

2015 1st IEEE Conference on Network Softwarization

(NetSoft 2015)

**London, United Kingdom
13-17 April 2015**



**IEEE Catalog Number: CFP15A76-POD
ISBN: 978-1-4799-7900-4**

PROGRAM – TUESDAY, APRIL 14

OPENING SESSION & KEYNOTE # 1

TUE 9:00 – 9:30 Opening Session

Chair: Prosper Chemouil - Orange Labs, France

TUE 9:30 –10:30 **KeyNote #1** **Andy Reid**, British Telecom, UK
Where is NFV Pushing Current Boundaries?

Chair: George Pavlou – University College London, UK

TUE 10:30 –11:00 Demo Session & Coffee Break

PLENARY SESSION

TUE 11:00 – 13:00 **PS1: Network Functions Virtualization**

Chair: Christian Jacquenet -Orange Labs, France

Design and Evaluation of Algorithms for Mapping and Scheduling of Virtual Network Functions

Rashid Mijumbi, *Universitat Politècnica de Catalunya, Spain*
Joan Serrat, *Universitat Politècnica de Catalunya, Spain*
Niels Bouten, *Ghent University – iMinds, Belgium*
Juan-Luis Gorricho, *Universitat Politècnica de Catalunya, Spain*
Filip De Turck, *Ghent University – iMinds, Belgium*
Steven Davy, *Waterford Institute of Technology, Ireland.*

Cost-based placement of vDPI functions in NFV infrastructures

Mathieu Bouet, *Thales Communications & Security, France*
Jeremie Leguay, *Huawei Technologies Co. Ltd., France*
Vania Conan, *Thales Communications & Security, France.*

LawNFO: A decision framework for optimal location-aware network function outsourcing

Kalika Suksomboon, *KDDI R&D Laboratories Inc., Japan*
Masaki Fukushima, *KDDI R&D Laboratories Inc., Japan.*
Michiaki Hayashi, *KDDI R&D Laboratories Inc., Japan*
Rathachai Chawuthai, *National Institute of Informatics, Japan.*
Hideaki Takeda, *National Institute of Informatics, Japan.*

Dependability Evaluation and Benchmarking of Network Function Virtualization Infrastructures

Domenico Cotroneo, *University of Naples Federico II, Italy.*
Luigi De Simone, *University of Naples Federico II, Italy.*
Antonio Ken Iannillo, *University of Naples Federico II, Italy*
Anna Lanzaro, *University of Naples Federico II, Italy.*
Roberto Natella, *University of Naples Federico II, Italy.*

TUE 13:00 –14:00 Demo Session & Lunch

PARALLEL SESSIONS

TUE 14:00 – 15:30 SS1a: SDN Architectures and Service Chaining

Chair: Walter Cerroni - University of Bologna, Italy

An SDN-based Architecture for Network-as-a-Service

Mani Prashanth Varma Manthena, Delft University of Technology, The Netherlands.

Niels L. M. van Adrichem, Delft University of Technology, The Netherlands.

Casper van den Broek, TNO, The Netherlands

Fernando A. Kuipers, Delft University of Technology, The Netherlands.

DICES: a Dynamic adaptive service-driven SDN architecture

Jean-Michel Sanner, Orange Labs, France

Meryem Ouzzif, Orange Labs, France.

Yassine Hadjadj-Aoul, University of Rennes 1, France.

Network service chaining with efficient network function mapping based on service decompositions

Sahel Sahhaf, Ghent University – iMinds, Belgium.

Wouter Tavernier, Ghent University – iMinds, Belgium

Didier Colle, Ghent University – iMinds, Belgium.

Mario Pickavet, Ghent University – iMinds, Belgium.

Dynamic Chaining of Virtual Network Functions in Cloud-Based Edge Networks

Franco Callegati, University of Bologna, Italy

Walter Cerroni, University of Bologna, Italy

Chiara Contoli, University of Bologna, Italy

iuliano Santandrea, University of Bologna, Italy.

TUE 14:00 – 15:30 SS1b: Content and Routing

Chair: Stefani Salsano - University of Rome, Italy

BaProbSDN: A Probabilistic-based QoS Routing Mechanism for Software Defined Networks

Ahmed Al-Jawad, Middlesex University, United Kingdom.

Ramona Trestian, Middlesex University, United Kingdom.

Purav Shah, Middlesex University, United Kingdom.

Orhan Gemikonakli, Middlesex University, United Kingdom.

OpenCache: A Software-defined Content Caching Platform

Matthew Broadbent, Lancaster University, United Kingdom.

Daniel King, Lancaster University, United Kingdom.

Sean Baildon, Lancaster University, United Kingdom.

Nektarios Georgalas, British Telecom Group, United Kingdom.

Nicholas Race, Lancaster University, United Kingdom.

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SRSC: SDN-based Routing Scheme for CCN

Elian Aubry, *Université de Lorraine, France.*

Thomas Silverston, *University of Tokyo & Japanese-French Laboratory for Informatics (JFLI), Japan.*

Isabelle Chrisment, *LORIA-TELECOM Nancy, Université de Lorraine, France.*

NDNFlow: Software-Defined Named Data Networking

Niels L. M. van Adrichem, *Delft University of Technology, The Netherlands.* **Fernando**

A. Kuipers, *Delft University of Technology, The Netherlands.*

TUE 15:30 –16:00 Demo Session & Coffee Break

TUE 16:00 – 17:30 SS2a: Control Plane

Chair: **Yoshiaki Kiriha** - *NEC Japan*

Bootstrapping Software Defined Network for Flexible and Dynamic Control Plane Management

Prithviraj Patil, *Vanderbilt University, USA*

Hakiri Akram, *Laboratoire d'Architecture et d'Analyse des Systèmes, France.*

Aniruddha Gokhale, *Vanderbilt University, USA.*

FRACTAL: A Framework for Recursive Abstraction of SDN Control-Plane for Large-Scale Production Networks

Myungchul Kwak, *Seoul National University, Korea*

Junho Suh, *Seoul National University, Korea.*

Taekyoung Kwon, *Seoul National University, Korea.*

Integrating an Identity-Based Control Plane with the HIMALIS Network Architecture

Pedro Martinez-Julia, *University of Murcia, Spain*

Ved P. Kafle, *National Institute of Information and Communications Technology (NICT), Japan.*

Antonio Fernando Skarmeta Gomez, *University of Murcia, Spain.*

A Greedy Approach for Minimizing SDN Control Overhead

Mathis Obadia, *Thales Communications & Security & Telecom Paristech, France.*

Mathieu Bouet, *Thales Communications & Security, France.*

Jean-Louis Rougier, *Telecom ParisTech / LTCl, France.*

Luigi Iannone, *Telecom ParisTech, France.*

TUE 16:00 – 17:30 SS2b: Monitoring and Troubleshooting

Chair: **Slawomir Kuklinski** - *Orange Labs, Poland*

Experiences Monitoring and Managing QoS using SDN on Testbeds Supporting Different Innovation Stages

Stuart E Middleton, *University of Southampton, United Kingdom*

Stefano Modafferi, *University of Southampton, United Kingdom.*

Observing software-defined networks using a decentralized link monitoring approach

Rebecca Steinert, *SICS Swedish ICT, Sweden*
Andrea Hess, *SICS Swedish ICT, Sweden*.

OF2NF: Flow monitoring in OpenFlow environment using NetFlow/IPFIX

Dušan Pajin, *Academic Network of Serbia (AMRES), Serbia*
Pavle V Vuletić, *University of Belgrade, School of Electrical Engineering & Academic Network of Serbia (AMRES), Serbia*.

SDN-RADAR: Network Troubleshooting Combining User Experience and SDN Capabilities

Gabriela Gheorghe, *University of Luxembourg, Luxembourg*.
Tigran Avanesov, *University of Luxembourg, Luxembourg*.
Maria Rita Palattella, *University of Luxembourg, Luxembourg*
Thomas Engel, *University of Luxembourg, Luxembourg*.
Ciprian Popoviciu, *Nephos6, USA*.

PROGRAM – WEDNESDAY, APRIL 15

PLENARY SESSION

WED 9:00 – 10:00 KeyNote #2 Alberto Leon-Garcia, University of Toronto, Canada
Applications Enablement on Software-Defined Infrastructures

Chair: Raouf Boutaba - *University of Waterloo, Canada*

WED 10:00 –10:30 Demo Session & Coffee Break

WED 10:30 – 12:30 PS2: Virtualized SDIs

Chair: Rui L. Aguiar - *University of Aveiro, Portugal*

Seamless integration of Cloud and Fog Networks

Igor Cardoso, *Instituto de Telecomunicações, Portugal*.
João Barraca, *University of Aveiro, Portugal*
Carlos Gonçalves, *NEC Europe Ltd., Germany*.
Rui L Aguiar, *University of Aveiro & Instituto de Telecomunicações, Portugal*.

Recursive, Hierarchical Embedding of Virtual Infrastructure in Multi-Domain Substrates

Ishan Vaishnavi, *Huawei Research Centre, Germany*.
Riccardo Guerzoni, *Huawei Technologies Co., Ltd. & European Research Center, Germany*.
Riccardo Trivisonno, *Huawei Technologies, Germany*.

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SAVE: Energy-Aware Virtual Data Center Embedding and Traffic Engineering using SDN

Yoonseon Han, Pohang University of Science and Technology, Korea
Jian Li, Pohang University of Science and Technology, Korea.
Jae Yoon Chung, Pohang University of Science and Technology, Korea
Jae-Hyoung Yoo, Pohang University of Science and Technology, Korea.
James W. Hong, Pohang University of Science and Technology, Korea.

PACAO: a Protocol Architecture for Cloud Access Optimization in Distributed Data Center Fabrics

Patrick Raad, University Pierre et Marie Curie – Paris 6, France
Stefano Secci, University Pierre et Marie Curie – Paris 6, France
Dung Phung Chi, Vietnam National University, Vietnam.
Pascal Gallard, Non Stop Systems, France.

WED 12:30 –14:00 Demo Session & Lunch

PARALLEL SESSIONS

WED 14:00 – 15:30 SS3a: Controllers and Service Orchestration

Chair: Fulvio Rizzo - Politecnico de Turino, Italy

Enhancing the BRAS through Virtualization

Thomas Dietz, NEC Europe Ltd., Germany
Roberto Bifulco, NEC Laboratories Europe, Germany.
Filipe Manco, NEC Laboratories Europe, Germany.
Joao Martins, NEC Laboratories Europe, Germany.
Hans-Joerg Kolbe, NEC Europe Ltd., Germany.
Felipe Huici, NEC Europe Ltd., Germany

Policy-based Orchestration of NFV Services in Software-Defined Networks

Kostas Giotis, National Technical University of Athens, Greece
Yiannos Kryftis, National Technical University of Athens, Greece
Vasilis Maglaris, National Technical University of Athens, Greece.

SDN controller for Context-aware Data Delivery in Dynamic Service Chaining

Barbara Martini, CNIT, Italy
Molka Gharbaoui, Scuola Superiore Sant'Anna, Italy
Piero Castoldi, Scuola Superiore Sant'Anna, Italy.
Andrea Sgambelluri, Scuola Superiore Sant'Anna, Italy
Federica Paganelli, National Inter-University Consortium for Telecommunications & Research Unit at the University of Firenze, Italy.
Ahmed Ali Mohammed, CNIT, Italy

BYOC: Bring Your Own Control. A new concept to monetize SDN's openness

Amin Aflatoonian, Orange Labs, France
Ahmed Bouabdallah, Institut Mines-Telecom – Telecom Bretagne, France
Karine Guillouard, Orange Labs, France.
Vincent Catros, Orange Labs, France
Jean-Marie Bonnin, Institut Mines Telecom / Telecom Bretagne & IRISA, France.

WED 14:00 – 15:30 SS3b: Mobility and Resource Management

Chair: David Griffin - *University College London, UK*

SDN Based Evolved Packet Core Architecture For Efficient User Mobility Support

Sakshi Chourasia, *Indian Institute of Technology Madras, India*
Krishna M. Sivalingam, *Indian Institute of Technology Madras, India.*

Quality of Service Control and Resource Prioritization with Software Defined Networking

Melih Karaman, *Koc University & Turk Telekom ARGELA, Turkey*
Burak Gorkemli, *Koç University, Turkey*
Sinan Tatlicioglu, *Turk Telekom ARGELA, Turkey*
Mustafa Komurcuoglu, *Turk Telekom ARGELA, Turkey*
Ozgur Karakaya, *Turk Telekom ARGELA, Turkey.*

The SDN/NFV Cloud Computing Platform and Transport Network of the ADRENALINE Testbed

Ricard Vilalta, *CTTC, Spain*
Arturo Mayoral, *CTTC, Spain*
Raul Muñoz, *CTTC, Spain.*
Ramon Casellas, *CTTC, Spain*
Ricardo Martinez, *CTTC, Spain.*

SDN-based Adaptive Cloud Network Management for 3D Rendering and Streaming Services

Donghyeok Ho, *Pohang University of Science and Technology, Korea.*
Kunwoo Shin, *Pohang University of Science and Technology, Korea*
Hwangjun Song, *Pohang University of Science and Technology, Korea.*

WED 15:30 –16.00 Demo Session & Lunch

WED 16:00 – 17:30 SS4a: Trust, Security and Management

Chair: Olivier Festor - *INRIA, France*

A novel approach for integrating security policy enforcement with dynamic network virtualization

Fulvio Valenza, *Politecnico di Torino, Italy*
Cataldo Basile, *Politecnico di Torino, Italy*
Antonio Lioy, *Politecnico di Torino, Italy*
Christian Pitscheider, *Politecnico di Torino, Italy*
Marco Vallini, *Politecnico di Torino, Italy.*

Trust Support for SDN Controllers and Virtualized Network Applications

Stéphane Betgé-Brezetz, *Alcatel-Lucent Bell Labs, France*
Guy-Bertrand Kamga, *Alcatel-Lucent Bell Labs, France.*
Monsef Tazi, *Télécom SudParis, France.*

Design and deployment of secure, robust and resilient SDN Controllers

Sandra Scott-Hayward, *Queen's University Belfast, United Kingdom.*

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Fast Proxyless Stream-Based Anti-Virus for Network Function Virtualization

Chia-Nan Kao, *National Tsing Hua University, Taiwan*
Salim SI, *National Tsing Hua University, Taiwan.*
Nen-Fu Huang, *National Tsing Hua University, Taiwan*
I-Ju Liao, *National Tsing Hua University, Taiwan.*
Rong-Tai Liu, *Trend Micro Incorporated, Taiwan.*
Hsien-Wei Hung, *Trend Micro Incorporated, Taiwan.*

WED 16:00 – 17:30 SS4b: Application Programming Interfaces

Chair: **Stefano Secci** - *Univ. Pierre and Marie Curie, France*

Introducing Network-Aware Scheduling Capabilities in OpenStack

Francesco Lucrezia, *Politecnico di Torino, Italy.*
Guido Marchetto, *Politecnico di Torino, Italy.*
Fulvio Rizzo, *Politecnico di Torino, Italy.*
Vinicio Vercellone, *Telecom Italia, Italy.*

Flexible Network Address Mapping for Container-based Clouds

Kyung Hwa Kim, *Columbia University, USA*
Jae Woo Lee, *Columbia University, USA*
Michael Ben-Ami, *Columbia University, USA*
Hyunwoo Nam, *Columbia University, USA*
Jan Janak, *Columbia University, USA*
Henning Schulzrinne, *Columbia University, USA.*

APIs for QoS configuration in Software Defined Networks

Cosmin Caba, *Technical University of Denmark, Denmark.*
Jose Soler, *Technical University of Denmark, Denmark.*

PROGRAM – THURSDAY, APRIL 16

PLENARY SESSIONS

THU 9:00 – 10:00 KeyNote #3 Peter T. Kirstein, *University College London, UK*
Software-Defined Edge Objects in the Internet of Things

Chair: **Alex Galis** - *University College London, UK*

THU 10:00 –10:30 Demo Session & Coffee Break

THU 10:30 – 12:30 PS3: SDI Protocols and Monitoring

Chair: **Erol Gelenbe** - *Imperial College London, UK*

Adaptive Software Defined Multicast

Jeremias Blendin, TU Darmstadt, Germany
Julius Rückert, TU Darmstadt, Germany
Tobias Volk, TU Darmstadt, Germany.
David Hausheer, TU Darmstadt, Germany.

Experience on the Development of LISP-enabled Services: an ISP Perspective

Taeyeol Jeong, Pohang University of Science and Technology, Korea.
Jian Li, Pohang University of Science and Technology, Korea.
Jonghwan Hyun, Pohang University of Science and Technology, Korea.
Jae-Hyoung Yoo, Pohang University of Science and Technology, Korea.
James W. Hong, Pohang University of Science and Technology, Korea.

liteFlow: Lightweight and Distributed Flow Monitoring Platform for SDN

Naman Grover, Grover, Indian Institute of Technology Hyderabad, India.
Nitin Agarwal, Indian Institute of Technology Hyderabad, India.
Kotaro Kataoka, Indian Institute of Technology Hyderabad, India.

SCLP: Segment-oriented Connection-Less Protocol for High-Performance Software Tunneling in Datacenter Networks

Ryota Kawashima, Nagoya Institute of Technology, Japan.
Shin Muramatsu, Nagoya Institute of Technology Aichi, Japan
Hiroki Nakayama, BOSCO Technologies Inc. Tokyo, Japan
Tsunemasa Hayashi, BOSCO Technologies Inc. Tokyo, Japan
Hiroshi Matsuo, Nagoya Institute of Technology Aichi, Japan

THU 12:30 –13:30 Demo Session & Lunch

THU 13:30 – 15:30 PS4: SDN & NFV for Mobile and IP Networks

Chair: Stuart Clayman -University College London, UK

Mobile Core Network Virtualization: A Model for combined Virtual Core Network Function Placement and Topology Optimization

Andreas Baumgartner, Chemnitz University of Technology, Germany
Varun Reddy, Chemnitz University of Technology, Germany
Thomas Bauschert, Chemnitz University of Technology, Germany.

Virtual Link Mapping for Delay Critical Services in SDN-enabled 5G Networks

Riccardo Guerzoni, Huawei Technologies Co., Ltd. & European Research Center, Germany.
Ishan Vaishnavi, Huawei Research Centre, Germany
Ansah Frimpong, Huawei Technologies, Germany
Riccardo Trivisonno, Huawei Technologies, Germany.

QoS Enabled WiFi MAC Layer Processing as an Example of a NFV Service

Jonathan Vestin, Karlstad University, Sweden
Andreas J. Kassler, Karlstad University, Sweden.

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Towards Migrating Security Policies of Virtual Machines in Software Defined Networks

Sahba Sadri, *Concordia University, Montreal, Canada.*

Yosr Jarraya, *Concordia University, Montreal, Canada.*

Arash Eghtesadi, *Inocybe Technologies, Canada.*

Mourad Debbabi, *Concordia University, Montreal, Canada.*

Tethered Linux CPE for IP Service Delivery

Fernando Sanchez, *PLUMgrid, INC., USA*

David Brazewell, *British Sky Broadcasting Ltd., United Kingdom.*

THU 15:30 –16:00 Demo Session & Coffee Break

THU 16:00 – 17:30 Panel

Potential Synergies between SDN-NFV, IoT and Cloud

Panel Organisers:

Antonio Manzalini, *Telecom Italia, Italy*

Stefano Previdi, *Cisco, Italy*

Panel members:

Andy Reid, *British Telecom, UK*

Stefano Secci, *UPMC-LIP6, France*

James Won-Ki Hong, *POSTECH, South Korea*

Fulvio Rizzo, *Politecnico di Torino, Italy*

Abstract: In the future, the border between infra-Consumers and infra-Providers will gradually disappear: more and more powerful Users' smartphones, tablets, devices, intelligent machines, smart things...will become just like "network nodes", storing large data-sets locally and even executing network functionalities and service component. "Softwarization" at the edge of current Telecommunications infrastructures and Internet of Things will merge in a sort of "continuum of logical resources", spanning from the terminals, to the infrastructure nodes, up to the Cloud Computing.

These are the key questions you will be asked to elaborate:

- What are the potential synergies between the three domains: SDN-NFV, IoT and Cloud?
- What will be the impacts on current value chains?
- What are the technical challenges and the enabling technologies?

CLOSING SESSION

THU 17:30 – 17:45 Closing Session

Chair: **Prosper Chemouil** - *Orange Labs, France*

DEMOS

Demo #1

An Integrated Environment for Open-Source Network Softwarization

Authors

Jong Hun Han, *University of Cambridge, UK*
Gianni Antichi, *University of Cambridge, UK*
Noa Zilberman, *University of Cambridge, UK*
Charalampos Rotsos, *Lancaster University, UK*
Andrew W. Moore, *University of Cambridge, UK*

Abstract: Network softwarization drives innovation both in software and hardware. This demo introduces a highly integrated environment that enables open source solutions for software defined network (SDN) in both hardware and software. This environment is built upon the NetFPGA platform for rapid prototyping of networking devices. It showcases tools (OSNT and OFLOPS) for evaluating the performance of networking devices, and demonstrates them using a pipelined multi-table OpenFlow enabled switch application. An open-source environment integrating both software and hardware that fully inter-operate, as demonstrated here, is essential for high-quality software defined networking solutions

Demo #2

Self-deploying Service Graphs over ELuWD EHU-OEF Lightweight UNIFY Domain

Authors

Jokin Garay, *University of the Basque Country, Spain*
Jon Matias, *University of the Basque Country, Spain*
Alaitz Mendiola, *University of the Basque Country, Spain*
Jasone Astorga, *University of the Basque Country, Spain*
Eduardo Jacob, *University of the Basque Country, Spain*

Abstract: This demonstration focuses on the interaction between the service and the orchestrator, presenting an access control service which upon successful authentication and authorization triggers deployment of a new service for the authenticated user.

Demo #3

Extending Hadoop's Yarn Scheduler Load Simulator with a Highly Realistic Network & Traffic Model

Authors

Philip Wette, *University of Paderborn, Germany*
Arne Schwabe, *University of Paderborn, Germany*
Malte Splietker, *University of Paderborn, Germany*
Holger Karl, *University of Paderborn, Germany*

Abstract: NetSLS brings together MaxiNet, a highly scalable emulator for software-defined networks, and SLS, a simulator for benchmarking Hadoop Job schedulers.

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The NetSLS demo shows how to emulate a whole cluster of Hadoop workers and the corresponding network infrastructure on only very few physical resources. This allows for testing novel job schedulers with a realistic network model as well as testing novel routing algorithms under realistic Hadoop workload.

With this work, the interdependency between the network and the jobs running on top of it can be included into the evaluation of new ideas, leveraging research on big-data applications with joint job and flow scheduling.

Demo #4

NetIDE: removing vendor lock-in in SDN

Authors

R. Doriguzzi-Corin, *CREATE-NET, Italy*
E. Salvadori, *CREATE-NET, Italy*
P. A. Aranda Gutierrez, *Telefonica I+D, Spain*
C. Stritzke, *Fraunhofer IPT, Germany*
A. Leckey, *Intel Labs Europe, Ireland*
K. Phemius, *Thales, France*
E. Rojas, *Telcaria Ideas S.L., Spain*
C. Guerrero, *IMDEA Networks, Spain*

Abstract: The objective of the demonstration is to show two of the NetIDE framework benefits:

An **Integrated Development Environment:** one single tool to manage the whole life-cycle of Network Application: from the design, to the implementation, deployment and testing;

Network Application re-usability and portability: Network Applications written for many different controller frameworks, e.g. implemented in the past for different environments/needs, can be re-used and executed on top of the controller framework that is currently managing a given network infrastructure; or the other way around, a well-tested Network Application can be ported and executed “as is” on a second network controlled by another controller framework.

Demo #5

Offloading personal security applications to a secure and trusted network node

Authors

R. Bonafiglia, *Politecnico de Turino, Italy*
F. Ciaccia, *Barcelona Supercomputing Center, Spain*
A. Liroy, *Politecnico de Turino, Italy*
M. Nemirovsky, *Barcelona Supercomputing Center, Spain*
F. Risso, *Politecnico de Turino, Italy*
T. Su, *Politecnico de Turino, Italy*

Abstract: The current device-centric protection model against security threats has serious limitations from the final user perspective – among others the necessity to keep each device updated with the latest security updates and the necessity to replicate all the security policies across all devices. In our model, the protection is decoupled from the users’ terminals and it is provided through a Trusted Virtual Domain (TVD) instantiated in future edge routers. The demo will show the architecture of a Network Edge Device (NED) augmented with a software that allows for the deployment of the user security applications in a trusted virtual domain; the demo will simulate a typical use case scenario,

with two user connecting to the NED, verifying its trustworthiness, authenticating and deploying the VMs enforcing their security policies.

Demo #6

Experimental Demonstration of Virtual Network Controller for Abstraction and Control of Multi-tenant Multi-technology Transport Networks

Authors

Ricard Vilalta, *Centre Tecnològic de Telecomunicacions de Catalunya, Spain*

Arturo Mayoral, *Centre Tecnològic de Telecomunicacions de Catalunya, Spain*

Raul Muñoz, *Centre Tecnològic de Telecomunicacions de Catalunya, Spain*

Ramon Casellas, *Centre Tecnològic de Telecomunicacions de Catalunya, Spain*

Ricardo Martínez, *Centre Tecnològic de Telecomunicacions de Catalunya, Spain*

Abstract: In this demo, we present the Virtual Network Controller (VNC) and the Multi-domain SDN Orchestrator. The VNC allows the deployment of OF-enabled multi-tenant Virtual Networks (VN). Once a requested VN is deployed, it is controlled with a customer SDN controller. The Multi-domain SDN Orchestrator is responsible for the provisioning of end-to-end paths across multi-technology network domains. The VNC interacts with the Multi-domain SDN Orchestrator to provision the requested virtual links.

Demo #7

ICONA: Inter Cluster Onos Network Application

Authors

Matteo Gerola, *Create-Net, Italy*

Michele Santuari, *Create-Net, Italy*

Elio Salvadori, *Create-Net, Italy*

Stefano Salsano, *University of Rome Tor Vergata, Italy*

Pier Luigi Ventre, *Consortium GARR*

Mauro Campanella, *Consortium GARR*

Francesco Lombardo, *University of Rome Tor Vergata, Italy*

Giuseppe Siracusano, *University of Rome Tor Vergata, Italy*

Abstract: Several Network Operating Systems have been proposed in the last few years for Software Defined Networks; however, only a few of them are offering the resilience, scalability and high availability required for production environments. In our demonstration we present a geographically distributed SDN Control Plane, called ICONA, build on top of the Open Networking Operating System (ONOS) and designed to meet the aforementioned Service Providers requirements. During the demo, which runs inside the GEANT OpenFlow pan-European testbed, we show how a Service Provider engineer can easily manage and monitor the network and deploy some services and how ICONA can automatically recover from Control and Data planes failures.

Workshop #1: Management on Software-Defined 5G Networks – Soft5G

FRI 9:00 – 10:00 Keynotes

Welcome Message from Workshop chairs

Thomas Magedanz, *Fraunhofer FOKUS, Germany*
Roberto Riggio, *CREATE-NET, Italy*

Keynote 1: 5G Mobile Network R&D in Japan

Speaker: Akihiro Nakao, *Tokyo University, Japan*

Keynote 2: The Challenges of Software-Based 5G Networks

Speaker: Zygmunt Lozinski, *IBM, United Kingdom*

FRI 10:00 – 10:30 Coffee break

FRI 10:30 – 12:30 S5G1: NFV architectures for 5G

Chair: Roberto Riggio, *CREATE-NET, Italy*

Towards Mobile Federated Network Operators

Alexander Willner, *TU Berlin & Fraunhofer FOKUS, Germany*
Thomas Magedanz, *TU Berlin & Fraunhofer FOKUS, Germany*
Yahya Al-Hazmi, *TU Berlin, Germany.*
Giuseppe Carella, *TU Berlin & Fraunhofer FOKUS, Germany.*
Joyce Mwangama, *University of Cape Town, South Africa*
Neco Ventura, *University of Cape Town, South Africa.*

Latency-aware Composition of Virtual Functions in 5G

Barbara Martini, *CNIT, Italy*
Federica Paganelli, *CNIT, Italy*
Paola Cappanera, *University of Florence, Italy.*
Stefano Turchi, *CNIT, Italy.*
Piero Castoldi, *Scuola Superiore Sant'Anna, Italy.*

SDN in the Wireless Context - Towards Full Programmability of Wireless Network Elements

Osianoh Glenn Aliu, *Fraunhofer FOKUS, Germany*
Senka Hadzic, *Fraunhofer FOKUS, Germany.*
Christian Niephaus, *Fraunhofer FOKUS, Germany.*
Mathias Kretschmer, *Fraunhofer FOKUS, Germany.*

Future Mobile Core Network for Efficient Service Operation

Takuya Shimojo, *NTT DOCOMO, INC, Japan*
Yusuke Takano, *NTT DOCOMO, INC, Japan*
Ashiq Khan, *NTT DOCOMO, INC, Japan.*
Stephane Kaptchouang, *NTT DOCOMO, INC, Japan.*

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Motoshi Tamura, *NTT DOCOMO, INC, Japan*
Shigeru Iwashina, *NTT DOCOMO, INC, Japan.*

FRI 12:30 – 13:30 Lunch

FRI 13:30 – 15:00 S5G2: QoS and QoE in software defined 5G networks

Chair: Serge Fdida, *UPMC, France*

Enabling Open Access to LTE network components; the NITOS testbed paradigm

Nikos Makris, *University of Thessaly, Greece*
Christos Zarafetas, *University of Thessaly, Greece.*
Spyros Kechagias, *University of Thessaly, Greece*
Thanasis Korakis, *Polytechnic Institute of New York University, US*
Alvan Seskar, *WINLAB, Rutgers University, USA.*
Leandros Tassioulas, *Yale University, USA.*

Mobility-Aware QoS Assurance in Software-Defined Radio Access Networks: An Analytical Study

Vassilios G. Vassilakis, *University of Surrey, United Kingdom.*
Ioannis Moscholios, *University of Peloponnese, Greece*
Andreas Bontozoglou, *University of Essex, United Kingdom*
Michael D. Logothetis, *University of Patras, Greece.*

Configuration Cost vs. QoS Trade-off Analysis and Optimization of SDR Access Virtualization Schemes

Mohammad-Moshiur Rahman, *École de Technologie Supérieure, University of Quebec, Canada*
Charles Despins, *Prompt, Canada*
Sofiène Affes, *INRS-EMT, Canada.*

FRI 15:00 – 15:30 Coffee Break

FRI 15:30 – 17:00 Keynotes

Keynote 3: The vHGW Use Case and Beyond

Speaker: Pedro Miguel Neves, *Telecom PT, Portugal*

Keynote 4: Underestimated Role of Software in 5G

Speaker: Sławomir Kukliński, *Orange & Warsaw University of Technology, Poland*

FRI 17:00 – 17:45 Panel

Opportunities and Challenges in Software-defined 5G Network Architectures and emerging Agile Eco-Systems

Moderator: Thomas Michael Bohnert, *Zurich University of Applied Sciences, Switzerland*

Bruno Chatras, *Orange Labs, France*
Jonathan Hart, *BT, United Kingdom*

Zygmunt Lozinski, *IBM, United Kingdom*
Carlos Parada, *Telecom PT, Portugal*.
Sławomir Kukliński, *Orange Poland & Warsaw University of Technology, Poland*.
Pedro Miguel Neves, *Telecom PT, Portugal*.

Workshop #2: Management Issues in Software-defined networks, Software-defined infrastructure and network function virtualization – MISSION 2015

FRI 9:00 – 10:00 Keynotes

Welcome Message from Workshop chairs

Kashinath Basu, *Oxford Brookes University, United Kingdom* **Chen Liu**, *Microsoft, USA*

Keynote: Management challenges and opportunities in SDN and NFV for telcos and enterprises

Speaker: **David Meyer**, *OpenDayLight Project & Brocade, USA*

FRI 10:00 – 10:30 Coffee break

FRI 10:30 – 11:30 SDN modeling

Chair: **Kashinath Basu**, *Oxford Brookes University, United Kingdom*

Self-Modeling based diagnosis of Software-Defined Networks

José M. Sánchez, *Orange Labs, France*

Imen Grida Ben Yahia, *Orange Labs, France*

Noel Crespi, *Institut Mines-Télécom, Télécom SudParis, France*.

Unified Metamodel for Orchestrating Different Domains in SDI

Masaki Fukushima, *KDDI R&D Laboratories Inc., Japan*

Keisuke Kuroki, *KDDI R&D Laboratories Inc., Japan*.

Michiaki Hayashi, *KDDI R&D Laboratories Inc., Japan*.

Toward a Semantic-based Packet Forwarding Model for Openflow

Khalil Blaiech, *Université du Québec à Montréal, Canada*

Salaheddine Hamadi, *UQAM, Canada*. **Petko Valtchev**, *UQAM & University of Montreal, Canada*.

Omar Cherkaoui, *University of Quebec in Montreal, Canada*

André Béliveau, *Ericsson Canada*.

FRI 11:30 – 12:30 SDN Infrastructure & NFV

Chair: **Kashinath Basu**, *Oxford Brookes University, United Kingdom*

Multi-tenancy for Virtualized Network Functions

Ahmed Mohamed Medhat Hassan, *TU Berlin, Germany*.

Joyce Mwangama, *University of Cape Town, South Africa*.

Giuseppe Carella, *TU Berlin / Fraunhofer FOKUS, Germany*

Neco Ventura, *University of Cape Town, South Africa*.

Flexible support of VNF placement functions in OpenStack

Simon Oechsner, *NEC Laboratories Europe & NEC Europe Ltd., Germany.*
Andreas Ripke, *NEC Labs Europe, Germany.*

An Open Framework to Enable NetFATE (Network Functions At The Edge)

Giovanni Schembra, *University of Catania, Italy.*
Giuseppe Faraci, *University of Catania, Italy.*
Alfio Lombardo, *University of Catania, Italy*
Antonio Manzalini, *Telecom Italia, Italy*
Corrado Rametta, *University of Catania, Italy*
Vincenzo Riccobene, *University of Catania, Italy.*

FRI 12:30 – 13:30 Lunch

FRI 13:30 – 15:00 SDN Operations and Management

Chair: Kashinath Basu, *Oxford Brookes University, United Kingdom*

Scalable Resilience for Software-Defined Networking Using Loop-Free Alternates with Loop Detection

Wolfgang Braun, *University of Tuebingen, Germany*
Michael Menth, *University of Tuebingen, Germany.*

SDN and ForCES Based Optimal Network Topology Discovery

George Tarnaras, *University of Patras, Greece.*

Load Balancing in Data Center Networks with Folded-Clos Architectures

Wile Sehery, *Virginia Tech, USAT.*
Charles Clancy, *Virginia Tech, USA.*

Extending OpenFlow for SDN-enabled Synchronous Ethernet networks

Raul Suarez, *Universitat Politècnica de Catalunya, Spain*
David Rincón, *Universitat Politècnica de Catalunya, Spain*
Sebastia Sallent, *Universitat Politècnica de Catalunya, Spain.*

FRI 15:00 – 15:30 Coffee break

FRI 15:30 – 16:45 Panel Discussion

Title: *Management challenges and opportunities in SDN and NFV for telcos and enterprises*

Moderator: *Kashinath Basu, Oxford Brookes University, United Kingdom*

Panel Members:

David Meyer, Brocade, USA

Giovanni Schembra, University of Catania, Italy

Daniel King, Lancaster University, United Kingdom

Workshop #3: Security Issues in SDN – SEC-SDN

FRI 9:00 – 10:00 Keynote

Welcome Message from Workshop chairs

Olivier Festor, Inria and Telecom Nancy, France

Radu State, University of Luxembourg, Luxembourg

Keynote: Virtualized Software DPI

Speaker: *Omar Cherkaoui, UQAM, Canada*

FRI 10:00 – 10:30 Coffee break

FRI 10:30 – 12:00 SEC: Securing the SDN Ecosystem

How to Detect a Compromised SDN Switch?

Po-Wen Chi, National Taiwan University, Taiwan

Chien-Ting Kuo, National Taiwan University, Taiwan

Jing-Wei Guo, Institute for Information Industry, Taiwan

Chin-Laung Lei, National Taiwan University, Taiwan.

Towards an Access Control Scheme for Accessing Flows in SDN

Felix Klaedtke, NEC Europe Ltd. Germany

Ghassan O. Karame, NEC Laboratories Europe, Germany

Roberto Bifulco, NEC Laboratories Europe, Germany

1st IEEE Conference on Network Softwarization

Heng Cui, *NEC Europe Ltd. Germany.*

Towards Trusted Software-Defined Networks using a Hardware-based Integrity Measurement Architecture

Ludovic Jacquin, *Hewlett-Packard Laboratories, United Kingdom*

Adrian L. Shaw, *Hewlett-Packard Laboratories, United Kingdom*

Chris Dalton, *Hewlett-Packard Laboratories, United Kingdom.*

FRI 12:00 – 12:30 Panel

Increased Software in the Network: Security Threats and Opportunities

Moderators: **Radu State**, *University of Luxemburg, Luxemburg*

Panel Members: *Papers Speakers*