FLAMINGO

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WP3 — Interaction with Academia and Industry

Deliverable D3.3 — Second Year Report on Interaction with Academia and Industry

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Executive Summary

Joint research and dissemination activities are the pillars for project's interaction with academia and industry. The organization of major conferences, journals, interoperability and testing labs, peer-to-peer interaction between researchers and industrial partners, joint work with other EU projects is beneficial for both the FLAMINGO consortium as well as for all external researchers in the area of network and service management. In the second year of the project the consortium carried out a number of tasks with respect to three objectives of this activity: organization of the scientific community, results dissemination to researchers within academia and industry, and achievement of scientific excellence. The following achievements have been made with regard to each of the above-listed objectives:

- **Establishment of the Open Digital Library.** FLAMINGO established the Open Digital Library providing free access to network management publications, and ensured that papers are available in the digital library when conference starts.
- **Organization of scientific conferences.** The FLAMINGO consortium organized and participated to three of the major conferences in the domain of Network Management in 2014 (IEEE/IFIP NOMS, IFIP AIMS and IFIP/IEEE CNSM) and also played an important role in establishing a brand new conference on Network Softwarization (IEEE NetSoft 2015).
- **Organization of scientific journals.** Members of the consortium served as editors for the major journals on Network Management. These journals include: IEEE Communications Magazine (ComMag), IEEE Transactions on Network and Service Management (TNSM), Journal of Network and Systems Management (JNSM) and International Journal of Network Management (IJNM). Furthermore, 4 special issues were organized on very relevant topics studied within the FLAMINGO project.
- **Improving the scientific quality of conferences and journals.** The classification and ranking activities have been continued and the updated taxonomy of Network and Service Management conferences has been further disseminated.
- **Organization of the annual European AIMS conference.** The Autonomous Infrastructure, Management and Security (AIMS 2014) conference was organised by the FLAMINGO consortium at Masaryk University in Brno, Czech Republic, June 30 till July 3, 2014.
- **Organization of specific workshops and events that foster interaction between academia and industry.** During the course of the second year, the FLAMINGO consortium organized 18 specific workshops and events, which are all described in section 3. of this deliverable.
- **Organization of interoperability events and testing labs.** The NETCONF interoperability lab has been further extended.
- **Integration of the European research landscape.** FLAMINGO organized and contributed to the Future Internet position paper as chair of the Future Internet Cluster, the stakeholders' consultation workshop, the tech coordination meetings (former concertation meetings), the EUCnC 2014 conference with 7 FLAMINGO presentations, the Future Internet Assembly (FIA), and collaborated with other on-going EU projects.
- **Organization of the FLAMINGO Scientific and Industrial Council.** The consortium carried out the second meeting of the Scientific and Industrial Council.

Please refer to sections 2 through 6 for more detailed information on the progress and achievements made during the second year of the project.

Contents

1 Introduction

WP3 is structured in five tasks, which all were active throughout Year 2. These tasks are carried out jointly by all project partners. The five tasks are listed below:

- Task 3.1 Organizing Scientific Excellence
- Task 3.2 Organization of Joint Workshops and Events
- Task 3.3 Setup of an Interoperability Lab
- Task 3.4 Integration of the European Landscape
- Task 3.5 Organization of a Scientific and Industry Council

Progress status and the achieved results for each task are detailed in Sections 2 through 6 of this deliverable. Table 1 below gives an overview of the objectives in the second year of the project and their status.

Objective	**Target Number**	**Achieved Number**
Conference organization	2	3
Journal organization	2	4
Special issue organization	2	4
Workshop organization	2	8
Actions to improve scientific quality	1	2
Specific events organization	2	6
Future Internet Assembly contributions	1	1
Dagstuhl seminar organization	1	2
Organization of interoperability lab	1	1
EuCNC contributions	1	7
Future Internet cluster organization	1	1
Joint work with other EU projects	2	5
Scientific and industrial council establishment and meeting	1	1
Total number of activities	**19**	**45**

Table 1: Status of FLAMINGO WP3 objectives in Year 2.

2 Scientific Excellence: Organization and Achievements

In this section, we describe the actions undertaken to organize conferences and symposia in our research field, scientific journals, the IEEE Technical Committee on Network Operations and Management, IFIP Working group on Management of Networks and Distributed Systems, and the IFIP Technical Committee on Communication Systems. Furthermore, the activities on Open digital library, conference ranking and the network and service management taxonomy are described.

2.1 Conferences and Symposia

The key conferences in the field of Network Management include: IFIP/IEEE International Symposium on Integrated Network Management (IM), IEEE/IFIP International Symposium on Network Operations and Management (NOMS), International Conference on Network and Service Management (CNSM) and International Conference on Autonomous Infrastructure, Management and Security (AIMS). During the second year of the FLAMINGO project IEEE/IFIP NOMS, CNSM and AIMS conferences took place, while IFIP/IEEE IM will take place in May 2015, according to its biennial schedule. The FLAMINGO consortium contributed to all three conferences by taking part in the Steering, Organizing and Technical Program committees. Table 2 indicates the number and the role of FLAMINGO members involved in the organization for each of these conferences. More information on the contributing members is provided in the sections below.

Conference	SC	OC	TPC
NOMS 2014	2	5	10
AIMS 2014	3	5	12
CNSM 2014	1	1	7

Table 2: Number and role (SC - Steering Committee; OC - Organizing Committee; TPC - Technical Program Committee) of FLAMINGO members in the main Network Management conferences in FLAMINGO Y2.

2.1.1 IEEE/IFIP Network Operations and Management Symposium, NOMS 2014

The consortium contributed to the organization of the IEEE/IFIP International Network Operation and Management Symposium (NOMS 2014: `http://www.ieee-noms.org/`), which is considered as one of the two flagship conferences in the domain of Network Management (IFIP/IEEE IM is the other, held in even years). NOMS 2014 took place in Krakow, Poland, May 5-9, 2014 and was hosted by AGH University, Poland. The theme of NOMS 2014 was *Management in a Software Defined World*.

The total number of technical track submissions was 140, whereas the total number of submissions was 270. The total submissions also include workshop paper submissions, dissertation submissions, demo paper submissions and experience paper submissions. The acceptance rate for the main conference track was 28

FLAMINGO members contributed in the following roles of the organizational process of IEEE/IFIP NOMS 2014:

- Keynote co-chair – Prof. Filip De Turck (iMinds),

- Patrons co-chair – Prof. Olivier Festor (INRIA),
- Panel co-chair – Prof. Aiko Pras (UT),
- Tutorial co-chair – Prof. Burkhard Stiller (UZH),
- Webmaster and social media – Dr. Steven Latré (iMinds),

Many FLAMINGO members (10 in total) assisted the Technical Program Committee in ensuring the scientific quality of the conference. Furthermore, the FLAMINGO Consortium organized the two special tracks in the main technical track. The two special tracks are:

- Special Track on Privacy and Analytical Modelling, chaired by Prof. Burkhard Stiller (UZH) and Dr. Sofie Verbrugge (iMinds),
- Special Track on the Management of the Internet of Things, chaired by Prof. Jürgen Schönwälder (JUB) and Anuj Sehgal (JUB).

2.1.2 International Conference on Autonomous Infrastructure, Management and Security, AIMS 2014

The 8th International Conference on Autonomous Infrastructure, Management and Security (AIMS 2014) has taken place from June 30 to July 3, 2014, in Brno, Czech Republic, hosted by the Masaryk University. AIMS 2014 followed the tradition of the previous events and included in the program, beside the main track, also keynotes, lab sessions, and the PhD Student Workshop. This year, the Organizing Committee in collaboration with the Steering Committee has also worked in re-defining AIMS "DNA", namely by strengthening the educational goals of the conference and its focus on PhD students and young researchers. Based on this, the AIMS 2014 has introduced a second keynote in the form of an "Educational Session Talk" delivered by senior researchers for guiding PhD students and young researchers in their academic steps; a light shepherding for the papers in the main track; and restructured the labs such as to be part interleaved with the technical and PhD sessions.

AIMS 2014 focused on monitoring and securing virtualized networks and services. The "Educational Session Talk" was given by Aiko Pras (UT) on the topic of "Where to publish", while the keynote speech was given by Martin Rehak (CISCO System) with a presentation titled "Security Analytics: Finding a Needle in the Hay Blower". AIMS 2014 also offered 3 hands on labs, namely "Fast Network Simulation Setup" (by Lorenzo Saino - UCL); "Deploying OpenFlow experiments on the Virtual Wall testbed" (by Niels Bouten, Maxim Claeys and Jeroen Famaey - iMinds); and "Cybernetic Proving Ground: a Cloud-based Security Research Testbed" (by Jakub Čegan, Martin Vizváry and Michal Procházka - Masaryk University).

The technical program consisted of three sessions – covering the topics of emerging infrastructures for networks and services, experimental studies for security management, and monitoring methods for Quality-of-Service and security – and included nine full papers, which were selected after a thorough reviewing process out of 29 submissions. Each paper received three or four independent reviews, followed by a shepherding process aimed at tutoring those 9 accepted papers through the preparation of the camera-ready paper version and to the paper presentation.

The AIMS PhD Student Workshop provides a venue for doctoral students to present and discuss their research ideas, and more importantly to obtain valuable feedback from the AIMS audience about their planned PhD research work. This year, the workshop was structured into four technical

sessions covering security, management of virtualized network resources and functions, software-defined networking, and monitoring. All PhD papers describe the current state of these investigations, including their clear research problem statements, proposed approaches, and an outline of results achieved so far. A total of 13 PhD papers were presented and discussed. These papers were selected after a separate review process out of 27 submissions, while all PhD papers received at least three independent reviews.

AIMS 2014 had 44 attendees, in line with previous editions.

2.1.3 International Conference on Network and Service Management, CNSM 2014

The CNSM 2014 conference is held in Rio De Janeiro, November 17-21, 2014. Prof. Aiko Pras (UT) and Prof. Filip De Turck (iMinds) from the FLAMINGO consortium take part in the Organizing Committee as Steering Committee Member and Workshop Chair, respectively.
CNSM 2014 received 133 submissions from all over the world (Africa, Asia, Europe, North America and South America). All submitted papers underwent a rigorous review process with at least three reviews for every paper and a rebuttal phase. Out of the 105 full papers submitted, 18 were accepted as regular papers a very competitive acceptance ratio of 17%. Due to the high quality of the submitted papers, many good papers could not be selected to the main technical conference. The 16 best such papers were selected for the Mini-Conference program. In addition, 29 short papers are presented in 2 poster sessions. The topics covered this year include: traffic measurement and characterization, software-defined networks, cloud management, virtualization, fault tolerance and security, performance management, mobile and wireless management, and risk management.
Next to the main track, the first International workshop on Management of SDN and NFV, co-located with CNSM 2014, was established by the FLAMINGO consortium (founded by Prof. Filip De Turck and co-chaired by Dr. Marinos Charalambides, UCL). Prof. Scott Shenker (Stanford University, USA) gives the keynote talk. The workshop attracted over 20 submissions from industry and academia and over 45 registered participants.

2.1.4 1st IEEE Conference on Network Softwarization, NetSoft 2015

The FLAMINGO consortium played an important role in establishing a new conference: the first IEEE conference on Network Softwarization (NetSoft 2015), organized in London, UK, April, 2015 and hosted by UCL. Prof. George Pavlou, UCL, serves as General Chair. Since it is the first edition, the role of a finance chair is very important: Prof. Olivier Festor, INRIA, serves as NetSoft 2015 Finance Chair. Furthermore, Prof. Filip De Turck serves as NetSoft 2015 Patron Chair.
NetSoft 2015 is realized as part of the recently established IEEE Software-Defined Networks initiative of the IEEE Future Directions Committee. Due to the enormous current world-wide interest in SDN and NFV, we expect many participants from the various branches of industry, academic experts and students.
NetSoft 2015 is the first of a series of IEEE annual events on SDN and NFV, and will receive a lot of coverage (websites, social media, publications, also in broader press).

2.2 Journals

Over the course of last year FLAMINGO partners held different organizational and editorial roles in the main journals of the Network and Service Management field:

- IEEE Network and Service Management Series in Communications Magazine (ComMag), http://www.comsoc.org/files/Publications/Magazines/ci/cfp/cfpcommagnetworkmanagementseries.html
- IEEE Transactions on Network and Service Management (TNSM), http://www.comsoc.org/tnsm/
- Journal on Network and Systems Management (JNSM, published by Springer), http://www.springer.com/computer/communication+networks/journal/10922
- International Journal on Network Management (IJNM, published by Wiley), http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1190

Table 3 shows the number of FLAMINGO members that contributed as editors to these journals in different roles over the course of FLAMINGO Y1.

Journal	Role				
	SE	**AEiC**	**EAB**	**AE**	**SIE**
ComMag	2	-	-	-	-
TNSM	-	-	-	4	-
JNSM	-	-	3	3	-
IJNM	-	2	-	5	4

Table 3: Number of FLAMINGO members in the major Network and Service Management journals. Journal role: SE - series editor, AEiC - associate editor-in-chief, EAB - editorial advisory board member, AE - associate editor and SIE - special issue editor.

2.2.1 IEEE Communications Magazine (ComMag)

Prof. Jürgen Schönwälder and Prof. George Pavlou serve as series editors of the IEEE Network and Service Management Series in Communications Magazine. Two times per year a series on Network and Service Management is published and the FLAMINGO project is explicitly acknowledged by the series editors.

2.2.2 IEEE Transactions on Network and Service Management (TNSM)

The following FLAMINGO members serve as associate editors for this journal: Prof. Olivier Festor, Prof. Filip De Turck, Prof. Burkhard Stiller and Prof. Aiko Pras.

2.2.3 Journal on Network and Systems Management (JNSM)

This journal has an Editorial Advisory Board with the following FLAMINGO members: Prof. George Pavlou, Prof. Olivier Festor and Prof. Aiko Pras. Following FLAMINGO members serve as associate editors: Prof. Jürgen Schönwälder, Prof. Filip De Turck and Prof. Burkhard Stiller.

2.2.4 International Journal on Network Management (IJNM)

Prof. Aiko Pras and Prof. Filip De Turck serve as associate-editor-in-chief and following FLAMINGO members serve as associate editors: Prof. Olivier Festor, Prof. Jürgen Schönwälder, Prof. Burkhard Stiller, Prof. Joan Serrat, and Prof. Gabi Dreo Rodosek.

2.3 Organization of Journal Special Issues

2.3.1 Flow-based Approaches in Network Management: Recent Advances and Future Trends

The University of Twente, in collaboration with the University of Aalborg (DK) and The University of Auckland (NZ), has organized a special issue of the International Journal of Network Management on the topic ”Flow-based Approaches in Network Management: Recent Advances and Future Trends”. The editors for this issue have been Dr. Ramin Sadre (Aalborg University, Denmark), Dr. Anna Sperotto (University of Twente), Prof. Nevil Brownlee (The University of Auckland, New Zealand) and Rick Hofstede (University of Twente). The special issue has been published online in June 2014.

The special issue identified emerging trends in flow-based research, in particular: i) an attempt in closing the gap between packet-based and flow-based monitoring; ii) the evolution of IPFIX towards a generic protocol for exporting structured data and iii) the interoperability between flow-based solutions and newly emerging environments like Clouds and Software Defined Networking. The special issue collected 22 submissions. Of these, only 3 were not considered for the review process because they have been identified in an early stage as being out of scope. The remaining 19 submissions went through a thorough review process in which each paper received at least three independent reviews. Finally, the published issue included seven papers.

More information about the special issue can be found in the editorial authored by the guest editors [1].

2.3.2 IJNM special issue on Security

The University of Twente (UT), the Universität der Bundeswehr München (UniBwM) and the University of Zurich (UZH), in collaboration with CAIDA (UCSD, USA) are organizing a special issue of the International Journal of Network Management on the topic of ”Measure, Detect and Mitigate - Challenges and Trends in Network Security”.

The need for this special issue is motivated by the fact that network attacks are becoming increasingly powerful and lucrative. Despite the ongoing economic crisis, cybercrime is estimated to still have double-digit annual growth rates. In addition, recently we have also witnessed attacks aiming at the core infrastructure of the Internet itself, such as backbones and the Domain Name System, indicating clearly that attackers are not only interested in damaging single end-system and highlighting the possible damages we will incur if such attacks cannot be stopped.

The goal of this special issue is twofold. On the one side, it aims at characterizing nowadays networks from a security perspective, highlighting the current and upcoming trends in malicious activities. On the other side, the special issue aims at attracting contributions in the field of detection and mitigation of network attacks.

Editors of this special issue are Prof. Gabi Dreo Rodosek (UniBwM), Dr. Anna Sperotto (UT), Dr. Corinna Schmitt (UZH), Rick Hofstede (UT) and Dr. Alberto Dainotti (CAIDA). The special issue is scheduled for publication in September 2015.

2.3.3 TNSM special issue on management of SDN/NFV-based systems

This special issue is organized by Prof. Filip de Turck, iMinds. The special issue focuses on efficient management of software-defined virtualized telecommunication systems and datacenters, which

will be of key importance in the future. Survey papers that offer a perspective on related work and identify key challenges for future research are considered as well.

The guest editors for the special issue are: Jun Bi (Tsinghua University, China), Raouf Boutaba (University of Waterloo, Canada), Prosper Chemouil (Orange Labs, France), Filip De Turck (Ghent University-iMinds, Belgium) and Cedric Westphal (Huawei and University of California, Santa Cruz, USA). The special issue is scheduled for publication in March 2015.

2.3.4 IJNM special Issue on Advances in Management of Multimedia Services

This special issue is organized by the FLAMINGO consortium with Dr. Marinos Charalambides, UCL as the main guest editor. The special issue is organized based on the current interesting challenges for the efficient management of multimedia services and applications. The traditional approach of management through a set of Quality of Service parameters (e.g. packet loss, delay, jitter) is no longer sufficient: the quality as perceived by the end users, the Quality of Experience (QoE), should be taken into account as well. For this special issue, submissions addressing these challenges and presenting novel research or experimentation results, are welcomed.

The guest editors for the special issue are: Marinos Charalambides (University College London, UK), Thomas Zinner (University of Wuerzburg, Germany), Hiroshi Saito (NTT, Japan), Prasad Calyam (University of Missouri-Columbia, USA), Steven Latré (Antwerp University-iMinds, Belgium). The special issue is scheduled for publication in July 2015.

2.4 Related Activities

2.4.1 IEEE Communications Society Technical Committee on Network Operation and Management (IEEE CNOM)

CNOM is the IEEE Communications Society Technical Committee on Network Operation and Management. CNOM provides the Communications Society with a focus on network and service operation and management, and actively encourages the exchange of information on the operational and technical management aspects of public and private networks for voice, data, image, and video, and organizes and sponsors publications and discussions of these topics.

Prof. Filip De Turck (iMinds) serves as the CNOM Technical Program Committee Chair and represents FLAMINGO in CNOM.

2.4.2 IFIP Working Group 6.6 (WG 6.6 Management of Networks and Distributed Systems)

The IFIP Working Group (WG) 6.6 aims to facilitate cooperation between different organizations and individuals internationally in the areas of distributed operations and management, integrated network management, systems management, and service engineering. It aims to be an effective conduit in the technology transfer between the academic and research communities, industry and the standard bodies.

Prof. Olivier Festor (INRIA) serves as the chair of IFIP WG 6.6, and Prof. Burkhard Stiller (UZH) as the co-chair of this IFIP WG 6.6.

2.4.3 IFIP Technical Committee 6 (TC6 - Communications Systems)

Technical Committee 6 (TC6 - Communications Systems) is an important Technical Committee within IFIP both in terms of its activity and of the revenue it generates for IFIP from publications and conferences. Currently, TC6 has ten Working Groups (WGs), the majority of which are concerned either with specific aspects of communications systems themselves or with the application of communications systems, one WG is concerned with communications in developing countries. TC6 meets twice a year, in Spring and Autumn (Fall), usually co-locating its meetings with a related conference.

Prof. Aiko Pras (FLAMINGO Coordinator) chairs IFIP TC6. The work of TC6 is largely concerned with managing and coordinating the WGs and with setting the strategies both for TC6 itself and for existing and future WGs.

2.4.4 Conference Ranking

The consortium has an ongoing work on defining a metric to rank conferences for the Network and Service Management community. During the second year of the project we investigated in more detail existing metrics used to rank academic conferences to apply to our community. We summarize bellow the six found metrics. Furthermore, we explain how we have been applying those metrics and the expected next steps to develop a conference ranking metric.

1. **Acceptance ratio**: is the number of accepted/published papers divided by the number of submitted ones (see Eq. 1). This metric indicates how selective a conference is accepting/publishing papers. [2, 3, 4] have been using this metric to classify computer science conferences.
$$AcceptanceRatio = \frac{NrAcceptedPapers}{NrSubmittedPapers} \quad (1)$$

2. **Popularity ratio**: is the number of accepted papers divided by the number of registered participants in a conference (see Eq. 2). This metric was introduced by [5] and highlights the conference popularity in terms of the number of attendees in a given community. To retrieve the number of conference attendees is not a straightforward task. However, for the Network and Service Management community most of information are available by Kevin Almeroth personal website [1]
$$PopularityRatio = \frac{NrAcceptedPapers}{NrAttendees} \quad (2)$$

3. **Citation ratio**: is the number of accepted papers divided by the number of citations that those papers have. This metric shows the impact of papers in the academic community. An extended version of this metric has been used by [6], called Impact Factor (IF) score, which considers two consecutive years of publications and citations. Note that this metric depends on the number of citations, which tends to increase over time. Therefore, a reliable and often updated source of information is strongly required. Between the two main sources of paper citation, Microsoft Academic Search[2] and Google Scholar[3], the latter demonstrates much more accuracy than the former.
$$CitationRatio = \frac{NrAcceptedPapers}{NrCitations} \quad (3)$$

[1] www.cs.ucsb.edu/~almeroth/conf/stats/

[2] academic.research.microsoft.com/RankList?entitytype=3&topDomainID=2&subDomainID=0

[3] scholar.google.com

4. **H-index**: is a metric also related to the number of citations, which is commonly used to rank academic researchers. This metric has a bigger granularity than the citation ratio metric, once the former is based on a set of the most cited papers and not on the complete list of published papers. This metric has been used by [7] to rank the conferences of the Brazilian computer science community.

5. **Conference Impact Factor (CIF)**: is a metric proposed by [5], which is achieved by the inverse of the sum between the `acceptance ratio, popularity ratio, and citation ratio` (see Eq. 4). Instead of presenting a biased ranking, this metric covers the main aspects to classify and compare conferences.

$$CIF = \frac{1}{AcceptanceRatio + PopularityRatio + CitationRatio} \tag{4}$$

6. **Empirical**: is an approach not based on scientific measurements but on subjective questionaires and can be considered controversial. Usually participants rank a set of well-known conferences in the context of a specific academic community. Although not based on measurements, this approach is largely used [8, 9, 10, 11].

After analyzing those six metrics we decide to improve the CIF metric and perform Empirical conference ranking on our community. Although the `Acceptance` and the `Popularity` ratio can be found on Kevin Almeroth personal website, we are improving the `Citation` ratio by using Google Scholar (instead of Microsoft Academic Search used by [5]). In Flamingo Y2, we also performed two empirical analyses within the Network and Service Management community. The first was performed manually involving members of the IFIP TC6, while the second one was performed using an automated approach [4] during the Autonomous Infrastructure, Management and Security (AIMS) conference. Both surveys show several similarities with the preliminary results using the CIF metric.
Following aspects will be included in the future: (i) the number of editions of a conference, (ii) the committee members' quality, (iii) review process reputation, (iv) reputation of authors that published in previous editions of this conference, and (iv) the industry connection of the conference (i.e. number of published papers from industry, number of submissions from industry and number of attendees from industry).

2.4.5 Open Digital Library

An important development for the research community, thus also the network and service management community, is open access to scientific papers. Although institutions such as the European Commission already heavily promote open access, the implementation of open access has so far not been successful. Publishers of scientific papers, such as Elsevier, Springer and Wiley, see their business models in danger with open access. Moreover, professional organisations such as ACM and IEEE see the risk that revenues from journals and their Digital Libraries will decrease. Since publishers and professional organisations understand that they are eventually forced to embrace open access, they slowly offer the possibility for authors to publish as open access. To keep their traditional income, they charge for each paper an amount between $500 and $3000. For an EU project like FLAMINGO, the costs of going 100% open access should therefore be estimated between 150.000 and 300.000 Euro, thus between 5% and 10% of our total project budget. Such numbers are, in our opinion, outrageous and lack any relationship with the real costs, which can be estimated at a few Euro per paper.

[4] `dacs-survey.ewi.utwente.nl/index.php/252711?lang=en`

It is clear that new initiatives are needed to promote open access. What will generally not work, are initiatives by unknown organisations to create novel open access journals. Such initiatives will not work, since these novel organisations lack the scientific reputation that is needed to ensure the high quality review process that is required by the scientific community. In addition, several of these novel journals ask the same amount of money from authors as the well-established publishers. Finally they often do not organise conferences and workshops, which are of crucial importance for the field of computer science.

What will work, however, are initiatives by respected professional organisations that do not have any substantial income from publications. Such organisations can easily use their reputation to ensure a high quality review process, without having to change their business model. In the field of ICT, an example of such organisation is IFIP. Even if IFIP is compared to IEEE and ACM relatively small, they can set an example and might force the other professional organisations to change their business models.

IFIP (International Federation for Information Processing) was established in 1960 under the auspices of UNESCO, and is organised in terms of 'Country members' and 'Technical Committees' (TC). The biggest of all TCs is TC6 (Communication Systems), and within TC6 the most active Working Group (WG) is WG6.6 (Management of Networks and Distributed Systems). IFIP has a small staff and has outsourced most of its publications to Springer, as part of the AICT and LNCS series. Despite the fact that Springer publishes the proceedings, the copyright stays with IFIP. The current contract between IFIP and Springer gives Springer the first 3 years exclusive publication rights; after 3 years IFIP can include all papers from a proceedings into its own Digital Library (DL). In 2008 IFIP has, in conjunction with the Australian Computer Society, experimented with a DL, but these experiments failed (`http://dl.ifip.org`).

Since open access is getting more important every day but costs for authors remain outrageous, members from FLAMINGO decided to start new initiatives within IFIP to create an IFIP Open DL. Such initiatives will have good chances to succeed, since FLAMINGO members hold strong positions within the world-wide network and service management community, provide the chairs for IFIP WG6.6, as well as the chair for TC6. Therefore FLAMINGO members hold key positions within IFIP. The initial idea was to create an IFIP TC6 open DL, which would include papers from all TC6 (thus networking) related conferences, as well as (as much as possible) papers from other TCs. The initial TC6 Open DL was discussed in May 2014 (Kracow) with the members of the FLAMINGO Scientific and Industrial Council (who proposed some changes), at the IFIP TC6 meeting in June 2104 (Trondheim) and at the recent IFIP General Assembly (GA), which took place in September 2014 (Vienna). At that IFIP GA meeting it was decided to use the IFIP TC6 Open DL as basis for the IFIP Open DL. Since september 2014 the IFIP Open DL is operational and the FLAMINGO members within IFIP will further develop this DL in the next few years

The IFIP Open DL takes as input author copies of papers, as well as meta data from DBLP. In case of proceedings published by Springer the author copies of papers are downloaded every three months by Springer at an IFIP FTP server. For proceedings not published by Springer, direct interaction takes place with the conference organisers; in the future this process will be automated and direct upload facilities from conference management systems will be implemented. For the metadata quite some help has been received from Michael Ley (DBLP). The meta-format used for the IFIP DL is equivalent to that of DBLP; contents added to the IFIP DL can therefore also be included in DBLP. Work is in progress to integrate the IFIP DL with the JEMS conference management system, to facility direct and automatic download from papers and metadata from JEMS into the TC6 DL.

The IFIP (TC6) DL (`http://opendl.ifip-tc6.org`) is now fully operational, and already includes all Springer LNCS, AICT and LNIBP proceedings of which IFIP holds the copyright (of course satis-

fying the contract with Springer, which says that the first 3 years Springer has exclusive publication rights). In addition it also holds several non-Springer IFIP proceedings. At the moment of writing this deliverable (October 2014) the DL holds 461 proceedings with 16,717 papers, of which 12,403 are older than 3 years and thus publicly available. This number is growing quickly, also since more and more conferences move away from Springer and publish directly in the IFIP DL; a good example of such conferences are the recent top conferences in the area of network and service management: the Integrated Management (IM 2015) and Conference on Network and Service management (CNSM 2013 and 2014), thanks to the FLAMINGO consortium. On the longer term, operation of the IFIP DL is foreseen to migrate from the FLAMINGO volunteers to INRIA HAL. This migration ensures that the Open Digital Library will still be expanded and maintained, also after the FLAMINGO project has concluded.

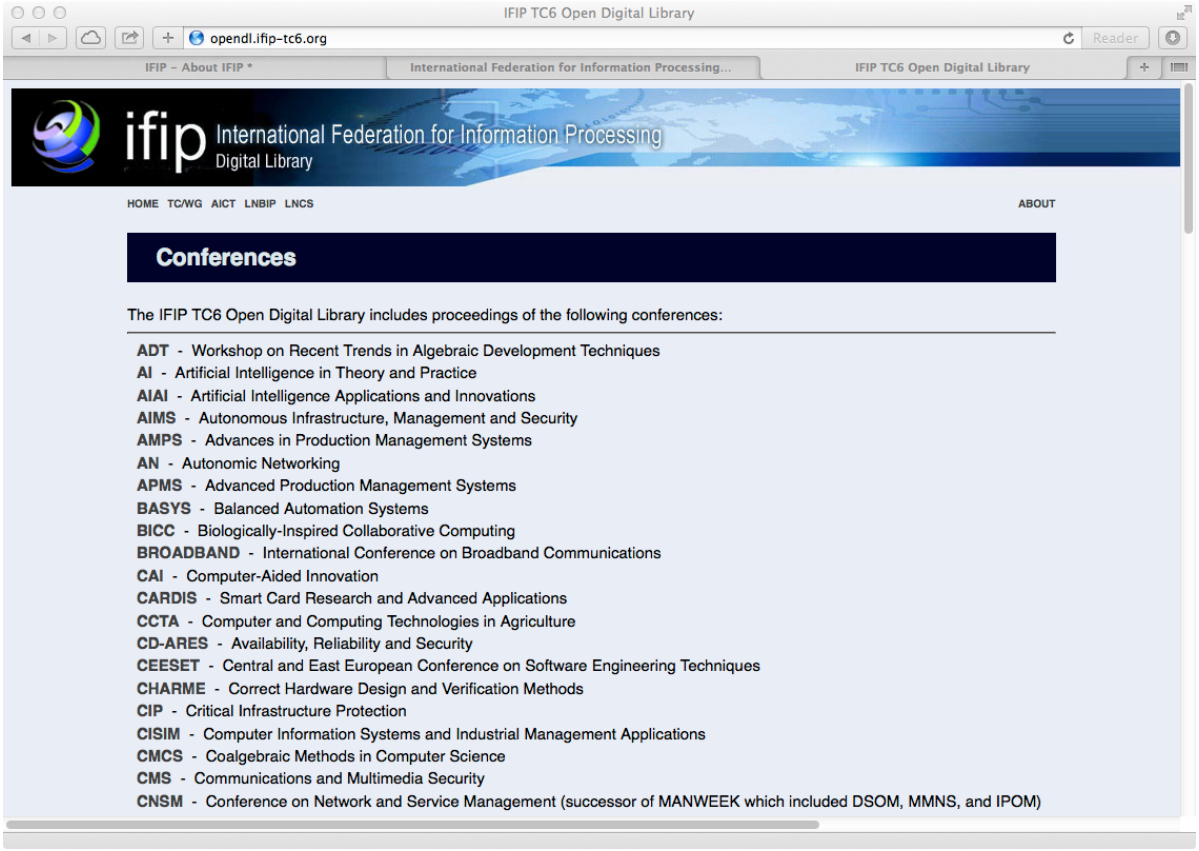

Figure 1: Screenshot of the IFIP Open Digital Library, realized by FLAMINGO.

2.4.6 Network and Service Management Taxonomy

The updated FLAMINGO taxonomy has been presented and discussed during (i) the CNOM meeting at GLOBECOM 2014, (ii) the CNOM and IFIP WG6.6 meeting at NOMS 2014, (iii) the NMRG meeting in Vancouver 2014, (iv) the EC stakeholders consultation workshop (session on Network Management), September 2014, Brussels.

A paper presenting the FLAMINGO taxonomy, the methodology and analysis of results has been submitted for publication in Journal of Network and Service Management (JNSM).

The taxonomy is publicly available on the Simpleweb, the CNOM website and the publicly available presented slides during the network management session of the EC stakeholders consultation

workshop.

The updated taxonomy has been implemented in JEMS, and a meeting with the TPC chairs of IFIP/IEEE IM 2015 symposium was held. As a result, the updated taxonomy was fully implemented for IM 2015.

2.4.7 IM 2015 Dissertation session organization

Prof. Olivier Festor, INRIA organises and co-chairs the Dissertation sessions during IFIP/IEEE IM 2015. The goal is to provide Ph.D. students in the area of Network and Service management the opportunity to present their Ph.D. work to a wide international audience and to give out an award for the best work. The assessment criteria for the award include the relevance of the work for network and service management, the potential of the thesis results for future engineering practice, the novelty and contribution of the work, as well as the quality of publications and software produced as part of the thesis.

2.4.8 Best Paper Awards

The prestigious IEEE/IFIP NOMS 2014 best paper award was given to a FLAMINGO paper, with UPC and iMinds as authors. The title of the paper is: *Design and Evaluation of Learning Algorithms for Dynamic Resource Management in Virtual Networks* and the authors are: Rashid Mijumbi, Juan-Luis Gorricho, Joan Serrat, Maxim Claeys, Steven Latré and Filip De Turck.

The paper presents a machine learning-based approach to virtual network resource management. A model for the substrate network as a decentralized system is proposed and a learning algorithm is introduced in each substrate node and substrate link, providing self-organization capabilities. A multi-agent learning algorithm that carries out the substrate network resource management in a coordinated and decentralized way, is presented. The task of these agents is to use evaluative feedback to learn an optimal policy so as to dynamically allocate network resources to virtual nodes and links. The agents ensure that while the virtual networks have the resources they need at any given time, only the required resources are reserved for this purpose. In addition, the agents ensure that resource re-allocations do not impact the quality of service requirements of virtual networks. Detailed performance evaluation results and optimizations are presented.

Moreover, the AIMS 2014 best paper was also awarded to a FLAMINGO paper (joint work between JUB and INRIA): *A Study of RPL DODAG Version Attacks* by Anthea Mayzaud, Anuj Sehgal, Rémi Badonnel, Isabelle Chrisment, and Jürgen Schönwälder.

2.4.9 Student Travel Grants

During NOMS 2014, two Student Travel Grants were awarded to authors from the FLAMINGO consortium (based on their application and high ranking of their paper):

- Rashid Mijumbi (UPC)
- Stefano Petrangelli (iMinds)

During SIGCOMM 2014, two Student Travel Grants were awarded to members of the FLAMINGO consortium as well:

- Ricardo de O. Schmidt (UT)
- Rashid Mijumbi (UPC)

3 Organization of Specific Workshops and Events

In this section, the various specific workshops and events organized by the FLAMINGO consortium (18 in total), are detailed.

3.1 NMRG workshop on Large Scale Measurements

Prof. Jürgen Schönwälder organised the NMRG workshop on Large Scale Network Measurements co-located with CNSM 2013 (joint organisation of Leone and FLAMINGO). All workshop attendees were invited to present their ideas about the subject, and joint and interesting discussions took place.

A report summarising the workshop and with FLAMINGO acknowledgement was published in the Journal of Network and Systems Management(JNSM) [12].

3.2 International Workshop on Management of the Future Internet, ManFI 2014

The FLAMINGO consortium organized the International Workshop on Management of the Future Internet (ManFI 2014) with Prof. Filip De Turck, iMinds as the main organizer. The workshop took place on May 5th, 2014 in Krakow, Poland. More than 30 people from industry and academia attended and actively participated to the workshop.

The keynote was given by Prof. Laurent Mathy, University of Liege, Belgium with title *The Impact of Virtualization on the Management of the Future Internet - Vision and Challenges*. The main technical track was divided in three topics, where based on paper presentations interactive discussions were initiated by the session chairs:

- *Virtualization Management*, with presentations from colleagues from CREATE-NET (Italy) and UCL (UK);
- *Future Internet Management*, presented by researchers from University of Bremen (Germany), University Politehnica of Bucharest (Romania), University of Nicosia (Cyprus), Cardiff University (UK), IBM T.J. Watson Research Center (USA), UFF (Brazil), PUC-Rio and (Brazil);
- *Management of Data Center Networks*, presented by researchers from POSTECH (Korea), KT AIT (Korea), and University of Western Ontario (Canada).

Prof. Abdelkader Lahmadi, INRIA served as a ManFI 2014 session chair. Next to Prof. Filip De Turck, Prof. Kazuhiko Kinoshita (Osaka University, Japan) and Prof. Jae-Hyoung Yoo (Postech, Korea) served as workshop co-chairs.

3.3 International Workshop on Quality of Experience Centric Management, QCMan 2014

The FLAMINGO consortium organized the International Workshop on Quality of Experience Centric Management (QCMan 2014) with Prof. Filip De Turck, iMinds as the main organizer. The workshop took place on May 9th, 2014 in Krakow, Poland. More than 25 people from industry and academia attended and actively participated to the workshop.
The keynote was given by Prof. Antonio Liotta, Technical University Eindhoven, the Netherlands

with title *Streaming beyond 2020: are neutrality and speed sufficient?*. The main technical track was divided in three topics, where based on paper presentations interactive discussions were initiated by the session chairs:

- *HTTP Adaptive Streaming*, with presentations from researchers of University of Novi Sad (Serbia) and iMinds (Belgium);
- *Network-aware QoE management*, presented by colleagues from NCSR Demokritos (Greece), University of Wuerzburg (Germany), and VTT Technical Research Centre (Finland);
- *QoE assessment and video coding*, presented by researchers from Alpen–Adria–Universität Klagenfurt (Austria), Beijing University of Posts and Telecommunications (China) and iMinds (Belgium).

Dr. Sebastian Van Leuven, iMinds served as a QCMan 2014 session chair. Next to Prof. Filip De Turck, Prof. Christian Timmerer (KlagenFurt University, Austria) and Prof. Steven Latré (iMinds, Belgium) served as workshop co-chairs.

3.4 CODE Research Center Event

During the second year of FLAMINGO the research center CODE (Cyber Defence@UniBwM) organized and participated in several events. During the last quarter of 2013 a Chinese delegation visited the research center to get updated information about current research areas. The delegation, consisted of representatives form authorities of different Chinese provinces, institutions and companies, discussed about ”Cyberspace Governance and Management in Germany”.

Later in 2013 the research center participated with an own exhibition booth at the ”BKA Autumn Conference” with the subject ”Cybercrime Threat, Intervention, Defence”. The conference was attended by about 500 representatives in the field of police, politics, judiciary and sciences. DDoS attacks against websites, cyber espionage, attacks against critical infrastructure and cyber terrorism are only a small part of attacks which were discussed during the conference. Due to the interesting presentation of the research center with posters, ongoing research and live demonstrations the exhibition boot of ”CODE” was frequently visited and spark great interest to the expert audience.

During the Open Day of the Universität der Bundeswehr München on June 30, 2014 the research center CODE presented current research results to the interested public. Researchers presented their work to interested visitors and explained current security challenges endangerments by the help of live demonstrations.

Please find below the list of participants from the industry and authorities:

- Bundeskriminalamt (BKA)
- Federal Criminal Police Office of Germany
- Fraunhofer Heinrich Hertz Institute
- Hasso Plattner Institute
- Fraunhofer Center for Organic Materials and Electronic Devices Dresden
- BITKOM e.V. Federal Association for Information Technology, Telecommunications and New Media

- Security-cooperation Cybercrime BITKOM
- Federal Office for Information Security (BSI)
- Center for Satellite Based Crisis Information
- Europol European Cybercrime Centre
- German Forum for Crime Prevention (DFK)

3.5 Dagstuhl Seminar 13472: Global Measurement Framework

The Dagstuhl Seminar "Global Measurement Framework" was a three day event that took place from November 17th to November 20th, 2013 in Schloss Dagstuhl. The seminar brought together experts working on large scale Internet measurements.

The seminar was extremely interesting since there were participants running large measurement systems (e.g., Sam Crawford who is running Sam Knows, Daniel Karrenberg who is involved in the design of RIPE Atlas), big operators (e.g., Trevor Burbridge and Phil Eardley (both BT)), big content providers (e.g., Arthur Berger, Akamai Technologies), regulators (e.g., Henning Schulzrinne, FCC) and key players from academia.

The seminar was organized jointly with the FP7 projects MPlane and Leone. The organizers of the Dagstuhl Seminar were Philip Eardley (BT), Marco Mellia (Polytechnic University of Torino), Jörg Ott (Aalto University) Jürgen Schönwälder (Jacobs University), and Henning Schulzrinne (FCC). FLAMINGO participants have been Anna Sperotto (UT), Jürgen Schönwälder (JUB), Abdelkader Lahmadi (INRIA), and Vaibhav Bajpai (JUB). More details including a detailed list of paritcipants can be found on the seminar web page[5].

Several of the participants are also collaborating in the IETF in the LMAP working group and the seminar clearly helped to have a better understanding of the various large-scale measurment activities and how they may impact the way the Internet functions and delivers services to users.

3.6 Dagstuhl Seminar 14052: Ethics in Data Sharing

The Dagstuhl Seminar on "Ethics in Data Sharing" was a week-long event that took place from January 26th, 2014 to January 31st, 2014 in Schloss Dagstuhl. The seminar brought together experts from the fields of Ethics, Networking and Law, form both industry and academia, giving the opportunity to the participant to complement each other expertise with fresh views from other fields.

Following the Dagstuhl tradition, the seminar was organized such as to have a free-evolving agenda in which each day the participants themselves will choose the topics of discussions that emerged as more significative. The first two days have focused on personal presentations, in which the participants had the opportunity to present themselves and introduce the aspects of their work that were most closely related to the topic of the seminar. These presentations also gave life to several animated discussions on a variety of topics, from the consequences of collecting data to the possible rise of regulations concerning the Internet. On the third day, the participants identified specific topics of common interests that were analyzed in depth in smaller groups on day four. The topics that have been identified were:

[5] http://www.dagstuhl.de/en/program/calendar/semhp/?semnr=13472

- Creating practical guidelines for supplier/researcher data sharing relationships
- Building ethical technologies
- Best practices for Institutional Review Boards (IRBs)/data sharing

Last, the seminar drew to a close on Friday, when the participants in plenary session concluded the week of discussion with a set of concrete action points for further research.

Of particular interested for FLAMINGO is the collaboration on the topics of "Creating practical guidelines for supplier/researcher data sharing relationships" between the University of Amsterdam, Tilburg University, University of Twente, SURFnet and University of Zurich that has originated in this seminar and it is now being further developed in the context of WP7 [13].

The organizers of the Dagstuhl Seminar on Ethics in Data Sharing were: Sven Dietrich (Stevens Institute of Technology, US), Mireille Hildebrandt (Free University of Brussels, BE), Aiko Pras (University of Twente, NL), Lenore D. Zuck (University of Illinois, Chicago, US), and Julie E. Cohen (Georgetown University, Washington, US). More details including a detailed list of paritcipants can be found on the seminar web page[6].

For further information on the Seminar, we refer to Dagstuhl report [14] and the blog summary by Roland van Rijswijk-Deij (SURFnet and University of Twente)[7].

3.7 International Workshop on Internet Charging and QoS Technologies, ICQT 2013

Prof. Burkhard Stiller, UZH organized as a Liaisons Chair the 8th International Workshop on Internet Charging and QoS Technologies (ICQT 2013) in Zürich, Switzerland on Monday October 14, 2014. He invited the ICQT 2013 General Co-Chairs Peter Reichl, University of Vienna (Austria) and Bruno Tuffin, INRIA (France) to host the workshop in Zürich and Sandrine Vaton, Telecom Bretagne (France) and Tuan Anh Trinh, BME (Hungary) served as TPC Co-Chairs of the workshop. As a Liaisons Chair Prof. Burkhard Stiller facilitated the local organisation, the interaction with the network management research community by co-locating the workshop with CNSM 2013, and the various advertisements of the workshop. The keynote speech was given by Claude de Jacquelot, political advisor Broadband-Infrastructure policy expert with title *E-Africa by the horizon 2020: Ultra Wide Band in Africa ? A mainly political choice*. Next two technical sessions took place:

- *Inter-domain Quality of Service* with interesting contributions from colleagues of PRISM, Université de Versailles Saint-Quentin en Yvelines (France), Thales Research and Technology (France), Telecom Paris Tech (France), Université Paris Dauphine (France), INRIA (France), and Alcatel-Lucent Bell Labs (France);
- *Charging Strategies for Content Delivery and Internet Access* with presentations by researchers from FTW Telecommunications Research Center Vienna (Austria), University of Vienna (Austria), University of Rome Tor Vergata (Italy), and Telecom Bretagne (France).

The workshop was attended by approximately 15 participants and generated a lot of interesting interactions, discussions, and insights between the participants (including members from the FLAMINGO consortium as well as members from SmartenIT and former projects, namely ETICS, DEMONS, and EuroNF).

The detailed ICQT 2013 program is available at [15].

[6] http://www.dagstuhl.de/en/program/calendar/semhp/?semnr=14052
[7] https://blog.surfnet.nl/?p=3174

3.8 Organization of workshop with Deutsche Telekom

On Tuesday June 24th, 2014, the FLAMINGO consortium organized a one-day workshop with Deutsche Telekom in Bonn, Germany (hosted by Deutsche Telekom). Prof. Jürgen Schönwälder, JUB served as the main organizer.

The goal of the workshop was twofold: (i) disseminate the FLAMINGO results to a major European operator in a one-to-one workshop and (ii) learn from Deutsche Telekom their main network management challenges and their vision.

The workshop counted 25 participants: 20 from the FLAMINGO consortium and 5 experts from Deutsche Telekom (Axel Clauberg, Vice President Aggregation, Transport and IP, Fixed Access, Tomislav Sukser, Aggregation, Transport and IP, Rainer Schatzmayr, Aggregation, Transport and IP, Ian Farrer, Aggregation, Transport and IP, and Andreas Gladisch, Vice President Converged Network and Infrastructure).

Deutsche Telekom presented their views as a Software Defined Operator and their TERASTREAM project. The challenges with respect to resource management, monitoring, measurement-based management, and resilience were interactively discussed in detail and interesting ideas were exchanged. Four presentations were given by FLAMINGO:

- *Link Dimensioning* by Ricardo de Oliveira Schmidt (UT)
- *HTTP Adaptive Streaming* by Niels Bouten (iMinds)
- *Measuring the BitTorrent System* by Andri Lareida (UZH)
- *Distributed Denial of Service* by Jair Santanna (UT)

Very interesting and valuable feedback was provided by the experts from Deutsche Telekom.

3.9 NOMS 2014 special track on IoT Management

A Special Track on the Management of the Internet of Things was organized and chaired by Prof. Jürgen Schönwälder (JUB) and Anuj Sehgal (JUB). The track attracted 20 submissions (14 full papers, 6 short papers) out of which 4 full papers were selected for presentation.

Presentations were given by colleagues from Technical University Munich (Germany), Polish Academy of Science and Proximetry (Poland), INRIA (France), University of California Irvine (USA), SRI International (USA) and University of Bologna (Italy).

3.10 NOMS 2014 special track on Privacy and Analytical Modeling

This Special Track on Privacy and Analytical Modeling was the outcome of FLAMINGO's activities on establishing a Special Session hosted at NOMS 2014 to interact, especially with respect to legal- and security-related topics, with the network and service management community. Out of 5 papers submitted for this special Call for Papers on Privacy, Trust, Regulation, and Legal Issues, chaired by Corinna Schmitt, University of Zürich, Switzerland and Sofie Verbrugge, University of Ghent - iMinds, Belgium, 2 have been selected after a review process, which became part of this Special Track on paper position 3 and 4.

Presentations were given by colleagues from Imperial College London (UK), SAP HANA Cloud Computing–Systems Engineering (USA), Technion (Israel), UFRGS (Brazil) and Universitat Rovira i Virgili, Taragonna (Spain).

3.11 1st International Workshop on Management of SDN and NFV Systems

The first International workshop on Management of SDN and NFV (ManSDN/NFV), was established by the FLAMINGO consortium (founded by Prof. Filip De Turck and co-chaired by Dr. Marinos Charalambides, UCL). The workshop will be held in conjunction with CNSM 2014 in Rio de Janeiro Brazil, on November 21st, where 9 full papers and 5 short papers will be presented. The keynote talk will be given by Prof. Danny Raz (Technion, Israel) on "When NFV Meets SDN: A Short Circuit or Sparkling Fireworks?". The workshop is expected to attract a lot of interest from both industry and academia.

Together with Dr. Marinos Charalambides, Prof. Dorgival Guedes (UFMG, Brazil), Dr. Liam Fallon (Ericsson, Ireland), and Dr. Toshio Tonouchi (NEC, Japan) served as workshop co-chairs.

3.12 EuCNC workshop on Management of Large Scale Virtualized Infrastructures: Smart Data Acquisition, Analysis and Network and Service Management in the Future Internet

Prof. Filip De Turck organized this workshop and involved the co-organizers: Dr. David Griffin (FP7 Fusion coordinator) and Dr. Philip Eardley (FP7 Leone coordinator).

The FP7 Leone project focuses on large scale measurement platforms and can be considered as the underlying layer for future network and service management platforms. The FP7 Fusion project studies a service layer for the Future Internet, and focuses on efficient provisioning, discovery and execution of service components distributed over the Internet, and promotes the idea of 'service-centric networking'.

The workshop was organized because many Future Internet research projects deal with efficient data acquisition and analysis of large scale data in order to make intelligent decisions for management of the network and the services offered over the network. The virtualized nature of future networks and computational infrastructures introduces specific problems, but also creates very interesting opportunities. The workshop focussed particularly on discussing in detail the synergies between the studied data acquisition and analysis approaches, the required interfaces, the coordination of actions taken in the different layers, and the challenges and opportunities of the recent emergence of virtualized infrastructures.

The interaction, interfaces, and synergies between the Monitoring Layer, Network Management Layer and Service Management and Control Layer was very interesting for the interactive workshop. For instance, among others, the following important questions were addressed and thoroughly discussed:

- How can the service layer benefit from the large scale monitoring and measurement systems?
- How can the interaction between content placement techniques and the services that make use of the content in the service management layer be organized in the best possible way?
- Which service security requirements are necessary to take into account in the network management layer?

The workshop program was structured as follows. First, an opening keynote session took place presenting the main achievements of the Leone, FLAMINGO, Fusion projects and stimulation of the participants with interesting challenges on the theme of "Management of Large Scale Virtualized

Infrastructures" (keynote speakers: Filip De Turck, David Griffin, Dario Ercole). A paper session with 4 presentations on "Smart Data Acquisition and Analysis in the Future Internet" took place (with presentations by Telcom Italia, Twente University, Jacobs University Bremen and University Roma Tre), followed by a paper session with 4 presentations on "Smart Management of Services in the Future Internet" (with presentations by Alcatel-Lucent Bell Labs, UCL, UPC, iMinds and Orange Poland). Finally, a panel session on "The interaction, interfaces, and synergies between the Monitoring Layer, Network Management Layer and Service Management Layer in the Future Internet" took place, where all workshop participants were given the opportunity to give their opinions and viewpoints. The panel was composed of the following participants: Dario Ercole (Telecom Italia), Maurizio Pizzonia (University Roma Tre), David Griffin (University College London), Frederik Vandeputte (Alcatel-Lucent Bell Labs), Marinos Charalambides (University College London), Filip De Turck (iMinds-Ghent University, Belgium) (panel moderator).

The discussion and interaction among the participants was stimulated and interesting ideas were generated, especially on future QoE-centric management, generation and exchange of datasets, and efficient cache and service placement algorithms.

3.13 EuCNC workshop on Mobile Cloud Infrastructures and Services (MCIS)

Dr. Marinos Charalambides, UCL gave a keynote during the EuCNC workshop on Mobile Cloud Infrastructures and Services (MCIS), with Dr. Georgios Karagiannis, UT as the main organizer. The title of the keynote talk was *Network Resource Management for Virtualised Infrastructures*. By contributing to this workshop, interesting discussions and interactions took place with the following FP7 projects: MCN, CONTENT and iJOIN.

3.14 FLAMINGO participation to TERENA conference

FLAMINGO has taken part in the TERENA 2014 conference, held in Dublin, 19-22 May, 2014 with the following posters. The first three posters have also been presented in a lightning talk during the TERENA conference.

- ReFlow - Statistics on Internet Traffic – Martijn Hoogesteger (University of Twente), Ricardo de O. Schmidt (University of Twente), Anna Sperotto (University of Twente), Aiko Pras (University of Twente)
- Real-time DDoS Defense: A collaborative Approach at Internet Scale – Jessica Steinberger (University of Applied Sciences Darmstadt and University of Twente), Anna Sperotto (University of Twente), Aiko Pras (University of Twente), Harald Baier (University of Applied Sciences Darmstadt)
- SSHCure: SSH Intrusion Detection using NetFlow and IPFIX – Luuk Hendriks (University of Twente), Rick Hofstede (University of Twente), Anna Sperotto (University of Twente), Aiko Pras (University of Twente)
- Towards Comparability of Intrusion Detection Systems: New Data Sets – Robert Koch (UniBwM), Mario Golling (UniBwM) and Gabi Dreo Rodosek (UniBwM)

3.15 IM 2015 demo session organization

Prof. Jürgen Schönwälder, JUB and Dr. Marinos Charalambides, UCL organize the demonstration session during the IFIP/IEEE International Symposium on Integrated Network Management (IM 2015). During this dedicated two-hour session, research prototypes will be demonstrated and emerging technologies will be discussed with the key thought leaders. Four types of contributions are considered:

- Demos from student authors about the concepts presented in their paper(s)
- Demos from all other authors of accepted contributions in the main conference and workshops
- Demos from industrial researchers
- Demos from faculty and academic research groups related to network and service management

Priority will be given to the authors of accepted papers in the conference and the workshops. An award for the best student demo will be presented at the IM 2015 closing ceremony. All demo session contributors submit a 2-page paper in IEEE conference double-column format, incorporating the demo system architecture illustration. Demo papers are peer-reviewed and accepted papers are included in the electronic conference/workshops proceedings and made available instantly via the Open Digital Library and IEEExplore.

3.16 FLAMINGO participation to SIGCOMM 2014

The following FLAMINGO members have attended SIGCOMM 2014 (two FLAMINGO participants received a SIGCOMM travel grant):

- Ricardo de O. Schmidt (UT) - SIGCOMM travel grant
- Rashid Mijumbi (UPC) - SIGCOMM travel grant
- Luuk Hendriks (UT) - FLAMINGO complimentary registration

3.17 FLAMINGO demonstrations during NOMS 2014

During the IEEE/IFIP Network Operations and Management Symposium (NOMS 2014), four demonstrations were given by FLAMINGO partners during the dedicated demonstration session in the NOMS 2014 schedule:

- *NETCONF Interoperability Lab*, Vaibhav Bajpai, Jürgen Schönwälder (Jacobs University Bremen)
- *Improved Delivery of Live SVC-based HTTP Adaptive Streaming Content*, Niels Bouten, Maxim Claeys, Robin Bailleul (Ghent University - iMinds) David Lou (Bell Labs, Alcatel-Lucent), Jeroen Famaey (Ghent University - iMinds), Steven Latré (University of Antwerp - iMinds), Jan De Cock,Filip De Turck (Ghent University - iMinds)

- *Automatic and On-demand Mobile Network Operator (MNO) Selection Mechanism Demonstration*, Christos Tsiaras, Samuel Liniger, Burkhard Stiller (University of Zürich)
- *PiCsMu: A System to Aggregate Multiple Heterogeneous Cloud Services Storage*, Guilherme Sperb Machado, Thomas Bocek, Burkhard Stiller (University of Zürich)

These demonstrations were well attended and the FLAMINGO acknowledgement was prominently mentioned.

3.18 GIIS 2014 special track on Cloud Infrastructure and Networking

A Special Track on Cloud Infrastructure and Networking was organized and chaired by Prof. Rémi Badonnel (INRIA) during the IEEE Global Information Infrastructure and Networking Symposium (IEEE GIIS 2014) which took place in Montreal, Canada in September 2014.

Presentations were given by colleagues from University of Washington (USA), Purdue University (USA), Federal University of Pernambuco (Brazil), Federal University of Parana (Brazil), SupCom (Tunisia), University of Toulouse (France), University Pierre et Marie Curie (France).

The conference was organized into 5 tracks (3 regular and 2 special tracks) and attracted 66 submissions out of which 23 full papers were selected for presentation.

The following FLAMINGO members were part of the technical program committee of IEEE GIIS 2014: Dr. Anna Sperotto (UT), Dr. Corinna Schmitt (UZH), Dr. Jeroen Famaey (Ghent University), Dr. Mario Golling (UniBW), and Prof. Rémi Badonnel (INRIA).

4 Interoperability and Testing Lab

In a pursuit to improve Network Configuration Protocol (NETCONF) [16] interoperability and foster it for community-based education, the FLAMINGO consortium has developed and deployed a NETCONF Interoperability Lab. The lab provides a platform to execute test-cases against an online catalogue of NETCONF server and client implementations. The lab is available online at: `http://www.interop-lab.net`.

4.1 Accomplishments

The table below summarises the accomplishments according to the planning provided in deliverable D3.2 in 2013.

Dec 2013	Online access to NETCONF servers and supporting documentation	✔
Dec 2013	Online catalogue of NETCONF server implementations available	✔
Dec 2013	Online catalogue of NETCONF clients implementations available	✔
Apr 2014	Collection of basic test cases available	✔
Jul 2014	Tool to generate test cases from data models available.	✔

The NETCONF Interoperability Lab was recently demonstrated at IEEE NOMS 2014. The accompanying paper is available online in the IEEExplore digital library [17].

4.2 Running System

The NETCONF interoperability server infrastructure (as described in D3.2) is now running live in production. A Xen hypervisor running Debian Xen dom0 supports the entire facility. The hypervisor underpins virtual machines that host backend NETCONF servers and the web frontend. Software licenses for commercial NETCONF server implementations have been procured. Software packages for commercial (and open-source) NETCONF servers have been installed in separate virtual machines. Currently, 4 NETCONF servers (as listed in D3.2) are running live on the facility. The NETCONF servers and the web frontend are dual-stacked and reachable both over IPv4 and IPv6. The open-source `ncclient` [18] package can be used to connect to these servers. The documentation to make a communication is available on the website frontend. Fig. 2 provides a screenshot of the live web frontend.

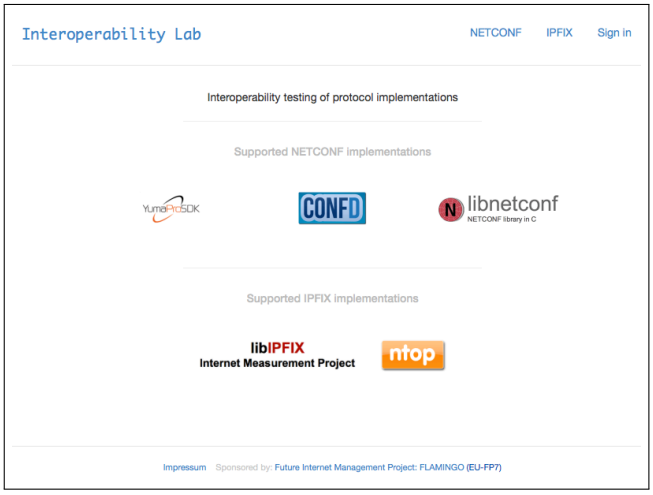

Figure 2: `http://www.interop-lab.net`.

4.3 Survey on NETCONF/YANG Feature Support

The configuration and operational state in NETCONF is formalised using YANG data models [19]. The data models supported by NETCONF implementations are announced during NETCONF session establishment. We used the NETCONF interoperability lab to survey YANG data models support in NETCONF server implementations as shown in Table 4.

Data Models	ConfD (v5.0)	YumaPro (v13.04)	OpenYuma (v2.2.5)	libnc (v0.6)
ietf-inet-types [20]	✔	✔	✖	✖
ietf-yang-types [20]	✔	✔	✖	✖
ietf-netconf-monitoring [21]	✔	✔	✔	✔
ietf-netconf-notifications [22]	✔	✔	✖	✖
ietf-netconf-acm [23]	✔	✔	✖	✔
ietf-netconf-with-defaults [24]	✔	✔	✔	✖

Table 4: YANG data models support [17]

NETCONF also provides support for capabilities that can supplement the base protocol specification. These capabilities augment basic operations of the managed devices and are also exchanged during the NETCONF session establishment. We used the NETCONF interoperability lab to survey the NETCONF protocol capabilities within deployed NETCONF server implementations. Table 5 enlists basic NETCONF capabilities and protocol extensions (● means the capability is available but disabled by default) supported by each server implementation.

Capability	ConfD (v5.0)	YumaPro (v13.04)	OpenYuma (v2.2.5)	libnc (v0.6)
:base:1.0 [25, 16]	✔	✔	✔	✔
:base:1.1 [16]	✔	✔	✔	✔
:writable-running:1.0 [16]	✔	●	●	✔
:candidate:1.0 [16]	✔	✔	✔	✔
:rollback-on-error:1.0 [16]	✔	✔	✔	✔
:startup:1.0 [16]	●	●	●	✔
:url:1.0 [16]	✔	✔	●	✔
:xpath:1.0 [16]	✔	✔	✔	✖
:confirmed-commit:1.0 [25]	✔	✔	✔	✖
:confirmed-commit:1.1 [16]	✔	✔	✔	✖
:validate:1.0 [25]	✔	✔	✔	✔
:validate:1.1 [16]	✔	✔	✔	✔
:notification:1.0 [26]	●	✔	✔	✔
:interleave:1.0 [26]	●	✔	✔	✔
:partial-lock:1.0 [27]	●	✔	✔	✖
:with-defaults:1.0 [24]	✔	✔	✔	✔

Table 5: NETCONF capabilities support [17]

4.4 Generating Test Cases from YANG Data Models

The data model implementations form a large and fast growing part of a NETCONF server implementation. While it can be assumed that the basic NETCONF protocol operations will become sufficiently stable, it is expected that data model implementations may exhibit bugs more frequently and thus it is crucial to develop tools that can assist with the interoperability testing of data model implementations. In order to facilitate this, it is desirable to have a tool that can generate test cases out of a YANG data model definition.

We have prototyped such a test case generator as a plugin to the `pyang`[8] YANG compiler. The tool generates valid and invalid XML instance documents for a given YANG data model. In particular, it generates test cases for testing boundary conditions. For example, given the following YANG snippet

```
list rule {
    key name;
    leaf name {
        type string {
            length "1..max";
        }
    }

    //...
}
```

the tool will generate test cases that check whether the name values of all list elements are unique and whether a one character name is accepted while a zero-length name is properly rejected.

The test cases generated by the `pyang` plugin are verified by running them through the DSDL validator. Valid test cases should pass the DSDL validator while invalid test cases should properly fail the validation step. This validation step enables us to verify the correctness of the test case generator and thus helps to build trust in the plugin.

The test cases are written to files so that they can be easily stored and executed. A Python script using the `ncclient` package has been used to run test cases against NETCONF servers that are part of the interoperability lab.

While the general approach has been shown to work, there are a number of things that can be improved. First of all, the current implementation primarily generates test cases by analyzing data types and their constraints. A future version may generate test cases based on a more global analysis of data object relationships or even by analyzing `must` and `when` expressions. Another issue is that implementations under test are often bound to further constraints that are resource specific. Thus, valid test cases can fail because of restrictions that are not expressed in the data model itself. Further work is needed in order to understand whether YANG deviations can be used to deal with this or whether YANG language extensions would be needed to express implementation specific resource constraints not captured in the data models.

4.5 Implementation of NETCONF over TLS and Call Home

`libnetconf` (a NETCONF server) [28] and `ncclient` (a NETCONF client) [17] are open-source implementations that are deployed as part of the NETCONF interoperability lab. The implementations have had support for NETCONF v1.1 [16] using NETCONF over Secure Shell (SSH) [29].

[8] https://code.google.com/p/pyang/

We (in collaboration with Czech Republic's National Research and Education Network (CESNET)) have added NETCONF over Transport Layer Security (TLS) [30] support in both implementations.

Fig. 3 describes the execution workflow showing how `ncclient` is able to establish a NETCONF over TLS session with a `libnetconf`-based NETCONF server. We use `stunnel`[9] as a local proxy to handle the TLS communication. On receiving an incoming connection, `stunnel` verifies the peer, saves the peer certificate on disk, and passes the location of the certificate as an environment variable to a new instance of the NETCONF subsystem. The subsystem then reads the certificate from disk and maps the certificate to a NETCONF username. This username is used to establish the NETCONF session with the server.

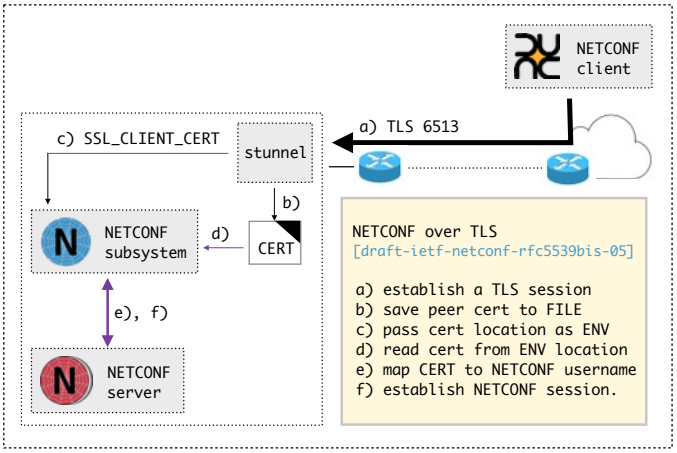

Figure 3: Implementation of NETCONF over TLS

We have also implemented a NETCONF call home mechanism [31] both over SSH and TLS that allows a managed device deployed behind a Network Address Translation (NAT) running a NETCONF server to successfully establish a NETCONF session with a Network Management System (NMS) running a NETCONF client. This requires implementation of a call home daemon on the server-side and a TCP listen mode on the client-side. The NETCONF server also needs to support the server configuration YANG data model [32].

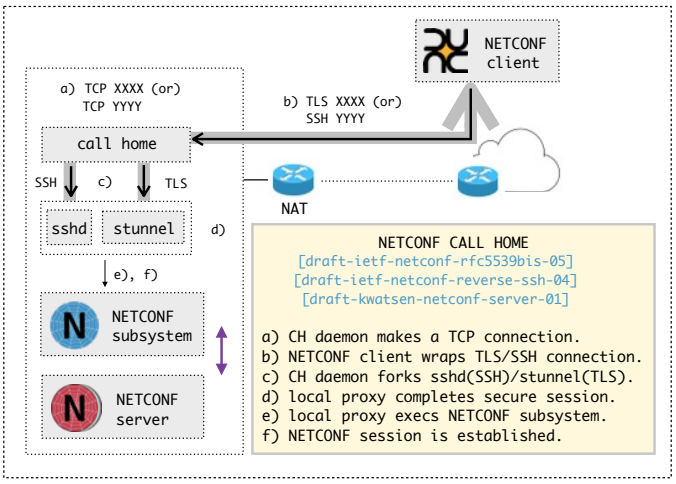

Figure 4: Implementation of NETCONF Call Home

Fig. 4 describes the execution workflow showing how the call home daemon starts by initiating a TCP connection to `ncclient` on a specific port depending on whether a TLS/SSH transport session is desired. `ncclient` uses this TCP connection to reverse roles and establish a TLS (or SSH) session back to the initiator. The call home daemon on receiving back the request forks a local proxy (`stunnel` in case of TLS or `ssh` daemon in case of SSH) depending on the type of incoming request on the established TCP connection. The local proxy completes the secure session with `ncclient` and spawns the NETCONF subsystem to establish a NETCONF session on top of the secure channel.

[9] `https://www.stunnel.org`

5 Integration of European Research Landscape

5.1 Future Internet Cluster

The Future Internet Cluster takes care of the coordination between the ongoing FP7 Future Internet projects. At the time of writing, 19 Future Internet projects are taking part in the Future Internet Cluster. Prof. Aiko Pras chaired the Future Internet Cluster until August 2014, when Prof. Filip De Turck took over as Future Internet Cluster Chair. Prof. Thomas Michael Bohnert serves as deputy chair of the Future Internet Cluster.

The Future Internet Cluster organizes joint coordination meetings and represents the ongoing Future Internet projects. The main realizations of the Future Internet cluster in the second year of the FLAMINGO project are the editorial role for delivering the joint position paper (with contributions from all ongoing FP7 Future Internet projects), contributions to the stakeholder consultation workshop, and the organization of the coordination meeting and contributions during the Net Tech Future coordination meeting. The position paper will be used as input for the upcoming H2020 calls for project proposals in 2016 and 2017. These main contributions are presented in more detail below.

5.2 Future Internet Cluster Position Paper

The European Commission requested input from the Future Internet Cluster to shape the work program in 2016-2017 of the H2020 calls on Smart Networks and Novel Architectures. For this reason, the Future Internet Cluster delivered a position paper, which outlines the important topics to be addressed in the upcoming calls. Each Future Internet Cluster project was kindly invited to contribute and the names and affiliations of the contributors are mentioned in the position paper. Each project provided their input on the future topics in the domain of their current project. Next to this, input from projects to other domains was welcomed as well. From the 19 invited projects, 12 sent their inputs in the first round. These inputs were presented during the stakeholder consultation day (as reported upon below). Based on the inputs by the different Future Internet Cluster projects and the discussions during the stakeholder consultation days, the position paper was structured according to the following six domains:

- Advanced content delivery systems
- Measurement based management
- SDN/NFV-based systems
- DDos detection and prevention
- QoE centric management
- Advanced Internet architectures

For the preparation of the Net Tech Future coordination meeting similar input was requested as the input for the position paper. Based on the provided inputs and interesting discussions during the coordination meeting, a first completed version was circulated among the project coordinators. Their inputs were processed and the position paper was delivered to the European commission. The editors of the Future Internet Cluster position paper are Prof. Filip De Turck, Prof. Thomas Michael Bohnert and Dr. Antonio Cimmino.

5.3 Collaboration with Related European Research Projects

JUB collaborated with researchers from the FP7 projects Leone and mPlane. The Leone project seeks to build a network management framework that integrates an unprecedented number and diversity of sources of information about the network and its performance, including measurements focussed on the quality of experience perceived by the end users in a world of highly distributed and increasingly meshed applications. mPlane consists of a Distributed Measurement Infrastructure to perform active, passive and hybrid measurements; it operates at a wide variety of scales and dynamically supports new functionality. The result of the collaboration was a jointly organized Dagstuhl Seminar (see section 3.5) and a joint workshop at EuCNC (see section 3.12).

UCL collaborated with researchers from the FP7 project ALIEN on issues relating to software defined networking, a topic which is of particular interest to the FLAMINGO project (especially WP6). The result of this collaboration was a joint paper at NOMS 2014 on ”Software-defined network support for transport resilience”. Additionally, UCL has been collaborating with FP7 FUSION on decentralised cloud management; a joint paper has been recently submitted to IEEE TNSM.

UT is collaborating with the mPlane project and the Mobile Cloud Networking (MCN) project. In Y2, UT has become a collaborating institution for the mPlane project. The MCN project aims at bringing together cloud computing and mobile networking for establishing on-demand mobile network deployment and operations. UT has collaborated with the MCN project in the context of cloud networking, which resulted, for example, in the positioning article ”Networking for the Cloud: Challenges and Trends” in PIK - Praxis der Informationsverarbeitung und Kommunikation.

5.4 Future Internet Assembly

The Future Internet Assembly FIA 2014 (https://www.fi-athens.eu/) assembled the DG CONNECT projects and related arenas to an exchange and discussion platform on research questions, liaison activities, and planning approaches on new potential paths of work and research in Europe. Key European Internet Stakeholders have met in March to discuss and reshape the Future Internet’s infrastructure of Europe, by addressing technology, innovation, and opportunities. Due to the FIA program compiled for March 19 and 20, 2014 (9 technical sessions embraced by an opening and closing plenary) and the organization of additional meetings around the core program the topic of Software-defined Networking (SDN) and Network Function Virtualization (NFV) has seen a very broad level of attention.

The main outcome of this FIA attendance is considered very positive, since the SmartenIT initiated and finally co-organized a session on Cloud Federations and SDN/NFV: The Highways toward Improved QoE, Cost, and Energy Efficiency (Co-organizers: Alexander Willner, Technische Universität Berlin (TUB), Germany, George D. Stamoulis, Athens University of Economics and Business (AUEB), Greece, Roman Capacz, Poznan Supercomputing and Networking Center (PSNC), Poland) has seen more than 75 attendees in the audience, short panelists’ statements, and an interesting panel afterwards. Burkhard Stiller, University of Zürich (UZH), Switzerland, SmartenIT coordinator, represented the STREP SmartenIT as well the NoE FLAMINGO during the panel especially on traffic management impacts for SDN, accounting, regulatory, and privacy-related facets, and possible technological alternatives to develop and support cost- and energy-efficient and QoE-aware cloud federations. As such many informal exchanges of work, ideas, and solutions emphasized the liaison activities of SmartenIT.

The detailed set-up of this session can be found at [33].

5.5 Stakeholder Consultation Meeting

The FLAMINGO consortium participated to the stakeholder consultation workshop on September 29-30, 2014 in Brussels, Belgium. This workshop was organized by the European Commission to solicit suggestions and ideas from the participants for the call for H2020 project proposals in 2016-2017. Six different sessions were organized: (i) Radio (architecture, technologies, mm-waves), (ii) Network management (security, big data for network management, energy efficiency), (iii) Internet of Things (IoT), (iv) Optical technologies (core, access), (v) Experiments, test beds and demonstrations (5G focus) and (vi) SDN/NFV/Internet architectures.

Prof. Filip De Turck presented the vision of the FLAMINGO consortium with respect to emerging and important topics during a 20 minute timeslot in the session on Network Management on September 29th and participated to the interesting discussions and suggestions based on the presented viewpoints. On September 30th, Prof. Filip De Turck participated to the session on SDN/NFV/Internet architectures and presented during a 20 minute timeslot the viewpoints of the Future Internet Cluster (based on the inputs collected from the ongoing Future Internet projects for the position paper of the Future Internet Cluster).

Over 200 experts participated to the stakeholder consultation meeting, a very interesting event to learn viewpoints, visions and network with European researchers and project coordinators.

5.6 Net Tech Future Coordination Meeting

The FP7 'Future Networks Concertation Meeting' have been renamed in Horizon 2020 to 'Net-Tech Future Coordination Meeting'. These regular meetings bring together EU research-funded projects in the area of communications networks to exchange the latest research findings and ideas for future activities. On October 23th, 2014 a coordination meeting took place with the following clusters involved: Future Internet (FI), Converged and Optical Networks (CaON), Radio Access and Spectrum (RAS), and The Internet of Things European Research Cluster (IERC).

In the morning, each cluster held a separate cluster meeting (4 cluster meeting in parallel during 3 hour timeslot). In the afternoon, a plenary session took place with representatives from all 4 clusters present. During the plenary timeslot, the Network technologies projects' research achievements and future work programme priorities were presented. One panel was dedicated to 5G research and innovation and will explore innovation infrastructures based on virtualized environments.

The Future Internet Cluster meeting was chaired by Prof. Filip De Turck (iMinds). All ongoing Future Internet projects were invited to have at least one representative of their Future Internet project present during the meeting. The main goal of the Future Internet Cluster meeting was to focus on the achievements during FP7 and also to work further on the vision of the projects with respect to topics to be addressed in the future. All representatives were invited to give a 5 minute presentation per project, addressing the following two points: (i) which main results did you achieve or do you plan to achieve with the current project? and (ii) which topics/areas do you consider important in the future (related to the scope of your ongoing project)? The inputs and discussions were used to further shape the Future Internet cluster position paper.

5.7 Contributions to EuCNC 2014

The EuCNC 2014 (European Conference on Networks and Communications) took place in Bologna, Italy from June 24 until June 27, 2014. Six FLAMINGO representatives were present all week (Filip

De Turck, Marinos Charalambides, Anuj Sehgal, Maxim Claeys, Rashid Mujumbi, and Jair Santana Dos Santos) and presented in total 7 papers, two keynote talks, participation in one panel. Furthermore, Prof. Filip De Turck (iMinds) and Dr. Marinos Charalambides (UCL) served as session chairs and Prof. Filip De Turck chaired a panel during the workshop organized by the FLAMINGO consortium and Dr. Marinos Charalambides (UCL) participated in the panel.

FLAMINGO organised a workshop during EuCNC on ”Management of Large Scale Virtualized Infrastructures: Smart Data Acquisition, Analysis and Network and Service Management in the Future Internet”. The workshop was co-organized by the FP7 Leone and FUSION projects. Interesting keynotes and presentations were given by the participants. The workshop was well attended and a panel discussion took place, generating some interesting ideas for future work on QoE-centric management, and joint cache and service placement in virtualized environments.

5.8 Journal Paper on FLAMINGO Taxonomy Submitted to JNSM

The FLAMINGO consortium submitted a journal paper on the FLAMINGO taxonomy to disseminate the taxonomy and stimulate its uptake. The paper details the methodology for realizing the taxonomy, an analysis of the popularity of its topics over the past 5 years (based on collected data from all IM/NOMS/CNSM conference in the 2010-2014 period), and a view on the future.

6 Scientific and Industry Council

This work package organizes the Scientific and Industrial Council (SIC) and its meetings. These meetings take place on a yearly basis and provide perfect opportunities for FLAMINGO partners to get feedback on their past research, and receive directions for future activities.

6.1 Members

The Scientific and Industrial Council is composed of top industrial and scientific researchers that have a recognized track-record in the area of network and service management, both from an industrial and scientific perspective. The following people take part in the FLAMINGO Scientific and Industrial Council:

- Marcus Brunner, Swisscom, Switzerland - Former IEEE CNOM chair, expert in standardization and clear view on network and service management from an industry point of view;
- Morris Sloman, Imperial College London, UK - Top researcher of the network management research community, high H-index (46), Editor-in-Chief of IEEE Transactions on Network and Service Management;
- Claudio Bartolini, HP, USA - Expert in IT service management and clear view on challenges for the industry;
- Lisandro Granville, UFRGS, Brazil - Current IEEE CNOM chair, active researcher and clear view on the network and service management challenges from academic point of view;
- Alex Clemm, Cisco, USA - Senior Principal Engineer, regular author of books and research articles;
- Raouf Boutaba, Waterloo University, Canada - Steering Committee Chair of the main network management conferences (NOMS/IM/CNSM), Top Researcher with high H-index (39) in network and service management research community;
- Rolf Stadler, KTH, Sweden - Top researcher of the network management research community, regularly publishes papers with lots of citations;
- Axel Clauberg, DT, Germany - Vice President, IP & Optical Technologies, large experience in various aspects of network management for three decades;
- Prosper Chemouil, Orange, France - Program Director on Future Networks at Orange Labs Networks, specifically involved in new networking paradigms like information-centric, programmable and autonomic networking and standardization.

6.2 Council Meeting in Krakow on May 9 2014

6.2.1 Agenda

1. Online course material
2. Questionnaire organization
3. FLAMINGO taxonomy

4. Interoperability lab
5. Open access repository
6. Key conferences and journals
7. Status research WPs (WP5, WP6, WP7)
8. General discussion

6.2.2 Participants

The meeting took place with following participants present the entire time:

- Aiko Pras (UT)
- Alex Clemm (Cisco)
- Lisandro Granville (UFRGS)
- Christos Tsiras (UZH)
- Raouf Boutaba (UW)
- Rémi Badonnel (INRIA)
- Filip De Turck (iMinds)
- Jürgen Schönwälder (JUB)
- Morris Sloman (ICL)
- Rolf Stadler (KTH)
- Prosper Chemouil (Orange)

Prof. Aiko Pras chaired the council meeting.

6.2.3 Meeting Minutes

First, the FLAMINGO videos were shown and discussed in terms of target audience (students and industry). The work to generate these videos is highly appreciated by the council members. It was suggested that a place on the FLAMINGO website should preferably be dedicated to provide integrated multi-media materials (slides, video, etc) to the interested visitors. The branding of videos and linking them with the research community was discussed next. It was agreed that videos of duration of maximum of 10 minutes are most appropriate.

Second, the questionnaire with input from experts (both industry and academia) was discussed. The council members showed interest in participating to a follow-up of the questionnaire in Y3 (to identify new topics and evaluate the relevance of the suggestions in Y1). The scope of the questionnaire should be on purely network and service management topics, to make sure the scope is not too broad. The council members are also strongly in favour to organize a workhop in Y3 to discuss the research challenges based on the input derived from the questionaires with

invited speakers. They suggest to select a few topics and elaborate during a workshop why the topic is important, what are the research challenges behind it, etc.

Third, the FLAMINGO taxonomy was discussed. Some council members were in favour to have a large taxonomy, others were more in favour of a taxonmoy with less topics and suggested that the current taxonomy should be trimmed. As a conclusion an action point for Y3 was agreed upon to revise the taxonomy with the goal to reduce some overlap between the topics. The action point will be executed together with the processing of the new questionnaire inputs in Y3. The implementation of the taxonomy for the journals in our field was discussed as well: the Manuscript central journal paper submission management system supports only free text keywords but we will investigate how a taxonomy can be implemented there.

Fourth, the status and planned actions of the FLAMINGO NETCONF Interoperability Lab were presented to the council members. They were all positive about this lab (both from an industry perspective as well as from an academic perspective) and suggested to also consider providing access to OpenDaylight as part of the FLAMINGO interoperability lab, given the current popularity of OpenDaylight.

Fifth, the efforts and realization of the open access repository for network management papers were presented. All council members appreciated these efforts. They suggested the name Open Digital Libray and proposed to consider adding a google search bar to the website to allow for efficiently searching articles in the repository. An interesting question was how to deal with transitions in conference names, such as the inclusion and name change of the DSOM workshop to the CNSM conference, established in 2010. The FLAMINGO consortium has access to all the DBLP meta data of the papers and will work this issue out.

Sixth, the key conferences and journals for our research area were discussed. It was agreed that IM/NOMS/CNSM are the most prominent conferences for network management and service management papers. The journals TNSM, JNSM, IJNM and the special series in IEEE Communication Magazine are considered as the most appropriate journals for network and service management research. For some subjects, other IEEE Transaction journals (next to TNSM) are also considered as appropriate. The council members mentioned that submitting to workshops related to SIGCOMM can be interesting as well, usually papers from our network management community do very well for these workshops. The experience of the council members is that some network management related papers at SIGCOMM are rather weak from the perspective of our community. SIGCOMM has the reputation of being a fairly closed shop and it is very tightly scoped to certain topics. On the other hand, it was agreed that the place where you publish has usually a direct impact on the number of citations you will get.

Finally, the status and the topics addressed by the research work packages (WP5, WP6 and WP7) were briefly presented and the council members confirmed the current relevance of the addressed topics and obtained results from both an industry point-of-view, as well as from an academic point-of-view. Furthermore, the collection of interesting data was pointed out to be very valuable for the network management community. As a final point, proposals and interesting topics for H2020 projects were discussed.

6.2.4 Planned Actions

1. The council is very positive about the efforts and realization of the open access repository with network management publications. Based on a suggestion by the council members, the name will be changed to Open Digital Library.

2. The council fully supports the idea of organizing a follow-up questionnaire to identify the future challenges in the network management community based on experts' input. The council also proposes to organize a workhop in Y3 to discuss the research challenges based on the input derived from the questionaires with invited speakers.
3. FLAMINGO should organize a process to revise the taxonomy with the goal to reduce overlap and the overall size. This is planned for Y3.
4. Make it clearer on the project web site who is involved in the FLAMINGO project, better link between the web site and the YouTube channel.
5. The council suggests to consider providing access to open daylight as part of the FLAMINGO interoperability lab.

7 Conclusions

This deliverable details the activities in the second year of the FLAMINGO project to organize the scientific network management community, to disseminate the results of FLAMINGO to researchers within academia and industry, and to achieve scientific excellence. The following activities were successfully undertaken during the second year:

- An Open Access Digital Library was realized for papers on Network and Service Management;
- The three major international conferences on network and service management (NOMS, AIMS, CNSM) were organized with a large contribution from the FLAMINGO consortium;
- The FLAMINGO consortium played an important role in establishing a new conference: the first IEEE conference on Network Softwarization (NetSoft 2015), organized in London, UK, April, 2015 and hosted by UCL;
- The four main journals on network and service management (ComMag, TNSM, JNSM, IJNM) were organized with large contributions from the FLAMINGO consortium;
- Four journal special issues were organized by the FLAMINGO consortium on currently very relevant topics.
- Eight workshops were organized by the FLAMINGO consortium with specific focus on new and emerging topics in the domain of Future Internet management;
- Specific actions were undertaken to improve scientific quality of conferences and journals: disseminating the FLAMINGO network and service management taxonomy and conference ranking;
- Six specific events were organized to foster interaction between academia and industry;
- The FLAMINGO consortium contributed to the EuCNC 2014 conference with the organization of a full-day workshop, 7 paper presentations (3 main track and 4 workshop papers), and 2 keynotes in two different workshops;
- Two Dagstuhl seminars were organized by the FLAMINGO consortium;
- The NETCONF interoperablility lab has been realized and extended;
- The FLAMINGO consortium contributed and participated to FIA, Athens;
- The FLAMINGO consortium makes regular contributions to the Future Internet Cluster and works jointly with other EU projects (e.g. Leone, mPlane, Alien, SmartenIT, Fusion, MCN);
- A meeting of the Scientific and Industry Council with top industrial and scientific researchers that have a recognized track-record in the area of network and service management, was organized.

Abbreviations

AIMS	Autonomous Infrastructure, Management and Security
CESNET	Czech Republic's National Research and Education Network
CNSM	International Conference on Network and Service Management
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IFIP	International Federation for Information Processing
IJNM	Wiley International Journal of Network Management
IM	IFIP/IEEE Symposium on Integrated Management
JNSM	Springer Journal of Network and Systems Management
NAT	Network Address Translation
NETCONF	Network Configuration Protocol
NMS	Network Management System
NOMS	IEEE/IFIP International Symposium on Network Operations and Management
SSH	Secure Shell
TLS	Transport Layer Security
TNSM	IEEE Transactions on Network and Service Management

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