Wenda Ni, Ph.D.

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Immigration Status

Permanent resident of Canada, landed on 8 April, 2014

Education

- **Tsinghua University** — Beijing, P. R. China
  Ph.D., Dept. of Electronic Engineering — *Sept. 2005 - Jul. 2010*
  - Topics: Network design, operation, and management with a focus on survivability, service differentiation, and two-layer traffic engineering in telecom transport networks
  - Thesis: Resource optimization and service quality in WDM optical networks
- **Tsinghua University** — Beijing, P. R. China
  Bachelor Degree of Engineering, Dept. of Electronic Engineering — *Sept. 2001 - Jul. 2005*
  - Major: Physical electronics and Optoelectronics
  - GPA: 88.8/100 Rank: 5/80

Honors and Awards

Runner-up for the 2013 Fabio Neri Best Paper Award	2013
Eligibility as NSERC Visiting Fellow in Canadian Government Laboratories	2011
Eligibility as NSERC Visiting Fellow in Canadian Government Laboratories	2010
Feng Deng conference travel grant (IEEE/OSA OFC 2010, San Diego, CA, USA, 12,000RMB)	2009
Semi-finalist in the 2010 Corning Outstanding Student Paper Competition (10-12 out of over 430)	2009
Feng Deng conference travel grant (IEEE/OSA OFC 2009, San Diego, CA, USA, 10,000RMB)	2008
MPS (Monolithic Power System Inc.) Scholarship for excellent students (second class)	2008
DAAD (Deutscher Akademischer Austausch Dienst) research fellowship for young doctoral candidates up to six months (5,800€)	2008
Feng Deng conference travel grant (IEEE/OSA OFC 2008, San Diego, CA, USA, 10,000RMB)	2007
Excellent individual in social practice	2007
Feng Deng conference travel grant (IEEE GLOBECOM 2007, Washington D.C., USA, 10,000RMB)	2007
Excellent graduate of Tsinghua University	2005
Shunde Wu Couple Scholarship for excellent students (second class)	2004
Shunde Wu Couple Scholarship for excellent students (second class)	2003
Individual prize in electronics process technology practice	2003
Citic Bank Scholarship for excellent students (second class)	2002

R&D Experience

- **Carleton University** — Ottawa, ON, Canada
  Researcher, Dept. of Systems and Computer Engineering — *Jun. 2011 - Aug. 2014*
  - Topics: 1) Datacenter networking; 2) Optical datacenters; 3) Protocol design; 4) Survivable telecom network design and analysis; 5) Decomposition methods, in particular, Lagrangian relaxation and column generation, for solving network optimization problems; 6) Software-defined networks; 7) Passive optical networks; 8) Optical node architecture
  - Designed optimal link capacity to enable full bandwidth communication in emerging datacenter networks using fat-tree and Microsoft VL2 topologies

- Proposed a low-cost, power-efficient, and reliable datacenter network architecture using passive optical devices. Resolved physical-layer scalability issues by employing advanced interconnection techniques. Designed a fully distributed link-layer communication protocol (termed HEDA) to enable collision-free frame transmission. Described the protocol using finite state machine and message sequence chart. Developed an analytical model to compute lower and upper bounds on the expected packet delay of our protocol. (This line of achievements are outputs of a six-month industry research project with Viscore Technologies Inc., Canada.)
- Studied a novel layered network architecture—Valiant load balancing (VLB) networks over optical networks. Developed a network-level availability model to compute the probability that a Valiant load balancing network is congestion-free under all traffic patterns. The main challenges in such a context arise from the unique routing and protection scheme that goes beyond the definition of conventional connection-level service availability as well as the logical link failure correlation that prohibits the use of traditional analytical methods. Our work was honored as a runner-up for the 2013 Fabio Neri Best Paper Award. One winner and three runners-up were selected from all papers published in *Elsevier Optical Switching and Networking* journal throughout year 2013. Official announcement: `http://www.journals.elsevier.com/optical-switching-and-networking/awards/announcement-2013-fabio-neri-best-paper-award/`
- Developed analytical models to accurately compute the availability of upper-layer connections in two-layer networks, where dedicated path protection is deployed at either the lower layer or the upper layer. The accuracy of our model is validated through OPNET simulation. A real-life case of such two-layer networks is IP over optical networks.
- Developed mental toughness in demanding research environments

- **State University of New York (SUNY) at Buffalo** Buffalo, NY, USA
  Senior research scientist, Dept. of Computer Science and Engineering *Oct. 2010 - May 2011*
  - Topic: network function virtualization; virtual network embedding; reliable network design and analysis
  - Studied service availability in virtual infrastructure mapping and cloud computing such as Amazon EC2. Implemented a numerical method to compute the probability that the target availability is not fulfilled over a finite service subscription period. Since the service duration is finite, conventional steady-state analysis cannot be applied. Rather, the numerical calculation is a method that performs transient analysis. Our study can help service providers to work out service level agreements that avoid significant penalty risk.
  - Learned to get along with supervisors and managers

- **Fraunhofer Heinrich-Hertz-Institut (HHI)** Berlin, Germany
  Visiting student, Dept. of Photonic Networks and Systems *Oct. 2008 - Mar. 2009*
  - Topic: survivability of WDM networks
  - Evaluated connection availability in optical networks that employ shared path protection and backup path reprovisioning after failure occurrence. Compared the impact of revertive and non-revertive operations after failure repair on connection availability.
  - Proposed and studied a new logical topology mapping problem, which incorporates the lightpath-based physical-layer failure localization capability into the traditional mapping design of IP over transparent optical networks. I, as the first author, was selected as a semi-finalist in the 2010 Corning Outstanding Student Paper Competition for this work. Over 430 student submissions were received that year, of which 10-12 papers were selected as semi-finalists.

- **Dept. of Electronic Engineering, Tsinghua University** Beijing, P. R. China
  Research assistant, Lab. of Optical Networking and Microwave Photonics *Feb. 2005 - Jul. 2010*
  - Kept updated with the cutting-edge research in optical networking
  - Responsible for project implementation, including topology and routing algorithm design and optimization, differentiated service provisioning, protection and restoration, service availability analysis, multi-period network planning, etc.

- Carried out joint research work with peers
- Took major roles in drafting research proposals based on the industry trends (proposal "Resource allocation and optimization in optical networks" funded by National 863 High Tech Program, year 2007-2008; proposal "Path-computation-element-based (PCE-based) network architecture and testbed for multi-layer multi-domain transport networks" funded by National 863 High Tech Program, year 2009-2010)
- Networked with world-class research groups and scientists through conferences and emails

Work Experience

- **Viscore Technologies Inc.** Ottawa, ON, Canada
  Senior network architect, software engineer *Sept. 2014 - present*
  - Topic: Reliable data replication over optical boradcast medium—optical coupler; prototype of HEDA protocol on NetFPGA-10G board
  - Setup NetFPGA-10G board on Fedora 14 through package installation, kernel module loading, and troubleshooting. Demonstrated UDP unicast, broadcast, and multicast over optical coupler with unidirectional fiber links.
- **Source Technologies International, Ltd.** Ottawa, ON, Canada
  Consulting software engineer *Jun. 2014 - Aug. 2014*
  - Developed a mobile scenario manager app—a commerical product for iPhone iOS. The key techniques employed include UIStoryboard, Model-View-Controller (MVC) pattern, target-action pattern, delegation pattern, singleton pattern, core data framework to interact with a local SQLite database, JSON text parsing, and HTTP/HTTPS POST method to communicate with a remote server for credential authentication, and scenario fetching, update, and launching.
  - Tested app on iOS simulator and real iPhone device through Xcode. Created and Distributed iOS App Store Package to testers and clients for beta testing.
  - Developed an Android counterpart fulfilling the same requirements. Gained insights into Activity/Fragement lifecycle, and managed state transitions through callback methods. Designed user interface layout using XML. Debugged Java code using LogCat.
- **NEC Laboratories America, Inc.** Princeton, NJ, USA
  Visiting scholar, Dept. of optical networking *Jan. 2011 - Feb. 2011*
  - Topic: Xen hypervisor and virtual machine (VM) live migration
  - Setup Xen 4.0.1 pv-ops Ubuntu 10.10 through kernel compilation and kernel module loading. Setup a network file system server to store the disk image that can be mounted concurrently by multiple VM clients. Demonstrated VM live migration between two physical hosts connected by a D-Link gigabit switch (DGS-2205).
- **Ericsson (China) Communications Co., Ltd.** Bejing, P. R. China
  System design engineer intern, Dept. of broadband networks *Jul. 2009 - Sept. 2009*
  - Topic: IEEE 1588v2 (precision clock synchronization protocol) over Ethernet
  - Developed a solid understanding of the clock synchronization mechanism. Finished one technical report on protocol review. The knowledge acquired becomes critical in later designing a link-layer polling protocol for optical datacenters (project with Viscore Technologies Inc., Canada), where the issue of clock synchronization among ports was resolved using a similar yet simpler mechanism.

Computer Skills

Languages: C, C++, Java, Python, Objective-C, XML, AMPL, MATLAB, bash script, assembly language, Fortran, VHDL, SQL

Operating Systems: Linux, Windows

Applications: AMPL/lp_solve, AMPL/CPLEX, OPNET, system programming, socket programming, iOS programming, Android programming, design patterns, Xcode, Eclipse, Git, LaTeX, Emacs, PSTricks, Gnuplot, Origin, PSPICE, MULTISIM, PROTEL

Professional and Volunteer Activities

- Optical Society of America (OSA) Young Professionals (YP) Program, April 2011 - December 2013
- **Technical committee member** of OSA Photonic Networks and Devices (Networks) 2013, 2014
- **Technical committee member** of IEEE International Conference on Communications (ICC), Symposium on Optical Networks and Systems 2012, 2013, 2014, 2015
- **Technical committee member** of IEEE International Conference on Optical Network Design and Modeling (ONDM) 2013, 2014, 2015
- **Technical committee member** of IEEE International Conference on Computing, Networking and Communications (ICNC), Optical and Grid Computing Symposium 2014, 2015
- **Technical committee member** of IEEE International Conference on Networks (ICON) 2012, 2013
- **Organization committee member** of the 56th Canadian Operational Research Society (CORS) Annual Conference, Telecommunications Cluster 2014
- **Reviewer** for IEEE/OSA Journal of Lightwave Technology (3), IEEE/OSA Journal of Optical Communications and Networking (5), IEEE Transactions on Communications (1), IEEE Communications Letters (1), Elsevier Computer Networks (2), Elsevier Computer Communications (1), Elsevier Optical Switching and Networking (11), Springer Photonic Network Communications (1), Springer Telecommunication Systems (1), Wiley International Journal of Communication Systems (1), Chinese Optics Letters (1), Acta Electronica Sinica (1), and many good conferences such as IEEE INFOCOM, IEEE ICC, IEEE GLOBECOM, IEEE DRCN, IEEE ONDM, etc.

Journal Papers

1. **Wenda Ni**, Changcheng Huang, and Jing Wu, "Integrated design of fault localization and survivable mapping in IP over transparent WDM networks," *Springer Photonic Network Communications*, Jun. 2014.
2. **Wenda Ni**, Changcheng Huang, Yunqu Leon Liu, Weiwei Li, Kin-Wai Leong, and Jing Wu, "POXN: a new passive optical cross-connection network for low-cost power-efficient datacenters," *IEEE/OSA Journal of Lightwave Technology*, vol. 32, no. 8, pp. 1482–1500, Apr. 15, 2014. (First-round review decision is "accept pending minor revisions".)
3. **Wenda Ni**, Changcheng Huang, and Jing Wu, "Provisioning high-availability datacenter networks for full bandwidth communication," *Elsevier Computer Networks, Special Issue on Communications and Networking in the Cloud*, vol. 68, pp. 71–94, Aug. 2014. (A thorough study with 24 pages in double-column format. 13 papers were accepted out of 60 submissions. Decision from the first-round review is "conditional accept" subject to "moderate revisions".)
4. **Wenda Ni**, Changcheng Huang, Jing Wu, and Michel Savoie, "Availability of survivable Valiant load balancing (VLB) networks over optical networks," *Elsevier Optical Switching and Networking, Special Section on Cross-Layer Innovations*, vol. 10, no. 3, pp. 274–289, Jul. 2013. (Runner-up for the 2013 Fabio Neri Best Paper Award—one winner and three runners-up were selected from all papers published in this journal in year 2013)

5. **Wenda Ni**, Jing Wu, Changcheng Huang, and Michel Savoie, "Analytical models of flow availability in two-layer networks with dedicated path protection," *Elsevier Optical Switching and Networking, Special Issue on Advances in Optical Networks Control and Management*, vol. 10, no. 1, pp. 62–76, Jan. 2013.

6. **Wenda Ni**, Xiaoping Zheng, Chunlei Zhu, Yanhe Li, Yili Guo, and Hanyi Zhang, "Achieving resource-efficient survivable provisioning in service differentiated WDM mesh networks," *IEEE/OSA Journal of Lightwave Technology*, vol. 26, no. 16, pp. 2831–2839, Aug. 15, 2008.

7. Yanwei Li, **Wenda Ni**, Heng Zhang, Yanhe Li, and Xiaoping Zheng,"Availability analytical model for permanent dedicated path protection in WDM networks," *IEEE Communications Letters*, vol. 16, no. 1, pp. 95–97, Jan. 2012.

8. Qingshan Li, **Wenda Ni**, Yanhe Li, Yili Guo, Xiaoping Zheng, and Hanyi Zhang, "Incremental survivable network design with topology augmentation in SDH/SONET mesh networks," *Springer Photonic Network Communications*, vol. 18, no. 3, pp. 400–408, 2009.

9. Chunlei Zhu, **Wenda Ni**, Yu Du, Yanhe Li, Xiaoping Zheng, Yili Guo, and Hanyi Zhang, "New and improved approaches for wavelength assignment in wavelength-continuous optical burst switching (OBS) networks," *SPIE Optical Engineering*, vol. 46, no. 9, 090504, Sept. 2007.

10. Qingshan Li, Xiaoping Zheng, **Wenda Ni**, Yanhe Li, Hanyi Zhang, "Incremental survivable network design against node failure in SDH/SONET mesh networks," *Springer Photonic Network Communications*, vol. 23, no. 1, pp. 25–32, Feb. 2012.

11. **Wenda Ni**, Qingshan Li, Yanhe Li, Hanyi Zhang, Bingkun Zhou, and Xiaoping Zheng, "Survivability in optical transport networks," *Acta Electronica Sinica*, vol. 41, no. 7, pp. 1395–1405, Jul. 2013. (in Chinese)

12. **Wenda Ni**, Chunlei Zhu, and Xiaoping Zheng, "Design and implementation of all optical networks supporting differentiated services," *ZTE Communications*, vol. 12, no. 6, pp. 10–13, Dec. 2006. (in Chinese)

Conference Papers (Selected)

1. **Wenda Ni**, Changcheng Huang, and Jing Wu, "On capacity provisioning in datacenter networks for full bandwidth communication," in *Proc. IEEE International Conference on High Performance Switching and Routing (HPSR)*, July 2013, pp. 62–67.

2. **Wenda Ni**, Jing Wu, Changcheng Huang, and Michel Savoie, "Flow availability analysis in two-layer networks with dedicated path protection at the upper layer," in *Proc. IEEE International Conference on Communications (ICC)*, Jun. 2012, CQR-P2.

3. **Wenda Ni**, Changcheng Huang, Jing Wu, Qingshan Li, and Michel Savoie, "Optimizing the monitoring path design for independent dual failures," in *Proc. IEEE International Conference on Communications (ICC)*, Jun. 2012, ONS03.

4. **Wenda Ni**, Erwin Patzak, Michael Schlosser, and Hanyi Zhang, "Availability evaluation in shared-path-protected WDM networks with startup-failure-driven backup path reprovisioning," in *Proc. IEEE International Conference on Communications (ICC)*, May 2010, ON02.

5. **Wenda Ni**, Yabin Ye, Michael Schlosser, Erwin Patzak, and Hanyi Zhang, "Survivable mapping with maximal physical-layer failure-localization potential in IP over transparent optical networks," in *Proc. IEEE/OSA Optical Fiber Communication Conference and Exposition (OFC)*, Mar. 2010, OWH1. (Semi-finalist in the 2010 Corning Outstanding Student Paper Competition—10-12 papers were selected as semi-finalists out of over 430 student submissions)

6. **Wenda Ni**, Erwin Patzak, Michael Schlosser, Yabin Ye, and Hanyi Zhang, "On operating shared-path-protected WDM networks non-revertively by using backup path reprovisioning," in *Proc. IEEE/OSA Optical Fiber Communication Conference and Exposition (OFC)*, Mar. 2010, OWH4.

7. **Wenda Ni**, Chunlei Zhu, Yabin Ye, Michael Schlosser, and Hanyi Zhang, "Reducing burst loss probability in multi-class optical burst switching networks by successive minimal incremental routing," in *Proc. IEEE/OSA Optical Fiber Communication Conference and Exposition (OFC)*, Mar. 2009, OWA6.

8. **Wenda Ni**, Michael Schlosser, Qingshan Li, Yili Guo, Hanyi Zhang, and Xiaoping Zheng, "Achieving optimal lightpath scheduling in survivable WDM mesh networks," in *Proc. IEEE/OSA Optical Fiber Communication Conference and Exposition (OFC)*, Feb. 2008, OWN5.

9. **Wenda Ni**, Chunlei Zhu, Xiaoping Zheng, Yanhe Li, Yili Guo, and Hanyi Zhang, "On routing optimization in multi-class optical burst switching networks," in *Proc. IEEE International Conference on Communications (ICC)*, May 2008, ON03-4.

10. **Wenda Ni**, Xiaoping Zheng, Chunlei Zhu, Yili Guo, Yanhe Li, and Hanyi Zhang, "An improved approach for online backup reprovisioning against double near-simultaneous link failures in survivable WDM mesh networks," in *Proc. IEEE Global Communications Conference (GLOBECOM)*, Nov. 2007, ONSS05-2.

11. Yanwei Li, **Wenda Ni**, Heng Zhang, Nan Hua, Yanhe Li, and Xiaoping Zheng, "Availability analytical model for permanent dedicated path protection in service differentiated WDM networks," in *Proc. IEEE/OSA Optical Fiber Communication Conference and Exposition (OFC)*, Mar. 2013, JW2A.01.

12. Jing Wu, **Wenda Ni**, and Changcheng Huang, "Flow availability in two-layer networks with dedicated path protection," in *Proc. OSA/IEEE/SPIE Asia Communications and Photonics Conference (ACP)*, Nov. 2012, ATh4D. (Invited talk)

References

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