

Hitesh Ballani

4130 Upson Hall
Cornell University
Ithaca, NY-14853

hitesh@cs.cornell.edu
www.cs.cornell.edu/~hitesh
Phone: 607-279-6780
Fax: 607-255-4428

Research Interests

Networked Systems: Routing, Protocols, Management, Security.

Education

Cornell University

Ph.D. candidate in Computer Science

Advisor: Paul Francis; GPA: 4.19/4.0

Minor in Statistics

Ithaca, NY.

Expected summer 2009

Indian Institute of Technology

Bachelor of Technology, Computer Science

GPA: 9.76/10.0

Roorkee, India.

May 2003

Research

ViAggre (Virtual Aggregation)

Cornell University

HotNets'08, NSDI'09

Aug. 2007 – Present

Invented and deployed ViAggre, a “configuration-only” technique to shrink the routing table on routers. ViAggre does not require any changes to router software and routing protocols and can be deployed by any ISP without the cooperation of other ISPs. It can reduce the routing table load on routers by more than an order of magnitude. ViAggre was deployed on a testbed of Cisco hardware routers. I also implemented an open-source configuration tool that can automatically reconfigure status-quo routers for operation according to ViAggre.

CONMan (Complexity Oblivious Network Management)

Cornell University

INM'06, SIGCOMM'07, INFOCOM'09

Jan. 2006 – Present

Conceived, designed and implemented CONMan, an architecture aimed to make IP networks amenable to management. CONMan restricts the operational complexity of protocols to their implementation by minimising the amount of protocol-specific information exposed in their management interface. I implemented a suite of CONMan protocols and management applications. The resulting testbed was shown to be configurable based on human specified high-level goals. Faults in the network were automatically detected and localised. Thus, in effect, the CONMan testbed is a largely self-managing network.

DNS DoS Mitigation

Cornell University

HotNets'06, CCS'08

Jan. 2006 – Aug. 2008

Designed “Stale Cache”, a minor modification to the caching behavior of DNS resolvers that reduces the need for nameserver availability in the *existing* DNS framework. This can, in turn, mitigate the impact of DoS attacks on DNS. Conducted a long-term measurement study that shows that even a single Internet resolver can use a Stale Cache and acquire significant protection against DNS DoS attacks.

Prefix Interception and Hijacking

Cornell University

SIGCOMM'07

May 2006 – Sep. 2007

Investigated the possibility of *Traffic Interception* in the Internet wherein the attacker transparently intercepts traffic from a sender to a receiver. As a proof-of-concept, I designed an Interception attack, deployed it and used it to capture real Internet traffic (belonging to a prefix I own). Also conducted a trace-based study to quantify the possibility of Hijacking and Interception in the Internet and a measurement study to detect ongoing Internet Interception.

Denial-of-Service protection

HotNets'05

Intel-Research, Berkeley

June 2005 – July 2005

Designed the *DefaultOff* architecture wherein end-hosts are “off by default” and each host is allowed to explicitly declare to the routing infrastructure what traffic it wants routed to it. Using traces from real ISPs, I showed that such a network is technologically feasible and proposed a *reachability protocol* to allow for flexible expression of reachability by end-hosts and end-sites.

Proxy IP Anycast Service (PIAS)

Worlds'04, SIGCOMM'05, IMC'06

Cornell University

Mar. 2004 – May 2006

Designed, implemented and deployed PIAS, as IP-level anycast architecture that combines the advantages of native IP anycast and application level anycast. Besides obviating client modifications, PIAS offers a unique array of features that allow P2P and overlay applications to use the proposed anycast service. I deployed the PIAS service in the Internet (presently at 7 PIAS nodes in US, UK and Asia) and have been maintaining this testbed for the past four years.

Delay-tolerant Bulk Transfers

Telefonica Research

June 2008 – present

Ongoing work that focusses on the problem posed by transfer of bulk traffic across the Internet. Devising mechanisms to take advantage of the delay-tolerance of bulk traffic to make it amenable to the network. Implementing an overlay that uses storage as one such mechanism to time-shift bulk traffic away from the peak hours for Internet ISPs. Also conducting a measurement study to determine bounds for the benefits that such time-shifting can entail.

Teaching

Computer Networks

Teaching Assistant

CS519, Cornell University

2004

Designed and implemented the course project for CS519 - a master's level networks course. The project comprised of basic sockets programming and a user-level IP stack implementation. Other tasks included holding office hours, lecturing on certain occasions, and grading.

Java Practicum

Teaching Assistant

CS212, Cornell University

2003

Designed problem sets, taught discussion sections, graded and conducted office hours for CS212, an undergraduate course that introduces students to the ways of software engineering using the Java programming language.

Publications

- [1]. **Hitesh Ballani**, Paul Francis, Tuan Cao and Jia Wang. Making Routers Last Longer with ViAggre. In *Proc. of USENIX Networked Systems Design and Implementation*

(*NSDI*) (April 2009).

- [2]. **Hitesh Ballani** and Paul Francis. Fault Management Using the CONMan Abstraction. In *Proc. of IEEE INFOCOM* (April 2009).
- [3]. **Hitesh Ballani** and Paul Francis. Mitigating DNS DoS Attacks. In *Proc. of ACM Conference on Communications and Computer Security (CCS)* (October 2008).
- [4]. **Hitesh Ballani**, Paul Francis, Tuan Cao and Jia Wang. ViAggre: Making Routers Last Longer! In *Proc. of workshop on Hot Topics in Networks (Hotnets-VII)* (October 2008).
- [5]. **Hitesh Ballani** and Paul Francis. CONMan: A Step towards Network Manageability. In *Proc. of ACM SIGCOMM* (August 2007).
- [6]. **Hitesh Ballani**, Paul Francis and Xinyang Zhang. A Study of Prefix Hijacking and Interception in the Internet. In *Proc. of ACM SIGCOMM* (August 2007).
- [7]. **Hitesh Ballani** and Paul Francis. A Simple Approach to DNS DoS Defense. In *Proc. of workshop on Hot Topics in Networks (HotNets-V)* (November 2006).
- [8]. **Hitesh Ballani**, Paul Francis and Sylvia Ratnasamy. A Measurement-based Deployment Proposal for IP Anycast. In *Proc. of Internet Measurement Conference (IMC)* (October 2006).
- [9]. **Hitesh Ballani** and Paul Francis. CONMan - Taking the Complexity out of Network Management. In *Proc. of Sigcomm Workshop on Internet Network Management (INM)* (September 2006).
- [10]. **Hitesh Ballani**, Yatin Chawathe, Sylvia Ratnasamy, Timothy Roscoe and Scott Shenker. Off by default! In *Proc. of workshop on Hot Topics in Networks (Hotnets-IV)* (November 2005).
- [11]. **Hitesh Ballani** and Paul Francis. Towards a global IP Anycast service. In *Proc. of ACM SIGCOMM* (August 2005).
- [12]. **Hitesh Ballani** and Paul Francis. Towards a Deployable IP Anycast Service. In *Proc. of First Workshop on Real, Large Distributed Systems (WORLDS)* (December 2004).

Talks

ViAggre: Making Routers Last Longer!

– *HotNets*, 2008

Mitigating DNS DoS Attacks

– *ACM CCS*, 2008

CONMan: A Step Towards Network Manageability

– *ACM SIGCOMM*, 2007

– *Cisco Tech Talk*, 2007

– *Ph.D Candidacy Exam*, 2007

– *AFOSR Funding Meeting* 2007

A Study of Prefix Hijacking and Interception in the Internet

– *ACM SIGCOMM*, 2007

CONMan - Taking the Complexity out of Network Management

- *ACM SIGCOMM INM*, 2006
- *Microsoft Edgenet Summit (Poster)*, 2006

A Measurement-based Deployment Proposal for IP Anycast

- *ACM IMC*, 2006

A Simple Approach to DNS DoS Mitigation

- *HotNets*, 2006

Towards a Global IP Anycast Service

- *ACM SIGCOMM*, 2005
- *DNS OARC Meeting*, 2005
- *ICSI Seminar*, 2005

Off by Default!

- *HotNets*, 2005

Towards a Deployable IP Anycast Service

- *WORLD5*, 2004

**Honors and
Awards**

Best Paper Award

ACM IMC, 2006

President's Gold Medal, 2003

For obtaining highest CGPA amongst graduating students at the Indian Institute of Technology, Roorkee

IIT Roorkee, Gold Medals, 2000-2003

Best undergraduate academic performance in each of the four years of study at Indian Institute of Technology, Roorkee

Cornell University, Outstanding TA award, 2004

Awarded in recognition of excellent TA'ship for Computer Networks (CS519), 2004.

IISc Bangalore, Summer Research Fellowship, 2002

Awarded a fellowship for summer research at the Indian Institute of Science, Bangalore

**Professional
Activities**

- Reviewer for ACM CCR, IJCNS, IEEE Communication Letters
- External Reviewer for NSDI'05, ICNP'05, DSN'07
- Member of IEEE and ACM

References

Prof. Paul Francis
Assistant Professor
Department of Computer Science
Cornell University
Ithaca, NY 14853
francis@cs.cornell.edu

Sylvia Ratnasamy
Researcher
Intel-Research, Berkeley
2150 Shattuck Avenue, Suite 1300
Berkeley, CA 94704
sylvia.p.ratnasamy@intel.com

Pablo Rodriguez
Scientific Director
Telefonica Research
Via Augusta, 177
08021, Barcelona. Spain
pablo.rodriguez@tid.es

Jia Wang
Researcher
AT&T Labs – Research
180 Park Avenue
Building 103, Room A165
Florham Park, NJ 07932
jiawang@research.att.com