Future Media Internet Architecture Think Tank
First Meeting

Venue: Hotel Catalonia Excelsior. Barcelonina 5, Valencia. Spain.
Date: 14th April 2010

Meeting participants:

Jan Bouwen	Alcatel-Lucent
Pablo Cesar	National Research Institute for Mathematics and Computer Science in the Netherlands
Van Jacobson	Palo Alto Research Centre (PARC)
George Pavlou	University College London (UCL)
Nikolaos Loutaris	Telefonica R&D
Giovanni Pau	University of California, Los Angeles (UCLA)
Christian Timmerer	Klagenfurt University
Theodore Zahariadis	Synelixis
Petros Daras	CERTH
Ebroul Izquierdo	Queen Mary University London
Federico Alvarez	Technical University of Madrid
Isidro Laso	European Commission
Arian Zwegers	European Commission
Tomas Piatrik	Queen Mary University London
Maria Alduan	Technical University of Madrid

10:00 Meeting start

1. Presentation of the meeting objectives and Terms of Reference of the FMIA Think Tank (Federico Alvarez and Isidro Laso) 10:30 – 10:45

The participants introduced themselves.

Federico presented the context of the group and the nextMEDIA activities. Isidro Laso agreed on the objectives.

The Terms of Reference document was presented and the group acknowledged the way of working.

Note: in the description of the presentations we are giving only the most relevant parts, as wider information can be found in the presentations attached to this document.

2. Initiatives and architectures for the Future Media Internet (Theodore Zahariadis) and nextMEDIA views 10:45 - 11:00

Theodore Zahariadis presented different ideas on the changes occurred on the Internet, the Evolutionary Future Internet Architecture (EFIA) and revolutionary views of Autonomic Layer-Less Objects Architecture (ALLOA). Other consolidated approaches were presented. The FI activities world wide were presented (NSF, Japan, etc.). In addition, the AKARI approach was presented along with the Next Generation Networks (NxGN) and the New Generation Networks (NwGN).

An interesting result of the presentation was the comparison among CCN, DONA/TRIAD, and AKARI, focusing on naming and routing issues.

3. Presentation from the participants (15 mins. each) 11:00 – 12:30

- Jan Bowen, Alcatel-Lucent and Pablo Cesar, National Research Institute for Mathematics and Computer Science in the Netherlands

Pablo and Jan presented their view of the Future Internet Architecture, starting from the applications' point of view (as a results of TA2 project[1]). Pablo presented the strengths and weaknesses of the web architectures, video conferencing, video playback and immersive 3D media environments. Jan presented the future ideas for Multi-device experiences, orchestrated real-time communications and the future objectives. He also proposed that the ALLOA architecture could be considered as a candidate of the Future Media Internet architecture. The last part of the presentation was about requirements for the shared experiencing in the FI.

A discussion started on one of the most critical issues, which is the content synchronization. Van Jacobson commented that the network cannot control the data and stressed his opinion that the network should remain naive and take care of simple activities, i.e. to carry and deliver content. It was agreed that it is difficult to include synchronization issues in the network since it is not possible to have a global time or global control. Thus, synchronization is depending on the granularity. On the contrary, if the end-points could direct request the content chunks they need, then they could skip whatever packets/chunks have already been lost (elapsed), and get only what is needed. Thus, naming (including direct requesting of specific parts of the content) is very important.

Agreement: Synchonisation is one of the points which should be considered in a layer upper than the network layer.

Then, a discussion followed on RTP and in which part of the networks you can select the information. Van Jacobson and Theodore Zahariadis proposed ideas on layer coding to adapt the information/network.

- Van Jacobson, Palo Alto Research Centre (PARC)

[1] More information, see *www.**ta2**-project.eu/*

Van presented the CCN ideas focusing on the naming issues. The most relevant point was that multicast does not help, and there is a need of a communications architecture that unifies the problem of distributing "in the time" and distributing "in the space".

Van proposed that names should be used to express context. The context was one of the discussions along with the unique names structure. Van said that context may even be included in the name itself. A question was raised on the problem of not using unique names. Van expressed that the value of this approach is on the fact that the names are not unique.

The conclusions of Van for the naming were that the names are part of the a solution for the FI and should be:

- descriptive
- ontological
- transparent
- usable
- scalable

A discussion started on the naming structure. Van proposed a local name and a global name which can coexist, which can be adaptable to a global FI architecture. Moreover, he expressed the opinion that in some cases relative names could be even more useful than global names. E.g. the "printer of this room" is a name that is valid only in "this room", but it is very useful as it automatically resolves to a different printer, when the user roams. On the other hand, for global reference of objects global naming may be needed, while a DNS-like functionality may be very important. Advantages and disadvantages of the naming were discussed and the group agreed to study this issue, including the context to assign the names.

After the discussion, different open issues were identified:

Key issues: storage, scalability, naming, reconstruction and synchronization, bidirectional communication, context, security and trust.

- George Pavlou, University College London (UCL)

George Pavlou presented the views on the evolutionary (overlays that operate in the application/service layer) and revolutionary/visionary approaches (change the fundamental assumptions of IP) for the FI Architecture. In addition, George presented the most relevant requirements, of the FI architectures: Content/user instead of node-oriented access, location transparency and mobility support, more flexible routing, better service-aware resource control, better security, privacy and spam protection, management inherently integrated within the network. George presented the COMET view for content mediator planes.

The presentation ended with the view of 4 key issues for the revolutionary approaches:

- Combined name resolution and routing
- Rendezvous-based ID Routing
- Caching packets/content in routers
- Network-media self-awareness

Theodore posed the "findability" problem (problem to find content) and the naming identification problem when the content is not known.

Regarding the revolutionary/evolutionary approaches, Van proposed that IP can coexist or not, over the CCN approach and proposed that the data should be signed by an authority so the origin can be identified. The self-management challenge was also discussed, and agreed that in CCNs, it may be easier to achieve self-management.

- Pablo Rodriguez, Nikolaos Laoutaris, Telefonica R&D

Nikolaos presented the way to have "intelligent" storage to avoid wasting in bandwidth, since storage is cheaper than bandwidth. Nikolaos proposed a network structure integrating storage/bandwidth optimization for future telco services. Based on his presentation, sometimes it is much cheaper and more efficient to move in advance popular content closer to the end-user, when bandwidth is available, even if this content may never be consumed. On the other hand, it is very difficult to find enough available bandwidth for such transactions and special design should be applied, as this will take place on a globe level. So, when it is night in USA (e.g. Brasil) and a lot of bandwidth is available, it is day in Spain (so not enough bandwidth), and vice versa.

- Giovanni Pau, University of California, Los Angeles (UCLA)

Giovanni presented the most relevant issues of the Internet of today and for a possible clean slate approach for the FI. Giovanni commented that there is a quest for privacy/security, content Search and retrieval beyond today Search Engines and CDNs, if we can answer complex question such as "does Federico Alvarez know Giovanni Pau in person?" and Economic models that can sustain growth. Giovanni commented the need for the Internet of Things.

For the clean slate approach, Giovanni proposed that it should solve:

- Interoperability (Cross Technology)
- Privacy/Authentication/Security (nobody will use it but is needed anyways)
- Resilience
- Reliability
- Natural Content Addressability
- Mobility Support
- Location Based Services

The participants started a discussion on how the user wants to access the contents and what the infrastructure could support.

- Christian Timmerer, Klagenfurt University

Christian presented the approaches from MPEG towards FI Architectures and new media experiencing (MPEG-U: Rich Media User Interface (RMUI) and MPEG-V: Media Context and Control (MCC)).

Christian presented the comparison between "content objects" and "MPEG21 digital object". On this point Theodore and Petros commented that maybe the major difference is that MPEG21 digital objects are at application layer, while content objects have a native approach to the network. Yet, as a result of the discussion it was agreed that:

a) A framework (MPEG-21) exists and content objects may target it
b) The similarities or differences should be further studies
c) Even if there are inherited differences, content objects may take advantage of the mature MPEG21 methodology, description language etc. to define ALLOA.

Christian presented the solutions which the EU FP7 project ALICANTEis offering for the FI.

- On top of the traditional network layer, virtualising the network nodes in two virtual layers, one for packet processing (CAN layer) and the other one for content delivery (Home-Box layer)
- Full User Environment, seamlessly interacting with the underlying layers
- Flexible Service Environment, based on cooperation between the traditional SPs and End-Users (through their HBs)
- Two level solution to fully support adaptation for the multimedia flow delivery over multi-domains
- Multi-layered monitoring solution at all defined levels: User, Service, Home-Box, CAN

Note: the point of the agenda regarding the

4. Architectures comparison and discussion. Advantages/disadvantages of the approaches. 12:30 – 14:00

It was discussed during the presentations.

5. Discussion on design principles. 15:00 – 16:00

It will be discussed off-line in the group.

The summary of identified open issues and assignments is the following:

Open issues	VJacobson	GPauvlou	N. Laoutaris	Giovanni Pau	CT	editor	contrib
Synchonisation and reconstruction	Local notion of time					PCesar	JB,
Storage	Memory as a first class element	Memory in the routers-servers	You need to use storage	Caching is key to the network		TZ	Nikos,
Routing and naming	Naming	Mediator plane	No end-to-end	Naming		TZ	Gpau, CT, ?, Pauvlou
Findability				Natural content addressability	Digital item	PD	EB,
Scalability	Naming	Naming				FA	CT
Bidirectional communications	Naming						
Context	Contextual naming (global&local)			Location based services		FA	CT, PC
Security and trust	Built-in by naming			Privacy-security-authentication			
Self-management and interoperability		Built-in				GPavlou	TZ
Parallel Internet/ federated		Meta-architecture / virtualisation				GPavlou	
Delay tolerant applications			Important for the future				
Reliability and resilence				Currently it is no way to rely			
Mobility support				Addresses not fixed to the location			

6. How to test and validate the different architectures? 17:15 – 17:30

The different funding programmes were described and Isidro commented the next Call.

7. Way to more forwards, timeframe and milestones. 17:30 – 17:50

The following next steps to be followed were agreed:

- April 2010: kick-off meeting.
- April-September 2010: off-line work and discussion. Phone-conferences will be set-up.
- August 2010: first version of the architectures comparison and design principles to be discussed in the second meeting.
- 31st August 2010 (tentative). Majorca, Spain. Second general meeting. Closing open issues.
- December 2010: third meeting. Gent, Belgium. Start drafting the reference architecture.
- December 2010 – March 2011: off-line work and discussion. Phone-conferences will be set-up.
- 25th January 2011: Open consultation and presentation of the agreed ideas and design principles and if possible initial draft of the reference architecture in a workshop (40 people, as a sounding board). Brussels, Belgium.
- End of March 2011: First version of the reference architecture.
- April 2011 (tentative): Forth general meeting.
- April 2011 – October 2011: Feedback from the community.
- June 2011 (tentative): 5th meeting.
- April/May 2011 (tentative): dedicated workshop in US to present the results.
- June 2011: dedicated workshop in Japan to present the results.
- September/October 2011: final reference architecture presentation to the community in an open workshop.

8. AOB 17:50 – 18:00

18:00 FMIA-TT meeting end

Future Media Internet Think Tank list of members:

Name	Affiliation
Jan Bouwen	Alcatel-Lucent
Pablo Cesar	CWI: Centrum Wiskunde & Informatica
Van Jacobson	Palo Alto Research Centre (PARC)
George Pavlou	University College London (UCL)
Pablo Rodriguez	Telefonica R&D
Giovanni Pau	University of California, Los Angeles (UCLA)
Christian Timmerer	Klagenfurt University
Martti Mäntylä	Helsinki University of Technology
Olivier Festor	INRIA
Gonzalo Camarillo	Ericsson Research
Olaf Kolkman	NL netlabs
Marcelo Bagnulo	Carlos III University
Theodore Zahariadis	Synelixis
Petros Daras	CERTH
Ebroul Izquierdo	Queen Mary University London
Federico Alvarez	Technical University of Madrid
Isidro Laso	European Commission
Arian Zwegers	European Commission