



FIREWORKS



## Report on FIRE Activities in Americas, and Asia

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## 1 USA - GENI

The 2nd GENI-FIRE workshop was held in connection with the Fifth GENI Engineering Conference (GEC5), hosted by the University of Washington on July 20-22, 2009 at the Sheraton Seattle Hotel, in Seattle. This workshop was organised by DG Information Society and Media of the European Commission and the National Science Foundation with support of the FIREworks project and the GENI Project Office. The meeting was the second of a regular series of meetings between the EC and NSF regarding collaborations in internet experimentation. The objective was to explore the synergies of activities in this area and develop joint work. The workshop will mainly focus on understanding federation, how it should be deployed and how users would benefit if federation was achieved, both for homogeneous and heterogeneous testbeds. A full report is available at [http://www.ict-fireworks.eu/fileadmin/events/FIRE-GENI\\_July09/FIREworks\\_report\\_on\\_2nd\\_GENI-FIRE\\_workshop.pdf](http://www.ict-fireworks.eu/fileadmin/events/FIRE-GENI_July09/FIREworks_report_on_2nd_GENI-FIRE_workshop.pdf)

As a natural step forward from the more generic events held between FIRE and GENI communities, it was initiated from the Internet research community to organise a federation workshop jointly between US and European partners. This Federation workshop was organised by NSF-FIRE at Princeton University on May 11-12, 2010. The motivation for the workshop was the increasing demand among researchers and production system architects to combine compute, storage, and network resources from multiple sources (e.g., the organization's own resources, their partners' resources, commercial and academic clouds, programmable network substrates). Various proprietary and experimental systems have taken the first steps to demonstrate the potential effectiveness of such combinations, but substantial concerns remain about security, interoperability and management. Consolidation seems certain, but we lack the right architectural framework, where new models must contend with a quickly growing base of incompatible production systems. Against this backdrop, this workshop focused on issues related to federating resources from multiple autonomous organizations into a seamless/ubiquitous resource pool, thereby giving users standard interfaces for accessing the widely distributed and diverse collection of resources they need. Workshop goal was to develop a common understanding of what it means for autonomous organizations to federate their compute, storage and network resources, including defining relevant terminology, establishing universal design principles, and identifying candidate federation strategies. The workshop resulted in an integration of the founding on federation issues in the future calls in GENI. The workshop was organized by Larry Peterson (Princeton University) and Serge Fdida. The collection of presentations of the workshop can be found at: <http://www.ict-fireworks.eu/events/fire-events/geni-fire-workshop-on-federation.html>

Finally, to conclude FIREworks activities altogether a FIR-GENI workshop was held in Brussels on September 30-October 1, 2010. This fourth workshop in collaboration of FIRE and GENI/NSF was organized by Joe Evans (University of Kansas) and Serge Fdida. The two-day workshop focused on identifying and planning cross-Atlantic experiments and was organised into parallel breakout sessions along the topics of 1) Infrastructures, 2) Measurement, 3) Use case needs, and 4) Wireless. The collection of presentations of the workshop can be found at: <http://www.ict-fireworks.eu/events/fire-events/4th-fire-geni-workshop.html>

## 2 Asia

### 2.1 AsiaFI

FIRE's main point of contact in Asia has been the umbrella organization AsiaFI, which can be considered its Asian equivalent. Asia Future Internet Forum (AsiaFI) was formed in 2007 to coordinate research and development on Future Internet among countries in Asia as well as with those on other continents. In order to coordinate efficiently, AsiaFI is involved in various activities, such as working groups on subjects ranging from Future Internet architecture to mobile and wireless networks, events including workshops and conferences, and educational courses such as the AsiaFI School on Architecture and Building Blocks, as well as research. Further information can be found on AsiaFI's website at <http://www.asiafi.net/>.

#### 2.1.1 UPMC

OneLab2 project leader Serge Fdida, full professor at UPMC, Paris, is a member of the AsiaFI board (2009-2011). For this reason Prof. Fdida has been present at numerous conferences and meetings, and has been a principal point of contact between FIRE and AsiaFI. Key events include participation in the AsiaFI Summer School and Future Internet Architecture Workshop in August 2010, as well as annual board meetings, and a presentation entitled "OneLab: Can we build a test-bed to explore the "future" Internet?" at the AsiaFI event in Bangkok (Thailand) on November 17 2009. FIRE's involvement with AsiaFI is set to continue in the future with participation in future events such as workshops, summer schools and board meetings and other AsiaFI events. Key contacts established within AsiaFI include **Kilnam Chon** at KAIST and **Daeyoung Kim** at Chungnam National University, both in South Korea, **Jun Bi** from Tsinghua University in China and **Kenjiro Cho** from Internet Initiative Japan Inc., in Japan (who is also a member of the OneLab Advisory Board). At the Asian Institute of Technology (AIT), Thailand, Prof. **Kanchana Kanchanasut**, a member of the AsiaFI Steering committee, is a principal contact, as are fellow AsiaFI Steering Committee members **Craig Partridge** of BBN Technologies and **Lixia Zang** of *University of California, Los Angeles*.

### 2.2 China

#### 2.2.1 UPMC

A key country for FIRE collaboration, China has been visited numerous times by Prof. Fdida in order to discuss mutual cooperation in the area of Future Internet. In November 2009 he visited the Chinese capital Beijing to make a presentation at the networking event "China Wireless World and Internet of Things 2009" (for further details see the website at <http://www.conference.cn/world/2009/english/>). Prof. Fdida gave a talk about the OneLab project entitled "Experimentally-driven Research in the Wireless World: the Onelab2 Solution". Also present was Jacques Babot, EC Project Officer and Team Leader of IPv6.

During his visit, Prof. Fdida was also involved in discussions at NDRC (National Development and Reform Commission) of the People's Republic of China. Here he met with a representative from Tsinghua University (and a key FIRE contact in China), Prof. Xing Li, director of the prestigious New Generation Network Technology & Applications Laboratory, and discussed the welcoming of the University as a new partner in the OneLab project. Prof. Fdida and Prof. Li signed an MoU setting the University's membership process formally in motion, and Tsinghua University is set to join the project later this year. Future collaborations will continue with a round-table meeting focused on EU-China mutual cooperation, to take place in Brussels in September 2010. Organized by Future Internet/ IPv6 and the Internet of Things, the aim of this workshop is to provide informed recommendations for

joint action at a strategic and implementation level. These will feed into the forthcoming Information Society Policy Dialogue with China by the end of 2010.

## **2.3 Japan**

Japan's key Future Internet initiative is the AKARI Architecture Design Project (AKARI Project). It is a large project for designing New Generation Network Architecture and is supported by the National Institute of Information and Communications Technology (NICT) of Japan. Launched in May 2006, the AKARI Project aims to build technologies for new generation network by 2015, developing a network architecture and creating a network design based on that architecture.

The members of the AKARI Project come from NICT and some other famous universities or companies such as Tokyo University, Keio University, Osaka University, Tokyo Institute of Technology and NTT etc.

### **2.3.1 UPMC**

As well as being present at the 2nd EU-Japan Cooperation Forum on ICT Research, in Brussels in July 2009, Serge Fdida has also given several presentations in Japan, related to establishing Future Internet links, for instance one entitled "The OneLab Project" at the JST/CNRS workshop in October 2008, and another, "FIRE OVERVIEW: European Testbeds Ecosystem" at the International Symposium on ICT Systems Testbeds, in March 2010. Both these events took place in Tokyo, Japan.

FIRE's key contact in Japan is Professor Aki Nakao at the University of Tokyo, who is leading the federation effort between the PlanetLab Japan testbed and OneLab's key testbed, PlanetLab Europe. Eventually, PlanetLab Japan will also be federated with OneLab's other Future Internet testbeds. On a national level, but also relevant to this report, the French research institution CNRS is also involved in a collaboration with JSPS (Japan Society for the Promotion of Science). This collaboration, of two-year duration, covers research on technologies to extend and improve the PlanetLab Europe system within the frame of the OneLab2 project, and involves two workshops per year as well as numerous visits and exchanges between researchers.

### **2.3.2 Eurescom**

On 13-14 October 2009, the Japanese National Institute of Information and Communication Technology (NICT) hosted the 2nd Japan EU Symposium on the New-Generation Network and Future Internet in Tokyo, Japan. The event was jointly organised by NICT and the European Commission, DG Information Society.

The Symposium's major objective was to explore prospects for deeper exchange and collaboration between the Japanese and European research communities in the area of what is referred to as "New-Generation Network (NWGN)" in Japan and "Future Internet (FI)" in Europe.

The symposium attracted 187 participants from Japan and Europe. 59 participants attended the event from Europe with most major European project in the area of Future Internet being represented and contributing to a fruitful discussion.

The event was opened by a welcome message of the President of NICT, Mr. Hideo Miyahara, which was followed by an opening keynote by the Director-General of International and Technology Policy Coordination at the Ministry of Internal Affairs and Communications (MIC) in Japan, Mr. Masataka Kawauchi. Mr. Kawauchi presented the MIC ICT vision of future society. From the European Commission, the Deputy Director General, DG Information Society, Mr. Antti Peltomaki, presented the European view on the Future Internet and the post i2010 EU strategy in ICT.

Among the topics of interest was the elaboration of the driving vision and research strategies in Europe and in Japan in relation to the FI and the NWGN, as well as the level and nature of public support to the initiatives, together with the available implementation instruments.

The symposium covered all important areas in the larger context of the theme, including future architectures, content, services, green ICT, trustworthy networks and services, broadband photonics, testbeds and experimentation, socio-economics, ubiquity & sensors, cognitive radio, as well as future and emerging technologies.

It was concluded that deeper collaboration between the research-communities would be of mutual benefit for both sides, in particular as there are certain possibilities for cross participation in respective research programmes. This event followed the first symposium that took place in Brussels on 9-10 June 2008, where EU and Japanese activities were introduced. With this second iteration, EU and Japanese researchers were offered the opportunity to exchange information about the respective research status and exploit direct future collaboration opportunities.

More information about the symposium and all presentations can be found at <http://www.prime-pco.com/nict-nwgn/events/2ndEUsymposium/>

## **2.4 South Korea**

### **2.4.1 UPMC**

FIRE's key Future Internet collaboration partner in South Korea is the Future Internet Forum, Korea. The Future Internet Forum (FIF) aims to provide an opportunity to review the information and knowledge at the forefront of new Internet architecture and related issues. A direction for the future R&D in Internet is expected to be shaped as a result of presentations and discussion among experts, and further detail is available on their website, <http://fif.kr/>. Our key contact in South Korea is Professor Sue Moon, Associate Professor of Computer Science at KAIST (the *Korea Advanced Institute of Science and Technology*), and a member of FIF's Executive Committee. Prof. Moon is also managing the federation effort between OneLab testbed PlanetLab Europe (and eventually the other OneLab testbeds) and the PPK testbed (Private PlanetLab Korea).

Both Prof. Serge Fdida and Dr Timur Friedman of UPMC have been involved in meetings, discussion and dissemination of the FIRE message to Korean organizations. At CIF 2009, the 4th International Conference on Future Internet Technologies (June 17-19, 2009, Seoul, Korea) Prof. Fdida was a General Co-Chair, while Dr Friedman was a Co-Chair of the Technical Program Committee. Prof. Fdida was also on the Steering Committee of CFI 2010, 5th International Conference on Future Internet Technologies (June 16-18, 2010, Seoul S. Korea).

## **2.5 Thailand**

### **2.5.1 UPMC**

Although Thailand does not yet have its own separate Future Internet Initiative, FIRE has none the less had a presence in the country and has begun to build up useful collaborative relationships. The reason is that AIT (Asian Institute of Technology) plays an important role of dissemination towards most Asian developing countries. Prof. Serge Fdida has been involved in for two years running with AINTEC (Asian Internet Engineering Conference). At AINTEC 2010 he presented the OneLab Project, while at AINTEC 2009, where he was a member of the Steering Committee, he made two presentations, a general introduction to the conference, and the more specific "Delay Estimation of a User-Preferred Content Distribution Scheme in Disruption Tolerant Networks". Both conferences were held in Bangkok, Thailand. The AsiaFI annual event of November 2009 was also held in Thailand, where Prof. Fdida gave a presentation entitled "OneLab: Can we build a test-bed to explore the "future" Internet?". The Local NREN was present and there is a plan in 2010 to make a Onelab2 tutorial aimed at a larger audience, including ThaiRen, Thailand Research and Education Network.

OneLab's PlanetLab Europe testbed has also been instrumental in the creation of collaboration links with institutions in Thailand, through the registration of a Thai member, the IntERLab (Internet Education and Research Laboratory) at AIT, based in Pathumthani, Thailand. Professor Kanchana Kanchanasut, Director of IntERLab, is a key contact in Thailand.

## 3 South-America

### 3.1 Brazil

#### 3.1.1 UPMC

No single Future Internet Initiative has yet emerged in Brazil, but Prof. Fdida has participated in several events with the aim of constructing research collaborations in the area of Future Internet research, notably the workshop “PlanetLab Everywhere – Brazil: A blueprint for disruptive technologies” in April 2009, in Rio de Janeiro. His presentation, entitled "PlanetLab Europe / OneLab and the FIRE Initiative", worked towards exploring new directions to expand the use of PlanetLab as a whole, and began the process of building constructive collaborative relationships between research institutions in Brazil and Europe.

Prof. Fdida also gave a talk entitled “OneLab: Can we build a testbed to explore the future Internet?” at the 27th Brazilian Symposium on Computer Networks and Distributed Systems (SBRC) in May 2009 in Recife, Brazil. Following he was interviewed on the website of Pernambuco Diario, an online newspaper covering the Pernambuco region of Brazil. The text of the interview (in Portuguese) is available online at the pernambuco.com website.

Another key event where FIRE had a presence was the CPQD News Architectures Workshop, in September 2009 in Campinas, Brazil, where Prof. Fdida also gave a presentation on the same theme. As a follow-up to this event, three key OneLab researchers authored a chapter about the OneLab initiative that has been published in a leading book series on new network architectures. The chapter, entitled "OneLab: An Open Federated Facility for Experimentally Driven Future Internet Research", appears in Volume 297 of *Studies in Computational Intelligence*, published by Springer Berlin/Heidelberg. The authors are Serge Fdida and Timur Friedman of UPMC and Thierry Parmentelat of INRIA. Full details of the publication can be found at <http://www.springerlink.com/content/q7463401u432l083/>. Future collaborations will be developed with **Prof. Otto Duarte** of UFRJ (Federal University of Rio de Janeiro). In addition, there are on-going discussions taking place with **Michael Stanton** (head of RNP (Rede Nacional de Pesquisa), the national NREN).

#### 3.1.2 Eurescom

On 8-9 September 2009, the University of São Paulo, Brazil hosted the EU-Brazil workshop 2009. The workshop was jointly organised by Ministério das Relações Exteriores, Ministério da Ciência e Tecnologia and the European Commission as a platform for the political and scientific dialog between Brazil and the European Union on matters of the Information Society. The main objective of the workshop was to promote collaboration, exchange ideas and experiences and identify the mechanisms to foster joint research between Brazilian and European Union academic and scientific communities as well as the industry, in different areas of Information and Communication Technologies (ICT). In the focus of the workshop were issues and topics concerning the Future Internet, e-Infrastructures for research, microelectronics, microsystems as well as embedded systems & control. In particular the sessions on Future Internet addressed the area of testbeds and experimental facilities with contributions by the European projects Panlab/PII and Federica as well as the EU FIRE initiative. Experiences were exchanged with local experts from institutions such as CPqD and University of Campinas. In the area of e-Infrastructures several contributions outlined the existing working relationships between Brazilian and European institutes as these exist in projects such as EELA-2 and EGEE. In the session of security and trust, existing collaboration was identified on the topic of Post Quantum cryptography. Due to the increasing governmental and industry interest in collaboration between Brazil and EU in this area, a number of additional topics of mutual interest were identified that are suitable for further exploration in the FP7 call 5 proposal phase. During the

workshop, demonstrations of Future Internet projects took place involving Brazilian and European academic and scientific partners in the area of music and cinema, showing how ICT can be an enabler for collaboration not only in the area of technology but also in other societal areas such as arts and education. At the closing plenary that was attended by the Director-General of DG information Society and Media, Mr. Fabio Colasanti, it was concluded that the existing working relationships have to be strengthened by enforcing the existing mechanisms of collaboration as well as by possibly creating new instruments such as joint calls. Anastasius Gavras from Eurescom was actively involved in the discussions. More information about the workshop as well as videos of the presentations can be found at: <http://www.cce.usp.br/servicos/eubr2009/>

## 4 Conclusions

FIRE is not only an initiative that needs to get global attention, it serves the global community of future internet research. The future internet is global research challenge and architectures developed and experimented need a global scope and facilitation. It is even anticipated that the breakthrough innovations and ideas do not grow in our secured welfare environment, we need to get out to collect them, stay involved in the emerging development as tightly as possible. US and North-East Asia were identified at the negotiation phase as the most prominent regions to match interests and have plans synchronised with the given limitations of time and resources. However, liaison and linkages have gone beyond that, and it could be said that in terms of WP4 FIREworks have exceeded the expectations to a large extent. Beyond promised scope are the southern part of Asia, Australia and South-America, where in particular OneLab2 has carried out a substantial effort and brought FIRE into awareness.

The Japan-EU cooperation had a quick and massive start in June 2008 organised event in Brussels attracting over 200 participants worldwide, including high-level people from Ministry of Internal Affairs and Communications and NICT. A follow-on event was held October 19-22, 2010, out of the project lifetime, but preparation and organisation were powered by the FIREworks project. The work has been substantial on a project level with several axels, CoreLab (PlaneLab Japan) and Tsinghua testbed being federated to OneLab2, and YRP (Yokosuka Research Park) getting connected to PII facilities through Dimes facilitation. Japanese researchers are keen on forming international alliances, especially in terms of next generation mobile communications. The competition on winning standards in large markets motivate for cooperation. Korea and China have been orderly liaised, and by UPMC and Dimes several links to both in academia and industry are active and contacted on a regular basis. Interactions, signed Memorandums of Understanding and cooperation plans have been put in place with Chinese, Korean and Thai colleagues on behalf of OneLab2, its global federation leads way for facility providers internationally. Recently established new connections via Japanese Chinese Broadband Association (JCBA) might offer the boost for Chinese counterparts to establish sustainable collaboration means for mutual benefit. NICTA in Australia being a OneLab2 consortium member offers new opportunities to establish links between Europe and Australia. South-American liaison was in the EC agenda during this second project period, and a workshop was organised in Sao Paolo. In addition, the links to various research organisations under PlanetLab theme were further developed.

Cooperation is tightest and most advanced with GENI initiative in US. Several events have been organised and invited talks to respective parties' conferences kept. The cooperation base is growing and cooperation on a project level intensifying. A few European FIRE actors were in the consortia that received GENI funding from the Solicitation in February 2009 (spiral 2). Cooperation pairs on a project level have been identified: PlanetLab/VINI-OneLab, iLab.t-Emulab, ORCA-PII. On the other hand the US initiative OpenFlow landed in FIRE as a result of call 5 in the OFELIA project. The latest more technical workshops organised together with GENI (in May 2010 in Princeton and in September 2010 in Brussels), as well as the project level engagement, presented use cases (e.g. T. Zseby: Multipath routing experiments in federated testbeds) and carried out experiments demonstrate the need for international testbed federation and close interaction with GENI.