

# Report on the 7th International Conference on Autonomous Infrastructure, Management, and Security (AIMS 2013): Emerging Management Mechanisms for the Future Internet

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**Abstract** This article contains the report on AIMS 2013, which was held on June 25–28, 2013 at the Universitat Politècnica de Catalunya (UPC), Spain and was driven by the theme “Emerging Management Mechanisms for the Future Internet”. It covers the three main parts that formed the event program: the keynote and technical sessions of the main track, the PhD workshop and the hands-on tutorials. Finally, the report highlights the evolutions that would shape the future version of AIMS.

**Keywords** Network management · Service management · Autonomous infrastructure · Security

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## 1 Introduction

The 7th International Conference on Autonomous Infrastructure, Management, and Security (AIMS 2013) was held at Universitat Politècnica de Catalunya, Spain on June 25–28, 2013 [1, 2, 3]. AIMS 2013 was co-sponsored by the IFIP WG 6.6 [4] and the Generalitat de Catalunya with the Grant 2009-SGR-1242. The 4-day AIMS 2013 conference was a single-track event integrating regular conference paper sessions, tutorials, a keynote, and a PhD student workshop into a highly interactive event. One of the key goals of AIMS is to look beyond borders and to stimulate the exchange of ideas across different communities and among PhD students. This year, AIMS 2013 focused on Emerging Management Mechanisms for the Future Internet. This theme is addressed in the technical program with papers related to emerging monitoring, security and autonomous mechanisms, completed by other papers, focusing on next-generation networks and services, such as, among others, content delivery, Information Centric Networks and Internet of Things.

## 2 Tutorials, Courses, and Labs

The event started with 1.5 days of three courses and labs which offered hands-on learning experience in network and service management topics and which required the attendees to work in practical on-site courses combined with preceding short tutorial-like teaching sessions.

### 2.1 Large-Scale Measurement Platforms

The first tutorial, delivered by Vaibhav Bajpai and Nikolay Melnikov on “Large-Scale Measurement Platforms”, introduced the context of large-scale measurement platforms, how to write and to schedule a measurement test, how to schedule the reporting of measurement results and how to retrieve the results for data analysis.

The curiosity to understand the performance of the Internet from the user’s point of view has led to the development of a number of independent large-scale measurement platforms. These platforms have deployed thousands of probes at strategic locations within the access and backbone networks and at residential

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gateways. The primary goal of these efforts is typically to measure the performance of broadband access networks and to help regulators sketch better policy decisions. Recently, the requirement for accurate measurements, coupled with efforts to define standards for device management and measurement reporting to allow interoperability among multi-vendor measurement probes, has led to a proposed Large-Scale Measurement of Broadband Performance Architectures and Protocols (LMAP) working group in the IETF. The LMAP birds of the feather (BOF) meeting was held at IETF 86, where the goals and milestones of the proposed working group were discussed.

Within this context, the tutorial introduced the audience to the complete Large-Scale Measurement of Broadband Performance ecosystem. In the first part of the tutorial, an introduction to the different large-scale measurement platforms that are currently deployed in the wild was given, along with the insights that have been published based on data collected over multiple years. In the second part of the tutorial the participants were introduced to an OpenWrt-based Measurement Agent (MA). The participants got practical training on how to write and to schedule a measurement test, how to schedule the reporting of measurement results, and later on, how to use a RESTful API to retrieve the results back for data analysis. They also had to provision a simulated MA in a virtualized environment under Gemu to develop and to debug their own measurement tests. In the third part of the tutorial the participants were introduced to the newly-released RIPE RESTful API for accessing user-defined measurements (UDM). They dissected several types of publicly available UDMs, and learned how to provision custom measurements on the RIPE Atlas infrastructure. Towards the end, the participants used the measurement data retrieved from the API to visualize the results using a data-driven JavaScript library (d3.js).

## 2.2 Virtual Wall Infrastructure

The second tutorial, delivered by Steven Latré and Jeroen Famaey on “Virtual Wall Infrastructure”, gave an overview of the The Virtual Wall [5], a generic experimental environment for advanced network, distributed software, service evaluation, and scalability research. The iMinds Virtual Wall is a test-bed facility for setting up large-scale network topologies. The Virtual Wall facilities consist of 100 nodes interconnected via a non-blocking VLAN Ethernet switch. Each server is connected with 4 or 6 gigabit Ethernet links to the switch. The Virtual Wall nodes can be assigned different functionalities ranging from terminal, server, network node, and impairment node. As such, it is a generic experimental environment for advanced network, distributed software and service evaluation, supporting scalability research. The Virtual Wall is also the test-bed facility that comprises one of the sites of both the FP7 BONFIRE [6] and FP7 OFELIA [7] projects.

In this tutorial, the presenters gave an overview of the functionality, the architecture and a hands-on guided tour for the tutorial participants. The tutorial explained how large-scale network experiments (e.g. the deployment of a new management algorithm) can be carried out. First, the tutorial discussed how complex network topologies can be created using either a graphical user interface or

through scripts. Furthermore, it was discussed how standard network functions (e.g. web server, proxy, cache or router) can be loaded on a node and extended to modify your network experiment. The tutorial also discussed how novel network algorithms can be tested under varying conditions by introducing dynamic traffic shaping and introducing impairments in the network.

### 2.3 EmanicsLab: A European Research Network tailored to Network and Service Management

Finally, the last tutorial delivered by David Hausheer dealt with “EmanicsLab: A European Research Network tailored to Network and Service Management”. EmanicsLab is a European research network initiated in 2007 and funded from 2007 to 2009 by the European Network of Excellence for the Management of Internet Technologies and Complex Services (EMANICS). EmanicsLab is based on myPLC, the backend management infrastructure of PlanetLab. The network currently consists of 22 nodes at 11 sites across Europe. EmanicsLab partners use the network for research activities in the area of network and service management, including distributed flow collection and analysis systems, distributed intrusion detection systems, and distributed monitoring and accounting systems.

This tutorial revisited the basic concepts of virtual distributed test-labs like PlanetLab or EmanicsLab, and gave a hands-on training about how to use them for research activities. First, the underlying idea and principles of PlanetLab was presented; and an overview on its services and tools were given. Furthermore, EmanicsLab, a small-scale test-lab which is based on the same technology as PlanetLab was introduced and discussed. In particular, the monitoring and management capabilities of EmanicsLab were shown. Finally, a set of practical exercises were carried out based on a simple service which was deployed on EmanicsLab.

## 3 Keynote

The AIMS conference continued with a keynote presentation delivered by Bertrand Mathieu, senior researcher at Orange Labs, France on the “Management and Monitoring Challenges in Content-Centric Networking”. This talk focused on management and monitoring challenges from a network operator’s point of view. Bertrand introduced the Information-Centric Networking (ICN) paradigm, with a special focus on the Content-Centric Networking (CCN) [8] solution. Further he provided insights into requirements and challenges for managing and monitoring the CCN network.

The keynote raised a lot of questions from the audience leading to active discussions. The first discussion concerned the arguments that would leverage the adoption of ICN by content providers that already own operational infrastructures. It was mentioned that ICN supporters still have to demonstrate the effectiveness, in terms of quality of service or cost, of such new infrastructures to incite content providers to adopt them. Then, discussions about the way ICN could be deployed

also took place, and network virtualization could be an option to enable both legacy stacks and ICN ones to operate concurrently. Finally, questions regarding the monitoring and management aspects were asked too, leading to exchanges about possible management architectures (e.g. P2P, ...) and particular use-cases (e.g. enabling the monitoring of a single user activity). To conclude, the keynote highlighted the opening toward management proposals for such infrastructures.

#### 4 Technical Paper Sessions

The four technical sessions of AIMS 2013—covering “Traffic engineering and Quality-of-Service”, “Security management”, “Autonomous management”, and finally, “Monitoring mechanisms”—included 11 full papers, which were selected after a thorough reviewing process out of a total of 32 submissions. All papers received three independent reviews. Each paper was presented in a 20–25 min time slot followed by 5–10 min for questions and discussions. Such timing proved necessary and sufficient in fully considering the content of each paper. It followed the already established tradition of an unusually vivid and interactive conference series.

In order to select the best paper at AIMS 2013, a best paper award committee was established. The IFIP sponsored the award for the best paper. The best paper award committee was established among the two TPC Co-chairs, the two PhD workshop TPC Co-chairs, a senior local organizer (Jean-Luis Gorricho, Associate Professor at UPC) and a TPC member (David Hausheer, assistant professor at TU Darmstadt, Germany). In order to avoid any conflict of interest, committee members who were co-authors of a paper presented at AIMS 2013 were not allowed to evaluate any paper they were involved in. Papers were ranked, on the one hand, according to the respective reviews in the paper submission system, on the other hand by presentation quality. Both dimensions were given equal weight. In application of this evaluation process, the highest ranked paper was “Design and Evaluation of Tile Selection Algorithms for Tiled HTTP Adaptive Streaming” by Jens Devloo, Nils Lamoot, Jelle van Campen, Evi Weymaere, Steven Latré, Jeroen Famaey, Ray Van Brandenburg, and Filip De Turck.

The conference proceedings [1] include the papers presented at AIMS 2013 and the overall final program. The proceedings demonstrate again the European scope of this conference series since most of accepted papers are from European research groups.

#### 5 PhD Workshop

The AIMS PhD workshop is a venue for early-stage doctoral students to present and to discuss their research ideas as well as, most importantly, to obtain valuable feedback from the AIMS audience about their planned PhD research work. This year, the PhD workshop included 7 short papers, chosen through a thorough review process among the 14 submitted papers. The workshop was structured in two

sessions, namely “Monitoring and Modelling” and “Content Distribution and Multimedia”.

The added value of the PhD workshop lies, since its first edition, in the lively discussions between the audience and the presenter. Such discussions are often led by the more senior researchers, who took upon them the role of challenging the new PhD students to look critically at their research. Also this year, the PhD workshop had a dynamic flavour to the presentation discussions. In addition, the students presentations have allowed the present researchers to identify common areas of interest and expertise, paving the way for possible future collaborations.

## 6 Perspectives for Future Events

This year, the event was a privileged place for members and chairs of both the technical program and steering committees to discuss together the evolution of the conference. The main idea that led the discussion is how to position AIMS as an integral part of the network and service management research community. The technical and steering committees both agreed that, following its original scope, AIMS’ DNA is in being a conference dedicated to the academic training of PhD students and young researchers. In this context, several ideas, that we summarize below, have been proposed to the steering committee:

- Re-introduce a “research education” session. This session would be devoted to educating attendees on transversal points of the research work such as: *How to write good papers? Where to publish? How to review a paper and provide a constructive and actually usable feedback? or How to present a research work to an audience?* In order to stimulate the interaction between the participants, it is envisaged that the research education session will be achieved in the form of a panel, gathering several senior researchers sharing their experience.
- Introduce a shepherding process during the preparation phase of accepted papers. This process would be meant to help and to educate PhD students and young researchers during the camera ready preparation phase by providing them with a constructive feedback on how to best present their work. To that aim, a subset of the TPC members would be asked to shepherd one paper each.
- Integrate the hands-on tutorials as an entire part of the conference. Joining these two parts could be beneficial to attract more people during the hands-on sessions and to simplify the registration by removing the different packages. Also, the technical and practical parts of the hands-on sessions will be re-inforced, thus clearly differentiating them from the tutorials of the major events.

## 7 Conclusion

AIMS 2013 event was attended by 44 people, the majority from universities and research centers within Europe. Thus it consolidates as a genuine event to articulate our academic community in the field of network and service management. We

achieved highly interactive, open-ended discussions in a relaxed environment. Interactions between PhD students themselves as well as senior researchers were common place. The event confirmed a unique opportunity for young researchers to present their work, to get a feedback on it and to establish international collaboration. In addition, AIMS 2013 set the environment facilitating different meetings like those celebrated by the FLAMINGO project [9], a Network of Excellence for the management of the Future Internet.

We are pleased to announce the AIMS 2014 conference on June 30–July 3, 2014, hosted by Masaryk University, Institute of Computer Science, Brno, Czech Republic. The organising committee, led by Pavel Čeleda (celeda@ics.muni.cz), general chair, is delighted to invite you to join us in Brno for another conference in this very successful series.

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