

# **IFIP NETWORKING 2016**

# Vienna, Austria May 17-19, 2016





# **Dear participants of IFIP NETWORKING 2016!**

In my role as General Chair of the 15<sup>th</sup> edition of this prestigious conference, which manages to bring together every year a remarkable community of scientists in the area of communication networks, it is a pleasure for me to warmly welcome you in the beautiful city of Vienna, Austria.

While Vienna is known as the "city of music" all over the world (and indeed, while strolling through the downtown area, you will notice that there is hardly any street corner left without a sign telling you that Mozart, Beethoven, Schubert, Strauß et al. have been living or working here at least for some time of their lives), you might be surprised to learn that it hosts also one of the eldest (last year, we have proudly celebrated our 650<sup>th</sup> anniversary) and, with currently more than 93,000 students, also one of the largest universities all over Europe.

The IFIP Networking 2016 Conference, sponsored by the IFIP Technical Committee on Communication Systems (TC6) and technically co-sponsored by IEEE Computer Society, continues a longstanding tradition of conferences held in Paris, Pisa, Athens, Ontario, Coimbra, Atlanta, Singapore, Aachen, Chennai, Valencia, Prague, New York, Trondheim and Toulouse. It will follow the wellestablished format of a three-day event with two parallel tracks of technical sessions and include two keynotes which span the bridge between Cambridge, UK, home to Peter Key of Microsoft Research, and Cambridge, MA, where Muriel Médard is working at the MIT. The technical program will be complemented by two high-level social events: a reception and banquet (Tuesday evening) at Vienna City Hall on invitation of the Mayor of the City of Vienna as well as a Gala Dinner (Wednesday evening) with some culinary and musical surprises in the imperial ambience of Palais Todesco.

In addition, the conference will include a "**One Minute Madness**" (OMM) session right at the start, where each presenter is allocated a one minute slot for briefly introducing his/her paper in order to raise the interest of the audience. While this will already provide a good overview over the entire conference program, a really unique feature of our especially developed conference app called **YuCCa** ("Yet 'nother Cool Conference App") will allow you to individually mark interesting papers during the OMM session and, based on your rating, will guide you through the technical program afterwards. For further details on YuCCA please refer kindly to the last page of this booklet.

This event would not have been possible without **our patrons AIT, VIX and netidee**, whose generous financial support is gratefully acknowledged. I am especially thankful to **H. Fassmann** as Vice Rector of the University of Vienna, **J. Saller** as President of the Austrian Federal Council, **M. Wiesmüller** representing the Austrian Ministry for Transport, Innovation and Technology, and **A Min Tjoa** as IFIP Honorary Secretary, for honoring this conference with their presence during the opening ceremony. Finally, I would also like to thank the Steering Committee, the TPC and its three chairs, the publicity chairs and publication chairs, the co-chairs of the co-located 1<sup>st</sup> IFIP Workshop on the Internet of People (IoP-W), and the entire COSY team for their never-ending enthusiasm and support.

Wishing you an interesting and highly successful conference and a great time in Vienna,

Peter Reichl General Chair IFIP NETWORKING 2016

# Welcome Message from the IFIP NETWORKING 2016 TPC Co-Chairs

Welcome to the 15<sup>th</sup> edition of the IFIP Networking conference! First of all, we thank the IFIP Technical Committee TC6 for giving us the opportunity to serve the Networking research community in the role of Technical Program Committee co-chairs for this edition. This year we have received 200 paper submissions from 43 different countries. The most represented countries, in terms of submitted papers and submitting authors, were USA and China, followed by Germany and France. The same four countries lead the ranking of accepted papers. About half of the submitting authors are from EMEA countries: this is not surprising considering the European location of this edition. As far as the selection process is concerned, each TPC member was assigned up to a maximum of six papers to evaluate. A preliminary bidding phase was key to ensure a good matching between the assigned papers and the topics of interest by each TPC member. Each submitted paper has received between three and five independent reviews. Following the first round of reviews, all TPC members assigned to the paper were invited to read the other reviews and then exchange their views (anonymously) during an online discussion phase. In a few cases the discussion was particularly intense, but eventually a consensus decision was achieved in all cases. In five cases we decided to accept the paper conditionally and resort to paper shepherding. At the end of the review process, the current program consists of 57 papers, roughly 28.5% of the initial submissions.

We are grateful to the TPC members that have actively contributed with their time and expertise to build what we believe will be an interesting and enjoyable conference program!

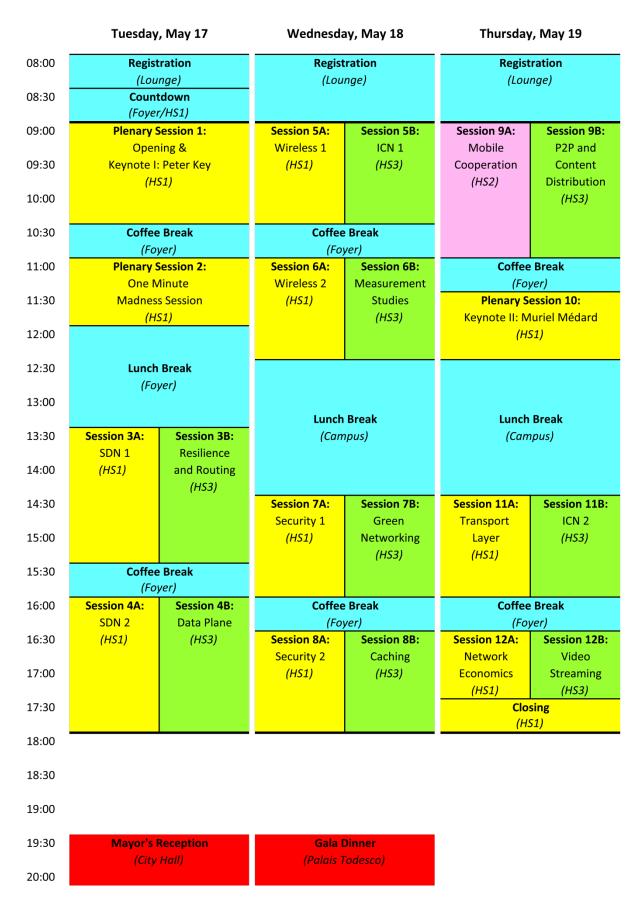
**Jörg Ott** TPC Co-Chair TU Munich, Germany Christos Papadopoulos TPC Co-Chair Colorado State University, U.S.A Fabio Ricciato TPC Co-Chair University of Ljubljana, Slovenia

# IoP-W 2016 Welcome Message

It is our great pleasure to welcome you to the first edition of the *IFIP Internet of People Workshop* – *IoP-W 2016*. The inaugural edition of this workshop focuses on all aspects related to the tight "embedding of humans" as key elements of the Internet systems design. We believe this exciting research area will be one of the drivers for the Future Internet development, for which IoP-W can serve as a reference forum. After a rigorous review process where each submission received at least three reviews, the IoP-W Program Committee accepted 7 papers for oral presentation. We are also very happy that the IoP-W 2016 program will feature a very stimulating keynote talk, entitled "*Power to the (local) People*" as well as a concluding open-floor session. This year's IoP-W is co-located with IFIP Networking, which creates an exciting opportunity for cross-fertilisation among many areas related to the future Internet design. Last but not least, we would like to thank all the authors of submitted papers, the PC members for their hard and high-quality work, and the Publicity Chairs for their timely and professional work. We hope that you will find this program interesting and thought-provoking and that the workshop will provide you with a valuable opportunity to share ideas with other researchers from institutions around the world.

Isabelle Chrisment IoP-W 2016 Co-Chair Université de Lorraine, France Andrea Passarella IoP-W 2016 Co-Chair IIT-CNR, Italy Ana Pont Sanjuán IoP-W 2016 Co-Chair Polytechnic Univ. of Valencia, Spain

# IFIP NETWORKING 2016 — Final Program



# Tuesday, May 17, 2016

# 08:00 – 08:30 Registration (Lounge)

08:30 – 09:00 Get together and Countdown (HS1)

Meet your friends (or make new ones), have a cup of coffee or tea, discover the secrets of YuCCa, learn how to operate Twitter version 0.0, and much more ...

# 09:00 – 10:30 Plenary Session 1: Opening and Keynote I (HS1 – Chair: Fabio Ricciato)

Peter Key (Microsoft Research Cambridge, UK): Networks, Auctions and the Cloud

## 10:30 – 11:00 Coffee Break

- 11:00 12:00
   Plenary Session 2: One Minute Madness (HS1 Chair: Andrea Passarella)

   Short presentations of all papers: one speaker one slide one minute (per talk)
- 12:00 13:30 Lunch Break

#### 13:30 – 15:30 Session 3A: Software-Defined Networking 1 (HS1 – Chair: Thomas Schmidt)

<u>Klaus-Tycho Förster</u>, Ratul Mahajan, Roger Wattenhofer: Consistent Updates in Software Defined Networks: On Dependencies, Loop Freedom, and Blackholes

<u>Shouxi Luo</u>, Hongfang Yu, Long Luo, Le Min Li: Arrange Your Network Updates as You Wish

<u>Heng Pan</u>, Gaogang Xie, Peng He, Zhenyu Li, Laurent Mathy: Action Computation for Compositional Software-Defined Networking

<u>Mohsen Rezvani</u>, Aleksandar Ignjatovic, Maurice Pagnucco, Sanjay Jha: Anomaly-Free Policy Composition in Software-Defined Networks

#### Session 3B: Resilience and Routing (HS3 – Chair: Poul Heegaard)

<u>Wei Koong Chai</u>, Vaios Kyritsis, Konstantinos Katsaros, George Pavlou: Resilience of Interdependent Communication and Power Distribution Networks against Cascading Failures

<u>Nashid Shahriar</u>, Reaz Ahmed, Shihabur Rahman Chowdhury, Md Mashrur Alam Khan, Raouf Boutaba, Jeebak Mitra, Feng Zeng: Connectivity-aware Virtual Network Embedding

<u>Shih-Hao Tseng</u>, Chiun Lin Lim, Ning Wu, Kevin Tang: Time-Aware Congestion-Free Routing Reconfiguration

<u>Olivier Brun</u>, Hassan Hassan, Josselin Vallet: Scalable, Self-Healing, and Self-Optimizing Routing Overlays

## 15:30 – 16:00 Coffee Break

#### 16:00 – 18:00 Session 4A: Software-Defined Networking 2 (HS1 – Chair: Jordi Domingo-Pascual)

<u>Bela Genge</u>, Piroska Haller: A Hierarchical Control Plane for Software-Defined Networks-based Industrial Control Systems

<u>Rhaban Hark</u>, Dominik Stingl, Nils Richerzhagen, Klara Nahrstedt, Ralf Steinmetz: DistTM: Collaborative Traffic Matrix Estimation in Distributed SDN Control Planes

<u>Marc Werner</u>, Johannes Schwandke, Matthias Hollick, Oliver Hohlfeld, Torsten Zimmermann, Klaus Wehrle: STEAN: A Storage and Transformation Engine for Advanced Networking Context

*Heitor Moraes, <u>Marcos Vieira</u>, Italo Cunha, Dorgival Guedes:* Efficient Virtual Network Isolation in Multi-Tenant Data Centers on Commodity Ethernet Switches

#### Session 4B: Data Plane (HS3 – Chair: Burkhard Stiller)

<u>Paul Emmerich</u>, Sebastian Gallenmüller, Georg Carle: FLOWer - Device Benchmarking Beyond 100 Gbit/s

*Farnaz Moradi, Christofer Flinta, Andreas Johnsson, Catalin Meirosu:* On Time-Stamp Accuracy of Passive Monitoring in a Container Execution Environment

<u>Serhat Nazim Avci</u>, Zhenjiang Li, Fangping Liu: Congestion Aware Priority Flow Control in Data Center Networks

<u>Patrick Maillé</u>, Shyam Parekh, Jean Walrand: Overlaying Delay-Tolerant Service Using SDN

**19:30 – 23:00** Mayor's Reception at Vienna City Hall – Wappensaal\* (entrance: Lichtenfelsgasse, 1010 Wien. Reception starts 20:00h, dresscode: smart elegant)

\*The generous support from our patrons AIT and VIX as well as the City of Vienna for this social event is gratefully acknowledged!





# Wednesday, May 18, 2016

## 08:00 - 09:00 Registration (Lounge)

## 09:00 – 10:30 Session 5A: Wireless Networking 1 (HS1– Chair: Bela Genge)

Sangyup Han, <u>Myungjin Lee</u>, Myungchul Kim: Demand-Aware Centralized Traffic Scheduling in Wireless LANs

<u>Ann Wang</u>, Muhammad Shahzad, Alex Liu: A Stochastic Frame Based Approach to RFID Tag Searching

<u>Mohamad Yassin</u>, Samer Lahoud, Marc Ibrahim, Kinda Khawam, Dany Mezher, Bernard Cousin: Centralized Multi-Cell Resource and Power Allocation for Multiuser OFDMA Networks

## Session 5B: Information-Centric Networking 1 (HS3 - Chair: Gunnar Karlsson)

<u>J. J. Garcia-Luna-Aceves</u>, Maziar Mirzazad Barijough: Content-Centric Networking Using Anonymous Datagrams

*Cesar Ghali, Gene Tsudik, <u>Christopher Wood</u>:* BEAD: Best Effort Autonomous Deletion in Content-Centric Networking

Jianxun Cao, Dan Pei, Zhelun Wu, Xiaoping Zhang, Beichuan Zhang, <u>Lan Wang</u>, Youjian Zhao: Improving the Freshness of NDN Forwarding States

## 10:30 – 11:00 Coffee Break

## 11:00 – 12:30 Session 6A: Wireless Networking 2 (HS1 – Chair: Özgür Gürbüz)

<u>Lynda Zitoune</u>, Stefan Cerovic, Danilo Cerovic, Véronique Vèque, Jean-Marc Kelif: Performance Evaluation of JT CoMP Approach: Tractable Model Using Spatial Fluid Modeling

*Guohao Lan, Sangyup Han, Il-Gu Lee, <u>Myungchul Kim</u>: AMONET: A Method for Detecting and Mitigating the Data Rate Degradation Due to Interference Over Wireless Networks* 

<u>Sebastian Schiessl</u>, Farshad Naghibi, Hussein Al-Zubaidy, Markus Fidler, James Gross: On the Delay Performance of Interference Channels

## Session 6B: Measurement Studies (HS3 - Chair: J. J. Garcia-Luna-Aceves)

<u>Džiugas Baltrunas</u>, Ahmed Mustafa Elmokashfi, Amund Kvalbein, Ozgu Alay: Investigating Packet Loss in Mobile Broadband Networks under Mobility

*Huy Hang, <u>Adnan Bashir</u>, Michalis Faloutsos, Christos Faloutsos, Tudor Dumitras:* "Infect-me-not": A User-centric and Site-centric Study of Web-Based Malware

#### 12:30 – 14:30 Lunch Break

#### 14:30 – 16:00 Session 7A: Network Security 1 (HS1 – Chair: Otto Spaniol)

<u>Hammad Kabir</u>, Jesus Llorente Santos, Raimo Kantola: Securing the Private Realm Gateway

<u>Cornelius Diekmann</u>, Julius Michaelis, Maximilian Haslbeck, Georg Carle: Verified iptables Firewall Analysis

<u>Rahul Hiran</u>, Niklas Carlsson, Nahid Shahmehri: Does Scale, Size, and Locality Matter? Evaluation of Collaborative BGP Security Mechanisms

#### Session 7B: Green Networking (HS3 – Chair: Peter Key)

<u>Angelos Chatzipapas</u>, Vincenzo Mancuso: Measurement-Based Coalescing Control for 802.3az

<u>Xiaoda Zhang</u>, Zhuzhong Qian, Sheng Zhang, Kui Wu, Sanglu Lu: Consolidating Flows with Implicit Deadlines for Energy-Proportional Data Center Networks

*<u>Fernando Ramos</u>, Jon Crowcroft, Ian White:* Blending Photons with Electrons to Reduce the Energy Footprint of IPTV Networks

## 16:00 – 16:30 Coffee Break

#### 16:30 – 18:00 Session 8A: Network Security 2 (HS1 – Chair: Raimo Kantola)

<u>Damjan Buhov</u>, Markus Huber, Georg Merzdovnik, Edgar Weippl: Pin It! Improving Android Network Security at Runtime

<u>Jorge Granjal</u>, Edmundo Monteiro: End-to-end Transparent Transport-Layer Security for Internet-integrated Mobile Sensing Devices

*Silke Holtmanns, <u>Siddharth Prakash Rao</u>, Ian Oliver:* User Location Tracking Attacks for LTE Networks Using the Interworking Functionality

#### Session 8B: Caching (HS3 – Chair: Yutaka Takahashi)

<u>Andrea Araldo</u>, Fabio Martignon, Dario Rossi: Representation Selection Problem: Optimizing Video Delivery through Caching

*Pietro Marchetta, <u>Jaime Llorca</u>, Antonia Tulino, Antonio Pescapé:* MC3: A Cloud Caching Strategy for Next Generation Virtual Content Distribution Networks

<u>Andre Gomes</u>, Torsten Braun, Edmundo Monteiro: Enhanced Caching Strategies at the Edge of LTE Mobile Networks

19:30 – 23:00 Gala Dinner at Palais Todesco (entrance: Kärntner Str. 51, 1010 Wien)

# Thursday, May 19, 2016

# 08:00 – 09:00 Registration (Lounge)

## 09:00 – 11:00 Session 9A: Mobile Cooperation (HS2 – Chair: Jörg Ott)

*Luca Baldesi, <u>Leonardo Maccari</u>, Renato Lo Cigno:* Optimized Cooperative Streaming in Wireless Mesh Networks

<u>Argyrios Tasiopoulos</u>, Ioannis Psaras, Vasilis Sourlas, George Pavlou: Tube Streaming: Modelling Collaborative Media Streaming in Urban Railway Networks

*Ajita Singh, Yuxuan Xing, <u>Hulya Seferoqlu</u>:* Energy-Aware Cooperative Computation in Mobile Devices

<u>Sylvia Kouyoumdjieva</u>, Gunnar Karlsson: Device-to-Device Mobile Data Offloading for Music Streaming

## Session 9B: P2P and Content Distribution (HS3 – Chair: Tobias Hossfeld)

<u>Wasiur KhudaBukhsh</u>, Julius Rückert, Julian Wulfheide, David Hausheer, Heinz Koeppl: Analysing and Leveraging Client Heterogeneity in Swarming-based Live Streaming

<u>Pedro Moreira da Silva</u>, Jaime Dias, Manuel Ricardo: Mistrustful P2P: Privacypreserving File Sharing over Untrustworthy Peer-to-Peer Networks

<u>Chang Liu</u>, Ramesh K Sitaraman, Don Towsley: Go-with-the-Winner: Performance Based Client-Side Server Selection

<u>Truong Khoa Phan</u>, David Griffin, Elisa Maini, Miguel Rio: Utility-maximizing Server Selection

## 11:00 – 11:30 Coffee Break

11:30 – 12:30 Plenary Session 10: Keynote II (HS1 – Chair: Aiko Pras) \*

*Muriel Médard (MIT, Cambridge, MA, U.S.A.):* Network Coding – A Personal Account of Combining Theory and Practice

\*This keynote presentation is organized in cooperation with the Computer Science Colloquium series of the Faculty of Computer Science of University of Vienna. The generous support of our patron netidee is gratefully acknowledged!





#### 12:30 – 14:30 Lunch Break

#### 14:30 – 16:00 Session 11A: Transport Layer (HS1 – Chair: Martina Zitterbart)

<u>Stephen McQuistin</u>, Colin Perkins, Marwan Fayed: TCP Hollywood: An Unordered, Time-Lined, TCP for Networked Multimedia Applications

<u>Simone Ferlin</u>, Özgü Alay, Olivier Mehani, Roksana Boreli: BLEST: Blocking Estimationbased MPTCP Scheduler for Heterogeneous Networks

<u>Yannis Thomas</u>, George Xylomenos, Christos Tsilopoulos, George Polyzos: Multi-Flow Congestion Control with Network Assistance

#### Session 11B: Information-Centric Networking 2 (HS3 – Chair: Myungchul Kim)

*Ali Dabirmoghaddam, Mostafa Dehghan, <u>J. J. Garcia-Luna-Aceves</u>: Characterizing Interest Aggregation in Content-Centric Networks* 

<u>Thomas Schmidt</u>, Sebastian Wölke, Nora Berg, Matthias Wählisch: Let's Collect Names: How PANINI Limits FIB Tables in Name Based Routing

Anat Bremler-Barr, <u>David Hay</u>, Daniel Krauthgamer, Shimrit Tzur David: Scalable URL Matching with Small Memory Footprint

## 16:00 – 16:30 Coffee Break

#### 16:30 – 17:30 Session 12A: Network Economics (HS1 – Chair: Sergey Gorinsky)

<u>Toni Mäki</u>, Patrick Zwickl, Martín Varela: Network Quality Differentiation: Regional Effects, Market Entrance, and Empirical Testability

<u>George Darzanos</u>, Iordanis Koutsopoulos, George Stamoulis: Economics Models and Policies for Cloud Federations

#### Session 12B: Video Streaming (HS3 – Chair: Christos Papadopoulos)

Zakaria Ye, Rachid El-Azouzi, Tania Jimenez, Eitan Altman, Stefan Valentin: Backward-Shifted Strategies Based on SVC for HTTP Adaptive Video Streaming

<u>Christian Sieber</u>, Poul Heegaard, Tobias Hossfeld, Wolfgang Kellerer: Sacrificing Efficiency for Quality of Experience: YouTube's Redundant Traffic Behavior

17:30 - 18:00 Closing (HS1)

# **IFIP IoP-W 2016**

# Workshop on Internet of People – Final Program

	Friday, May 20	08:00 - 09:00	Registration (Lounge)
08:00	<b>Registration</b> (Lounge)	09:00 - 10:15	Welcome Address and Keynote Talk (HS2)
08:30			<i>Jörg Ott (TU Munich, Germany):</i> Power to the (Local) People
09:00	Plenary Session:		
	Welcome Address &	10:15 – 10:45	Coffee Break
09:30	Keynote: Jörg Ott <i>(HS2)</i>	10:45 – 12:30	Session 1: Social Aspects of IoP (HS2)
10:00			C. Quadri, M. Zignani, S. Gaito , G. P. Rossi:
	Coffee Break		Clique-Aware Mobile Social Clouds
10:30	(Foyer)		<i>L. Maccari:</i> On the Technical and Social Struc-
11.00	Session1:		ture of Community Networks
11:00	Social Aspects of IoP		
11:30	(HS2)		P. Terevinto Charquero, A.Pont Sanjuán, J. A. Gil Salinas, J. Domenech i de Soria: A Flexible Workload Model Based on Roles of Interactive
12:00			Users in Social Networks
12:30 13:00	Lunch Break		N. Yousefnezhad, M. Nagy, N. Asokan: On Improving Tie Strength Estimates by Aggregating Multiple Communication Channels
10.00	(Culinarium)	42.22 44.02	
13:30	(,	12:30 - 14:00	Lunch Break
		14:00 - 15:15	Session 2: Analysis towards supporting IoP
14:00	Session 2:		System Design (HS2)
	Analysis towards		
14:30	supporting		M. Seufert, T. Hossfeld, A. Schwind, V. Burger, P.
	IoP System Design		Tran-Gia: Group-based Communication in WhatsApp
15:00	(HS2)		M. Hall, S. Caton: Online Social Engagement at
	Open Discussion		Higher Education Institutes: A German Case Study
15:30	and Closing		Q. Vinh Dan, CL. Ignat: Performance of Real-Time
16:00	(HS2)		Collaborative Editors at Large Scale: User Perspective

# 15:15 – 16:00 Open Discussion and Closing (HS2)

Note that, at the time of the conference, all full papers (main conference and workshop) are already available online at the IFIP Digital Library, see

http://dl.ifip.org/db/conf/networking/networking2016/index.html

and will – in line with the General Policies – be submitted for publication at IEEExplore afterwards.

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# LOCATION INFORMATION



# Important addresses:

IFIP NETWORKING 2016: Währinger Strasse 29 Lunch May 18/19: Stiegl-Ambulanz, Campus Altes AKH Lunch May 20: Restaurant Culinarium, Währinger Strasse 21 Mayor's Reception May 17: City Hall, Wappensaal (Feststiege II), entrance Lichtenfelsgasse 2 Gala Dinner May 18: Palais Todesco, Beletage, Kärntner Str. 51

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As an early adopter, IFIP NETWORKING 2016 Vienna will feature YuCCA, an especially designed new app platform with a strong focus on conference audience engagement. The app has been developed in the framework of a BSc thesis at the Faculty for Computer Science of University

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A short demonstration of the key app features will be provided during the "Countdown" session immediately before the opening of the main conference (May 17, 2016, at around 08:45am HS1). Looking forward to welcome you there!!

If you need any further information, please do not hesitate to contact us at networking2016@lists.univie.ac.at.

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