FIA Poznan

Title of the workshop: “Future Internet Key Architectural Challenges”

Format of the workshop:
Four presentations followed by panel discussion. We are planning to poll electronically¹ the audience for their opinion on number of questions for our session. The result will be used to direct the panel discussion and for future research and development.

Problem Statement and Objectives of the workshop
Society increasingly depends on communication networks in general and the Internet in particular, for just about every aspect of daily life. Consumers use the Internet to access information, obtain products and services, manage finances, and communicate with one-another. Businesses use the Internet to conduct business with consumers and other businesses. Nations rely on the Internet to conduct the affairs of government, deliver services to their citizens.

This session aims to present 4 key architectural aspects for Future Internet (FI) followed by a panel on the key design tasks in FI research and development: FI functional elements; key architectural challenges; main tussles in FI; how to evaluate an architecture for FI. The results of this session are planed as a research orientation for the FI design. The 4 presentations are as follow:

1. “Design Principles for Future Internet” - This presentation will start from the current Design Principles that govern the Internet and analyse which are still valid and are challenged. Then based on the FIArch group work [3], it will try to analyse and argue which Design Principles should be preserved, which should be modified/adapted to the Future Internet foreseeable needs and which seeds of new principle(s) could govern the next steps towards the Future Internet Architecture. The aim of this presentation is to provide to the FIA community the progress of the FIArch group and collect feedback/comments.

2. “The Importance of Resilience in the Future Internet: Framework, Mechanisms and Experiments”- With this increasing dependence on the Internet the consequences of networked service disruption become more significant. The personal and professional life of individuals, the economic viability of businesses and organizations, and the security of nations are directly linked to the resilience, survivability, and dependability of the Global Internet. Ironically, the higher dependence on services renders Internet more vulnerable to problems. Mobile wireless Internet access is more susceptible to the challenges of time-varying, weakly connected channels, and unpredictable delay. The Internet is an increasingly attractive target to recreational crackers, industrial espionage, terrorists, and information warfare. In the same time, it is recognised that the Internet largely relies on isolated tweaks and patches, rather than on coherent systematic approach, to cope with these challenges. In this presentation, we will address this issue and introduce a framework for quantifying the impact of different types of challenges and failures on normal network service operation. Resilience metrics [2] and classes of network resilience and policies to control and increase resilience will be discussed. The outcome should ease the understanding of network engineers about resilient networks and services. The talk will also look into mechanisms and algorithms that should become part of a network infrastructure so that the requirements identified at the

¹ an USB dongle with polling software will be supplied before the start of the session -
http://www.turningtechnologies.com/studentresponsesystems/studentresponsesolutions/turningpointanywhere/
framework level are met. We will also describe the currently on-going and planned experiments that eventually will show the viability of our approach.

3. "Management of Future Internet" - It is commonly recognized that traditional network management schemes are not the most efficient approach for addressing the complexity associated with the Future Internet. Autonomics, applied in network and services management, appear as the most viable way forward. However, despite the significant research efforts and achievements in this field, the adoption is not yet as widespread as it could be. In this direction, a pragmatic approach is to start by addressing actual manageability problems encountered by operators (this is the approach taken currently by the EC project UniverSelf [1]). The tackling of operators’ problems can lead to a Unified Management Framework (UMF). This presentation will provide a concise description of the UMF design in terms of core, reusable and cohesive functional blocks and interfaces, which derive from operator problems and high-level principles and goals, such as the unification/federation of diverse autonomic solutions and technology domains, the governance of autonomic infrastructures and services, as well as the embodiment of autonomic solutions (intelligence) into the management ecosystem. The talk will address the relation of UMF with various legacy network management standards and emerging concepts like: Self-Organising Networks, Autonomic/Cognitive schemes, etc. The talk will present UMF features that are essential to be present in the Future Networks architecture.

4. “Experiences with Implementing RINA - Recursive Inter Network Architecture” - The Internet is only a network of collaborating networks, a catenet, a concatenation of networks. It is not an efficient inter process communication system as it has missed the key property of layering that early researchers/developers had understood in the late 70's. The Internet sees layering primarily as a means for creating modules within a system. And while it is true, that the concept of layers came from its use in operating systems for this purpose, the use of layers in networks is far more fundamental. The distributed nature of layers in networks creates the major and dominating property not found in a single system “a layer is first and foremost a locus of shared state, of a given scope across multiple systems”. This is why the more we look at the nature of layers in the Internet, the more we find signs that the Internet is a variant of the telephony beads-on-a-string model. It is fundamentally not a layered architecture, it is the DOS of its time. With RINA [4][5], we are more interested in investigating an Internet of collaborating networks. RINA adopts the principle that “networking is interprocess communication (IPC) and only IPC”, as all the entities executing in computing systems are processes, networking can be seen as distributed inter-process communication. Although in the Internet for many years, a layer was synonymous with a single data transfer protocol of some form, RINA recognises that it is important to have both network management and layer management. This talk aims to raise questions about our knowledge and assumptions of a new modern networking platform, while seamlessly leaving the old Internet intact. It shall also show the many benefits of implementing RINA in a cloud computing environment, which include, bounding router table size, allowing mobility and multicast to scale, and highlight better security and data management.

Session organisers: Theodore Zahariadis (Synelixis, Greece), Dimitri Papadimitriou (Alcatel-Lucent, Belgium), Bernhard Plattner (ETH, Switzerland), Paul Smith (ULANC, U.K.), Laurent Ciavaglia (Alcatel-Lucent, France), Gerard Nguengang Thales, France), Panagiotis Demestichas (University of Piraeus, Greece), Miguel Ponce de Leon (TSSG, Ireland)

Steering Committee representative: Alex Galis (UCL, U.K.)
Target audience:
Future Internet researchers, designers and architects.

Build on previous FIA sessions:


Agenda

10 min – “Introduction FI Architectural Topics and Systems” Alex Galis - University College London, United Kingdom

20 min - Presentation “Design Principles for Future Internet” Dimitri Papadimitriou - Alcatel-Lucent, Belgium

20 min – Presentation “The Importance of Resilience in the Future Internet: Framework, Mechanisms and Experiments” Paul Smith - The University of Lancaster, United Kingdom

20 min - Presentation “Management of Future Internet” Panagiotis Demestichas - University of Piraeus, Greece

20 min - Presentation “Experiences with Implementing RINA - Recursive Inter Network Architecture” Miguel Ponce de Leon – TSSG, Ireland

30 min - Panel Q&A - what are the key design challenges in Future Internet research and development

References:

[1] UniverSelf FP7 Project www.univerself-project.eu/
[4] Recursive Internet Architecture (RINA) http://csr.bu.edu/rina/ and