CS419: Computer Networks

Lecture 5, Part 4: Feb 23, 2005

Internet Routing:
Practical aspects of OSPF (Open Shortest Path First)

- Link-state protocol
  - 189 pages long!!!
  - (versus 31 pages for RIP)
- 2-level hierarchy
  - Virtual links
- Designated router on LANs
- Hop-by-hop security
- External routes

Note: The term “Open” was a marketing attack against cisco, whose routing protocol was proprietary
OSPF scalability

- OSPF runs in a single Autonomous System (AS)
  - But an AS can be big
- To improve scalability, the AS can be partitioned into areas
  - Area is composed of subnets and routers
  - Areas are connected by a single backbone
- Two level hierarchy
OSPF backbone and areas
Backbone is logically (but not necessarily physically) contiguous
Designated routers on LAN

- A single broadcast LAN with N routers logically looks like $N^2$ point-to-point links
- Silly to advertise all of these $N^2$ links
- Rather, the LAN is advertised as a multi-access link
- One router is dynamically elected as a designated router to advertise the link and adjacent routers
  - A backup is also elected
- Spanning tree algorithm modified to cope with multi-access links
OSPF security model

- Security is *hop-by-hop*
- Each router authenticates its neighbors
  - But does not authenticate LSUs!
- If a single rogue router joins the algorithm, it can bring down the network
  - Claim to have an interface with all subnets!
External routes

- As an AS, OSPF routers at the AS boundary can reach external IP prefixes.
- These are advertised in OSPF as external routes.
  - Can be “default route”
- Two types:
  - Type 1: Cost is the sum of intra-AS path and external metric.
  - Type 2: Intra-AS cost is ignored when calculating path.
External routes example

Type 2 shortest path (cost = 3)

Type 1 shortest path (cost = 10)
Which path should be taken here?
The usual answer: it depends

- The dilemma of inter-domain routing is that each AS sets its metrics independently
  - No way to impose uniformity
  - (as least not in the “unregulated” Internet)
- Though an AS can autonomously determine how to view external routes