



The Fifth IEEE International Conference on Cloud Engineering **IC2E 2017**

KEYNOTES

Debanjan Saha (AWS)
Andrew Warfield (UBC)
Johannes Gehrke (Microsoft)
James Bottomley (IBM)
Colin Bennett (UVic)
Craig Shank (Microsoft)

CO-LOCATED EVENTS

IEEE Blockchain Summit
Doctoral Symposium
Workshop on Container Technologies and Container Clouds (WoC)
Workshop on Legal and Technical Issues in Cloud Computing and
the Internet of Things (CLaw)

TUTORIALS

Cloud Computing for Science and Engineering: Scaling Science in the Cloud
Parallelizing Trajectory Stream Analysis on Cloud Platforms
Building Secure Cloud Architectures and Ecosystems Using Patterns

Message from the General Chairs



IEEE IC2E continues to provide a high-quality forum that brings together expert researchers and practitioners working across all levels of the cloud stack, from systems, storage, networking, and platforms, through to databases, and other cloud-hosted applications. The impact of the cloud on all areas of computing endeavor continues to grow.

The main conference again spans over three full days this year. We have a rich research track program including full and short papers, alongside the industry track. We are proud and honored to have three excellent keynote speakers: Debanjan Saha (AWS), Andrew Warfield (UBC), and Johannes Gehrke (Microsoft).

Alongside the main conference, we have two tutorials, three workshops, and a doctoral symposium. Also, IC2E this year will host the first IEEE Blockchain Summit.

The organization of IEEE IC2E 2017 has been supported by a fantastic team: we would first like to thank our TPC Co-Chairs, Indranil Gupta and Jiangchuan Liu: they have ensured a top-notch program. We thank the TPC itself for their work in reviewing all of the research submissions. We would also like to emphasize our thanks and appreciation of the hard work done by the other members of the organizing committee, including Canturk Isci (Industry Track Chair), Jatinder Singh (Workshops Chair), David Bermbach (Tutorials Chair), Aniruddha Gokhale (Doctoral Symposium Chair), Tian Guo (Proceedings Chair), David Irwin and Thomas F. J.-M. Pasquier (Publicity Co-Chairs), Michael Le (Finance and Registration Chair), and Raluca Diaconu (Web and Information Chair). We are also grateful for the work done by the local team in Vancouver, led by the Local Arrangements Co-Chairs, Kui Wu and Bob Gill.

A huge thanks to the IC2E Steering Committee, and Hui Lei in particular, who has always been willing and quick to provide feedback and guidance. The conference management teams at the IEEE USA and Simon Fraser University have also been helpful and supportive.

Last, but not least, we would like to extend our thanks to all of the paper authors, the tutorial presenters, the workshop organizers, and the conference delegates, for together making IEEE IC2E 2017 a success. We hope that you have a highly enjoyable, inspiring and rewarding stay in Vancouver!

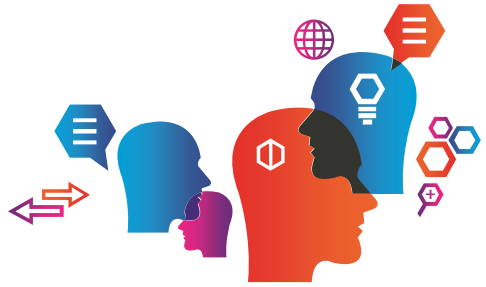
David Eyers and Shu Tao

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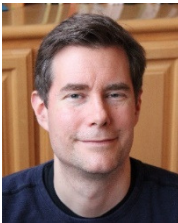
IC2E Keynote Speakers



Debanjan Saha is the General Manager of Amazon Aurora, a massively scalable relational database service re-imagined for the cloud. Amazon Aurora, launched in July 2015, is the fastest growing service in the history of AWS. Prior to joining Amazon, Debanjan held multiple executive and technical leadership positions in IBM where he led the development of virtualizing storage controllers and created a \$1B/year business. Earlier in his career he was with Tellium, an optical networking pioneer, that he helped grow from an early stage start-up to a public company.

An acclaimed innovator and author, Debanjan has co-authored 50+ US patent applications, 100+ technical articles including award winning papers and major Internet standards. Debanjan is a Fellow of the IEEE and was the recipient of IEEE William Bennett award in 2003 and IEEE Frederic W. Ellerscik award in 2004. He holds MS and PhD degrees from University of Maryland, and a B.Tech from IIT, all in Computer Science.

Andrew Warfield is an associate professor in the Computer Science Department at the University of British Columbia. He is a Sloan Research Fellow, and explores research topics broadly related to software systems including cloud computing, storage, networking, security, and big data. Andrew is the CTO at Coho Data, a Vancouver-based enterprise storage company that provides a scalable data platform based on high-performance nonvolatile memories. Dr. Warfield completed his PhD at the University of Cambridge, and has held technical positions at AT&T Research, Intel Research, XenSource, and Citrix.



Johannes Gehrke is a Technical Fellow at Microsoft in the Office Product Group. Johannes' research interests are in the areas of database systems, data science, and distributed systems. Johannes has received an NSF Career Award, an Arthur P. Sloan Fellowship, a Humboldt Research Award, the 2011 IEEE Computer Society Technical Achievement Award, and the 2011 Blavatnik Award for Young Scientists from the New York Academy of Sciences, and he is an ACM Fellow. He co-authored the undergraduate textbook Database Management Systems (McGrawHill (2002), currently in its third edition), used at universities all over the world. Johannes was Program co-Chair of KDD 2004, VLDB 2007, ICDE 2012, SOCC 2014, and ICDE 2015.



Workshop Keynote Speakers



James Bottomley is a Distinguished Engineer at IBM Research where he works on Cloud and Container technology. He is also Linux Kernel maintainer of the SCSI subsystem. He has been a Director on the Board of the Linux Foundation and Chair of its Technical Advisory Board. He went to university at Cambridge for both his undergraduate and doctoral degrees after which he joined AT&T Bell labs to work on Distributed Lock Manager technology for clustering. In 2000 he helped found SteelEye Technology, a High availability company for Linux and Windows, becoming Vice President and CTO. He joined Novell in 2008 as a Distinguished Engineer at Novell's SUSE Labs, Parallels (later Odin) in 2011 as CTO of Server Virtualization and IBM Research in 2016.

Colin Bennett received his Bachelor's and Master's degrees from the University of Wales, and his Ph.D from the University of Illinois at Urbana-Champaign. Since 1986 he has taught in the Department of Political Science at the University of Victoria, where he is now Professor. He has enjoyed Visiting Professorships at Harvard's Kennedy School of Government, the Center for the Study of Law and Society at University of California, Berkeley, the School of Law, University of New South Wales and at the Law, Science, Technology and Society Centre at the Vrije Universiteit in Brussels. His research has focused on the comparative analysis of surveillance technologies and privacy protection policies at the domestic and international levels. In addition to numerous scholarly and newspaper articles, he has written or edited seven books, including *The Governance of Privacy* (MIT Press, 2006) and *The Privacy Advocates: Resisting the Spread of Surveillance* (MIT Press, 2008), and policy reports on privacy protection for Canadian and international agencies. He was co-investigator of a large Major Collaborative Research Initiative grant entitled "The New Transparency: Surveillance and Social Sorting" which culminated in the report: *Transparent Lives: Surveillance in Canada*. Through a new SSHRC Partnership Grant on "Big Data Surveillance", he is currently researching the capture and use of personal data by political parties in Western democracies.








Craig Shank is the Vice President for the Corporate Standards Group in Microsoft's Corporate, External and Legal Affairs (CELA). Microsoft's Corporate Standards Group is a multidisciplinary team of engineers, diplomats and policy experts working together to support Microsoft's engagements in standards setting organizations around the world.

Since joining Microsoft in 2003 Craig has held VP and General Manager roles focused on relationships with customers, industry and government in both its CELA group and the Windows product organization. Most recently Craig led the Microsoft International CELA teams, based in Paris with teams responsible for Microsoft's for government, industry and community affairs activities and legal work across Europe, Middle East, Africa, India, Asia Pacific, Japan and Latin America. Over the years Craig has led teams responsible for supporting Microsoft's work on government affairs, open source interoperability labs, key community relationships such as the company's open source project hosting website CodePlex and interoperability-related intellectual property licensing.




Before joining Microsoft, Craig held business development, finance and operations executive roles for two years at Lineo, a venture-backed embedded Linux developer with teams in Japan, France, Australia, Canada and the U.S. Prior to Lineo, Craig held executive business development and general counsel roles at NetManage and Wall Data, both NASDAQ listed software companies and leaders in cross-platform interoperability for enterprise systems, connecting users and applications on Windows, IBM mainframe and Unix systems. Before that, Craig was a partner in the technology practice at Perkins Coie, the Northwest's largest law firm.

Craig graduated from Harvard College (1982) and Georgetown University Law Center (1986). In his spare time, Craig sails, skis and tries to keep up with his wife and their two children.





Tuesday, April 4th

08:00	Breakfast & Check-in (<i>Harbour Centre Concourse</i>)	
	Blockchain Summit <i>(Sauder Industries Policy Room)</i>	Doctoral Symposium & WoC 2017 <i>(Canfor Policy Room)</i>
08:25	Welcome Remarks Dr. Greg Adamson (Chair, IEEE Blockchain)	Doctoral Symposium
08:40	Blockchain & Cloud – Can it Meet the Demands of a Verifiable Data Supply Chain Jeff Pearce (Director, Guardtime)	08:45 Welcome & Introduction
09:20	Securing the Drug Supply Chain: Using Blockchain to Fight Fake Medicines Tim Mackey (Director of the Global Health Policy Institute; Assistant Professor of Anesthesiology & Global Public Health, University of California, San Diego School of Medicine)	09:00 Introducing SECURESTREAMS: Scalable Middleware for Reactive and Secure Data Stream Processing Aurelien Havet (University of Neuchatel, Switzerland) Paving the Way for Energy Efficient Cloud Data Centers: A Type-Aware Virtual Machine Placement Strategy Auday Al-Dulaimy (Beirut Arab University, Lebanon)
10:00	 Coffee break	10:00 style="text-align: center;">  Coffee break
10:30	“SmartData”: Leveraging Blockchain to Securely Capture & Verify Scientific Provenance Data Murat Kantarcioglu (Professor, Erik Jonsson School of Engineering & Computer Science, University of Texas at Dallas)	10:30 Engineering Self-adaptive Applications on Cloud with Software Defined Networks Nasim Beigi-Mohammadi (York University, Canada) Algorithmic Enhancements to Big Data Computing Frameworks for Medical Image Processing Shunxing Bao (Vanderbilt University, USA)
11:10	Panel Discussion: Opportunities for Development of Standards for Effective Blockchain Adoption <i>Panelists:</i> Walid Al-Saqaf (Internet Society); Sri Chandrasekan (Director of Standards & Technology, IEEE-Standards Assoc.); Greg Adamson (Chair, IEEE Blockchain); <i>Moderator:</i> Maria Palombini (Director, IEEE-Standards Assoc.)	11:30 Group Discussion (All Participants)
12:10	 Lunch	12:00 style="text-align: center;">  Lunch
13:10	Decentralized Identity: The One Global Problem for Which Blockchain Technology Really Is the Ideal Solution Drummond Reed (Chief Trust Officer, Evernym Inc.)	WoC 2017
13:50	Healthcare Data on the Blockchain—the Health/Life Currency that will Open New Doors of Opportunity Leonard Kish (COO, YouBase)	13:15 Welcome & Introduction
14:30	Brainstorming Break: Convergence of IoT and Blockchain – How will it Impact Data Security? (Group discussion)	13:30 Keynote: “Has the Container Wave Finished breaking over Cloud?” <i>James Bottomley (Distinguished Engineer, IBM Research)</i>
15:10	Innovation in the Financial Services Industry: An Empirical Investigation of the Fintech Ecosystem and Implications for Company Strategies Steven R. Kursh (Ph.D., CSDP, CLP, Executive Professor, Northeastern University)	14:30 Integrating MPI with Docker for HPC Maximilien de Baysse and Renato Fontoura de Gusmão Cerqueira (IBM Research Brazil) Comparing Scaling Methods for Linux Containers Shripad Nadgawda, Sahil Suneja and Ali Kanso (IBM T. J. Watson Research Center)
15:50	Panel Discussion: Outside of the Blocks: Ethics and Governance in Grassroots Blockchain Communities <i>Panelists:</i> Scott Nelson (Human Data Commons Foundation), Nicholas Perrin (Cepr), Cameron Gray (dctrl hackerspace), Mari Eagar (Digital Futures), Gary Lachance (Decentralized Dance Party); <i>Moderator:</i> Chelsea Palmer (Acting Executive Director, Human Data Commons Foundation)	15:30 style="text-align: center;">  Coffee break
16:50	Enabling Data Provenance in the Cognitive Computing Age Luis Bathen (IBM Almaden Research Center)	16:00 DockerFinder: Multi-attribute search of Docker images Antonio Brogi, Davide Neri and Jacopo (University of Pisa, Italy) Enabling Docker Containers for High-Performance and Many-Task Computing Soldani Abdulrahman Azab (University of Oslo, Norway)
17:30	 Reception & Poster Session (<i>Concourse & Teck Gallery Lounge</i>)	17:00 Closing notes
19:30		




Wednesday, April 5th

08:00	Breakfast & Check-in (<i>Harbour Centre Concourse</i>)	
	Main Conference (<i>Fletcher Challenge Theater</i>)	Tutorial (<i>Canfor Policy Room</i>)
08:45	Opening Remarks	
09:00	Keynote: "Amazon Aurora: a look under the hoods" <i>Debanjan Saha (General Manager, Amazon Aurora)</i>	
10:00	 Coffee break	
10:30	Full Research Paper Session: Resource Management (<i>Session Chair: Jean Bacon</i>) ICSI: A Cloud Garbage VM Collector for Addressing Inactive VMs with Machine Learning In Kee Kim (Univ of Virginia); Sai Zeng, Christopher Young, Jinho Hwang (IBM Watson Research); Marty Humphrey (Univ of Virginia) Dark Shadows: User-level Guest/Host Linux Process Shadowing Peter A. Dinda, Akhil Guliani (Northwestern Univ) BalCon: A Distributed Elastic SDN Control via Efficient Switch Migration Marco Cello (Nokia Bell Labs); Yang Xu (NYU); Anwar Walid, Gordon Wilfong (Nokia Bell Labs); H. Jonathan Chao (NYU); Mario Marchese (Univ of Genoa)	Tutorial 1 Cloud Computing for Science and Engineering: Scaling Science in the Cloud Dennis Gannon (Indiana University, USA), Ian Foster (University of Chicago and Argonne National Lab), Vani Mandava (Microsoft Research)
12:00	 Lunch	
13:00	Industry Session 1 (<i>Session Chair: Canturk Isci</i>) Agile Composition of Compliant Data Analytics Platforms Michael Le, Jayaram Kallapalayam Radhakrishnan, Yaron Weinsberg, Daniel J. Dean, Shu Tao (IBM) An Early Functional and Performance Experiment of the MarFS Hybrid Storage EcoSystem Hsing-bung Chen (Los Alamos National Lab) Columbus: Filesystem Tree Introspection for Software Discovery Shripad Nadgowda, Sastry Duri, Canturk Isci, Vijay Mann (IBM Research)	Tutorial 1 (continued)
14:15	Short Research Paper Session 1 (<i>Session Chair: Aniruddha Gokhale</i>) EXFed: Efficient Cross-Federation with Availability SLAs on Preemptible IaaS Instances Alexander Pucher, Rich Wolski, Chandra Krintz (UC Santa Barbara) QoS-aware Virtual Machine Consolidation in Cloud Datacenter Mohammad Alaul Haque Monil, Allen D. Malony (Univ of Oregon) Impact of Multiple Video Representations in Live Streaming: A Cost, Bandwidth, and QoE Analysis Kashif Bilal, Aiman Erbad (Qatar Univ)	
15:15	 Coffee break	
15:45	Full Research Paper Session: Cloud Scheduling (<i>Session Chair: Peter Dinda</i>) GenPack: A Generational Scheduler for Cloud Data Centers Aurélien Havet, Valerio Schiavoni, Pascal Felber (Univ of Neuchatel); Maxime Colmant (ADEME); Romain Rouvoy (Univ Lille); Christof Fetzer (TU Dresden) CloudGC: Recycling Idle Virtual Machines in the Cloud Bo Zhang, Yahya Al Dhuraibi, Romain Rouvoy, Fawaz Paraisfeo, Lionel Seinturier (Univ of Lille) CoMlCon: A Cooperative Management System for Docker Container Images Senthil Nathan (IIT Bombay); Rahul Ghosh, Tridib Mukherjee, Krishnaprasad Narayanan (Xerox Research India)	Tutorial 1 (continued)
17:20		

Thursday, April 6th

08:00	Breakfast & Check-in (<i>Harbour Centre Concourse</i>)	
	<div style="background-color: #f4a460; padding: 10px; text-align: center;"> Main Conference (Fletcher Challenge Theater) </div>	<div style="background-color: #66a6e0; padding: 10px; text-align: center;"> Tutorial (Canfor Policy Room) </div>
09:00	Keynote: "Keeping up with the architects: Software evolution for dense datacenters" Andrew Warfield (<i>Associate Professor, UBC</i>)	
10:00	 Coffee break	
10:30	Full Research Paper Session: Infrastructure (<i>Session Chair: Jinho Hwang</i>) Cloud Engineering Principles and Technology Enablers for Medical Image Processing-as-a-Service Shunxing Bao, Andrew J. Plassard, Bennett A. Landman, Aniruddha Gokhale (Vanderbilt Univ) Revising OpenStack to Operate Fog/Edge Computing Infrastructures Anthony Simonet (INRIA); Jonathan Pastor (ANL); Adrien Lebre, Frédéric Desprez (INRIA) Meeting Latency Target in Transient Burst: a Case on Spark Streaming Robert Birke, Mathias Bjoerkqvist, Lydia Y. Chen (IBM Research Zurich Lab)	Tutorial 2 Parallelizing Trajectory Stream Analysis on Cloud Platforms Yan Liu (Concordia University, Canada)
12:00	 Lunch	
13:00	Industry Paper Session 2 (<i>Session Chair: Kui Wu</i>) Mitigating Resource Contention and Heterogeneity in Public Clouds for Scientific Modeling Services Wes Lloyd (University of Washington); Shrideep Pallickara, Olaf David, Mazdak Arabi (Colorado State University); Ken Rojas (USDA-NRCS) One Time Trapdoor based Searchable Encryption Kulvaibhav Kaushik and Vijayaraghavan Varadharajan (Infosys Ltd) Quest: Search-driven Management of Cloud-Scale Data Centers Atreyee Maiti, Rahul Singh, Ramesh Chandra, Himanshu Shukla (Nutanix Inc.)	
14:15	Short Research Paper Session 2 (<i>Session Chair: David Bermbach</i>) Benchmarking Key-Value Stores via Trace Replay Edwin F. Boza, Cesar San-Lucas, Cristina L. Abad (ESPOL) Impact of the Vendor Lock-in Problem on Testing as a Service (TaaS) Ricardo Ramos de Oliveira (Univ of Sao Paulo); Rafael Messias Martins (Linnaeus Univ); Adenilso da Silva Simao (Univ of Sao Paulo) PHP2Uni: Building Unikernels using Scripting Language Transpilation Thomas Pasquier (Harvard Univ); David Eysers (Univ of Otago); Jean Bacon (Univ of Cambridge)	Tutorial 3 Building Secure Cloud Architectures and Ecosystems Using Patterns Eduardo B. Fernandez (Florida Atlantic University, USA)
15:15	 Coffee break	
15:45	Invited Paper Session 1 (<i>Session Chair: Shripad Nadgowda</i>) Dependency-Aware Data Locality for MapReduce Xiaoqiang Ma, Xiaoyi Fan, Jiangchuan Liu (SFU); D. Li (Tsinghua) Optimize the Server Provisioning and Request Dispatching in Distributed Memory Cache Services Boyang Yu, Jianping Pan (University of Victoria) Towards Pricing for Sensor-Cloud Chunsheng Zhu, Xiuhua Li, Victor C.M. Leung (UBC); Laurence T. Yang (St. Francis Xavier University); Edith C.-H. Ngai (University of Uppsala); Lei Shu (Guangdong University of Petrochemical Technology) Thermal-Aware Scheduling of Batch Jobs in Geographically Distributed Data Centers Shaolei Ren, Marco Polverini, Athanasios Vasilakos, Marco Polverini (DIET Department, University of Roma - La Sapienza); Antonio Cianfrani	Tutorial 3 (continued)
17:30		
19:00	 Conference Banquet	
22:00		

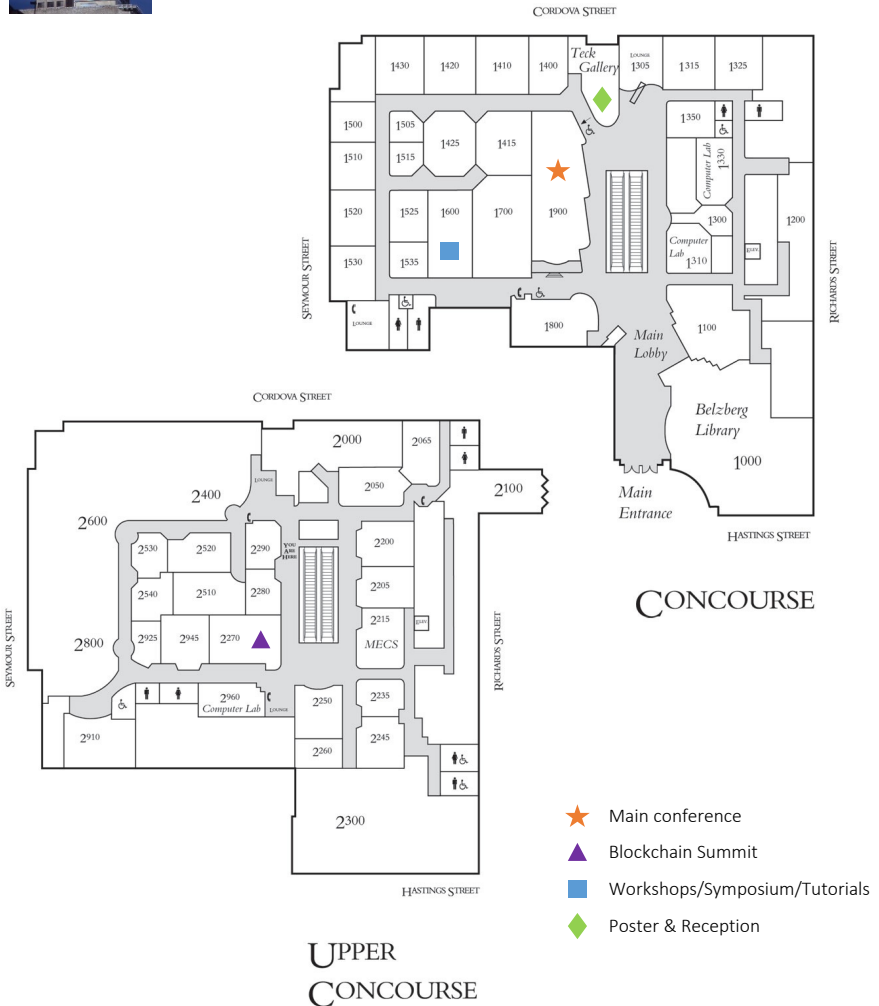
Friday, April 7th

08:00	Breakfast & Check-in (<i>Harbour Centre Concourse</i>)	
	Main Conference <i>(Fletcher Challenge Theater)</i>	CLaw Workshop <i>(Canfor Policy Room)</i>
09:00	Keynote: "Advances in optimistic concurrency control" <i>Johannes Gehrke (Technical Fellow, Microsoft)</i>	
10:00	 Coffee break	
10:30	Full Research Paper: Security (<i>Session Chair: Ken Moody</i>) Performance Impact of DDoS Attacks on Three Virtual Machine Hypervisors Pezhman Sheinidashtegol, Michael Galloway (West Kentucky Univ) Trustworthy Services Built on Event Based Probing for Layered Defense Read Sprabery, Zak Estrada, Zbigniew Kalbarczyk, Ravishankar Iyer (UIUC); Rakesh Bobba (Oregon State Univ); Roy Campbell (UIUC) VirtusCap: Capability-based Access Control for Unikernels Ioannis Sfyraakis, Thomas Gross (Newcastle Univ)	
12:00	 Lunch	
13:00	Short Research Paper Session 3 (<i>Session Chair: Indranil Gupta</i>) Image-centric Social Discovery Using Neural Network under Anonymity Constraint Kazi Wasif Ahmed, Mohammad Zahidul Hasan, Noman Mohammed (Univ of Manitoba) SwiftAnalytics: Optimizing Object Stores for Big Data Analytics Lukas Rupprecht (Imperial College London); Rui Zhang (IBM Research Almaden); Bill Owen (IBM Tuscon); Peter Pietzuch (Imperial College London); Dean Hildebrand (IBM Research Almaden) Practical Data Compliance for Cloud Storage Martin Henze, Roman Matzutt, Jens Hiller, Erik Mühmer, Jan Henrik Ziegeldorf, Johannes van der Giet, Klaus Wehrle (RWTH Aachen Univ)	Keynote: "Transnational Flows of Personal Data: Adequate Laws, Accountable Companies or Data Localization" <i>Colin Bennett (Professor, University of Victoria)</i>
14:00	Main conference closing	In search for the value of connectivity: citizens' contribution to investigate the relationships between environmental factors and human diseases in IoT powered smart cities Anna Berti Suman (Tilburg University) Internet of Things Ecosystems: Unpacking Legal Relationships and Liabilities Christopher Millard, Kuan Hon (Queen Mary University of London); Jatinder Singh (University of Cambridge)
		 Coffee break
14:30		
15:00		Keynote: "Emerging Technologies - Standards and Trust Mechanisms" <i>Craig Shank (VP, Microsoft)</i>
15:45		Towards the Classification of Confidentiality Capabilities in Trustworthy Service Level Agreements Yudhistira Nugraha, Andrew Martin (University of Oxford) Eyes of Things Jose M. Rico-Saavedra (University of Castilla-La Mancha)
16:15		
16:45		Discussion and wrap-up



Conference Venue

Simon Fraser University Vancouver Campus
 Harbour Centre, 555 W Hastings St
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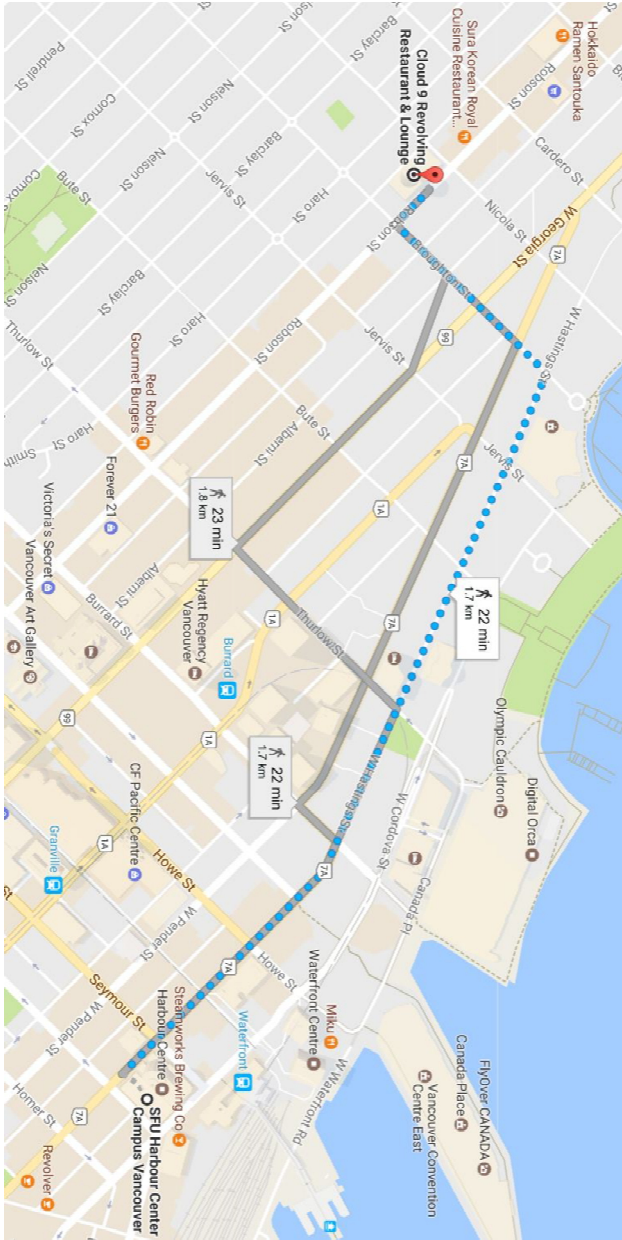
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Conference Banquet

The conference banquet will be held in the **Cloud 9 Revolving Restaurant & Lounge** at 1400 Robson Street, Vancouver, BC V6G 1B9, within walking distance from the conference (see map below).





Conference web site



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