

# Tal Lavian, Ph.D.

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## Research and Consulting: Network Communications, Telecommunications, Mobile Wireless and Internet Technologies

Possesses strong engineering background and ability to turn forward-looking academic research and novel concepts into products.

- Scientist, educator and technologist with 25 years of experience.
- Co-author of over 25 scientific publications, journal articles, and peer-reviewed papers.
- Prolific innovator, co-inventing over 60 patents issued and pending.
- UC Berkeley Engineering - CET Industry Fellow and Lecturer.

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### EDUCATION

- **Ph.D.**, Computer Science specializing in networking and communications, UC Berkeley
- **M.Sc.**, Electrical Engineering, Tel Aviv University
- **B.Sc.**, Mathematics and Computer Science, Tel Aviv University

### EXPERTISE

Telecommunications, network communications, network architecture, and computer networks:

- **Communication networks:** TCP/IP suite, TCP, UDP, IP, IP-v4, IP-v6, OSI Layers, FTP, network applications, Data Link, ICMP, ARP, DNS, SNMP, Multicast, Unicast, SMTP, POP
- **Wireless:** Cellular Systems, Mobile devices, Smartphone, Wireless, WLAN
- **Routing/switching:** routing protocols, RIP, BGP, DNS, Quality of Service (QoS), NAP, MPLS, switching, packet switching, circuit switching, LAN, WAN,VPN, network infrastructure, network architecture
- **Internet:** intranet, extranet, web, web applications, HTTP, HTML, URL, Java, C, C++, Grid Computing, Client Server, file transfer, Unix communications

### PROFESSIONAL SUMMARY

- Selected as Principal Investigator for three US Department of Defense (DARPA) projects.
- Led a wireless research project for an undisclosed US Federal Agency.
- Led a research project on networking computation project for the US Air Force Research Lab (AFRL)
- Led and developed the first network resource-scheduling service for Grid Computing.
- Managed and engineered the first demonstrated Transatlantic dynamic allocation of 10Gbs Lambdas as a grid service.
- Spearheaded and planned the first demonstrated wire-speed active network on commercial hardware.
- Bridges science, engineering, and innovation to identify patentability.
- Analyzes patents, consults in patent infringement litigation, and generates intellectual property.
- Created and chaired Nortel Networks' EDN Patent Committee.
- Co-Invented over 60 patents issued, pending, and published; advised over 100 other inventions.
- Co-authored over 25 scientific publications, journal articles, and peer-reviewed papers.
- IEEE Senior Member.

## PROFESSIONAL EXPERIENCE

INNOVATIONS-IP, Sunnyvale, CA

2006-Present

### Principal Scientist

- Scientific research and advanced-technology investigations. Bridge the disciplines of science, engineering, and innovation.
- Turn forward-looking academic research and novel concepts into products.
- Lead projects in telecommunication infrastructure and systems to provide tangible value in the innovation of advanced technologies.
- CTO of a stealth mode company in the area of network communications.
- Invent, and help innovators turn novel ideas into, patents and products.

UNIVERSITY OF CALIFORNIA BERKELEY, Berkeley, CA

2000-Present

### Berkeley Industry Fellow, Lecturer, Visiting Scientist, Ph.D. Candidate, Nortel's Scientist Liaison

*Some positions and projects done concurrently, others sequentially.*

- Serve as Industry Fellow and Lecturer at the Center for Entrepreneurship and Technology.
- Study the areas of network services, telecommunication systems and software, communications infrastructure, and data centers.
- Develop long-term technology for the enterprise market, integrating communication and computing technologies.
- Conducted research projects in data centers (RAD Labs), telecommunication infrastructure (SAHARA), and wireless systems (ICEBERG).
- Acted as scientific liaison between Nortel Research Lab and UC Berkeley, providing tangible value in advanced technologies.
- Earned a Ph.D. in Computer Science, specializing in communications and networking.

NORTEL NETWORKS, Santa Clara, CA

1996 - 2007

### Principal Scientist, Principal Architect, Principal Engineer, Senior Software Engineer

- Held scientific and research roles at Nortel Labs, Bay Architecture Labs, CTO Office.

### Principal Investigator for US Department of Defense (DARPA) Projects

- Conceived concepts, wrote proposals, and completed three research projects: Active Networks, DWDM-RAM, and a networking computation project for Air Force Research Lab (AFRL).
- Led a wireless research project for an undisclosed US Federal Agency.

### Academic and Industrial Researcher

- Analyzed new technologies with the objective of reducing risks associated with R&D investment.
- Spearheaded research collaboration with leading universities and professors at UC Berkeley, Northwestern University, University of Amsterdam, and University of Technology Sydney.

### Patent Leader

- Facilitated a continuous stream of innovative ideas, over 100 inventions, and their related IPR.
- Developed intellectual property assets through invention and analysis of existing technology portfolios.
- Searched prior art for competitors' patents.
- Evaluated competitive products relative to Nortel's patent portfolio.
- Provided technology advice for patent litigation, evaluating technology in patent infringement cases.

### Technology Innovator

- Proactively identified prospective business ideas, leading to new networking products.
- Predicted technological trends well in advance through researching the technology horizon and academic world.

### Projects

- Data-Center Communications: network and server orchestration 2006-2007
- DRAC: an SOA-facilitated L1/L2/L3 network dynamic controller 2003-2007
- Omega: classified wireless project for an undisclosed US Federal Agency 2006
- Open Platform: project for the US Air Force Research Laboratory 2005
- Network Resource Orchestration for Web Services Workflows 2004-2005
- Proxy Study between Web/Grids Services and Network Services 2004
- Streaming Content Replication: real-time A/V media multicast at edge 2003-2004
- DWDM-RAM: a US DARPA-funded program on agile optical transport 2003-2004
- Packet Capturing and Forwarding Service: on IP and Ethernet traffic 2002-2003
- CO2: content-aware agile networking 2001-2003
- Active Networks: a US DARPA-funded research program 1999-2002
- ORE: a programmable network service platform 1998-2002
- JVM Platform: Java on network devices 1998-2001
- Web Based Device Management: network device management 1996-1997

APTEL COMMUNICATIONS, Netanya, Israel 1994-1995

*Start-up company, developing wireless spread-spectrum PCN/PCS.*

### Software Engineer, Team Leader

- Designed and managed a personal communication network (PCN) and personal communication system (PCS), the precursors of SMS.
- Held responsibility for the design and development of a network software product.
- Brought two-way paging product from concept to development.

SCITEX LTD, Herzeliya, Israel 1990-1993

### Software Engineer, Team Leader

*Software and hardware company acquired by Hewlett Packard (HP)*

- System and network communications for pre-press devices.
- Invented a Parallel SIMD Architecture. Participated in the Technology Innovation group.

SHALEV, Ramat-HaSharon, Israel 1987-1990

*A start-up company.* **Software Engineer** Developed algorithms.

### **PROFESSIONAL ACTIVITIES**

- IEEE Senior Member
- Technical Co-Chair, IEEE Hot Interconnects 2005 at Stanford University
- Member, IEEE Communications Society (COMMSOC)
- Member, IEEE Computer Society
- Member, IEEE Systems, Man, and Cybernetics Society
- Member, ACM, ACM Special Interest Group on Data Communication (SIGCOM)
- Member, ACM Special Interest Group on Hypertext, Hypermedia and Web (SIGWEB)
- Member, IEEE Consultants' Network (CNSV)
- Global Member, Internet Society (ISOC)
- President Java Users Group – Silicon Valley Mountain View, 1999-2000
- Toastmasters International - Competent Communicator

### **PROFESSIONAL AWARDS**

- Top Talent Award – Nortel
- Top Inventors Award – Nortel EDN

# Patents and Publications

*(not a complete list)*

## Patents Issued

- **US 8,078,708** Grid proxy architecture for network resources
- **US 8,054,952** Systems and methods for visual presentation and selection of IVR menu
- **US 8,000,454** Systems and methods for visual presentation and selection of IVR menu
- **US 7,944,827** Content-aware dynamic network resource allocation
- **US 7,860,999** Distributed computation in network devices
- **US 7,734,748** Method and apparatus for intelligent management of a network element
- **US 7,710,871** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device
- **US 7,580,349** Content-aware dynamic network resource allocation
- **US 7,433,941** Method and apparatus for accessing network information on a network device
- **US 7,359,993** Method and apparatus for interfacing external resources with a network element
- **US 7,313,608** Method and apparatus for using documents written in a markup language to access and configure network elements
- **US 7,260,621** Object-oriented network management interface
- **US 7,237,012** Method and apparatus for classifying Java remote method invocation transport traffic
- **US 7,127,526** Method and apparatus for dynamically loading and managing software services on a network device
- **US 7,047,536** Method and apparatus for classifying remote procedure call transport traffic
- **US 7,039,724** Programmable command-line interface API for managing operation of a network device
- **US 6,976,054** Method and system for accessing low-level resources in a network device
- **US 6,970,943** Routing architecture including a compute plane configured for high-speed processing of packets to provide application layer support
- **US 6,950,932** Security association mediator for Java-enabled devices
- **US 6,850,989** Method and apparatus for automatically configuring a network switch
- **US 6,845,397** Interface method and system for accessing inner layers of a network protocol
- **US 6,842,781** Download and processing of a network management application on a network device
- **US 6,772,205** Executing applications on a target network device using a proxy network device
- **US 6,564,325** Method of and apparatus for providing multi-level security access to system
- **US 6,175,868** Method and apparatus for automatically configuring a network switch
- **US 6,170,015** Network apparatus with Java co-processor
- **EP 1,905,211** Technique for authenticating network users
- **EP 1,142,213** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device
- **EP 1,671,460** Method and apparatus for scheduling resources on a switched underlay network
- **CA 2,358,525** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device

## Patent Applications Published and Pending

- **US 20100220616** Optimizing network connections
- **US 20100217854** Method and Apparatus for Intelligent Management of a Network Element
- **US 20100146492** Translation of Programming Code
- **US 20100146112** Efficient Communication Techniques
- **US 20100146111** Efficient Communication in A Network
- **US 20090313613** Method and Apparatus for automatic Translation of a Computer Program Language Code
- **US 20090313004** Platform-Independent Application Development Framework
- **US 20090279562** Content-aware dynamic network resource allocation
- **US 20080040630** Time-Value Curves to provide dynamic QoS for time sensitive file transfers
- **US 20070169171** Technique for authenticating network users
- **US 20060123481** Method and apparatus for network immunization
- **US 20060075042** Extensible resource messaging between user applications and network elements in a communication network
- **US 20050083960** Method and apparatus for transporting parcels of data using network elements with network element storage
- **US 20050076339** Method and apparatus for automated negotiation for resources on a switched underlay network
- **US 20050076336** Method and apparatus for scheduling resources on a switched underlay network
- **US 20050076173** Method and apparatus for preconditioning data to be transferred on a switched underlay network
- **US 20050076099** Method and apparatus for live streaming media replication in a communication network
- **US 20050074529** Method and apparatus for transporting visualization information on a switched underlay network
- **US 20020021701** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device

## Publications

- “Applications Drive Secure Lightpath Creation across Heterogeneous Domains, Feature Topic Optical Control Planes for Grid Networks: Opportunities, Challenges and the Vision.” Gommans L.; Van Oudenaarde B.; Dijkstra F.; De Laat C.; Lavian T.; Monga I.; Taal A.; Travostino F.; Wan A.; *IEEE Communications Magazine*, vol. 44, no. 3, March 2006, pp. 100-106.
- *Lambda Data Grid: Communications Architecture in Support of Grid Computing*. Tal I. Lavian, Randy H. Katz; Doctoral Thesis, University of California at Berkeley. January 2006.
- “Information Switching Networks.” Hoang D.B.; T. Lavian; *The 4th Workshop on the Internet, Telecommunications and Signal Processing, WITSP 2005*, December 19-21, 2005, Sunshine Coast, Australia.
- “Impact of Grid Computing on Network Operators and HW Vendors.” Allcock B.; Arnaud B.; Lavian T.; Papadopoulos P.B.; Hasan M.Z.; Kaplow W.; *IEEE Hot Interconnects at Stanford University 2005*, pp.89-90.
- *DWDM-RAM: A Data Intensive Grid Service Architecture Enabled by Dynamic Optical Networks*. Lavian T.; Mambretti J.; Cutrell D.; Cohen H.J; Merrill S.; Durairaj R.; Daspit P.; Monga I.; Naiksatam S.; Figueira S.; Gutierrez D.; Hoang D.B., Travostino F.; CCGRID 2004, pp. 762-764.
- *DWDM-RAM: An Architecture for Data Intensive Service Enabled by Next Generation Dynamic Optical Networks*. Hoang D.B.; Cohen H.; Cutrell D.; Figueira S.; Lavian T.; Mambretti J.; Monga I.; Naiksatam S.; Travostino F.; Proceedings IEEE Globecom 2004, Workshop on High-Performance Global Grid Networks, Houston, 29 Nov. to 3 Dec. 2004, pp.400-409.
- *Implementation of a Quality of Service Feedback Control Loop on Programmable Routers*. Nguyen C.; Hoang D.B.; Zhao, I.L.; Lavian, T.; Proceedings, 12th IEEE International Conference on Networks 2004. (ICON 2004) Singapore, Volume 2, 16-19 Nov. 2004, pp.578-582.
- *A Platform for Large-Scale Grid Data Service on Dynamic High-Performance Networks*. Lavian T.; Hoang D.B.; Mambretti J.; Figueira S.; Naiksatam S.; Kaushil N.; Monga I.; Durairaj R.; Cutrell D.; Merrill S.; Cohen H.; Daspit P.; Travostino F; GridNets 2004, San Jose, CA., October 2004.
- *DWDM-RAM: Enabling Grid Services with Dynamic Optical Networks*. Figueira S.; Naiksatam S.; Cohen H.; Cutrell D.; Daspit, P.; Gutierrez D.; Hoang D. B.; Lavian T.; Mambretti J.; Merrill S.; Travostino F; Proceedings, 4th IEEE/ACM International Symposium on Cluster Computing and the Grid, Chicago, USA, April 2004, pp. 707-714.
- *DWDM-RAM: Enabling Grid Services with Dynamic Optical Networks*. Figueira S.; Naiksatam S.; Cohen H.; Cutrell D.; Gutierrez D.; Hoang D.B.; Lavian T.; Mambretti J.; Merrill S.; Travostino F.; 4th IEEE/ACM International Symposium on Cluster Computing and the Grid, Chicago, USA, April 2004.
- *An Extensible, Programmable, Commercial-Grade Platform for Internet Service Architecture*. Lavian T.; Hoang D.B.; Travostino F.; Wang P.Y.; Subramanian S.; Monga I.; *IEEE Transactions on Systems,*

Man, and Cybernetics on Technologies Promoting Computational Intelligence, Openness and Programmability in Networks and Internet Services Volume 34, Issue 1, Feb. 2004, pp.58-68.

- *DWDM-RAM: An Architecture for Data Intensive Service Enabled by Next Generation Dynamic Optical Networks*. Lavian T.; Cutrell D.; Mambretti J.; Weinberger J.; Gutierrez D.; Naiksatam S.; Figueira S.; Hoang D. B.; Supercomputing Conference, SC2003 Igniting Innovation, Phoenix, November 2003.
- *Edge Device Multi-Unicasting for Video Streaming*. Lavian T.; Wang P.; Durairaj R.; Hoang D.; Travostino F.; Telecommunications, 2003. ICT 2003. 10th International Conference on Telecommunications, Tahiti, Volume 2, 23 Feb.-1 March, 2003 pp. 1441-1447.
- The SAHARA Model for Service Composition Across Multiple Providers. Raman B.; Agarwal S.; Chen Y.; Caesar M.; Cui W.; Lai K.; Lavian T.; Machiraju S.; Mao Z. M.; Porter G.; Roscoe T.; Subramanian L.; Suzuki T.; Zhuang S.; Joseph A. D.; Katz Y.H.; Stoica I.; Proceedings of the First International Conference on Pervasive Computing. ACM Pervasive 2002, pp. 1-14.
- *Enabling Active Flow Manipulation in Silicon-Based Network Forwarding Engines*. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Durairaj R.; Hoang D.B.; Sethaput V.; Culler D.; Proceeding of the Active Networks Conference and Exposition, 2002.(DANCE) 29-30 May 2002, pp. 65-76.
- *Practical Active Network Services within Content-Aware Gateways*. Subramanian S.; Wang P.; Durairaj R.; Rasimas J.; Travostino F.; Lavian T.; Hoang D.B.; Proceeding of the DARPA Active Networks Conference and Exposition, 2002.(DANCE) 29-30 May 2002, pp. 344-354.
- *Active Networking on a Programmable Network Platform*. Wang P.Y.; Lavian T.; Duncan R.; Jaeger R.; Fourth IEEE Conference on Open Architectures and Network Programming (OPENARCH), Anchorage, April 2002.
- *Intelligent Network Services through Active Flow Manipulation*. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Hoang D.B.; Sethaput V.; IEEE Intelligent Networks 2001 Workshop (IN2001), Boston, May 2001.
- Intelligent Network Services through Active Flow Manipulation. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Hoang D.B.; Sethaput V.; Intelligent Network Workshop, 2001 IEEE 6-9 May 2001, pp.73 -82.
- *Enabling Active Flow Manipulation in Silicon-based Network Forwarding Engine*. Lavian, T.; Wang, P.; Travostino, F.; Subramanian S.; Hoang D.B.; Sethaput V.; Culler D.; Journal of Communications and Networks, March 2001, pp.78-87.
- *Active Networking on a Programmable Networking Platform*. Lavian T.; Wang P.Y.; IEEE Open Architectures and Network Programming, 2001, pp. 95-103.
- *Enabling Active Networks Services on a Gigabit Routing Switch*. Wang P.; Jaeger R.; Duncan R.; Lavian T.; Travostino F.; 2nd Workshop on Active Middleware Services, 2000.

- *Dynamic Classification in Silicon-Based Forwarding Engine Environments*. Jaeger R.; Duncan R.; Travostino F.; Lavian T.; Hollingsworth J.; Selected Papers. 10th IEEE Workshop on Metropolitan Area and Local Networks, 1999. 21-24 Nov. 1999, pp.103-109.
- *Open Programmable Architecture for Java-Enabled Network Devices*. Lavian, T.; Jaeger, R. F.; Hollingsworth, J. K.; IEEE Hot Interconnects Stanford University, August 1999, pp. 265-277.
- *Open Java SNMP MIB API*. Rob Duncan, Tal Lavian, Roy Lee, Jason Zhou, Bay Architecture Lab Technical Report TR98-038, December 1998.
- *Java-Based Open Service Interface Architecture*. Lavian T.; Lau S.; BAL TR98-010 Bay Architecture Lab Technical Report, March 1998.
- *Parallel SIMD Architecture for Color Image Processing*. Lavian T. Tel – Aviv University, Tel – Aviv, Israel, November 1995.