# SATISH RAGHUNATH

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## PROJECTS

- ***Scalable Measurement Infrastructure for Core Network Routers at Juniper Networks,*** Sunnyvale, CA, 10/2005-Present
  - Designing and building vital components of core routers to enable measurement of MPLS and IP traffic
  - Enabling NetFlow v9 compliance
  - Designing and building Intrusion Detection mechanisms that perform at very high data rates.
  - Building multiprocessor-aware QoS enforcement infrastructure for core routers
- ***Dynamic Resource Allocation at Nortel Networks,*** Billerica, MA, 05/2004-10/2005
  - **Designing and building interface for network provisioning software with OS virtualization software**, 04/2005-Present
    - Integrating network provisioning capabilities with Operating System virtualization software targeting data-centers and clusters.
    - Building Linux system software to help high-speed migration of live Operating Systems running apps from one physical location to another.
    - Designed a GRE-based IP tunnel scenario to enable mobility of back-end applications transparent to client sessions.
    - Implemented C and shell script software to enable secure and remote configuration of tunnel parameters and OS migration.
    - ***Tools:*** Xen virtual machine, C, Shell scripting, Java/JMS on Linux 2.6.x
  - **Architected components of a network service layer to enable network-aware grid computing**, 10/2004-03/2005
    - Specified high-level service primitives to be exposed as API to enable applications to use network as a schedulable resource.
    - Implemented interfaces to enable integration of provisioning middleware with the industry standard Globus Grid toolkit for grid computing infrastructures.
    - Setup a demonstration network featuring two element metro optical ring
    - *Live demonstration at GlobusWorld 2005*
  - **Architected and built key components of a policy-driven Inter-domain lightpath provisioning software**, 05/2004-10/2004
    - Architected and built a unified framework to provision layer-2 and layer-3 packet and optical network elements (SONET, Ethernet).
    - Architected and building a cross-layer path discovery module that leverages heterogeneous topology information.
    - Architected a fault-detection and response framework for restoration-like ability.
    - Implemented prototype fault detection and response with SNMP traps triggering failover path provisioning
    - Enabled dynamic high-bandwidth layer-2 paths for bandwidth-intensive apps.
    - Implemented interfaces to leverage ASTN control plane
    - Enhanced session management modules based on Java messaging and XML.
    - ***Tools:*** Java 1.4, JMS messaging on Linux 2.6.x
    - *Live demonstration at Supercomputing 2004*
- ***Characterization of IP/MPLS VPNs at AT&T Labs Research and RPI***, 06/2001 – 05/2004 (Part of Doctoral work)

- **Measurement-based characterization of IP VPNs**, 06/2003-05/2004
  - Analyzed characteristics of VPNs to help capacity planning and network architecture.
  - Analyzed large datasets for hundreds of VPNs with custom built tools
  - Evolved automated techniques to identify communication hubs for prioritized engineering.
  - Obtained temporal characterization of VPN traffic for feasibility of adaptive provisioning
  - Built optimization framework for rapid calculation of large traffic matrices
  - ***Tools:*** C++, Perl, MATLAB, AMPL on Solaris 2.6 and Linux 2.4.x
  - ***Papers:*** *ACM IMC 2004, ACM Sigmetrics 2004, IEEE Infocom 2005*
- **Edge-based architectures for adaptive VPN infrastructure**, 06/2001-05/2004
  - Architected a new framework for point-to-multipoint QoS assurances
  - Adaptive bandwidth provisioning with statistical assurances on QoS
  - Statistical framework based on edge-based policing and shaping
  - Implemented in NS-2 simulation framework, tested with packet traces and popular commercial Internet backbone topologies
  - ***Tools:*** C++/STL, Tcl/OTcl, Perl on Linux 2.4.x
  - ***Papers:*** *IEEE ICC 2002, QoFIS 2003, Sigmetrics 2004, Infocom 2005*

- ***Designed and built traffic replay tool to help customer support to reproduce faults*** at ***Packeteer Inc.***, CA, 05/2000-08/2000
  - Software for support engrs to reproduce problems at cust. site by replaying traffic traces.
  - Tool featured ability to spoof specific layers including inter-packet times, accelerate or decelerate the traffic events to deal with multi-hour traces.
  - ***Tools:*** C, Packet Sockets Library on Linux 2.2.18
- ***Built Network Traffic Management Components at Novell Bangalore***, 07/1998-07/1999
  - Designed components of RMON2 agent (Remote Network MONitoring MIB)
  - Ported FDDI component of RMON agent from NetWare to NT 4
  - ***Tools:*** C/C++, Java on Windows NT 4, NetWare 4.x, 5.x

# EDUCATION

**M.S., Ph.D**. (Computer and Systems Eng.), Rensselaer Polytechnic Institute, Troy, NY 05/2004
**GPA 3.88/4.0**, ***Topic:*** *Edge-based point-to-multipoint QoS Provisioning*

**B.E.** (Computer Eng.), **GPA 4.0/4.0**, Karnataka Regional Engg College (KREC), India 07/1998

# PUBLICATIONS

- **S. Raghunath,** K.K. Ramakrishnan, "Resource Management for Virtual Private Networks," IEEE Communications Magazine, April 2007
- **S. Raghunath,** K.K. Ramakrishnan, S. Kalynanaraman, "Measurement based characterization of IP VPNs," To Appear, ***IEEE/ACM Transactions on Networking, Dec 2007***.
- F. Travostino, P. Daspit, L. Gommans, C Jog, C. Laat, J. Mambretti, I. Monga, B. Oudenaarde, **S. Raghunath**, P. Wang, "Seamless Live Migration of Virtual Machines over the MAN/WAN", **Elsevier Future Generation Computer Systems 2006**
- **S. Raghunath,** et al, "Trade-offs in resource management for Virtual Private Networks," ***IEEE INFOCOM 2005.***
- P. Wang, I. Monga, **S. Raghunath,** F. Travostino, T. Lavian, "Workflow Integrated Network Resource Orchestration", ***GlobusWorld 2005***, Short Paper.
- **S. Raghunath,** et al, "Measurement based characterization and provisioning of IP VPNs," ***IMC 2004.***
- **S.Raghunath**, et al, "Quantifying Trade-offs in Resource Allocation for VPNs", ***ACM SIGMETRICS 2004***
- **S. Raghunath**, S. Kalyanaraman, "Statistical Point-to-Set Edge-based QoS Provisioning", ***QoFIS 2003***.
- **S. Raghunath**, et al, "Edge-Based QoS Provisioning for Point-to-Set Assured Services," ***IEEE ICC 2002***.
- O. Tickoo, **S. Raghunath**, S. Kalyanaraman, "Route Fragility: A Novel Metric for Route Selection in Mobile Ad Hoc Networks," In *Proc. of* ***IEEE ICON***, Sydney, 2003

## EXPERIENCE AND SKILLS

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|---|---|
| **EXPERIENCE** | • Research Engineer, Nortel Networks, 05/2004-10/2005<br>• Summer Manager, AT&T Labs Research, 06/2003-08/2003<br>• Summer Intern, Packeteer Inc, 05/2000-08/2000<br>• Software Engineer, Novell India, 07/1998-07/1999 |
| **LANGUAGES** | • C, C++/STL, Java, BASH, PERL, Tcl/OTcl, AMPL, CPLEX, MATLAB |
| **TECHNOLOGIES** | • MPLS, ASON, SONET/SDH, RPR, Ethernet, Grid Computing, Web-services<br>• RFC 2547 VPNs, E-Line, E-LAN, VPLS, TCP/IP suite, SNMP, TL1 |
| **PATENTS** | • ***Resource Allocation and Admission Control for efficient provisioning of VPNs in the Hose Model.*** Patent Pending (with Dr. K.K. Ramakrishnan)<br>• ***BANANAS: A New Connectionless Traffic Engineering Framework for the Internet.*** (with Prof. S. Kalyanaraman et al) US Provisional Patent No. 60/356,032<br>• ***Method and Apparatus for Implementing Missions on a Communication Network*** Patent Pending (with F. Travostino et al) |

**References available on request.**