IEEE HPSR™

FINAL PROGRAM

11-14 May 2020 // Virtual Conference

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Welcome Message

Welcome to the 21st edition of the International Conference on High Performance Switching and Routing, wishing good health to you and your close ones during these trying times.

This version of the conference, which has turned into a virtual format for the first time in the history of the conference, has consolidated a unique program: exceptional keynotes and panelists from academia and industry, technical symposia with works accepted from an open call, and a series of invited sessions on different themes, from standardization of 5G technologies, Blockchain, and future technologies and concepts on computer networking, such as Name Defined Networking and New IP, as emerging topics in communications.

The technical symposia comprise a collection of peer-reviewed papers on diverse topics on networking, including practical applications of artificial intelligence technologies applied to communications, and progress on other novel networking concepts applied not only to communications but to other fields, such as energy.

The organizing committee and I hope that you find this conference informative and as a small window of opportunity to exchange information with people with similar interests in several parts of the world who represent a portion of our networking community.

Roberto Rojas-Cessa

General Chair

Organizing Committee

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Keynote Speakers

12 MAY 2020, 9:00am-9:45am

Prof. Jennifer Rexford

Princeton University, USA

Networks Capable of Change

Abstract: The early designers of the Internet fostered tremendous innovation by leaving much of the network's functionality to the programmable computers at its periphery. Unfortunately, the *inside* of the network has been much harder to change. Yet, changing the network is important to make the Internet more reliable, secure, performant, and cost-effective. The networking research community has struggled for many years to make networks more programmable. What has worked, and what hasn't, and what lessons have we learned along the way? This talk offers my perspective on these questions, through a 25-year retrospective of research on programmable networks, focusing on my own research experiences as well as reflections on major trends in the field. The talk advocates a sort of "ambitious pragmatism" that approaches an ambitious long-term goal (a programmable network infrastructure) through smaller, pragmatic steps while keeping an eye on the prize.

Biography: Jennifer joined the Computer Science Department at Princeton University in February 2005 after eight and a half years at AT&T Research. Her research focuses on Internet routing, network measurement, and network management, with the larger goal of making data networks easier to design, understand, and manage. Jennifer is the co-author of the book Web Protocols and Practice: HTTP/1.1, Networking Protocols, Caching, and Traffic Measurement (Addison-Wesley, May 2001) and co-editor of She's an Engineer? Princeton Alumnae Reflect (Princeton University, 1993, see recent talk about the book). Jennifer served as the Chair of ACM SIGCOMM from 2003 to 2007 and has served on the ACM Council, the board of the Computing Research Association, the advisory council of the Computer and Information Science and Engineering directorate at NSF, and the Computing Community Consortium. She received her BSE degree in electrical engineering from Princeton University in 1991 and her MSE and Ph.D. degrees in computer science and electrical engineering from the University of Michigan in 1993 and 1996, respectively. She was the winner of ACM's Grace Murray Hopper Award for outstanding young computer professional of the year for 2004.

12 MAY 2020, 1:05pm-1:50pm

Richard Li

Futurewei Technologies Inc., USA

New IP: Market Opportunities and Research Directions

Abstract: New IP is a new wave of internet technology developments and innovations. Leveraging and extending the existing IP architecture and protocols, New IP is aimed to address new market challenges and emerging industry verticals in a progressive and evolutionary way while maximally protecting the investment in the current Internet infrastructure. This talk will discuss new market opportunities, challenges, and requirements, and outline some research directions for New IP.

Biography: Dr. Richard Li is the Head of Network Technologies Lab, Chief Scientist and Vice President of Network Technologies of Futurewei Technologies Inc., Huawei R&D USA. Richard also serves as the Chairman of the ITU-T FG Network 2030. Previously he was the Vice-Chairman of the European ETSI ISG NGP (Next-Generation Protocols) from January 2016 to December 2019. He has also served as Chair of steering committees and technical program committees of some academic and industrial conferences. Before joining Futurewei, he worked with Cisco and Ericsson in the field of networking technologies, standards, solutions, and operating systems. Richard is extremely passionate about advancing data communications technologies and solving problems in their entirety, thus creating a bigger and long-term impact on the networking industry. During his career, Richard spearheaded network technology innovation and development in Routing and MPLS, Mobile Backhaul, Metro and Core Networks, Data Center, Cloud, and Virtualization. Currently, he leads a team of scientists and engineers to develop technologies for next-generation network architectures, protocols,

algorithms, and systems in support of forward-looking applications and industry verticals in the context of New IP and Network 2030.

13 MAY 2020, 9:00am-9:45am

Mohammad Alizadeh

Massachusetts Institute of Technology, USA

A Decade After: The Future of Datacenter Transport Protocols

Abstract: Over the last decade, large datacenter operators have replaced traditional transport protocols like Transmission Control Protocol (TCP) with protocols designed specifically for datacenter environments. These protocols, exemplified by Datacenter TCP (DCTCP), can reduce network latency by an order of magnitude, improve tolerance to traffic bursts ("Incast"), and dramatically improve flow completion times. In this talk, I will reflect on a decade of research on datacenter transport protocols. I will describe the key ideas underlying datacenter transport protocols, including congestion control and scheduling-based approaches, and highlight the evolution of these protocols from early schemes like DCTCP and pFabric to recent protocols like HPCC and Homa. I will then explain how three trends — rapidly increasing link speeds, limited switch buffer capacity, and the prevalence of short transfers — will push existing schemes to their practical limits. I will end with some ideas for overcoming these challenges by revisiting hop-by-hop flow control.

Biography: Mohammad Alizadeh is an Associate Professor of Computer Science at MIT. His research interests are in the areas of computer networks and systems and applied machine learning.

His current research focuses on algorithms and protocols for datacenter and wide-area networks, video streaming, and AI-based systems. Mohammad's research has garnered significant industry interest. His work on datacenter transport protocols has been implemented in Linux and Windows, and has been deployed by large network operators; his work on adaptive network load balancing algorithms has been implemented in Cisco's flagship datacenter switching products. Mohammad received his Ph.D. from Stanford University and then spent two years at Insieme Networks (a datacenter networking startup) and Cisco before joining MIT. He is a recipient of the Microsoft Research Faculty Fellowship, VMware Systems Research Award, NSF CAREER Award, SIGCOMM Rising Star Award, Alfred P. Sloan Research Fellowship, and multiple best paper awards.

13 MAY 2020, 1:00pm-1:45pm

Peter Jones

Cisco Enterprise HW Team, USA

Back to the future – 10Mb/s Ethernet again!

Abstract: The business of standards development has changed. We focus on fitting technology to the application, not the other way around. 10Mb/s Single Pair Ethernet (10SPE) has the potential to truly enable IT/OT convergence in our lifetime. What makes it different?

Biography: Peter is a Distinguished Engineer in Cisco's Enterprise HW team. He works on system architecture for Cisco's enterprise switching, routing, wireless, and IoT products. He's active in IEEE 802.3 and the Ethernet Alliance. He works on the evolution of technology to add value to physical infrastructure, and how to make technology consumable.

14 MAY 2020, 9:55am-10:40am

Yuanyuan Yang,

National Science Foundation, State New York University, USA

The Role of Computer Architecture in Emerging Cloud Computing and Edge Computing Paradigms

Abstract: Currently, we are facing great challenges of even-increasing demand of computing power from many computation-intensive applications, such as machine learning, and big data, and the

diminishing returns of Moore's Law and Dennard Scaling of CMOS technology. Cloud computing, and more recently, edge computing have emerged as promising paradigms to address these challenges and provide performance scalability. In this talk, I will explore the central role computer architecture research plays in these new computing paradigms. I will first discuss how to greatly reduce the hardware cost of data center networks by an architectural approach of utilizing inherent server redundancy. I will then present a pervasive edge computing platform where heterogeneous edge devices (e.g., smartphones, tablets, IoT and vehicles) can collaborate to sense, process data and create many novel applications at the edge. I will also show how to implement such a platform by a modular, composable hardware/software architecture with specialized edge devices.

Biography: Yuanyuan Yang received the BEng and MS degrees in computer science and engineering from Tsinghua University, Beijing, China, and the MSE and Ph.D. degrees in computer science from Johns Hopkins University, Baltimore, Maryland, USA. Dr. Yang is a SUNY Distinguished Professor in the Department of Electrical & Computer Engineering and Department of Computer Science at Stony Brook University, New York, USA. She is currently on leave serving as a Program Director at the US National Science Foundation. She has served as the Associate Dean for Academic Affairs of College of Engineering and Applied Sciences at Stony Brook University and a Division Director of New York State Center of Excellence in Wireless and Information Technology. Dr. Yang is internationally recognized for her contributions in parallel & distributed computer architectures and systems. She was named an IEEE Fellow in 2009 for contributions to parallel and distributed computing. Her current research interests include parallel computer architecture, network-based computing, cloud computing, edge computing, and mobile computing. She has published over 400 scientific papers in leading refereed journals and conferences. Dr. Yang is currently the Associate Editor-in-Chief for IEEE Transactions on Cloud Computing and an Associate Editor for ACM Computing Surveys. She has served as the Associate Editor-in-Chief for IEEE Transactions on Computers, and an Associate Editor for IEEE Transactions on Computers and IEEE Transactions on Parallel and Distributed Systems.

Invited Speakers

Highspeed 5G: Industry Standards and R&D Progress
Xiang Liu, Futurewei Technologies, USA
Gregory Wright, Nokia Bell Labs, USA
Jun Shan Wey, ZTE TX Inc., USA
Kai Yang, Columbia University, USA

Invited Session on New IP I
K. K. Ramakrishnan, University of California, USA
Kiran Makhijani, Futurewei Technologies, USA
Lijun Dong, Futurewei Technologies, USA
Lin Han, Futurewei Technologies, USA

Invited Session on New IP II
Mohamed Faten Zhani, l'École de Technologie Supérieure, Canada
Uma Chunduri, Futurewei Technologies, USA
Cedric Westphal, Futurewei Technologies, USA
Zili Ning, University of Surrey, UK

NDN Realization Using Bloom Filter Variants
Hyesook Lim, Ewha Womans University, South Korea
Hayoung Byun, Ewha Womans University, South Korea
Jungwon Lee, Ewha Womans University, South Korea
Ju Hyoung Mun, Boston University, USA

Invited Session on Blockchain
Rosario Gennaro, City University of New York (CUNY), USA
Chris Wilmer, University of Pittsburgh, USA
Bina Ramamurthy, University at Buffalo, USA
Anita Raja, City University of New York (CUNY), USA
Qiang Tang, New Jersey Institute of Technology, USA

Guest Speakers

Prof. Moshe Kam
Dean of Newark College of Engineering
New Jersey Institute of Technology

Prof. Abbas Jamalipour
Fellow IEEE, IEICE, IEA
HPSR Steering Committee Chair

Tutorials

11 MAY 2020, 8:30am-10:30am

TUTORIAL 1: ***Machine Learning for Data Mining in Computer Network***

Kohei Shiomoto
Tokyo City University, Japan

Abstract: Recently machine learning and deep learning have been applied to various network management tasks. In this tutorial, we learn machine learning algorithms applied to data mining in computer network management. We learn machine learning algorithms including multi-layer perceptron (MLP), auto-encoder (AE), and generative adversarial network (GAN).

The existing supervised learning algorithms require a dataset of high quality and quantity of human-annotated data for training. To minimize the human labor-intensive and time-consuming dataset annotation task, it is thus required to find a data-efficient learning algorithm/technique to build a classifier model. We should also note that anomalies are difficult to occur in practice, so the anomaly classes are usually sparse in the dataset. As such it is extremely important for the operators to deal with an unbalanced data set where a few class has only a handful of data instances while others have a lot of data instances. We discuss challenges when we apply machine learning applied to computer network problems including training and inference, data labeling costs, feature selection, anomaly detection, and few-shot learning.

A hands-on session is prepared to understand the application of machine learning to the intrusion detection system.

Biography: Kohei Shiomoto is a Professor of Tokyo City University, Tokyo Japan. He has had been engaged in R&D in the data communication industry for over 28 years since he joined NTT Laboratories in 1989. He has been active in the areas of Network Virtualization, Data-Mining for Network Management, Traffic & QoE Management since he joined Tokyo City University in 2017.

From 1989 to 2017, he produced technologies to innovate Internet, Mobile, and Cloud at NTT Laboratories, where he was engaged in research and development of high-speed computer networks including ATM networks, IP/MPLS networks, GMPLS networks, network virtualization, traffic management, network analytics. From 1996 to 1997 he was engaged in research in high-speed networking as a visiting scholar at Washington University in St. Louis, MO, USA. He published 70+ journal papers and 130+ reviewed international conference papers. He published 6 RFCs in IETF.

He serves as Associate Editor of the IEEE Transactions on Network Service and Management and as Series Editor of the IEEE Communications Magazine (Telecom Software, Network Virtualization, and Software Defined Networks series). He served as Guest Co-Editor for a series of special issues on Management of Softwareized Networks established in the IEEE Transactions on Network Service and Management. He served as Guest Co-Editor for the IEEE Communications Magazine. He served in various roles for organizing IEEE ComSoc profile conferences such as IEEE NOMS, IEEE IM, IEEENetSoft. He presented keynote speeches and took part in the distinguished expert panels.

He received his B.E., M.E., and Ph.D. degrees in information and computer sciences from Osaka University, Osaka in 1987, 1989, and 1998. He is a Fellow of IEICE, a Senior Member of IEEE, and a member of ACM.

11 MAY 2020, 10:45am-1:45pm

TUTORIAL 2: ***Segment Routing over IPv6 (SRV6) and the Network Programming Model***

Stefano Salsano
University of Rome Tor Vergata, Italy

Abstract: Segment Routing for IPv6 (SRv6 in short) is the instantiation of the Segment Routing (SR) architecture for the IPv6 data plane. SRv6 is based on loose source routing: a list of segments (represented as IPv6 addresses) can be included in the IPv6 packet headers. According to the “SRv6 Network Programming Model”, the segments can represent both topological way-points (nodes to be crossed along the path towards the destination) and specific operations on the packet to be performed in a node. Examples of such operations are encapsulation and decapsulation, lookup into a specific routing table. More in general, arbitrarily complex behaviors can be associated with an SRv6 segment, like those that are executed in a Virtual Network Function (VNF).

The SRv6 standardization activity in IETF is progressing at a good pace. Recently, several large-scale deployments of SRv6 in operator networks have been disclosed. SRv6 implementations from different vendors are available. Linux supports SRv6 since Feb 2017.

In this tutorial, we first discuss the SRv6 architecture and the SRv6 Network Programming model. We present the main use case scenarios (SRv6 Overlays, Traffic Engineering, Fast Restoration). We introduce the ecosystem of SRv6, which includes different hardware and software implementations (proprietary and Open Source). We analyze the Linux kernel SRv6 implementation, also discussing its packet forwarding performance. Finally, we show how to build SRv6 based services using Linux on a Mininet emulation.

Biography: Stefano Salsano is an Associate Professor in the Electronic Engineering Dept. of University of Rome Tor Vergata. Since July 2018 he is the Coordinator of the Bachelor's Degree "Ingegneria di Internet" and of the Master's Degree "ICT and Internet Engineering". He received his Ph.D. in 1998 from Univ. of Rome "La Sapienza". In 2000 he has joined the University of Rome Tor Vergata as Assistant Professor.

He participated in 16 research projects funded by the EU, being Work Package leader or unit coordinator in 8 of them, technical coordinator in two of them (Simple Mobile Services, SCISSOR) and project coordinator in one (Superfluidity). He has been principal investigator in several research and technology transfer contracts funded by industries with total funding of more than 1.7M€. Since 2017 he is cooperating with Cisco Systems on IPv6 Segment Routing and he has received two Research Grants from Cisco Systems. His current research interests include Software-Defined Networking, Network Function Virtualization, Cybersecurity, Mobile and Pervasive Computing. He is co-author of an IETF RFC and of more than 160 papers and book chapters. He has been the General Chair of the 14th International Conference on Network and Service Management (CNSM 2018).

Follow with a VM for Virtualbox

You can follow the hands-on part with a VM for Virtualbox. Download and installation instructions are available at:

https://github.com/netgroup/rose/blob/master/docs/rose-vm.md

If you're interested, please download and configure in advance the VM, as it can take a long while time to download.

Program At-A-Glance

Monday, May 11, 2020	Tuesday, May 12, 2020	Wednesday, May 13, 2020	Thursday, May 14, 2020
	8:40am-8:55am Welcome/Opening		
8:30am-10:30am Tutorial 1 ML and DS In Networks	9:00am-9:45am Keynote 1 Jennifer Rexford (Princeton)	9:00am-9:45am Keynote 3 Mohammad Alizadeh (MIT)	8:30am-9:50am Invited Session 4 NDN and Bloom Filters
10:45am-1:45pm Tutorial 2 Network Programming Segment Routing	9:50am-11:10am Invited Session 1 5G Standardization	9:50am-11:10am Tech. Session 2 Network Architecture	9:55am-10:40am Keynote 5 Yuanyuan Yang (NSF)
	11:15am-12:55pm Tech. Session 1 Switching, Routing, Forwarding	11:15am-12:50pm Invited Session 3 New IP II	10:45am-12:05am Tech. Session 4 Network Application/Architecture
	Recess	Recess	Recess
	1:05pm-1:50pm Keynote 2 Richard Li (Futurewei)	1:00pm-1:45pm Keynote 4 Peter Jones (Cisco)	12:15pm-1:55pm Invited Session 5 Blockchain
	1:55pm-3:30pm Invited Session 2 New IP I	1:45pm-2:50pm Industry Panel	1:55pm-2:05pm Awards Ceremony
	3:35pm-4:55pm Workshop 1 NFV SDN / LPWAN	2:50pm-4:10pm Tech. Session 3 Resource Allocation	2:05pm-2:10pm Wrap up / Closing

Full Program

Day 1 (May 11): Tutorials Schedule

Session Chair: Eiji Oki (Kyoto University, Japan)

8:30am-10:30am
Tutorial 1: **Machine Learning for Data Mining in Compute Networks,**
Kohei Shiomoto, Professor, Tokyo City University, Japan

10:30am-10:45am
Recess

10:45am-1:45pm
Tutorial 2: **Segment Routing over IPv6 (SRV6) and the Network Programming Model**,
Stefano Salsano, Professor, University of Rome Tor Vergata, Italy

Day 2 (May 12): Technical Program

8:15am-8:30am
Presentation platform open to presenters for testing.

8:40am-8:50am
Welcome message by Dean and 49th President and CEO of IEEE Prof. **Moshe Kam,** New Jersey Institute of Technology

- 8:40am - Welcome Remarks, Moshe Kam (New Jersey Institute of Technology, USA)
- 8:50am - Opening Remarks, Abbas Jamalipour (The University of Sydney, Australia)
- 8:55am - Opening, Roberto Rojas-Cessa, IEEE HPSR 2020 Organizing Committee

9:00am-9:45am
Keynote 1: Jennifer Rexford, Professor, Princeton University, USA
Networks Capable of Change
Session Chair: Roberto Rojas-Cessa (New Jersey Institute of Technology, USA)

9:50am-11:10am
Session I1: **Highspeed 5G Fronthaul: Industry Standards and R&D Progress**
Session Chair: Yuanqiu Luo, Director of Optical Access Standards, Futurewei Technologies, USA

I1-1: **Optical Fiber Communication Technologies in the 5G Era**, Xiang Liu, Vice President for Optical Transport and Access, Futurewei Technologies, USA

I1-2: **Where the Skies are Not Cloudy All Day, or How Will We Ever Move the Radio Access Network into the Data Center?,** Gregory Wright, Nokia Bell Labs, USA

I1-3: **Optical Access Technologies for 5G xHaul Transport Network**, Jun Shan Wey, Director of Fixed Networks Technology Strategy and Standards, ZTE TX Inc., USA

I1-4: **AIOPS in the 5G Era,** Kai Yang, Distinguished Professor, Tongji University, China

11:15am-12:55pm
Session T1: Switching, Routing and Forwarding
Session Chair: Xiaojun (Matt) Cao (Georgia State University, USA)

T1-1 **SERENADE: A Parallel Iterative Algorithm for Crossbar Scheduling in Input-Queued Switches**

Long Gong (Georgia Institute of Technology, USA); Liang Liu (Georgia Tech, USA); Sen Yang (Facebook, USA); Jun Xu (Georgia Tech, USA); Yi Xie (Xiamen University, China); Xinbing Wang (Shanghai Jiaotong University, China).

T1-2 **Multibit Tries Packet Classification with Deep Reinforcement Learning**, Md Hasibul Jamil (Southern Illinois University Carbondale, USA); Ning Weng (Southern Illinois University at Carbondale, USA)

T1-3 **XOR-based Source Routing**
Jerome Lacan (ISAE-Supaero and University of Toulouse, France); Emmanuel Lochin (ENAC & Université de Toulouse, France)

T1-4 **Implementation of Accurate Per-Flow Packet Loss Monitoring in Segment Routing over IPv6 Networks**
Pierpaolo Loreti and Andrea Mayer (University of Rome "Tor Vergata", Italy); Paolo Lungaroni (CNIT, Italy); Stefano Salsano (University of Rome Tor Vergata, Italy); Rakesh Gandhi (Cisco Systems, Canada); Clarence Filsfils (Cisco Systems, Inc., Belgium)

T1-5 **PEQ: Scheduling Time-Sensitive Data-Center Flows Using Weighted Flow Sizes and Deadlines**, Vinay Krishna Gopala Krishna (NJIT, USA); Yagiz Kaymak (New Jersey Institute of Technology, USA); Chuan-bi Lin (Chaoyang University of Technology, Taiwan); Roberto Rojas-Cessa (New Jersey Institute of Technology, USA).

1:05pm-1:50pm
Keynote 2: Richard Li, Futurewei Technologies, USA
New IP: Market Opportunities and Research Directions
Session Chair: Roberto Rojas-Cessa (New Jersey Institute of Technology, USA)

1:55pm-3:30pm
Session I2: New IP I
Session Chair: Xiang Sun (University of New Mexico, USA)

I2-1. Session Keynote: **K. K. Ramakrishnan**, Professor, University of California at Riverside, USA
Are Network Layer Enhancements Needed for Supporting Emerging Applications?

I2-2. New IP: A Data Packet Framework to Evolve the Internet, Kiran Makhijani, Principal Research Scientist at Network Technologies Lab, Futurewei, USA

I2-3. Qualitative Communication Via Network Coding and New IP, Lijun Dong, Research Architect at Futurewei Technologies, USA

I2-4. Key technologies to realize the end-to-end guaranteed service for both bandwidth and latency for future network, Lin Han, Futurewei Inc., USA

3:35pm-4:55pm
International Workshop on NFV, SDN, and LPWAN
Session Chair: Bijoy Chand Chatterjee (South Asian University, USA)

W1. Automatic eNodeB State Management in LTE Networks Using Semi-Supervised Learning with Adversarial Autoencoder, Kazuki Hara (University of Tsukuba, Japan); Kohei Shiomoto (Tokyo City University, Japan); Chin Lam Eng (Ericsson Japan, Japan); Sebastian Backstad (Ericsson, Japan)

W2. Impact of Large-Scale Correlated Failures on Multilevel Virtualized Networks, Max Medina (Missouri University of Science and Technology, USA); Mohammed J.F. Alenazi (King Saud University, Saudi Arabia); Egemen K. Çetinkaya (Verizon, USA)

W3. Analyzing Service Chaining of Virtualized Network Functions with SR-IOV, Aris Leivadeas (École de Technologie Supérieure, Canada); Matthias Falkner (Cisco, Germany); Nikolai Pitaev (Cisco Systems, Germany).

W4. Virtual Machine Introspection for Anomaly-Based Keylogger Detection, Huseyn Huseynov (The City College of New York, USA); Tarek Saadawi (The City University of New York/The City College, USA); Kenichi Kourai (Kyushu Institute of Technology, Japan); Obinna Igbe(City University of New York, USA)

W5. Energy-Efficient Drone Coverage Path Planning Using Genetic Algorithm, Rutuja Shivgan and Ziqian (Cecilia) Dong (New York Institute of Technology, USA)

Day 3 (May 13): Technical Program

9:00am-9:45am
Keynote 3: **Mohammad Alizadeh**, Massachusetts Institute of Technology
"**A Decade After: The Future of Datacenter Transport Protocols**"
Session Chair: Roberto Rojas-Cessa (New Jersey Institute of Technology, USA)

9:50am-11:10am
Technical Session 2: Network Architectures
Session Chair: Moshe Zukerman (City University of Hong Kong)

T2-1. Anonymous Blockchain Based Routing for Moving-target Defense Across Federated Clouds, Yousra Magdy (Faculty of Engineering Alexandria University, Egypt); Mona Kashkoush (The City of Scientific Research and Technological Applications, Egypt); Mohamed Azab (Advanced Computing and Information Systems Laboratory, ECE, University of Florida & Virginia Tech, USA); Mohamed Rizk (Alexandria University, Egypt)

T2-2. Dynamic Network Slicing Using Utility Algorithms and Stochastic Optimization, Sidharth Sharma and Ashwin A Gumaste (Indian Institute of Technology, Bombay, India); Mallik Tatipamula (Ericsson Research, USA)

T2-3. Bridging the Gap: FPGAs as Programmable Switches, Thomas Luinaud (Polytechnique Montréal, Canada); Thibaut Stimpfling and Jeferson Santiago da Silva (Polytechnique Montreal, Canada); Pierre J.M. Langlois (Ecole Polytechnique de Montreal, Canada); Yvon Savaria (École Polytechnique de Montréal, Canada)

T2-4. A Theil Index-Based Countermeasure Against Advanced Vampire Attack in Internet of Things, Cong Pu, Jacqueline Brown and Logan Carpenter (Marshall University, USA)

11:15am-12:50pm
Invited Session **I3: New IP II**
Session Chair: Xiang Sun (University of New Mexico, USA)

I3.1 Session Keynote: **Mohamed Faten Zhani, Professor, l'École de Technologie Supérieure (ÉTS Montreal), Canada**
FlexNGIA – Drawing the Architecture of the Next-Generation Tactile Internet

I3.2 **Deep Reinforcement Learning for NFV-based Service Function Chaining in Multi-Service Networks**, Zili Ning, Ning Wang, and Rahim Tafazolli, University of Surrey, Guildford, UK.

I3.3 **5G/B5G: Role of Fixed Networks (Transport Network Requirements, Challenges and Beyond)**
Uma Chunduri, Futurewei, USA

I3.4 **Transport Protocols for New IP**
Cedric Westphal, Futurewei, USA

12:50pm-1:00pm
Recess

1:00pm-1:45pm
Keynote 4: **Peter Jones, Cisco**, Distinguished Engineer, Cisco Enterprise HW Team, USA
Back to the future – 10Mb/s Ethernet again!
Session Chair: Roberto Rojas-Cessa (New Jersey Institute of Technology, USA)

1:45pm-2:50pm
Industry Panel: **Machine Learning for Networking, and Vice versa**

Panel Chair: **H. Jonathan Chao** (Tandon School of Engineering, NYU, USA)

Panelists:
Anwar Walid, Bell Labs, USA
Junchen Jiang, University of Chicago, USA
Ming Zhang, Alibaba, USA
Siddhartha Sen, Microsoft Research, NYC, USA

2:50pm-4:10pm
Session T3: **Network Resource Allocation**
Session Chair: Vinod Vokkarane (University of Massachusetts, USA)

T3-1. Performance Evaluation of 5G mmWave Networks with Physical-Layer and Capacity-Limited Blocking, Jingjin Wu (BNU-HKBU United International College, China); Meiqian Wang, Yin-Chi Chan and Eric W. M. Wong (City University of Hong Kong, Hong Kong); Taejoon Kim (University of Kansas, USA)

T3-2. Shared Backup Resource Assignment for Middleboxes Considering Server Capability, Risa Fujita, Fujun He and Eiji Oki (Kyoto University, Japan)

T3-3. Resilient Virtual Network Function Placement Model Based on Recovery Time Objectives, Naoki Hyodo, Takehiro Sato, Ryoichi Shinkuma and Eiji Oki (Kyoto University, Japan)

T3-4. Distributed Server Allocation Model with Preventive Start-time Optimization Against Single Failure, Shuto Masuda and Fujun He (Kyoto University, Japan); Akio Kawabata(NTT, Japan); Eiji Oki (Kyoto University, Japan)

Day 4 (May 14): Technical Program

8:30am-9:50am
Session I4: **NDN Realization Using Bloom Filter Variants**
Session Chair: **HyeSook Lim** (Ewha Women University, South Korea)

I4-1. **Introduction to Bloom filter variants**,Prof. **Hyesook Lim**, Ewha Womans University, South Korea

I4-2. **Using functional Bloom filters for name lookup in NDN**,
Hayoung Byun, Ewha Womans University, South Korea

I4-3. **Using Dual-load Bloom filter for name lookup in NDN**,
Dr. **Jungwon Lee**, Ewha Womans University, South Korea.

I4-4. **FIB Sharing and Cache Sharing using Bloom filters in NDN**,
Ju Hyoung Mun, Boston University, USA.

9:55am-10:40am
Keynote 5: Yuanyuan Yang, National Science Foundation, State New York University, USA
The Role of Computer Architecture in Emerging Cloud Computing and Edge Computing Paradigms

10:45am-12:05am
Session T4: Network Application and Architectures
Session Chair: Rafael Asorey-Cacheda (Technical University of Cartagena, Spain)

T4-1. **A State-Merging Scheduling Method for Bulk Transfers with Store-and-Forward over Inter-DC Optical Networks**, Xiao Lin and Jia Zhang (Fuzhou University, China); Shengnan Yue (Shanghai Jiao Tong University, China); Yuanlong Tan and Xiaoyu Wang (University of Virginia, USA); Weiqiang Sun (Shanghai Jiaotong University, China); Malathi Veeraraghavan (University of Virginia, USA); Weisheng Hu (Shanghai Jiao Tong University, China)

T4-2. **i-CEON: Information-centric Elastic Optical Transport Network for Efficient Content Delivery**, Takashi Miyamura (NTT, Japan); Akira Misawa (Chitose Institute of Science and Technology, Japan)

T4-3. **Effectiveness of Many-to-Many GRASP-Based Routing Algorithms for Power Distribution**, Jorge Medina, Zhengqi Jiang and Roberto Rojas-Cessa (New Jersey Institute of Technology, USA)

T4-4. **A Performance Evaluation of an In-body Nano-Network Architecture**, Sebastian Canovas-Carrasco, Rafael Asorey-Cacheda, Antonio-Javier Garcia-Sanchez and Joan Garcia-Haro (Technical University of Cartagena, Spain); Pawel Kulakowski (AGH University of Science and Technology, Poland); Krzysztof Wojcik (Jagiellonian University, Poland)

12:05am-12:15pm
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12:15pm-1:55pm
Session I5. **Emerging Applications of Blockchain**
Session Chair: Renita Murimi (University of Dallas, USA)

I5-1. Session Keynote: **Rosario Gennaro**, CCNY-CUNY, USA
I5-2 **Capturing Carbon Emissions & The People Who Lie About Them**
Chris Wilmer, University of Pittsburgh, USA.
I5-3 **Reimagining a decentralized world — From cryptocurrency to global cleanup**
Bina Ramamurthy, University at Buffalo, USA
I5-4 **Blockchain for Distributed Applications**,
Anita Raja, Hunter College- CUNY, USA
I5-5. **Dumbo: Fast Asynchronous Permissioned Consensus Protocols**
Qiang Tang, New Jersey Institute of Technology, USA

1:55pm-2:05pm
Award Announcements

- Best Paper Award IEEE HPSR 2020
- Best Student Award IEEE HPSR 2020
- Best Online Presentation Award IEEE HPSR 2020

2:05pm-2:10pm
Closing of Conference

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