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**Report on joint actions,
common papers and joint contributions**

Abstract:

In this report we describe the completed and upcoming publications, specifically focussing on the white papers produced by members of the EIFFEL Think Tank community which is composed of EIFFEL Support Action members and partners from the wider academic and industrial communities.

Keywords – EIFFEL Think Tank, Liaison

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RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1 Introduction

The EIFFEL Support Action has created an international community of Internet researchers and practitioners who meet regularly to discuss crucial issues concerning the design of the Future Internet. Activities have focussed around the EIFFEL Think Tank meetings. Whilst Think Tank participants recognise that there are no clear-cut solutions to the current design issues identified, there is a belief that it is possible to frame issues as a disagreement and, in some cases, to state clearly what the pros and cons of various solutions might be. To this end, the Think Tank group has authored (and is in the process of producing) several publications. In this report, the publications released and those that are nearing completion are described. We focus specifically on the **white paper work**, since these are the key jointly worked on documents. A more detailed discussion on the content of each of the white papers, together with other key joint papers such as the recent REARCH publication jointly with Think Tank members, can be found from Deliverable D2.7.

2 Joint Papers

Publications produced by the Think Tank are described in other EIFFEL reports such as [1] and will not be elaborated here. Three further publications are nearing completion. There are two on the subject of Internet measurements, one on privacy and finally, one on the topic of network virtualisation. The EIFFEL Think Tank has formulated the “disagreement” or “discussion” around each topic and these are summarised in this section. The Appendix contains a listing of the current structure for the draft papers. Final versions of these papers will be ready in early 2011 and the Think Tank expect to publish the content in appropriate forums. One final publication, a whitepaper on Developing Economies will be completed later in 2011 after Tim Unwin, the UNESCO chair in ICT for development (ICT4D) and Sir John Daniel, President and Chief Executive Officer of the Commonwealth of Learning, have assisted in developing the material further.

2.1 *Measurement Driven Internet Research*

The lack of measurement data is currently one of the key obstacles towards understanding the use, functioning and evolution of complex networked systems such as the Internet on the inter-domain level. We still have a very limited understanding of the evolution of the large-scale structure of the Internet, and often know even less about the dynamics of the various applications executing over its infrastructure. This is in stark contrast to the intra-domain case, which has been the focus of much of the measurement, modelling and analysis work in the past and is much better understood. In this paper we discuss the challenges faced by the networking community in carrying out measurements on this global scale and reasoning about the data obtained. We also provide concrete examples of research questions that are of interest to different stakeholders involved in Internet evolution, including commercial players, which cannot be addressed without a measurement-driven approach. The focus will be on technical and funding policy related issues, but we will also discuss issues pertaining to making data available among different stakeholders.

2.2 *Wireless Network Monitoring and Modelling*

With wireless access technologies expected to play a key role in the Future Internet, it is critical to understand their performance and workloads in order to develop networks that are more robust, easier to manage and scale, and more able to utilize efficiently their scarce resources. While in several cases over-provisioning in wired networks is acceptable, it can become problematic in the wireless domain. A number of mechanisms, such as capacity planning, dimensioning, resource reservation, device adaptation, and load balancing, need to be employed to support such networks. Real-life measurement studies can be particularly beneficial in the development and analysis of such mechanisms, as they can uncover deficiencies of the technologies and different phenomena of the access and workload. In this paper, the prerequisites for wireless network modelling are discussed:

- Availability of measurement data from various networking environments is crucial for carrying out comparative performance analysis. This stresses the importance of having dedicated funding calls focused on issues of data availability and sharing, as recommended in the previous section.
- More extensive sets of traces of data access patterns and user activity, especially in mobile settings, are necessary. Collaboration between the academic community and commercial players is significant to this end, since data from production wireless networks, nowadays usually considered proprietary, are vital in order for the models built to be realistic.
- Interdisciplinary research can be effective in analyzing data and deriving accurate measurement-driven models.

2.3 *Privacy*

In this paper a discussion on privacy issues, focusing on civil security will be developed through a set of use cases. The principle questions investigated will be:

1. Access to information
 - a. Who are the stakeholders: owners, managers, subjects of information?

- b. What information are we concerned with?
- c. Why do we care: what can happen and what are the associated risks?
- 2. Revealing information
 - a. How can we express constraints?
 - b. What restrictions are there or should there be on revealing information?
 - c. How do we enforce constraints and restrictions and what action can we take under violation conditions?
- 3. Revealing information about actions
 - a. Can privacy be designed to protect important freedoms such as freedom of thought, speech and association?

2.4 *Network Virtualisation*

On the one hand, network virtualisation (as a service) is likely to yield benefits for providers and consumers. Some service providers are keen to offer customers on-demand network services with levels of flexibility akin to that of cloud computing. Network hardware manufacturers such as Cisco and Juniper are now offering some level of router virtualisation and it is becoming clear that stock PC hardware can provide many of the capabilities of dedicated commercial solutions at least for part of the routing infrastructure. On the other hand, no clearly defined network virtualisation solutions have emerged to date and it is not obvious whether network virtualisation could be economically beneficial to the parties involved in delivery and usage. In reality, manufacturers may not be prepared to bear the development costs for uncertain financial gains and the introduction, gradual or otherwise, of new technologies in the current internet is extremely hard to do. Pragmatically, the issues surrounding the day-to-day management of virtual networks must also be addressed; there must be mechanisms in place to support accounting, access and security, faultfinding and the set up and dismantling of connections.

2.5 *Developing Economies*

At a fundamental level, we need to consider whether developing economies have requirements which are different to those of more advanced economies and whether the similarities and differences identified should shape our thinking about the Future Internet. On the one hand, mankind's strong desire for communication could lead us to believe that market forces alone will drive the activities necessary to satisfy demand, as exemplified by the huge growth in mobile phone use in the developing world and the emergence of many innovative mobile phone based applications. On the other hand, large parts of the world are still hampered by the scarcity of affordable telecommunications services. Progress towards the goal of achieving an Information Society is impeded by factors such as challenging topography, sparse populations and the lack of backhaul network provision. Social factors such as the high cost of bandwidth relative to income, low levels of education and literacy and political instability are equally problematic. Perhaps we should view these constraints as a set of exciting challenges for the future; to quote Gaetano Borriello¹: "The design space of computing is huge and we only explore a small piece of it when we constrain ourselves to conditions present in highly industrialized societies. Developing technology for the developing world will cause us to look at much more robust systems that require less maintenance and infrastructure."

¹ http://www.cra.org/ccc/docs/CCC_GD_Proceedings.pdf

3 Conclusion

The EIFFEL Think Tank will continue, as a working group, beyond the end date of the project. Members have formed valuable working relationships and have established a forum within which they are able to discuss and debate key issues that will affect the design of the Future Internet. The published and upcoming EIFFEL whitepapers encapsulate these discussions and the viewpoints expressed by participants. It is hoped that this material will provide an informative starting point for others working in the field.

4 References and links

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| [1] | <i>D4.2, Report on the activities and actions carried out at international level, including Global EIFFEL standardisation issues</i> , Stephen Hailes, Borka Jerman-Blažič, Petri Mähönen, Janne Riihijärvi, Dimitri Papadimitriou, George Polyzos, Dirk Trossen |
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Appendix A

A.1 Measurement Driven Internet Research

1. Introduction
2. The Role of Data in Understanding Internet Evolution
3. Models for Measuring the Internet
4. Issues in Dealing with Data
5. The Way Forward
6. Conclusion
7. References

A.2 Wireless Network Monitoring and Modelling

1. Introduction
2. Performance Metrics
3. Traffic Modelling
4. Requirements for Model Development
5. Common Modelling Pitfalls
6. Monitoring
7. Modelling Based on Empirical Measurements
8. The Way Forward
9. Conclusion
10. References

A.3 Privacy

1. Introduction
2. Use Cases
 - a. Social Networking
 - b. Access to Information
 - c. Privacy Violations and Countermeasures
3. Looking Forward
4. Conclusion
5. References

A.4 Network Virtualisation: Is there a point?

1. Introduction
2. Application domain
 - a. Existing areas of use
3. Architectural and engineering components for network virtualisation
4. Opportunities: New forms of network
5. Incentives to deploy network virtualisation
6. Cost benefit analysis
7. A brief review of existing research papers
8. Existing network virtualisation projects
9. Conclusion
10. References

A.5 Developing Economies

1. Introduction
2. Information and Communication Technologies in the Developing World
3. Architectural Challenges and Limitations
 - a. Access Networks
 - b. Core Networks
 - c. Virtualisation
4. The Importance of Policy & Regulation
5. The Way Forward
6. Conclusion
7. References