Pavlos Papageorge

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U.S. Citizen

Summary

- Experience in implementing systems software with in-depth knowledge of the Linux network stack, especially geared towards performance. Background in network protocol analysis, design and prototype implementation. Experience in protocol performance evaluation and test automation. Firm theoretical background combined with advanced software development skills.
- Working towards Ph.D. degree in Electrical Engineering. Doing research in a real distributed system to perform modular internet measurement services. Designed a new network protocol that enables applications to measure the network more efficiently. Implemented the system inside the Linux kernel and evaluated with real network traffic. Prior research work spans distributed denial of service attacks, wireless LAN security, sensor networks and VoIP.

Education

- **Ph.D, Electrical and Computer Engineering**, *(Expected Dec 2008)*
  Dept. of Electrical and Computer Engineering, University of Maryland, College Park, MD
  Thesis Topic: *Modular Internet Measurement Services*, Advisor: Prof. Michael Hicks
- **Bachelor's Degree in Computer Science**, *June 1997*
  Dept. of Informatics and Telecommunications, Kapodistrian University of Athens, Athens Greece
  Thesis Topic: *Lossless Handover in Wireless ATM Networks*, Advisor: Prof. Lazaros Merakos

Experience

- **Graduate Research Assistant**
  Computer Science Dept, University of Maryland, College Park, MD
  June 2006 to present
- **Software Engineer Intern**
  Google, New York, NY
  July 2007 to Sep 2007 (summer internship)
- **Software Engineer**
  Riorey, Inc, Bethesda, MD
  Sep 2005 to June 2006 (part-time)
- **Software Engineer**
  Protocols Group, Ericsson IP Infrastructure, Rockville, MD
  Feb 2004 to May 2005 (part-time)
  July 2002 to Jun 2003 (part-time)
- **Graduate Research Assistant**
  Institute for Systems Research, University of Maryland, College Park, MD
  Jan 2000 to June 2002
- **Research Intern**
  Internet Architecture Research Lab, Telcordia, Morristown, NJ
  Dec 2000 to Feb 2001 (part-time)
  Sep 1999 to Dec 1999 (part-time)
  June 1999 to Aug 1999 (summer internship)
- **Graduate Teaching Assistant**
  Dept. of Computer Science, University of Maryland, College Park, MD
  Sep 1998 to Dec 1999 (three semesters)
- **System Administrator**
  Office of the Minister of Defense, Greek Armed Forces
  Jan 1998 to July 1998
- **Battle Tank Commander**
  Greek Armed Forces
  Jan 1997 to Dec 1997

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Professional Experience

- **Software Engineer Intern**, Google, New York, NY
  July 2007 - Sep 2007 (summer internship)

  – **Linux Kernel Development: Packet Load Balancing at Layer 3**
  Designed, implemented and tested software inside the Linux kernel to load balance packets arriving to a virtual IP address across multiple servers with source-address affinity. Designed the in-kernel components to operate at 1 Gibabit/sec line rate and to adapt when servers fail and then come up again.

- **Software Engineer**, RioRey, Inc, Bethesda, MD
  Sep 2005 - June 2006 (part-time)

  – **Linux Kernel Development: Packet Processing at Gigabit speeds**
  Designed and implemented a Linux kernel module to process IP packets at the line rate of 1 Gigabit/sec. The module bypassed the Linux network stack and retrieved packets directly from the driver. The module was the key performance component for the startup company's only product, an Intrusion Detection System (IDS) to detect and filter distributed denial of service attacks in real time. Designed the APIs between the different sub-components of the system and acquired in-depth knowledge of the internals of the Linux network stack, especially issues that concern performance.

  – **Evaluation, Testing and Demonstration of Intrusion Detection System Prototype**
  Classified denial of service attacks and implemented software tools in C and Python to emulate 20 different attack scenarios. The tools were used to evaluate and test the prototype of the company's Intrusion Detection System (IDS). Created the setup for the demonstration of the filtering capabilities of the IDS system. The setup demonstrated how the IDS box successfully filtered attack traffic while allowing valid flows of streaming video to pass. The demo played an important role to ensure a second round of funding for the startup company.

  – **System Administration**
  Contributed in every aspect of system administration since the company was a startup with less that 10 employees. Installed the office network, installed Gentoo Linux on all development machines and setup centralized administration. Setup and maintained NFS, VPN, remote access and created in Python all the scripts for automated snapshot-style backups. Created the intranet wiki and provided initial IT support to new employees as the company expanded.

- **Software Engineer**, Ericsson IP Infrastructure, Rockville, MD
  Feb 2004 to May 2005 (part-time)
  July 2002 to Jun 2003 (part-time)

  – **Conformance Testing: OSPF, IS-IS, BGP, RIP and SNMP**
  Performed conformance testing on in-house implementations of all the routing and management protocols. Acquired detailed knowledge of test tools such as IXIA, QARobot, ANVL, MRT toolkit, BGPSim. Gained hands-on experience and operational knowledge of Cisco and Juniper routers. Developed custom automated test framework to coordinate the whole test process from beginning to end.

  – **Automated Test Framework for Routing Protocol Testing**
  Developed an automated test framework to handle all aspects of protocol testing on IP routers: router configuration, test execution, log and result collection and report generation. Framework proved useful for other developers and shortened the total duration of each test cycle. Test framework consisted of a collection of Perl scripts, code in C and test scripts.

  – **BGP Operation, Administration and Maintenance**
  Designed, implemented and tested the software module that handles the configuration interface for the BGP routing protocol. The new design upgraded the existing mechanism and provided an incremental and transaction based configuration interface for BGP.

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Research Experience

- **Graduate Research Assistant**, University of Maryland, College Park, MD

  - **The Measurement Manager: Modular Internet Measurement Services**
    Jan 2004 - present, Supervisor: Prof. Michael Hicks
    As part of my Ph.D. dissertation work, developed a new system called the Measurement Manager that coordinates all measurement between two endhosts so that applications and transport protocols can treat measurement as a separate service. Main objective of this work is to enable efficient network measurement with the flexibility and accuracy of active probing. Key insight is that transport payload can be used to fill empty probes.

    Implemented first a prototype in userspace in C. After experimenting with the design, moved the implementation to the Linux kernel. Designed a new network protocol that piggybacks transport payload on empty probes. Implemented the new protocol as a Layer-4 protocol in the linux kernel that can carry real traffic between two internet hosts. Conducted experiments to evaluate the implementation and determine the trade-offs of the system.

  - **Security in Wireless LANs**
    June 2003 - Dec 2003, Supervisor: Prof. Ashok Agrawala
    Evaluated, tested and extended a specific link layer security protocol for IEEE 802.11. The protocol's objective was to provide wireline-equivalent security for unicast traffic. Studied cryptographic soundness and key exchange policy of the protocol. Analyzed OpenBSD and Windows implementations. Tested NDIS driver implementation on MS Windows for conformance and efficiency. Identified potential problems and suggested tweaks to the baseline protocol. Expanded protocol to provide security for broadcast and multicast traffic as well.

  - **Sensor Networks**
    Jan 2003 - May 2003, Supervisor: Prof. Bobby Bhattacharjee
    Conducted survey of the area of Wireless Sensor Networks and identified open research topics. Explored routing and self-configuration issues, appropriate models, evaluation methods and transport protocols.

  - **VoIP: H323 vs SIP**
    Jan 2000 - June 2002, Supervisor: Prof. Leandros Tassiulas
    Analyzed performance aspects of two dominant signaling protocols for Internet Telephony, H.323 and the Session Initiation Protocol (SIP). Collected measurements on emulated multimedia calls in order to determine the call setup delay, fault tolerance and message complexity. Evaluated protocol performance for deployment in both wireline and wireless environments.

- **Research Intern**, Internet Architecture Research Lab, Telcordia, Morristown, NJ

  - **Self Managed Virtual Networks**
    Dec 2000 to Feb 2001 (part-time)
    Mentors: Dr. Isil Sebuktekin, Dr. Moncef Elaoud
    Developed framework in *ns2 (network simulator)* and *nam (network animator)* to evaluate and demonstrate the operation of the Dynamic Virtual Network Configuration Protocol (DVNCP). The framework was used by other members of the group to identify weaknesses of the protocol under development and quickly assess alternatives. This work involved creation of code in C/C++, Perl and Tcl/Tk.

  - **QoS Provisioning of combined voice and data over IP VPNs**
    Aug 1999 to Dec 1999 (part-time)
    June 1999 to Aug 1999 (summer internship)
    Mentors: Dr. Archan Misra, Dr. Isil Sebuktekin
    Analyzed through ns2 simulations the effects of multiplexing voice and data on the same logical or physical link. Evaluated alternatives to isolate VoIP from data traffic in order to meet QoS objectives for combined service environments.

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Refereed Publications

- Pavlos Papageorgiou [1] and Michael Hicks, *"Merging Network Measurement with Data Transport"* Passive and Active Measurement Workshop, Boston, March 2005
- A. Kaloxylos, G. Papageorgiou, P. Papageorge, L. Merakos, *"Smart Buffering Technique for Lossless Hard Handover in Wireless ATM Networks"* IEEE 6th International Conference on Universal Personal Communications, San Diego, October 1997

Teaching Experience

- **Graduate Teaching Assistant**
  Dept. of Computer Science, University of Maryland, College Park, MD

  Assisted in the instruction of Computer Science courses by organizing and presenting recitation classes, grading projects and exams, and holding office hours. Developed a collection of Perl scripts and programs in C for the automated grading of coding assignments. This grading framework was used for a number of years.

  - **CMSC 114: Computer Science I (Introduction to C++)**
    Sep 1999 to Dec 1999 (one semester), Supervisor: Instructor Nelson Padua-Pérez
  - **CMSC 106: Introduction to C Programming**
    Sep 1998 to May 1999 (two semesters), Supervisor: Instructor Jandelyn Plane

Awards and Honors

- **GAANN Graduate Fellowship**, Academic year 2004-2005
  US Department of Education
- **Award of Excellence in Telecommunications**, March 1998
  Ericsson Hellas, Athens, Greece, Award for best thesis work in telecommunications
- **Scholarship for top performance in university entrance examinations**, September 1992
  State Scholarship Council (IKY), Athens, Greece

Computer Skills

- **Networking:**
  TCP/IP Networking, Transport Protocols, Linux Network Stack Internals, Network Measurement Algorithms
- **Software Languages:**
  C, C++, Python, Perl, Unix Shells, Tcl/Tk, Verilog HDL
- **Operating Systems:**
  Unix/Linux, Linux Kernel Development, Linux Drivers, MS Windows (NDIS Intermediate Drivers)
- **Routing and Management Protocols:**
  Cisco and Juniper routers, BGP, OSPF, IS-IS, RIP, SNMP
- **Performance/Conformance Testing:**
  IXIA, QARobot, RouterTester, SmartBits, ANVL, MRT Toolkit, BGPSim.
- **Network Simulators:**
  ns2 *Network Simulator*, nam *Network Animator*
- **Evaluation Testbeds:**
  Emulab [2], PlanetLab [3]
- **Software version control:**
  Subversion, CVS, Clearcase

[1] I am also known as Pavlos Papageorgiou or Paul Papageorge
[2] http://www.emulab.net
[3] http://www.planet-lab.org