

Lei Shi

PERSONAL DATA

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Nationality: Irish

EDUCATION

University of Göttingen, Faculty of Mathematics and Computer Science, Göttingen, Germany

Dr. rer. nat. March, 2007 - Nov, 2010
Dissertation: On Monitoring and Fault Management of Next Generation Networks.
Advisor: Prof. Xiaoming Fu (Member of Academia Europaea) and Prof. Dieter Hogrefe, University of Göttingen.

Uppsala University, Department of Information Technology, Uppsala, Sweden

Master, Computer Science September, 2005 - December, 2006
Master Thesis: The Implementation of Forwarding Elements on IXP Network processor
Advisor: Prof. Peter Sjödin, Royal Institute of Technology (KTH), Sweden

PROFESSIONAL EXPERIENCE

South East Technological University, Carlow, Ireland

[*September 2017 - now*] **Lecturer** in the Department of Computing and Networking. Develop and deliver lectures and lab sessions on networking, cryptography, data structure and algorithms, operating systems, online gaming technologies, game development, and programming. Supervise theses of postgraduates and final year projects for software development and data science programmes.

EMC Research Europe, Dell, Ireland

[*March 2017 - September 2017*] **Senior Research Scientist** on the 5G multi-domain slice management and next generation transport-layer architecture for the Internet. Working as the work package leader for EU H2020 SliceNet project, participate in the design and development of the overall architecture of 5G sliced networks and contribute to the technical specifications of user scenarios. Develop and port the rsync utility with NEAT APIs to automatically adapt the data transmission to the current network conditions.

TSSG, Waterford Institute of Technology, Waterford, Ireland

[*January 2016 - February 2017*] **Research Fellow** on the datacenter resource management and service management. Design and develop a latency-aware load scheduling system that schedules network flows in the multi-path cloud datacenters in order to meet the latency requirements of tenant applications, alleviating the unbalanced link utilization caused by hash-based multi-path routing methods.

Network Systems Laboratory, University of Massachusetts, Amherst, USA

[*January 2014 - December 2015*] **Researcher** under the supervision of Professor Tilman Wolf on the ChoiceNet project, one of the five largest Future Internet Architecture (FIA) projects sponsored by NSF, which aims to make technological choices in the network explicitly visible. Investigated how provider competition and user choices affect price and quality of network services in the context of fine-grained service control and automation of dynamic contracts for users.

TSSG, Waterford Institute of Technology, Waterford, Ireland

[*November 2010 - December 2013*] **Research Fellow** on the Federated, Autonomic Management of End-to-end communication services (FAME) project, which is funded by SFI as a strategic research cluster. Developed autonomic management solutions that can be applied to build federated network and service management systems that understand changes in the environment and coordinate their actions to reconfigure network resources and services to effectively deliver services on an end-to-end basis. Conducted research on the service management and resource management of cloud data center.

[*September 2008 - November 2010*] **Researcher** on the FP7 EFIPSANS IP project. The EFIPSANS project aimed at exposing the features in IPv6 protocols that could be exploited or extended for the purposes of designing and building autonomic networks and services. Worked on the IPv6 network monitoring and fault management.

Department of Computer Science, Technion –Israel Institute of Technology, Haifa, Israel

[*May 2013 - July 2013*] **Visiting Professor** hosted by Professor Roy Friedman.

University of Göttingen, Göttingen, Germany

[*March 2007 - November 2010*] **Research Assistant** working on network monitoring, protocols and fault management under the supervision of Professor Xiaoming Fu and Professor Dieter Hogrefe. Explored the potential of utilizing cross-layer interactions and hardware-software co-design to optimized the end-to-end TCP performance, designed and developed a network-processor based TCP proxy. Worked on various research topics such as peer-to-peer video streaming measurement and fault management of centrally controlled IP networks.

Huawei Beijing Research Institute, Beijing, China

[*April 2004 - August 2005*] **Research Engineer** developed Quidway NetEngine 5000E Terabit Switching Router based on Intel IXP2800 network processors. Conducted performance optimization of core routers where the flexibility and programmability are achieved by high-performance network processors. Designed and implemented protocols such as MPLS and IPv6 in data plane, as well as the solution for sending fragmented packets and jumbo frames. Analyzed and developed CSIX/SPI-4 RX/TX, queue management and QoS modules for the high-end distributed routing system.

Hutchison Optel Telecom Technology, Beijing, China

[*February 2001 - March 2004*] **Software Engineer** developed the routing protocols and software for MSTP and access routers. Transplanted communication protocols, such as RIP, TCP, UDP, ICMP and IGMP, to Optel's hardware platform – intelligence multi-access platform (IMAP). Implemented the Resilient Packet Ring (RPR) protocol for data plane and tested numerous communication protocols on the hardware platform using traffic generator Smartbits.

- Peng Yu and **Lei Shi**, Cloud/edge Computing and Big Data System with 6G, 6G Wireless Communications and Mobile Networking, pp. 224-240, ISBN 978-1-68108-797-9, 2021
- Baoju Liu, Peng Yu, Qiu Xuesong, **Lei Shi**, Survivability-aware routing restoration mechanism for smart grid communication network in large-scale failures, EURASIP journal on wireless communications and networking, Springer, 2020
- Baoju Liu, Peng Yu, Qiu Xuesong, **Lei Shi**, Risk-Aware Service Routes Planning for System Protection Communication Networks of Software-Defined Networking in Energy Internet, IEEE Access, 2020
- Yonghua Huo, Chunxiao Song, Xillin Ji, Mo Yang, Peng Yu, Minxing Tao, **Lei Shi**, DRL Driven Energy-efficient Resource Allocation for Multimedia Broadband Services in Mobile Edge Network, The IEEE International Symposium on Broadband Multimedia Systems and Broadcasting 2020
- Mo Yang, Peng Yu, Ying Wang, Xiuli Huang, Weiwei Miu, Pengfei Yu, Wei Li, Ruxia Yang, Minxing Tao, **Lei Shi**, Deep Reinforcement Learning based Green Resource Allocation Mechanism in Edge Computing driven Power Internet of Things, The 2020 annual International conference on Wireless Communications & Mobile Computing, 2020
- Zhuojun Jin, Peng Yu, ShaoYong Guo, Lei Feng, Fanqin Zhou, Minxing Tao, Wenjing Li, Xuesong Qiu, and **Lei Shi**, Cyber-Physical Risk Driven Routing Planning with Deep Reinforcement-Learning in Smart Grid Communication Networks, The 2020 annual International conference on Wireless Communications & Mobile Computing, 2020
- Feng Wang, Dingde Jiang, Houbing Song, **Lei Shi**, Branch-based Link Planning for Time-varying Space-air Integrated networks, IEEE ICC 2020
- Feng Wang; Dingde Jiang; Sheng Qi; Chen Qiao; **Lei Shi**, A Dynamic Resource Scheduling Scheme in Edge Computing Satellite Networks, Mobile Networks and Applications, Springer, 2020.
- Genaro Longoria, Alan Davy and **Lei Shi**, "Subsidies-Free Renewable Energy Trading: A Meta Agent Approach," in IEEE Transactions on Sustainable Energy, 2019
- Baoju Liu, Peng Yu, Fangzheng Chen, Fang Chen, Xuesong Qiu, **Lei Shi**, Risk-Aware Service Routes Planning for System Protection Communication Network in Energy Internet, IEEE/IFIP IM 2019
- Wenchen He, Shaoyong Guo, Yun Liang, Rui Ma, Xuesong Qiu, **Lei Shi**, QoS-Aware and Resource-Efficient Dynamic Slicing Mechanism for Internet of Things, Computers, Materials & Continua. Vol.61, No.3, 2019, pp.1345-1364. Tech Science Press.
- Jiang, Dingde; Wang, Wenjuan; **Lei Shi**; Song, Houbing, A Compressive Sensing-Based Approach to End-to-End Network Traffic Reconstruction, IEEE Transactions on Network Science and Engineering, 2018
- Martin Harrigan, **Lei Shi**, and Jacob Illum, Airdrops and Privacy: A Case Study in Cross-Blockchain Analysis, IEEE ICDM workshop BlockSEA, Singapore, November 17, 2018
- Longoria Genaro, Alan Davy, **Lei Shi**, Ornstein-Uhlenbeck-Levy Electricity Portfolios with Wind Energy Contracting, Technology and Economics of Smart Grids and Sustainable Energy, Springer, 2018
- Ouzhou Dong, Peng Yu, Huiyong Liu, Lei Feng, Wenjing Li, Fang Chen, **Lei Shi**, A Service Routing Reconstruction Approach in Cyber-Physical Power System Based on Risk Balance, IEEE/IFIP NOMS 2018
- Radhika Loomba, **Lei Shi**, and Brendan Jennings. State-machine driven Collaborative Mobile Sensing Serving Multiple Internet-of-Things Applications. In Proc. 2017 IEEE International Symposium on Integrated Network Management (IM 2017) . IEEE, 2017.
- Genaro Longoria, Fayaz Akhtar, and **Lei Shi**. Wireless Power Transmission in Smart Cities: The wisdom Wireless Smart Neighborhood. In 2017 6th International Conference on Smart Cities and Green ICT Systems, April. 2017.
- Genaro Longoria, and Lei Shi. Nash-Equilibrium Electricity Portfolios In the Smart Grid: A Genetic Annealing Solution. In 2017 5th International Istanbul Smart Grid Congress and Fair (ICSG) , April 2017.
- Runxin Wang, Juliano Araujo Wickboldt, Rafael Pereira Esteves, **Lei Shi**, Brendan Jennings and Lisandro Zambenedetti Granville, Using Empirical Estimates of Effective Bandwidth in

Network-Aware Placement of Virtual Machines in Datacenters, *IEEE Transactions on Network and Service Management*, 2016

- Runxin Wang, Simone Mangiante, Alan Davy, **Lei Shi**, Brendan Jennings, QoS-aware Multipathing in Datacenters Using Effective Bandwidth Estimation and SDN, 3rd International Workshop on Management of SDN and NFV Systems, CNSM 2016.
- Dingde Jiang, Jindi Liu, Zhihan Lv, Shuping Dang, Gaojie Chen, **Lei Shi**, A robust energy-efficient routing algorithm to cloud computing networks for learning. *Journal of Intelligent and Fuzzy Systems* 31(5): 2483-2495 (2016)
- Dingde Jiang, **Lei Shi**, Peng Zhang, Xiongzi Ge. QoS Constraints-Based Energy-Efficient Model in Cloud Computing Networks for Multimedia Clinical Issues. *Multimedia Tools and Applications*, Volume 75, Issue 22, pp 14307-14328, 2016
- Xingyun He, Cezary Zielinski, Steven Davy, **Lei Shi**, A Constrained Guess-Check Approach for Resource Allocation in the Robot Control System, *Advances in Reconfigurable Mechanisms and Robots II*, Ding, Xilun, Kong, Xianwen, Dai, Jian S. (Eds.), ISBN 978-3-319-23327-7, 2016, Springer.
- Genaro Longoria, Dingde Jiang, Alan Davy, **Lei Shi**, Wind Energy Allocation Strategies for Long-Term Contracts in Open Energy Markets, the International Conference on Renewable Energy Research and Applications (ICRERA) 2016, UK
- Renlong Tu, Jin Zhao, Xin Wang, **Lei Shi**, and Tilman Wolf, Design of a Load-Balancing Middlebox Based on SDN for Data Centers, *The International Workshop of Software-Defined Data Communications and Storage (SDDCS) 2015*, in conjunction with IEEE INFOCOM 2015, Hongkong, April 2015
- Runxin Wang, Rafael Esteves, **Lei Shi**, Juliano Araujo Wickbolt, Brendan Jennings, and Lisandro Zambenedetti Granville. Network-aware Placement of Virtual Machine Ensembles using Effective Bandwidth Estimation. In *Proc. 10th International Conference on Network and Service Management (CNSM 2014)*, Rio, Brazil, 2014 (acceptance rate $\approx 17\%$).
- Radhika Loomba, **Lei Shi**, and Brendan Jennings. State-machine driven Opportunistic Sensing by Mobile Devices. *IEEE Globecom*, Austin, 2014.
- Radhika Loomba, **Lei Shi**, Brendan Jennings, Roy Friedman, John Kennedy, and Joe Butler. Information Aggregation for Mobile Sensing in Mobile Cloud Computing. In *Proc. 2nd IEEE International Conference on Mobile Cloud Computing, Services and Engineering*, Oxford, 2014
- Runxin Wang, **Lei Shi**, and Brendan Jennings. On Classifying Traffic in NEMO Networks. In *Proc. 17th Research Colloquium on Communications and Radio Science into the 21st Century (RIA-CRS 2014)*, 2014.
- **Lei Shi**, Bernard Butler, Dmitri Botvich, and Brendan Jennings. Provisioning of Requests for Virtual Machine Sets with Placement Constraints in IaaS Clouds, *Proc. 13th IFIP/IEEE International Symposium on Integrated Network Management*, Ghent, 2013.
- Martin Serrano, **Lei Shi**, Mícheál Ó Foghlú, and Willie Donnelly. Cloud Services Composition Support by using Semantic Annotation and Linked Data. *Communications in Computer and Information Science*, Vol. 348, Fred, A.; Dietz, J.; Liu, K.; Filipe, J. (Eds.), ISSN 1865-0929, 2013, Springer Berlin Heidelberg.
- Runxin Wang, **Lei Shi**, Brendan Jennings. Ensemble Classifier for Traffic in Presence of Changing Distributions, *IEEE Symposium on Computers and Communications (ISCC)*, July, 2013, Croatia.
- **Lei Shi**, John Furlong, and Runxin Wang. Empirical Evaluation of Vector Bin Packing Algorithms for Energy Efficient Data Centers, the Third Workshop on Management of Cloud Systems (MoCS 2013), collocated with IEEE Symposium on Computers and Communications (ISCC), July 7th, 2013, Croatia.
- Runxin Wang, **Lei Shi**, and Brendan Jennings. Training Traffic Classifiers with Arbitrary Packet Sets. In *Workshop on Traffic Identification and Classification for Advanced Network Services and Scenarios (TRICANS2013)*, collocated with IEEE International Conference on Communications (ICC), Budapest, Hungary, June 2013.
- Steven Davy, Jason Barron, **Lei Shi**, Bernard Butler and Brendan Jennings. A Language Driven Approach to Multiple System Access Control, *Proc. 13th IFIP/IEEE International Symposium*

on Integrated Network Management, Ghent, 2013.

- **Lei Shi**, Bernard Butler, Runxin Wang, Dmitri Botvich, and Brendan Jennings. Optimal Placement of Virtual Machines with Different Placement Constraints in IaaS Clouds. In Proc. 2012 China Ireland Symposium on ICT and Energy Efficiency (CICT 2012), Dublin, Ireland, July 2012.
- Martin Serrano, **Lei Shi**, Mícheál Ó Foghlú, and Willie Donnelly. Ontological Modeling in Cloud Services: About Information Sharing to Support Service Composition. In Proc. International Conference on Knowledge Engineering and Ontology Development (KEOD 2011), Paris, France, October 2011.
- Lei Xu, **Lei Shi**, Runxin Wang, and Brendan Jennings. A Multiple Criteria Service Composition Selection Algorithm Supporting Time-sensitive rules. In Proc. 12th IFIP/IEEE International Symposium on Integrated Network Management (IM 2011), IEEE, 2011.
- **Lei Shi**, Alan Davy, David Muldowney, Steven Davy, Edzard Höfig, and Xiaoming Fu. Intrinsic Monitoring within an IPv6 Network: Mapping Node Specific information to Network Paths, International Conference on Network and Service Management (CNSM), Niagara Falls, Canada, Oct 2010.
- **Lei Shi** and Alan Davy, Intrinsic Monitoring within an IPv6 Network: Relating Traffic Flows to Network Paths, IEEE International Conference on Communications (ICC), Cape Town, South Africa, May 2010.
- **Lei Shi** and Steve Davy, On Minimizing the Network Nodes Update Time, IEEE Globecom 2010, Miami, USA, Dec 2010.
- Runxin Wang, **Lei Shi**, Mícheál Ó Foghlú. Using Meta Approach to Learn Data with Concept Drift, International Conference on Knowledge Discovery and Information Retrieval (KDIR 2010), Valencia, Spain, Oct. 2010.
- Jun Lei, **Lei Shi**, Xiaoming Fu, An Experimental Analysis of Joost Peer-to-Peer VoD Service, Peer-to-Peer Networking and Applications, Volume 3, Number 4, Pages 351-362, Springer Verlag, ISSN 1936-6442, December 2010.
- **Lei Shi** and Alan Davy, Security Considerations for Intrinsic Monitoring within IPv6 Networks, Proceedings of 9TH IEEE International Workshop on IP Operations and Management (IPOM 2009), Venice, Italy, Oct 2009.
- **Lei Shi**, Jing Fu and Xiaoming Fu, Loop-Free Forwarding Table Updates with Minimal Link Overflow, IEEE International Conference on Communications (ICC), Dresden, Germany, June 2009.
- **Lei Shi**, Peter Sjödin, A VLAN Ethernet Backplane for Distributed Network Systems, IEEE Workshop on High Performance Switching and Routing (HPSR) 2007, New York, USA, May 2007.

RESEARCH INTERESTS

Cloud computing, BlockChain, Network management, Resource management, Service management, Non-linear Optimization, Machine Learning.

TEACHING INTERESTS & ABILITIES

- General Interests: Networking, Programming, Security, IT management, Blockchain, Deep Reinforcement Learning, Math
- MSc in Data Science Dissertation, 2018-2022, IT Carlow)
- Final Year Project (Coordinator, 2017-2022, IT Carlow)
- Networking II (2021-2022, IT Carlow)
- Cryptography (2021-2022, IT Carlow)
- System Administration (2021, IT Carlow)
- Online Gaming Technologies (2017 - 2022, IT Carlow)
- Gameplay Programming II (2017- 2020, IT Carlow)
- Data Structure and Algorithms (2017, IT Carlow)
- Introduction to Programming (2017, IT Carlow)
- Operating Systems (2017, IT Carlow)
- Digital Image Processing (2016, GuiZhou Normal University)

- Business Information Systems (2016, Griffith College Cork)
- Object-Oriented Programming Principles (2016, Waterford IT, Nanjing University of Information Science and Technology)

PROFESSIONAL ACTIVITIES

- Guest Editor, IEEE Internet of Things Journal, Special Issue on Green IoT for Future Space-Air-Ground-Ocean Integrated Networks and Applications, 2022
- Technical Program Committee Chair, 14th EAI International Conference on Simulation Tools and Techniques, EAI, 2022
- TPC member, Blockchain & Cryptocurrency Congress, Barcelona, Spain, 2022
- Member of Irish IPv6 Task Force
- Reviewer for IEEE Network, JNSM, IM, Globecom, NOMS, MobiArch, LCN, IET Communications, ICNP, Computer Communications, etc.
- Open Day coordinator, Carlow Institute of Technology (2021-2022).
- Technical Program Committee Member: EAI SMARTGIFT 2020,
- Session Chair: IWCMC 2020
- TPC Member: EAI Simutools 2020
- TPC Member: IEEE SDN-NFV 2019
- TPC Member: EAI Simutools 2018
- TPC Member: IEEE IEEE Global Conference on Signal and Information Processing, 2015
- TPC Member: GSCIT 2014
- TPC Member: ISWTA 2014
- TPC Member: ICACCI 2014
- Invited speaker at IBM Haifa Research Lab, 2013
- Demonstration Program Committee Member: IEEE/IFIP IM 2013
- Industry Session Chair: IEEE/IFIP IM 2013

SUPERVISION

- Suan Zhu, PhD, 2026 (expected)
- Song Liu, PhD, 2024 (expected)
- Genaro Longoria, PhD, Completed 2020, first position: Economical and Social Research Institute
- Radhika Loomba, PhD, Completed 2017, first position: Intel Research
- Runxin Wang, PhD, Completed 2016, Currently with Google

HONORS AND AWARDS

Travel Grant for IEEE/IFIP CNSM, 2014
 Marie Skłodowska-Curie Fellowship, Marie Skłodowska-Curie Actions, 2013
 Elevate Fellowship, Irish Research Council, 2013
 Honorable Mention, MCM (Mathematical Contest in Modeling), USA, 2001
 Honors Graduate of Chongqing University, 2001
 Honors Thesis of Chongqing University, 2001

FUNDING

- Principal Supervisor, South East Regional Development Scholarship Fund, 2022
- Principal Supervisor, IT Carlow President Scholarship, 2022
- Principal Supervisor, IT Carlow President Scholarship, 2020
- Principal Supervisor, IT Carlow President Scholarship, 2018
- Principle Investigator, SFI Industry Fellowship Programme, Market-Oriented Resource Management for Embedding Network Slices (MORE), €71,411 direct cost budget, 2017 (declined)
- Work package leader (5G Multi-Domain Slice Management Plane), H2020 SliceNet, €7.9 M total budget, 2017
- Researcher, H2020 NEAT, €3.9 M total budget, 2017
- Principal Supervisor, WIT PhD Programme Scholarship, Open-market Energy Procurement Strategies to Integrate Wind Energy, €72,000 total budget, 2015
- Sole Principal Investigator, Elevate Fellowship, Irish Research Council, co-funded by EU Marie Curie Actions, An Adaptive Hierarchical Mobile Cloud Framework for Sensor Data Processing, €260,598.15 total budget, 2014-2016

- Collaborator, International Strategic Cooperation Award (ISCA) programme for China: €73, 800 total budget, March, 2013-March, 2015.
- Principal Supervisor, Irish Research Council Enterprise Partnership Scheme, co-funded by Intel, €72,000 total budget, 2012
- Researcher, Science Foundation Ireland, Strategic Research Cluster: Federated Autonomic Management of End-to-end Services (partners include TSSG-WIT; Trinity College; University College Dublin; University College Cork; and National University of Ireland, Maynooth), €3.7M total budget (November 2010 to December 2013).
- Researcher, EU FP7-ICT, Exposing the Features in IP version Six protocols that can be exploited/extended for the purposes of designing/building Autonomic Networks and Services (partners include TU Berlin, Fraunhofer FOKUS, BUPT, Telefonica, Alcatel-Lucent Bell Labs, Ericsson, Telecordia, Fujitsu, etc), €9,836,069 total budget (September, 2008 to November, 2010)