStatus_t            systemStatus;
) CSTASysStatReqConfEvent_t
```

cstaSysStatStart structures

```
typedef unsigned char  SystemStatusFilter_t;
#define SS_Initializing                      0x800
#define SS_Enabled                           0x400
#define SS_Normal                            0x200
#define SS_MessageLost               0x100
#define SS_Disbaled                          0x080
#define SS_OverloadImminent          0x040
#define SS_OverloadReached           0x020
#define SS_OverloadRelieved          0x010
```

```
typedef struct CSTASysStatStart_t (
    SystemStatusFilter_t      statusFilter;
} CSTASysStatStart_t;
```

CSTASysStatStartConfEvent structures

```
typedef struct CSTASysStatStartConfEvent_t (
    SystemStatusFilter_t      systemFilter;
) CSTASysStatStartConfEvent_t
```

cstaSysStatStop structures

```
typedef struct CSTASysStatStop_t (
    Nulltype          null;
} CSTASysStatStop_t;
```

CSTASysStatStopConfEvent structures

```
typedef struct CSTASysStatStopConfEvent_t (
    Nulltype          null;
) CSTASysStatStopConfEvent_t
```

cstaChangeSysStatFilter structures

```
typedef struct CSTAChangeSysStatFilter_t (
    SystemStatusFilter_t      statusFilter;
} CSTAChangeSysStatFilter_t;
```

CSTAChangeSysStatFilterConfEvent structures

```
typedef struct CSTAChangeSysStatFilerConfEvent_t
{
    SystemStatusFilter_t      statusFilterSelected;
    SystemStatusFilter_t      statusFilterActive;
} CSTAChangeSysStatFilterConfEvent_t;
```

CSTASysStatEvent structures

```
typedef struct CSTASysStatEvent_t {
{
    SystemStatus_t            systemStatus;
};
```

CSTASysStatReqEvent structures

```
typedef struct CSTASysStatReqEvent_t {
    Nulltype          null;
} CSTASysStatReqEvent_t;
```

cstaSysStatReqConf structures

```
typedef struct CSTASysStatReqConf_t {
       SystemStatus_t         systemStatus;
} CSTASysStatReqConf_t;
```

cstaSysStatEventSend structures

```
typedef struct CSTASysStatEventSend_t {
       SystemStatus_t         systemStatus;
} CSTASysStatEventSend_t;
```

CSTA Control Services

cstaGetAPICaps structures

```
typedef struct CSTAGetAPICaps_t {
       Nulltype null;
) CSTAGetAPICaps_t;
```

CSTAGetAPICapsConfEvent structures

```
typedef struct CSTAGetAPICapsConfEvent_t {
    int             alternateCall;
    int             answerCall;
    int             callCompletion;
    int             clearCall;
    int             clearConnection;
    int             conferenceCall;
    int             consultationCall;
    int             deflectCall;
    int             pickupCall;
    int             groupPickupCall;
    int             holdCall;
    int             makeCall;
    int             makePredictiveCall;
    int             queryMwi;
    int             queryDnd;
    int             queryFwd;
    int             queryAgentState;
    int             queryLastNumber;
    int             queryDeviceInfo;
    int             reconnectCall;
    int             retrieveCall;
    int             setMwi;
    int             setDnd;
    int             setFwd;
    int             setAgentState;
    int             transferCall;
    int             eventReport;
    int             callClearedEvent;
    int             conferencedEvent;
```

```
    int             connectionClearedEvent;
    int             deliveredEvent;
    int             divertedEvent;
    int             establishedEvent;
    int             failedEvent;
    int             heldEvent;
    int             networkReachedEvent;
    int             originatedEvent;
    int             queuedEvent;
    int             retrievedEvent;
    int             serviceInitiatedEvent;
    int             transferredEvent;
    int             callInformationEvent;
    int             doNotDisturbEvent;
    int             forwardingEvent;
    int             messageWaitingEvent;
    int             loggedOnEvent;
    int             loggedOffEvent;
    int             notReadyEvent;
    int             readyEvent;
    int             workNotReadyEvent;
    int             workReadyEvent;
    int             backInServiceEvent;
    int             outOfServiceEvent;
    int             privateEvent;
    int             routeRequestEvent;
    int             reRoute;
    int             routeSelect;
    int             routeUsedEvent;
    int             routeEndEvent;
    int             monitorDevice;
    int             monitorCall;
    int             monitorCallsViaDevice;
    int             changeMonitorFilter;
    int             monitorStop;
    int             monitorEnded;
    int             snapshotDeviceReq;
    int             snapshotCallReq;
    int             escapeService;
    int             privateStatusEvent;
    int             escapeServiceEvent;
    int             escapeServiceConf;
    int             sendPrivateEvent;
    int             sysStatReq;
    int             sysStatStart;
    int             sysStatStop;
    int             changeSysStatFilter;
    int             sysStatReqEvent;
    int             sysStatReqConf;
    int             sysStatEvent;
} CSTAGetAPICapsConfEvent_t;
```

cstaGetDeviceList structures

```
typedef enum CSTALevel_t {
    CSTA_LEVEL1 = 1,
    CSTA_LEVEL2 = 2,
    CSTA_LEVEL3 = 3,
```

```
    CSTA_LEVEL4 = 4,
    CSTA_LEVEL5 = 5,
    CSTA_LEVEL6 = 6
} CSTALevel_t;
```

CSTAGetDeviceListConfEvent structures

```
typedef struct CSTAGetDeviceListConfEvent_t
{
    Level_t            acsLevelReq;
    int                        totalDevices;
    DeviceID_t *deviceIDs;
} CSTAGetDeviceListConfEvent_t;
```

CSTA Event Structures

CSTA event types

```
#define CSTAREQUEST                    3
#define CSTAUNSOLICITED                4
#define CSTACONFIRMATION       5
#define        CSTAEVENTREPORT         6
```

CSTA Request Event structure

```
typedef struct
{
    InvokeID_t invokeID;
    union
    {
        CSTARouteRequestEvent_t              routeRequest;
        CSTAReRouteRequest_t           reRouteRequest;
        CSTAEscapeSvcReqEvent_t              escapeSvcReqeust;
        CSTASysStatReqEvent_t          sysStatRequest;
    } u;

} CSTARequestEvent;
```

CSTA Event Report structure

```
typedef struct
{
    union
    {
        CSTARouteRegisterAbortEvent_t   registerAbort;
        CSTARouteUsedEvent_t           routeUsed;
        CSTARouteEndEvent_t            routeEnd;
        CSTAPrivateEvent_t             privateEvent;
        CSTASysStatEvent_t             sysStat;
        CSTASysStatEndedEvent_t              sysStatEnded;
    }u;
} CSTAEventReport;
```

CSTA Unsolicited Event structure

```
typedef struct
{
    CSTAMonitorCrossRefID_t           monitorCrossRefId;
    union
    {
        CSTACallClearedEvent_t        callCleared;
        CSTAConferencedEvent_t        conferenced;
        CSTAConnectionClearedEvent_t  connectionCleared;
        CSTADeliveredEvent_t          delivered;
        CSTADivertedEvent_t           diverted;
        CSTAEstablishedEvent_t        established;
        CSTAFailedEvent_t             failed;
        CSTAHeldEvent_t                      held;
        CSTANetworkReachedEvent_t     networkReached;
        CSTAOriginatedEvent_t         originated;
        CSTAQueuedEvent_t             queued;
        CSTARetrievedEvent_t          retrieved;
        CSTAServiceInitiatedEvent_t   serviceInitiated;
        CSTATransferredEvent_t        transferred;
        CSTACallInformationEvent_t    callInformation;
        CSTADoNotDisturbEvent_t              doNotDisturb;
        CSTAForwardingEvent_t         forwarding;
        CSTAMessageWaitingEvent_t     messageWaiting;
        CSTALoggedOnEvent_t           loggedOn;
        CSTALoggedOffEvent_t          loggedOff;
        CSTANotReadyEvent_t           notReady;
        CSTAReadyEvent_t              ready;
        CSTAWorkNotReadyEvent_t              workNotReady;
        CSTAWorkReadyEvent_t          workReady;
        CSTABackInServiceEvent_t      backInService;
        CSTAOutOfServiceEvent_t              outOfService;
        CSTAPrivateStatusEvent_t      privateStatus;
        CSTAMonitorEndedEvent_t       monitorEnded;
    } u;

} CSTAUnsolicitedEvent;
```

CSTA Confirmation Event structure

```
typedef struct {
    InvokeID_t invokeID;
    union {
        CSTAAlternateCallConfEvent_t         alternateCall;
        CSTAAnswerCallConfEvent_t            answerCall;
        CSTACallCompletionConfEvent_t        callCompletion;
        CSTAClearCallConfEvent_t             clearCall;
        CSTAClearConnectionConfEvent_t       clearConnection;
        CSTAConferenceCallConfEvent_t        conferenceCall;
        CSTAConsultationCallConfEvent_t
        consultationCall;
        CSTADeflectCallConfEvent_t           deflectCall;
        CSTAPickupCallConfEvent_t            pickupCall;
        CSTAGroupPickupCallConfEvent_t
        groupPickupCall;
        CSTAHoldCallConfEvent_t                     holdCall;
        CSTAMakeCallConfEvent_t                     makeCall;
        CSTAMakePredictiveCallConfEvent_t    makePredictiveCall;
        CSTAQueryMwiConfEvent_t                     queryMwi;
        CSTAQueryDndConfEvent_t                     queryDnd;
        CSTAQueryFwdConfEvent_t                     queryFwd;
        CSTAQueryAgentStateConfEvent_t
        queryAgentState;
        CSTAQueryLastNumberConfEvent_t
        queryLastNumber;
        CSTAQueryDeviceInfoConfEvent_t
        queryDeviceInfo;
        CSTAReconnectCallConfEvent_t         reconnectCall;
        CSTARetrieveCallConfEvent_t          retrieveCall;
        CSTASetMwiConfEvent_t                setMwi;
        CSTASetDndConfEvent_t                setDnd;
        CSTASetFwdConfEvent_t                setFwd;
        CSTASetAgentStateConfEvent_t         setAgentState;
        CSTATransferCallConfEvent_t          transferCall;
        CSTAUniversalFailureConfEvent_t
        universalFailure;
        CSTAMonitorConfEvent_t               monitorStart;
        CSTAChangeMonitorFilterConfEvent_t   changeMonitorFilter;
        CSTAMonitorStopConfEvent_t           monitorStop;
        CSTASnapshotDeviceConfEvent_t        snapshotDevice;
        CSTASnapshotCallConfEvent_t          snapshotCall;
        CSTARouteRegisterReqConfEvent_t
        routeRegister;
        CSTARouteRegisterCancelConfEvent_t   routeCancel;
        CSTAEscapeSvcConfEvent_t             escapeService;
        CSTASysStatReqConfEvent_t            sysStatReq;
        CSTASysStatStartConfEvent_t          sysStatStart;
        CSTASysStatStopConfEvent_t           sysStatStop;
        CSTAChangeSysStatFilterConfEvent_t   changeSysStatFilter;
    } u;
} CSTAConfirmationEvent;
```

CSTA Event_t structure

```
typedef struct
{
       ACSEventHeader_t      eventHeader;
       union
       {
              ACSUnsolicitedEvent   acsUnsolicited;
              ACSConfirmationEvent  acsConfirmation;
              CSTARequestEvent      cstaRequest;
              CSTAUnsolicitedEvent  cstaUnsolicited;
              CSTAConfirmationEvent cstaConfirmation;
              CSTAEventReport              cstaEventReport;
       } event;
       char   heap[CSTA_MAX_HEAP];
} CSTAEvent_t;
```

Chapter 12 References

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