Global Experimentation for Future Internet - 2019

GEFI 19 meeting

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Report of Contributions

Contribution ID: **2** Type: **Position Statement**

FABRIC and International Testbed Collaboration

Thursday, 7 November 2019 14:55 (7 minutes)

(Please see PDF attachment for a nicely formatted 2 page pdf with figures.)

FABRIC and International Testbed Collaboration
Paul Ruth, pruth@renci.org, RENCI - UNC Chapel Hill (author and attendee)

This document is a response to the GEFI 2019 call for position statements. This statement includes two major contributions that will be interesting to the GEFI community. First, is an announcement of the $20 Million NSF networking testbed called FABRIC. Second, is a description of a new collaboration between Chan

Announcing FABRIC

The NSF on September 17, 2019 announced a $20 Million collaborative project, led by RENCI – UNC Chapel Hill, to create a platform for testing novel internet architectures that could enable a faster, mor

A series of government-funded programs from the 1960s through the 1980s established the computer networking architectures that formed the basis for today's internet. FABRIC will help test out new network designs that could overcome current bottlenecks and continue to extend the Internet's broad benefits for science and society. FABRIC will explore the balance between the amount of information a network maintains, the network's ability to process information, and its scalability, performance and security.

The core FABRIC team includes RENCI, the University of Kentucky, the Department of Energy's Energy Sciences Network (ESnet), Clemson University, and the Illinois Institute of Technology. Contributors from the University of Kentucky and ESnet will be instrumental in designing and deploying the platform's hardware and developing new software. Clemson and Illinois Institute of Technology researchers will work with a wide variety of user communities—including those focused on security, distributed architectures, scientific applications and data transfer protocols—to ensure FABRIC can serve their needs. In addition, researchers from many other universities will help test the platform and integrate their computing infrastructure and scientific instruments into FABRIC.

The construction phase of the project is expected to last four years, with the first year dedicated to software development, finalizing technical designs, and prototyping. Subsequent years will focus on rolling out the platform's hardware to participating sites across the nation and connecting it to major national computing facilities. Ultimately, national and international experimenter communities will be able to attach new instruments or hardware resources to FABRIC's uniquely extensible design, allowing the infrastructure to grow and adapt to changing research needs over time. Currently the FABRIC team is looking to build a community of experimenters and facility partners to provide insight into the testbed design through community workshops starting early 2020.

Antwerp CityLab (imec/UA) - Chameleon/ExoGENI Collaboration

In July 2019, Paul Ruth traveled to Antwerp and Ghent, Belgium, to kick off a research collaboration with several members of Prof. Johann Marquez-Barja's research group that operate the Antwerp CityLab as part of IDLab/IMEC. The intent of the meetings were to foster an emerging collaboration between CityLab, ExoGENI, and NSF Cloud Chameleon with the goal of supporting global networking experiments that span all of these testbeds.

The CityLab in Antwerp is a great place to deploy Smart City experiments requiring low-latency local edge computing capabilities. However, it has limited access to regional private clouds and large remote clouds. An emerging collaboration between CityLab, ExoGENI, and NSFCloud Chameleon aims to enable tiered experiments that use regional private clouds (ExoGENI at University of Amsterdam) and large remote clouds (NSF Cloud Chameleon). The goal of this collaboration is to enable experiments spanning the three testbed as seen in the figure.

The meetings began with presentations to Paul Ruth by IDLab researchers Jeroen Famaey and Johann Marquez-Barja about the roles of IMEC-IDLab and the many different testbeds that IDLab operates (including Antwerp's CityLab). The remainder of the day was focused on discussions about how to enable experiments spanning the three testbeds. The discussions resulted in a much better understanding of the possibilities and limitations of enabling these experiments. A second day of meetings was in Ghent, Belgium and was hosted by Brecht Vermeulen at the IDlab-IMEC facilities in Ghent. Brecht is responsible for Fed4Fire which is needed to "stitch" ExoGENI circuit to CityLab. The meetings in Ghent included very low-level discussions about how the stitched circuit would be implemented. One unexpected outcome of the meeting was that we now plan to use a generic way to stitch ExoGENI to Fed4Fire. This more generic technique will enable stitching between ExoGENI and several other Fed4Fire testbeds including CityLab and Grid5000. The resulting plan is currently being deployed.

We plan to continue deploying the mechanisms required for experiments spanning Chameleon, ExoGENI, and Fed4Fire testbeds. We hope to present initial experiments at the 2019 GEFI workshop and perform a more robust experiment that with result in a published paper. As FABRIC is developed this initial collaboration will spur international collaboration with NSF's newest networking testbed.

Primary author: RUTH, Paul

Presenter: RUTH, Paul

Session Classification: Edge Computing

Contribution ID: **3** Type: **Position Statement**

Distributed Network Experiment Emulation

Thursday, 7 November 2019 09:55 (7 minutes)

With the ever growing complexity of networks, researchers have to rely on test-beds to be able to fully assess the quality of their propositions. In the meanwhile, Mininet offers a simple yet powerful API, the goldilocks of network emulators. We advocate that the Mininet API is the right level of abstraction for network experiments. Unfortunately it is designed to be run on a single machine. To address this issue we developed a distributed version of Mininet – Distrinet – that can be used to perform network experiments in any Linux-based testbeds, either public or private. To properly use testbed resources and avoid over- commitment that would lead to inaccurate results, Distrinet uses optimization techniques that determine how to orchestrate the experiments within the testbed. Its programmatic approach, its ability to work on various testbeds, and its optimal management of resources make Distrinet a key element to reproducible research.

Primary authors: Mr DI LENA, Giuseppe (Inria/Orange); Dr DABBOUS, Walid (Inria)

Co-authors: Dr TOMASSILLI, Andrea (université Côte d'Azur); Dr LAC, Chidung (Orange); Dr GIROIRE, Frédéric (CNRS/université Côte d'Azur); Dr DAMIEN, Saucez (Inria); Dr TURLETTI, Thierry (Inria)

Presenter: Dr DABBOUS, Walid (Inria)

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **4** Type: **Position Statement**

An online social network platform for security intelligence collaborations

Humans lived for centuries with limited methods of communication. While the Internet, smart phones and Online Social Networks (OSNs) dissolve location and all other barriers exist between humans for centuries, attackers' minds evolve rapidly to accommodate and fully utilize those technologies. There is a need for security defense mindsets to evolve also to fully utilize those same technologies to proactively detect and respond to cyber threats. Project Sollaborate aims to fill that need.

Security mindsets should acknowledge that information related to hacking, malwares, phishing attacks, should not be classified as confidential and hence the public users should be supported and encouraged to collaborate not only in data collection (e.g. alerts and detections of possible attacks, threats, etc.) but also collaborate in proposing and evaluating methods to counter such threats.

On the other hand, Anti-Malware companies should not act as pharmaceutical companies and exclusively and privately hold treatments for security problems. The public crowd should be encouraged to be part of all those activities.

One of the key factors to counter large-scale cyber security threats is timeliness. The current main entities to track and counter such large-scale threats are: (1) Cyber security private sector companies, driven by finance and business goals, and (2) public cyber entities, impacted by resource limitations, possible bureaucracy, etc. Sollaborate aims to involve a third category (the public crowd) to integrate and collaborate with the previous two entities and compensate for their limitations.

What is that brought the Internet to what it is right now in comparison with its initial vision to be just an online library information system. What made the Internet to bypass TVs that exist way before; it's the ability of public users to be part of the Internet, to contribute and be more visible and not only be passive content receivers.

Primary author: Dr IZZAT ALSMADI, Izzat

Presenter: Dr IZZAT ALSMADI, Izzat

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **6** Type: **Position Statement**

Leveraging Distributed Networked Cloud Testbeds for Domain Science Research and Experimentation

Friday, 8 November 2019 10:52 (7 minutes)

Computational science today depends on complex, data-intensive applications operating on datasets from
a variety of scientific instruments. A major challenge is the integration of data into the scientist's workflow.
Recent advances in dynamic, networked cloud resources provide the building blocks to construct reconfigurable, end-to-end infrastructure that can increase scientific productivity. However, applications
have not adequately taken advantage of these advanced capabilities. In the context of the DyNamo [4]
project funded under the NSF Campus CyberInfrastructure program, we have developed a novel networkcentric
platform, Mobius [7], which enables high-performance, adaptive data flows and coordinated access
to distributed multi-cloud resources (cloud research testbeds like ExoGENI [1], Chameleon [2], XSEDE
JetStream [3], etc.), and data repositories for atmospheric scientists.

(download PDF for full text)

Primary author: MANDAL, Anirban (RENCI)

Co-author: RUTH, Paul (RENCI)

Presenter: MANDAL, Anirban (RENCI)

Session Classification: Reproducibility and Open Data

Contribution ID: **7** Type: **Position Statement**

Reproducibility by Design: A Family of Testbeds for High-Precision Network Experiments

Friday, 8 November 2019 11:39 (7 minutes)

Reproducibilification, i.e., making experiments reproducible, is the ultimate goal for successful scientific experiments. In this work, we identify key challenges for the design of reproducible network experiments. We present our approach for reproducible network research which enforces an experiment workflow leading to inherently replicable network experiments. Our approach realized in our testbed infrastructure combines high-precision measurement tools, full automation, and support for publishing experiment scripts and results. We further present ongoing work, including extending high precision traffic generation and measurement capabilities for 100G Ethernet. Future plans involve the creation of a multi-site wireless testbed, which connects our testbed infrastructure with different remote testbeds, thereby creating a federated testbed. This federated testbed can be used for scenarios combining 5G Radio Access Network infrastructure with high-performance backbone infrastructure to investigate low-latency communication and edge computing use cases.

Primary author: CARLE, Georg (TUM)

Presenter: CARLE, Georg (TUM)

Session Classification: Reproducibility and Open Data

Contribution ID: **8** Type: **Position Statement**

Protecting the Future of our Critical Infrastructure: Novel Approach Towards Understating Disruptive Network, Communication, and System Technologies

Developing a skilled diverse workforce with the knowledge to protect our future critical infrastructure (i.e., power grids, transportation, water, gas and oil, and other systems) is a serious challenge because of its complexity and high demand for specialized workforce skill set normally taught at a few academic institutions.
Thus, there is gap between disruptive and innovative technologies that can to solve the problems and the demand for a qualified workforce in cybersecurity that will provide safety for our future critical infrastructure.
Workforce development and readiness at diverse academic institutions like our current institution is usually developed via internship/co-ops, which not all students have access or even know how to obtain and be prepared for. Also, students need to develop research, communication, problem solving, and critical thinking skills under a real-world perspective.
We have explored this challenge during our previous research by providing opportunities inside and outside of the classroom for students to be actively engaged in their learning process using the Affinity Research Group
(ARG). ARG is used to teach research skills, create a safe environment for students and collaborators to become lifelong learners, leaders, and create community. Additionally, ARG involves and engages students in research
projects that range from how to use testbeds/equipment for network experimentation as well as using wireless networks to monitor critical transportation infrastructure such as bridges. Thus, building on the success of our previous research, our current research seeks to understand how to better prepare students to have research skills and be workforce ready to protect our critical infrastructure. Particularly, we would like to explore and understand/experiment disruptive network and systems technologies using testbeds. For example, we are very interested in learning how disruptive communication infrastructure technologies such as Software Defined Networks (SDN) and P4 programming language can be used to automat the protection, measurement, and monitor network infrastructure safety. Current network infrastructure is the basic communication mechanism that supports our future critical infrastructure. Innovations in SDN, P4, and other technologies may solve many
of the existing problems but they may also bring new vulnerabilities not considered before. T. Dargahi and et at.
study the security implications and vulnerabilities of these technologies when used to communicate user data across the networks (T. Dargahi, A. Caponi, M. Ambrosin, G. Bianchi, and M. Conti. IEEE Communications
Surveys & Tutorials 19 (3), 1701-1725, 2017). We will like to expand on their work and understand better these technologies.

(download PDF for full text)

Primary author: PERERA, Graciela (NIU)

Presenter: PERERA, Graciela (NIU)

Contribution ID: **9** Type: **Position Statement**

Toward Integrated Experimentation of Cloud/Edge Computing and IoT Applications on Shared Cyberinfrastructure Testbeds

The increasing data processing and networking demand of emerging applications plays an important role in the design and implementation of novel computing infrastructures of today and tomorrow. New technologies, including big data, deep learning, as well as Internet-of-Things (IoT) and 5G/6G networks, are ushering in a new era of rapid transformation with ubiquitous connectivity and distributed intelligence for smart and connected communities. New architectural designs, such as Cloud/Edge/Fog Computing, Information-Centric Networking (ICN) [1], and Software-Defined Networking [2], have been proposed in order to meet various application requirements, including high data throughput, low latency, delay tolerance, rapid mobility, and scalability.

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Primary author: LIU , Jason (FIU)

Presenter: LIU , Jason (FIU)

Contribution ID: **10** Type: **Position Statement**

A Trans-Pacific Programmable Network Testbed for Future Real-time Science Applications

Thursday, 7 November 2019 09:27 (7 minutes)

A growing number of scientific fields require the ability to analyze data in near real-time, so that results from one experiment can guide selection of the next—or even influence the course of a single experiment. The experiments are often tightly scheduled, with timing driven by factors ranging from the physical processes involved in an experiment to the travel schedules of on-site researchers. With improvements in the sensor and detector technologies at experimental facilities (e.g., synchrotron light sources and neutron sources), data produced at these facilities significantly exceed their own local processing capabilities. Thus, the data needs to be moved to remote compute facilities both within and outside a country (or continent) as the users of these facilities often span diverse geographic locations.
The computing and network resources must be available at a specific time, for a specific period. Ondemand network bandwidth, though provided by backbone research and education networks such as ESnet and Internet2, is not easy to get end-to-end in an automated fashion. Even though compute resources can be obtained on-demand (at least in some institutions), those resources are not typically connected to the wide-area network (WAN). The typical model is that the data coming from the WAN goes into the parallel file system via the dedicated data transfer nodes (DTNs) and compute nodes access the data from the parallel file system. This model does not work well for near real-time analysis of the data streams coming from an experiment or simulation. We need international (and intercontinental) testbeds to evaluate solutions to enable these emerging science workflows.

(download PDF for full text)

Primary author: JOAQUIN, Chung (ANL)

Presenter: JOAQUIN, Chung (ANL)

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **11** Type: **Position Statement**

Federated International Future Internet Experimental Research Testbeds

Thursday, 7 November 2019 15:45 (7 minutes)

With its national and international research partners, the International Center for Advanced Internet Research (iCAIR) at Northwestern University designs, develops, implements, and operates large scale, including world-wide, computer science testbeds. Generally, with its research partners, iCAIR operates between 25 and 30 national, international, and local testbeds. The majority have been designed and implemented as network research testbeds. However, several are distributed compute fabrics including the NSFCloud Chameleon, several computational science clouds, and computational science Grid facilities. iCAIR policies, procedures and technologies strongly support international collaboration and testbed federation.

(download PDF for full text)

Primary author: JOE, Mambretti (NW)

Presenter: JOE, Mambretti (NW)

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **12** Type: **Position Statement**

Some thoughts on current and future experimentation needs

Experimental networking research needs have probably not changed much from the time the NSF Workshop Network Research Testbeds took place in 20021. So, it would be worth revisiting the outcomes of that workshop with the current context. In this sense, this paper tries to do this for some of the items dealt with in the report generated (e.g., Multi-user experimental facilities, federated testbeds, network research kits) and to revisit some of the experimentation needs in the light of recent developments on network softwarization. In fact, virtualization was already identified as a relevant trend. However, developments at that time were far from those recently generated.

(download PDF for full text)

Primary author: MANGUES, Josep (CTIC)

Presenter: MANGUES, Josep (CTIC)

Session Classification: Wireless Research Infrastructure - Part II

Contribution ID: **13** Type: **Position Statement**

Experimental Testbeds as a Foundation for Reproducibility of Experiments

Friday, 8 November 2019 11:19 (20 minutes)

Computer Science experimental testbeds allow investigators to explore a broad range of different state-of-the-art hardware options, assess scalability of their systems, and provide conditions that allow deep reconfigurability and isolation so that one user does not impact the experiments of another. Although the primary purpose of those testbeds is to provide resources to users who would not be able to satisfy their experimental needs otherwise, an important side-effect is that multiple users and user groups have access to the same resources, that are compatible with the same experimental artifacts, such as appliances/images or orchestration templates. This creates conditions which allow users to share experiments and replicate each other's work more easily and creates an opportunity to foster good experimental practices as well as create a sharing ecosystem.

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Primary author: KEAHEY, Kate (ANL)

Presenter: KEAHEY, Kate (ANL)

Session Classification: Reproducibility and Open Data

Contribution ID: **14** Type: **Position Statement**

Improving the management of system images on cloud testbeds

Testbeds such as Cloudlab, Chameleon, VirtualWall or Grid'5000 provide a collection of system images (appliances) to experiments. This is an important part of testbeds' offerings, because it is part of what makes it possible for experimenters to perform experiments in an environment that meets their needs: recent software, or a linux distribution that is supported by the software they want to experiment on.

(download PDF for full text)

Primary author: NUSSBAUM, Lucas (LORIA)

Presenter: NUSSBAUM, Lucas (LORIA)

Contribution ID: **15** Type: **Position Statement**

Open Cloud Testbed: A Testbed for the Research Community Exploring Next-Generation Cloud Platforms

Friday, 8 November 2019 10:59 (20 minutes)

Cloud testbeds are critical for enabling research into new cloud technologies - research that requires experiments which potentially change the operation of the cloud itself. Several such testbeds have been created in recent past (e.g., Chameleon, CloudLab, etc.) with the goal to support the CISE systems research community. It has been shown that these testbeds are very popular and heavily used by the research community [1]. Testbed utilization often reaches 100%, especially ahead of deadlines for major systems conference, while there are also periods of modest (<40%) testbed usage.

(download PDF for full text)

Primary author: ZINK, Michael (UoM)

Presenter: ZINK, Michael (UoM)

Session Classification: Reproducibility and Open Data

Contribution ID: **16** Type: **Position Statement**

NITOS testbed: a heterogeneous environment for 5G and beyond experimentation

Friday, 8 November 2019 09:28 (7 minutes)

In this position paper, we focus on the NITOS testbed and the experimentally driven 5G activities around the established experimentation ecosystem it provides. NITOS is a highly heterogeneous testbed located in the premises of University of Thessaly, Greece. The testbed provides remote access to experimenters from around the globe, allowing repeatable experimentation with cutting edge resources. In this position paper, we cover some of the main contributions with frameworks for experimentation in Cloud-based Radio Access Networks, Multi-access Edge Computing, Spectrum Coordination, as well as frameworks for orchestrating different software functions as VNFs.

Primary author: MAKRIS, Nikos (University of Thessaly)

Presenter: MAKRIS, Nikos (University of Thessaly)

Session Classification: Wireless Research Infrastructure - Part II

Contribution ID: **17** Type: **Position Statement**

Dynamic Edge/Cloud Computation Offloading and Control for Drone Video Analytics

Thursday, 7 November 2019 14:27 (7 minutes)

Unmanned aerial vehicles (UAV) or drone systems equipped with cameras are extensively used in different surveillance scenarios and often require real-time control and high-quality video transmission. However, unstable network situations and various transport protocols may result in impairments during video streaming, which in turn negatively impacts user's quality of experience (QoE). In this position statement, we present dynamic edge/cloud computation offloading and control framework requirements to handle video processing from IoT devices in the field for public safety and precision agriculture use cases. The framework features image impairment detection under various available network bandwidth conditions and adapts transport protocols (e.g., QUIC) for air-to-ground, air-to-air and ground-to-ground data transfers. We present results from a preliminary implementation of our framework viz., DyCOCo in a testbed setup on the GENI infrastructure. Our demo results show that our DyCOCo framework approach can efficiently choose the suitable networking protocols and orchestrate both the camera control on the drone, and the computation offloading of the video analytics over limited edge computing/networking resources.

Primary author: CALYAM , Prasad (University of Missouri)

Presenter: CALYAM , Prasad (University of Missouri)

Session Classification: Edge Computing

Contribution ID: **18** Type: **Position Statement**

Simulating Network Coexistence of NR-U and IEEE 802.11ax in ns-3

Friday, 8 November 2019 09:21 (7 minutes)

In this position paper, CTTC and University of Washington provide a status update regarding new protocol stacks for end-to-end and multi-RAT scenario simulations in the open source network simulator ns-3 (www.nsnam.org). Specifically, the recent advances enable network performance evaluation research in the emergent areas of 5G NR-U and IEEE802.11ax coexistence in unlicensed band. The work relies on previous open contributions of the two partners in the area of NR and IEEE802.11, respectively, among a long track of successful collaborations in the areas of LTE-LAA, and LTE for Public Safety.

Primary author: ROY, Sumit (Centre Tecnologic de Telecomunicacions de Catalunya)

Presenter: ROY, Sumit (Centre Tecnologic de Telecomunicacions de Catalunya)

Session Classification: Wireless Research Infrastructure - Part II

Contribution ID: **20** Type: **Position Statement**

Cross-Layer Infrastructure Optimization for Data-Centric Applications

Thursday, 7 November 2019 09:41 (7 minutes)

Modern data-centric applications are among the major drives for next generation Internet and network infrastructure innovation. These applications, often founded in broad societal challenges such as overpopulation and diminishing natural resources, cut across many different scientific domains and require collection, transfer, and processing capabilities on data from broad range of sources.
These applications can only be effectively enabled however in the presence of a supporting research infrastructure, which should provide the necessary tools for searching, accessing and integrating data and software for different workflows within scientists research activities. Recent paradigm shift towards data centric approaches further motivated the development of advanced network and computing technologies, e.g., SDN (software defined networking), ICN (Information-Centric Networking) and 5G, as well as the Cloud technologies in Edge Cloud and machine learning (ML). In the following, we use our recent research experience in supporting environmental research as an example to help lay out our collaborative research agenda.

(download PDF for full text)

Primary author: XIN, Yufeng (RENCI)

Presenter: XIN, Yufeng (RENCI)

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **21** Type: **Position Statement**

Accelerating Network Function Virtualization and Service Function Chain Processing for Emerging 5G Services and Edge Computing

Thursday, 7 November 2019 14:07 (20 minutes)

Network Function Virtualization (NFV), coupled with Software Defined Networking (SDN), promises to revolutionize networking by allowing network operators to dynamically modify and manage networks. Operators can create, update, remove or scale out/in network functions (NFs) on demand, construct a sequence of NFs to form a so-called service function chain (SFC) and steer traffic through it to meet various policy and service requirements. In the emerging 5G technologies – besides innovations in radio technologies such as 5G new radio (NR), NFV will be a key enabling technology underpinning the envisioned 5G "Cloud RANs" (radio access networks), MECs (mobile edge clouds) and packet core networks for support of network slicing and diverse services ranging from enhanced mobile broadband (eMBB) to massive machine type communications (mMTC) and ultra-reliable low latency communications (URLLC). For example, upon a request for a service (e.g., from a mobile user or a machine, say, an autonomous vehicle or an industrial controller), a SFC will be dynamically constructed using a series of virtualized network functions (vNFs) such as firewalls, mobility managers, network address translators, traffic shapers and so forth that are deployed on demand at appropriate locations within a (dynamic) network slice to meet the desired service requirements.

(download PDF for full text)

Primary author: ZHANG, Zhi-Li (University of Minnesota)

Presenter: ZHANG, Zhi-Li (University of Minnesota)

Session Classification: Edge Computing

Contribution ID: **22** Type: **not specified**

Opening: Logistics / Topics / Goals / Introductions

Thursday, 7 November 2019 08:30 (45 minutes)

Presenter: GOSAIN, Abhimanyu (Northeastern Univ.)

Contribution ID: **23** Type: **not specified**

Distributed Networked Infrastructure: Open discussion

Thursday, 7 November 2019 10:02 (28 minutes)

Contribution ID: **24** Type: **not specified**

Wireless Research Infrastructure: Open discussion

Thursday, 7 November 2019 12:00 (30 minutes)

Contribution ID: **25** Type: **not specified**

Edge Computing: Open discussion

Thursday, 7 November 2019 15:09 (21 minutes)

Contribution ID: **26** Type: **not specified**

Distributed Networked Infrastructure - Part II: Open discussion

Thursday, 7 November 2019 16:45 (30 minutes)

Contribution ID: **27** Type: **not specified**

Debrief, feedback, Next steps

Thursday, 7 November 2019 17:15 (30 minutes)

Contribution ID: **28** Type: **not specified**

Quick recap of Day 1

Friday, 8 November 2019 08:30 (30 minutes)

Contribution ID: **29** Type: **not specified**

Wireless Research Infrastructure: Open discussion

Friday, 8 November 2019 10:00 (30 minutes)

Contribution ID: **30** Type: **not specified**

Reproducibility and Open Data: Open discussion

Friday, 8 November 2019 11:49 (26 minutes)

Contribution ID: **31** Type: **not specified**

Final remarks on GEFI 2019

Friday, 8 November 2019 12:15 (15 minutes)

Contribution ID: **32** Type: **not specified**

EU-US projects and exchange views on the upcoming ICE-T solicitations

Friday, 8 November 2019 13:30 (15 minutes)

Presenter: FOGLIETTA, Stefano

Session Classification: ICE-T Lunch Session

Contribution ID: **33** Type: **not specified**

ICE-T Overview

Friday, 8 November 2019 13:45 (15 minutes)

Presenter: MEDHI, Deepankar

Session Classification: ICE-T Lunch Session

Contribution ID: **34** Type: **not specified**

A Knowledge-Defined Platform for Real-Time Management of Transmissions and Computations at Network Edge

Friday, 8 November 2019 14:00 (15 minutes)

Presenter: ESPOSITO, Flavio

Session Classification: ICE-T Sessions

Contribution ID: **35** Type: **not specified**

Accelerating Network Function Virtualization and Service Function Chain Processing for Emerging 5G Services and Edge Computing

Friday, 8 November 2019 14:15 (15 minutes)

Presenter: ZHANG, Zhi-Li

Session Classification: ICE-T Sessions

Contribution ID: **36** Type: **not specified**

AI enabled radios for dynamic spectrum sharing

Friday, 8 November 2019 14:30 (15 minutes)

Presenter: SESKAR, Ivan

Session Classification: ICE-T Sessions

Contribution ID: **37** Type: **not specified**

Horizontal Resource Management in Distributed Edge Clouds

Friday, 8 November 2019 14:45 (15 minutes)

Presenter: SHENOY, Prashant

Session Classification: ICE-T Sessions

Contribution ID: **38** Type: **not specified**

Millimeter Wave Communications and Edge Computing for Next Generation Tetherless Mobile Virtual Reality

Friday, 8 November 2019 15:00 (15 minutes)

Presenter: CHAKARESKI, Jacob

Session Classification: ICE-T Sessions

Contribution ID: **39** Type: **not specified**

Multi-Domain Multi-Broker Elastic Optical Networks with Cognitive Functionalities

Friday, 8 November 2019 15:15 (15 minutes)

Presenter: PROIETTI, Roberto

Session Classification: ICE-T Sessions

Contribution ID: **40** Type: **not specified**

Multi-Element Mobile Visible Light Communication for Smart Cities

Friday, 8 November 2019 16:00 (15 minutes)

Presenter: YUKSEL, Murat

Session Classification: ICE-T Sessions

Contribution ID: **41** Type: **not specified**

Optimizing Internet video through support from the network edge

Friday, 8 November 2019 15:45 (15 minutes)

Presenter: RAO, Sanjay

Session Classification: ICE-T Sessions

Contribution ID: **42** Type: **not specified**

Simulating Network Coexistence of NR-U and IEEE 802.11ax in ns-4

Friday, 8 November 2019 16:30 (15 minutes)

Presenter: ROY, Sumit

Session Classification: ICE-T Sessions

Contribution ID: **43** Type: **not specified**

Software Hardware Efficient Extensible Protocols (SHEEP)

Friday, 8 November 2019 16:15 (15 minutes)

Presenter: DOOLEY, John

Session Classification: ICE-T Sessions

Contribution ID: **44** Type: **not specified**

Towards a Secure and Flexible Personal Data Platform on the Edge

Friday, 8 November 2019 16:45 (15 minutes)

Presenter: NADEEM, Tamer

Session Classification: ICE-T Sessions

Contribution ID: **45** Type: **not specified**

Towards End-to-End Resource Optimization for Time-Critical Computing Using Reinforcement Learning and Program Analysis

Presenter: WANG, Liqiang

Session Classification: ICE-T Sessions

Contribution ID: **46** Type: **not specified**

Towards Highly Reliable Low Latency Broadband (HRLLBB) Communications over Wireless Heterogeneous Networks

Friday, 8 November 2019 17:00 (15 minutes)

Presenter: SAAD, Walid

Session Classification: ICE-T Sessions

Contribution ID: **47** Type: **not specified**

Debrief, Feedback, Next steps, Adjourn

Friday, 8 November 2019 17:15 (30 minutes)

Presenter: GOSAIN, Abhimanyu

Session Classification: ICE-T Sessions

Contribution ID: **48** Type: **Position Statement**

A Plan of an NICT P4 Testbed

Thursday, 7 November 2019 09:20 (7 minutes)

NICT provides testbed facilities such as JGN, JOSE, RISE, and StarBED to promote research and development of information and communications technology. Recently, a trend to open networking has been accelerating, and many projects have been proposing innovative networking mechanisms utilizing programmable networking capabilities. Especially, data-plane programming with the P4 programing language attracts much attention of researchers and developers because it enables more flexible and stateful packet processing. Thus, we are considering supporting network programmability with P4 in our testbed environments and providing a P4 testbed in the future.
To realize the P4 testbed, we have a stepwise plan. As the first step, we are considering using the P4 behavioral model (bmv2) that works as P4 software switches. Among the NICT testbeds, RISE is an SDN/OpenFlow testbed and it already provides network environments with software switches as well as those with hardware switches. Therefore, we will use this software-based RISE environment and replace the software switches with bmv2 instances to create a P4 testbed environment.
As the second step, we will introduce hardware P4-enabled switches. The challenges we face here is how to achieve multi-tenancy. RISE provides multi-tenancy with hardware switches by using the virtualization (slicing) mechanism implemented in those switches. However, at the time of writing, we have not yet found such equipment that supports both P4 programmability and virtualization.
In the workshop, I will talk about our plan of our P4 testbed, discuss use cases of P4, and look for opportunity for collaboration on the P4 testbed development.

Primary author: KAWAI, Eiji (NICT)

Presenter: KAWAI, Eiji (NICT)

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **49** Type: **Position Statement**

Software-Defined Infrastructure at RNP

In this talk, we will describe the software-defined infrastructure and the corresponding orchestrator deployed at RNP, the Brazilian NREN. This infrastructure is composed by a completely virtualizable SDN Overlay Network and a two-tier private cloud. The orchestrator is based on ONOS and it is responsible for the lifecycle management of virtual resources such as SDN/L2 software switches, NSI/VXLANs/VLANs circuits, VMs/containers, and storage blocks. The presentation will contain an overview of the architecture and its main features, along with the description of two use cases: dynamic provisioned CDN on SDN and containers; and Softwarization of Science DMZ Infrastructure.
Besides this infrastructure, RNP is deploying a testbed composed by SDMZ 100G DTN
nodes on top of SDN whiteboxes and an emulated optical layer. This testbed will allow the remote experimentation on SDN Multilayer for the fast provisioning of network services, optimization of resources and, in particular, complete automation of the network. The emulated optical layer will be composed by disagreggated whiteboxes from different vendors. In this talk, we will report on the status of this project and look for possible international collaborations in this field.

Primary author: REZENDE, José (RNP)

Presenter: REZENDE, José (RNP)

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **50** Type: **Position Statement**

5G-DIVE: eDge Intelligence for Vertical Experimentation

Thursday, 7 November 2019 16:20 (7 minutes)

5G-DIVE targets end-to-end 5G trials aimed at proving the technical merits and business value proposition of 5G technologies in two vertical pilots, namely (i) Industry 4.0 and (ii) Autonomous Drone Scout. Its design is built around two main pillars, namely (1) end-to-end 5G connectivity including 5G New Radio, Crosshaul transport and 5G Core, and (2) distributed edge and fog computing integrating intelligence located closely to the user to achieve optimized performance, improving significantly the business value proposition of 5G in each targeted vertical application.

Primary author: GUIMARÃES, Carlos (Universidad Carlos III de Madrid)

Presenter: AZCORRA, Arturo (Universidad Carlos III de Madrid)

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **51** Type: **not specified**

An online social network platform for security intelligence collaborations

Presenter: ALSMADI, Izzat

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **52** Type: **not specified**

An overview of Fed4FIRE testbeds and beyond

Thursday, 7 November 2019 09:34 (7 minutes)

Presenter: NUSSBAUM, Lucas

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **53** Type: **not specified**

AERPAW PAWR Platform

Thursday, 7 November 2019 11:00 (7 minutes)

Presenter: DUTTA, Rudra

Session Classification: Wireless Research Infrastructure

Contribution ID: **54** Type: **not specified**

Mllimeter Wave Communications and Edge Computing for Next Generation Tetherless Mobile Virtual Reality

Presenter: CHAKARESKI, Jacob

Session Classification: Wireless Research Infrastructure

Contribution ID: **55** Type: **not specified**

Heterogeneous Processing for Software Defined Radio

Thursday, 7 November 2019 11:07 (7 minutes)

Presenter: SESKAR, Ivan

Session Classification: Wireless Research Infrastructure

Contribution ID: **56** Type: **not specified**

Multi-Element Mobile Visible Light Communication for Smart Cities

Thursday, 7 November 2019 11:14 (7 minutes)

Presenter: YUKSEL, Murat

Session Classification: Wireless Research Infrastructure

Contribution ID: **57** Type: **not specified**

PAWR and Colosseum

Thursday, 7 November 2019 11:21 (7 minutes)

Presenter: GOSAIN, Manu

Session Classification: Wireless Research Infrastructure

Contribution ID: **58** Type: **not specified**

Research platforms for advanced wireless research (5G and beyond)

Thursday, 7 November 2019 11:28 (7 minutes)

Presenter: NAKAO, Aki

Session Classification: Wireless Research Infrastructure

Contribution ID: **59** Type: **not specified**

A Knowledge-Defined Platform for Real-Time Management of Transmissions and Computations at Network Edge

Thursday, 7 November 2019 14:00 (7 minutes)

Presenter: ESPOSITO, Flavio

Session Classification: Edge Computing

Contribution ID: **60** Type: **not specified**

Edge Computing and EdgeNet: A Worldwide Edge Cloud

Thursday, 7 November 2019 14:34 (7 minutes)

Presenter: FRIEDMAN, Timur

Session Classification: Edge Computing

Contribution ID: **61** Type: **not specified**

Horizontal Resource Management in Distributed Edge Clouds

Presenter: SHENOY , Prashant

Session Classification: Edge Computing

Contribution ID: **62** Type: **not specified**

Optimizing Internet video through support from the network edge

Presenter: RAO, Sanjay

Session Classification: Edge Computing

Contribution ID: **63** Type: **Position Statement**

Towards a Secure and Flexible Personal Data Platform on the Edge

Thursday, 7 November 2019 14:48 (7 minutes)

Increased ubiquity of sensing via smart devices and IoT devices in smart homes and smart healthcare domains, for example, has caused a surge in sensitive and personal data generation and use from browsing habits to purchasing patterns to real-time location to personal health information. Unfortunately, our ability to collect and process data has overwhelmed our ability to protect that information in which concerns over privacy, trust, and security are becoming increasingly important as different stakeholders attempt to take advantage of such rich data resources. In addition, different applications on these devices result in diverse traffic characteristics that require different performance levels of reliability, loss, and latency. Therefore, it becomes essential to have greater visibility and control over the traffic generated from smart and IoT devices in order to guarantee an optimized performance of smart and IoT applications as well as high quality of experience to users. In this research, we aim to design and develop ExtremeDataHub platform an open-source, flexible, and programmable networked edge device that collates and mediates access to our sensitive and personal data, under the data subjects control as well as to cope with various characteristics and requirements of smart and IoT applications that access this data in order to provide better performance and quality of experience to users.

Presenter: NADEEM, Tamer

Session Classification: Edge Computing

Contribution ID: **64** Type: **not specified**

Multi-Domain Multi-Broker Elastic Optical Networks with Cognitive Functionalities

Thursday, 7 November 2019 15:52 (7 minutes)

Presenter: PROIETTI, Roberto

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **65** Type: **not specified**

Towards End-to-End Resource Optimization for Time-Critical Computing Using Reinforcement Learning and Program Analysis

Presenter: WANG, Liqiang

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **66** Type: **not specified**

SFI2 - Slicing Future Internet Infrastructures project

Thursday, 7 November 2019 15:59 (7 minutes)

Co-author: CIUFFO, Leandro (RNP)

Presenter: REZENDE, José (RNP)

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **67** Type: **not specified**

Software Hardware Efficient Extensible Protocols (SHEEP)

Thursday, 7 November 2019 16:06 (7 minutes)

Presenter: DOOLEY, John

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **68** Type: **not specified**

Think NEXUS

Thursday, 7 November 2019 16:13 (7 minutes)

Presenter: VAN DAELE, Peter

Session Classification: Distributed Networked Infrastructure - Part II

Contribution ID: **69** Type: **not specified**

AI enabled radios for dynamic spectrum sharing

Friday, 8 November 2019 09:00 (7 minutes)

Primary author: MOERMAN, Ingrid

Presenter: VERMEULEN , Brecht (imec)

Session Classification: Wireless Research Infrastructure - Part II

Contribution ID: **70** Type: **not specified**

Towards Highly Reliable Low Latency Broadband (HRLLBB) Communications over Wireless Heterogeneous Networks

Friday, 8 November 2019 09:07 (7 minutes)

Presenter: SAAD, Walid

Session Classification: Wireless Research Infrastructure - Part II

Contribution ID: **71** Type: **not specified**

Some thoughts on current and future experimentation needs

Friday, 8 November 2019 09:14 (7 minutes)

Presenter: GREGORATTI, David

Session Classification: Wireless Research Infrastructure - Part II

Contribution ID: **72** Type: **not specified**

CloudBank: Cloud Access

Friday, 8 November 2019 10:45 (7 minutes)

Presenter: QAZI, Amin

Session Classification: Reproducibility and Open Data

Contribution ID: **73** Type: **not specified**

IEEE Future Networks - INGR Testbed Working Group

Thursday, 7 November 2019 09:48 (7 minutes)

Presenter: SESKAR, Ivan (Rutgers)

Session Classification: Distributed Networked Infrastructure - Part I

Contribution ID: **74** Type: **not specified**

The Notebook: A Testbed Configuration and Programming Environment

Thursday, 7 November 2019 14:41 (7 minutes)

Presenter: MCGEER, Rick

Session Classification: Edge Computing

Contribution ID: **75** Type: **not specified**

SLICES: Super Infrastructure for Large-scale Experimental Computer Science

Presenter: FDIDA, Serge (Sorbonne)

Session Classification: Reproducibility and Open Data