The **mPlane Final workshop** is hosted in NEC Europe LTD Laboratories, in conjunction with <u>CoNEXT 2015</u>, *the 11th International Conference on emerging Networking EXperiments and Technologies.*

NEC premises, Heidelberg

Monday - November 30th, 2015

9:00-17:30

Scope of the Workshop

To illuminate the current and obscure dynamics of the Internet, mPlane project has focused on building the Internet measurement plane, by designing a flexible, open platform that allows one to collect, store and process measurements collected from the Internet.

This workshop will present mPlane's achievements towards this goal. In addition to full presentations about mPlane reference architecture (featuring an open source implementation), components and the use cases that it enables, the workshop will feature talks of measurement experts who will speak about topics related to the main concepts of building an *Internet measurement plane*.

Featured speakers

- **Dr. Balachander Krishnamurthy, AT&T Labs – Research:** he is a lead inventive scientist at AT&T Labs - Research. His focus of research is in the areas of Internet privacy, Online Social Networks and Internet measurements. He has authored and edited ten books, published over one hundred technical papers, holds sixty-four patents, and has given invited talks in thirty five countries. He co-founded the successful Internet Measurement Conference in 2000 and in 2013 the Conference on Online Social Networks (http://cosn.acm.org). He has been on the thesis committee of several PhD students, collaborated with over eighty researchers worldwide, and given tutorials at several industrial sites and conferences. His most recent book *"Internet Measurements: Infrastructure, Traffic and Applications"* (525pp, Wiley, with Mark Crovella), was published in July 2006 and is the first book focusing on Internet Measurement. His previous book *"Web Protocols and Practice: HTTP/1.1, Networking Protocols, Caching, and Traffic Measurement"* (672 pp, Addison-Wesley, with Jennifer Rexford) is the first in-depth book on the technology underlying the World Wide Web, and has been translated into Portuguese, Japanese, Russian, and Chinese.

- **Dr. Fabián E. Bustamante, Northwestern University**: he is a professor of Computer Science in the EECS Department at Northwestern University. He has been at Northwestern since 2002, after receiving his PhD. and M.S. in Computer Science from the Georgia Institute of Technology. Fabián's research spans a range of topics on measurement, analysis and design of Internet-scale distributed systems and their supporting infrastructure. He and his group have released over 15 software artifacts that have been adopted by over 1.5 million users from nearly every country in the world. Fabián is a recipient of the *US National Science Foundation CAREER award* and the *E.T.S. Watson Fellowship Award* from the Science Foundation of Ireland, and a senior member of both the ACM and the IEEE. He was the general co-chair for the ACM SIGCOMM 2014. Fabián currently serves in the editorial boards of *IEEE Internet Computing, the ACM SIGCOMM CCR, the IEEE/ACM Transactions on Networking, the Steering Committee for IEEE P2P* (as chair), and the External Advisory Board for the mPlane initiative.
- **Dr. Alberto Dainotti, Center for Applied Internet Data Analysis (CAIDA)**: he is a Research Scientist at CAIDA (Center for Applied Internet Data Analysis), University of California San Diego - USA. In 2008 he received his PhD. in Computer Engineering and Systems at the Department of Computer Engineering and Systems of University of Napoli "Federico II", Italy. His main research interests are in the field of Internet measurement and network security, with a focus on the analysis of large-scale Internet events. He co-authored several peer-reviewed papers published at conferences and in scientific journals and is regularly invited speaker at conferences, workshops, and operational meetings (DARPA, FCC, ISOC, RIPE). In 2012 he was awarded the *IRTF Applied Networking Research Prize*. He regularly serves for the *European Commission and the US National Science Foundation* as an independent reviewer of projects proposals and the External Advisory Board for the mPlane initiative.

Program

9:00 am	**Registration and coffee**
9:15 am	**Welcome** S. Niccolini, mPlane WPs Coordinator

- *Session 1: Architectures – Chair: Saverio Niccolini*

9:20 am	**Overview of the mPlane project** M. Mellia, mPlane General Project Coordinator
9:45 am	**mPlane architecture and principles** B. Trammell, WP1 Leader (Use Cases, Requirements and Architecture)

10:15 am	**Keynote: "Is measurement still an afterthought?"** Dr. Balachander Krishnamurthy, AT&T Labs – Research *Abstract: In the early days of ARPAnet it was possible to trace passage of a single packet through the network. Traffic between nodes could be directly measured and routers could be queried for current statistics. But only in the late 1980s were SNMP and traceroute created (and are still in use!). With fragmentation and decentralization, measurement became effectively a second-class citizen. Thus, architectural innovations come without measurement as a fundamental concept requiring reinvention of tools and techniques. Most of the work is now guided by needs of applications. I believe that we should identify measurement primitives that can aid in quicker construction of relevant tools in new application areas or novel architectures. This talk is aimed at pushing the community towards such a search using one application area as exemplar: SDN.*
11:00 am	**Coffee-break**
11:20 am	**mPlane live demo** F. Invernizzi, WP5 Leader (Integration, Deployment, Data Collection, Evaluation)
11:45 am	**Keynote: " Content distribution on next generation cellular networks "** Prof. Fabián E. Bustamante, Northwestern University *Abstract: Smartdevices are becoming the primary, and for many only, Internet point of access for an ever-larger fraction of users. Nearly a quarter of web traffic is mobile, and content consumption on mobile devices is expected to grow fourfold by 2018. Much of this content is served by content delivery networks (CDNs) that, as in the rest of the Internet, replicate content in servers around the world and redirect clients to nearby replicas. Replica selection is typically done following some well-established heuristic, such as client IP or the proximity between most hosts and their local DNS servers. Unlike in the rest of the Internet, however, these heuristics are generally ineffective, with their ineffectiveness becoming obvious in fast, next generation cellular networks. In this talk, I will discuss our work on understanding next generation cellular network infrastructure and configuration and evaluating its impact on content distribution and users's quality of experience. I will then sketch a new approach to replica selection that acknowledges the centrality of cellular gateways in cellular network routing and present early results from a realization of this approach as a client/CDN cooperation, i.e. without the cooperation of cellular operators.*
12:30 pm	**Lunch**

- ### *Session 2: Applications and Demos – Chair: Marco Mellia*

1:30 pm	**mPlane components: probes** Á. Bakay, WP2 Leader (Programmable Probes)
2:00 pm	**mPlane components: repositories** P. Michiardi, WP3 Leader (Large-scale data analysis)
2:30 pm	**mPlane components: reasoners** P. Casas, WP4 Leader (mPlane Supervisor: Iterative and Adaptive Analysis)

3:00 pm — **Keynote: BGPStream "A framework for the historical analysis and real-time monitoring of BGP data"**

Dr. Alberto Dainotti, Center for Applied Internet Data Analysis (CAIDA)

Abstract: I will present the design and implementation of BGPStream, an open-source software framework (available at bgpstream.caida.org) for the analysis of historical and live Border Gateway Protocol (BGP) measurement data. Although BGP is a crucial operational component of the Internet infrastructure, and is the subject of fundamental research (in the areas of performance, security, topology, protocols, economy, etc.), there is no standard and easy way of processing large amounts of BGP measurement data. BGPStream fills this gap by making available a set of API and tools for processing large amounts of live and historical data thus supporting investigation of specific events, rapid prototyping, and building complex tools and efficient large-scale monitoring applications (e.g., detection of connectivity disruptions or BGP hijacking attacks). I will describe the design choices and challenges in the development of BGPStream. I will present how components of the framework can be used in different applicative scenarios, and I will describe the development and deployment of complex services for global Internet monitoring that we built on top of it.

3:45 pm — **Coffee-break**

4:00 pm — **Live demos of mPlane use cases**

Parallel session with posters and demoes for each use case

UC1 - Estimating Content and Service Popularity	UC2 - Active Measurements for Multimedia Content Delivery	UC3 - Quality Experience for Web Browsing	UC4 - Mobile Network Performance Issue Analysis	UC5 – Anomaly detection and root cause analysis in large-scale networks	UC6 – Verification of SLA	UC7 – Passive Content Curation
NEC	NETVISOR	EURECOM	TID	FTW	FUB	ALBLF

5:30 pm — **Wrap-up and final remarks, workshop closing**

7:30 pm — **Social Dinner at "*Heidelberger Kulturbrauerei*"**   https://goo.gl/maps/eqWV6PEEFTp

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