Future InterneT (of ThINGs) facility:

FITTING

11340 Final Report 2013

T1300A – T1318A

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1 Overview on FITTING 2013

1.1 Focus and organization

We promised to work in 2013 on 1) for more targeted disseminating, encouraging the usage of FITTING infrastructure and tools to all ICT actors, liaising closely with the relevant ICT Labs Innovation Catalysts in order to industrial and invite in particular the SME experimenters to the FITTING platform; 2) by adding Trento node, and new Carries from all, and 3) by giving a special push on measurement and monitoring.

FITTING has provided for ICT Labs since its very beginning the common, shared, federated experimental facilities, its Testbed Catalyst. FITTING has materialised the ICT Labs strategy of the knowledge triangle where research, education and innovation meet each other on a real federated platform that offers means to support each of the three sides of the triangle. FITTING offers EXPERIMENTATION and VALIDATION stated in the EIT ICT Labs strategy and as a vehicle in the business plan for 2013 to transfer a) idea into product, b) lab into market and c) students into entrepreneurs. FITTING has matured and grown to offer unique scale and diversity of these necessary means to learn and validate novel paradigms and services produced within ICT at large.

The special effort planned and realised for 2013 was at making FITTING facilities known and accessible to ICT Labs partners, inviting industrial, in particular SME experimenters to use FITTING platform. FITTING has so far successfully connected three ICT Labs nodes, their interconnection is still at different phases depending on their timing to join the FITTING federation. In 2013 FITTING completed the federation of the existing facilities and brought in one more node in Trento. The new partner in Budapest (ELTE) provided tools that support harmonizing the measurement and monitoring tools, therefore enabling the cross testbed data exchange that has turned out to be a challenge. To extend the FITTING platform both in nodes and services, the activity relies on the Testbeds, Testing Platforms & Simulation Tools catalyst of the KIC.

The work performed during 2013 is four-folded and consists of the following tasks:

1. T1301A - T1307A (UPMC, INRIA, ALBLF, Mines, FOKUS, U Trento, BME) – Extended federation: 1. Extending the usage and offering of FITTING platform within ICT Labs actors
    a. disseminating widely, liaising with ICT Labs Innovation catalysts for increasing the usage of FITTING facilities
    b. adding Trento node into FITTING federation

c. extending the current wireless testbeds, especially with heterogeneous devices.

2. T1308A – T1311A (UPMC, INRIA, FOKUS, ELTE) – Resource browsing: A harmonized way to learn about the resources available on different testbeds and their capabilities.
3. T1312A – T1315A (UPMC, INRIA, TU Berlin, ELTE) – Cross testbed measurement: Development of tools that are capable of performing measurements across physically interconnected testbeds.
4. T1316A – T1318A (UPMC, INRIA, ELTE) – Data repository: Collection of measurement data in a common format

The FITTING 2013 results in the following deliverables:

D1301	FITTING federation	Public report	30/11/13
D1302	Resource browsing	Software module	23/12/13
D1303	Cross testbed measurement	Software module	23/12/13
D1304	Data repository	Software module	23/12/13

1.2 Achievements

In December 2013, the activity “Future Internet of ThINGs - *FITTING*” was concluded with success, achieving the following number of KPI’s:

KPI	Q1	Q2	Q3	Q4	Target Value	Total
R1.01A | # pan-European testbeds, experience & living-labs	10	10	10	10	10	10
R2.08A | # experiments and tests in test beds	200	236	236	258	100	>250 ongoing
R2.09 | # interconnected technical components in a testbed or lab (physical computers, servers, network elem	350	10	350	350	7 (different way of counting)	>350: 50 wireless nodes, 1024 sensor nodes, 20 mobile terminals, 350 VMs, etc.

Evidence for the KPIs is visible at: http://stats.planet-lab.eu/

By 12/2013 the main outcome is:

1) FITTING has a stable single Portal that offers open access for EIT ICT Labs partners to FITTING resources, i.e. experimental facilities and experiment tools developed and maintained in various EIT ICT Labs nodes and even beyond.

2) FITTING connects to Network Operations Centre located in Paris, in connection to Paris CLC, hosted by UPMC, where one can connect and monitor all FITTING -> OneLab testbeds.

3) FITTING has facilitated a legal entity to be set up for governing the testbed federation, namely OneLab. TU Berlin, UPMC and INRIA are governors in this federation that is open to any testbeds to join at.

4) FITTING has liaised closely with education, catalysing and supporting online courses to be created benefiting from FITTING resources, i.e. offering supported, safe-guarded real-time access to educators and learners to FITTING testbeds, providing sample classes, labs, tutorials and help to run the experiments. A FP7 project FORGE was spined off from these activities and the collaboration on this will continue beyond Europe

5) FITTING has disseminated its tools and federation standards and convinced colleagues in Asia (China and South-Korea following already federated Japan) and South-America to implement interoperable APIs on their resources, thereby enlarging the footprint and magnitude of federated experimental resources to a unique one on a global scale.

6) FITTING EC-FIRE & SME engagement spinned off two projects, FP7 CI-FIRE and KIC activity Fantaastic, which work on collaboration and sustainability models for prototyping and mature experimental resources to be offered especially for SMEs and entrepreneurs.

2 Work split by partners

The FITTING 2013 consortium consists of ET ICT Labs partners in Paris (UPMC, INRIA, Mines Télécom, ALBLF), Berlin (Fraunhofer FOKUS, TU Berlin), Trento (University of Trento) and Budapest (BME, ELTE) nodes. The researchers and developers are located at the respective CLC's, hence benefiting from the Centers logistics and infrastructure and also easily reachable for other ICT Labs participants. The rough split and outcome of each partner's responsibilities is as follows.

2.1 UPMC

UPMC has coordinated the activity, contributed to MANIFOLD framework (MySlice and TopHat), built up and maintains the NOC (Network Operations Centre), disseminated, liaised and catalysed many new activites (education -> FORGE, FIRE collaboration -> CI-FIRE, testbed, testing (TBaaS, TaaS) brokering for SMEs -> Fantaastic, demo and exhibition at ICT2013 Vilnius)

2.2 INRIA

INRIA has provided the core for the federation architecture (generic SFA wrapper, various SFA wrappers, support in adopting them), NEPI for experiment control, wireless nodes extension, renewed sensor testbed.

2.3 Mines Télécom

Institut Mines Télécom is developing and experimenting in mobile wireless testbed (robots). In 2013, Mines Télécom worked on the automatic deployment of robot networks according to certain patterns. Concerning scattering (the automatic positioning of robots to cover an area while remaining connected), Mines team has built two algorithms that need implementation. Flocking has been overcome by a strategy that gives moderate results in simulation. The delivery of the hardware components was delayed and hence the analysis of tests will be finalised by the end of January 2014.

2.4 Alcatel Lucent Bell Labs France

ALBLF had developed a compact (truly mobile) LTE test environment.

2.5 Fraunhofer FOKUS

Fraunhofer FOKUS continued to enhance the resource description mechanisms of the FITeagle federation tool for FITTING testbeds and started to work on harmonized aggregation, discovery and display mechanisms.

2.6 TU Berlin

TU Berlin has integrated has integrated FUSECO testbed into FITTING via FITeagle, hence enabling also all other resources described in FITeagle to be accessed through MySlice-based portal and vice versa.

2.7 University of Trento

University of Trento is a partner and developing further WOTBL (Wireless and Optical TestBed Laboratory) testbed to be benefited by FITTING users.

2.8 BME

BME has developed thea DroidLab testbed to be benefited by FITTING users. DroidLab is a framework developed for Android smartphones allowing the testing of networking/crowdsourcing applications through real world measurements. The DroidLab framework is ready for pilot mode operation; it can be downloaded from the Google Play Store, the back-end runs in the Google AppEngine cloud, we developed the sample modules and sample plug-ins, and the corresponding developer documentation as well.

2.9 ELTE

ELTE has developed rich measurement and monitoring tools to be benefited in FITTING experiment. Furthermore, ELTE (with TUB) tested the nmVO data loader interface for PacketTracking data. MySlice-nmvo integration efforts have been continued on the implementation of nmVO-MySlice gateway. The new web interface and query processor for nmVO, called GrayWulf was launched. GrayWulf now supports MySQL, MSSQL and PostgreSQL databases, covering all the available database technologies used by FITTING partners. By using this system, TopHat's topology data (PostgreSQL in Paris) may be joined to geolocation data stored in nmVO (MSSQL in Budapest) easily (using simple and well-known SQL syntax).

Effectively the FITTING 2013 results converge into the functions and usability of the Portal (OneLab portal) as a materialisation of the testbed federation:

1. OneLab federation having its own legal entity behind it and its charter being signed by its governors 01/2014.
2. The experimentation tools & testing resources can be browsed by the Portal
3. The cross testbed measurements can be managed from a common entry point
4. The measurement data from experiments being stored and retrieved from common, harmonised registries.

To this purpose the MANIFOLD framework has been released both by UPMC and INRIA that aims at offering a stable and production ready interface for testbed federation (i.e. the backend of the OneLab portal). The Portal features:

- Complete user registration and validation cycle
  - Account Registration
    - Register to MySlice
    - Select an authority from SFA
    - Generate private and public keys
    - Email to the PI of user's institution
  - Account Validation
    - Validate or Reject user's account from the portal
    - Validation sent to SFA
  - Authentication
    - Login et authentification via SFA
    - Forgot my password
    - Manage : Automatically delegate SFA credentials (if MySlice has the private key and user_hrn)
  - My Account
    - Display user informations (local DB & SFA)
    - Display config to access each platform
    - Edit information (update)
    - Generate new private and public keys
    - Display platforms that I have access to (have an account)
    - Uploaded pub_key: Download SFA and delegate your creds (link package & tuto)
  - My Site
    - My institution (SFA authority)
  - Nodes (slice page)
    - Display a list of all resources
    - Google Maps
    - Users in the slice
    - Filter resources (minor js bug)
    - Update Slice / Reserve Nodes (minor update RSpec version 3)
  - Slices
    - My Slices : Already on the dashboard
    - Create slice : User request a slice
  - Resources
    - More info about one specific resource by selecting it in datatables
  - Contact Us
    - Link to support
    - Send email to FLS
  - Sites (Testbed Dir.)
    - Display platforms
    - Add new platform using (command line - web interface in the future)
    - Enable platform
    - Update platform informations (command line - web interface in the future)

Links to source code repository and packaged versions, as well as documentation and developer information can be found on the http://trac.myslice.info website.

3 Business Relevance

FITTING brings together the major European testbed initiatives and flagship projects. These Carriers develop and federate experimental facilities within certain consortia, FITTING offers both access to these facilities for ICT Labs partners and bridges between the numerous infrastructure initiatives, creating synergies and standards across the separate research of different Catalysts. FITTING 2013 grew both in carrier project coverage (new FP7-FIRE projects, new EIT ICT Labs activities) and in including more ICT Labs nodes within: in addition to Paris, Berlin and Budapest nodes FITTING 2013 added Trento in its federation. The extension followed the already established FITTING processes (SFA federation, MANIFOLD framework), but also be further refined by the progress produced by the new partners and Carriers. The work on harmonizing the tools went both deeper (more strict, detailed commonalities) and wider (more tools harmonized across more testbeds) with the new partners, specialists in the field (e.g. ELTE).

FITTING has had an impact on ICT Labs at large: all users of the FITTING testbeds, from industry and academia. Special focus was put on new user groups such as educators/learners and the SME sector. Both focal groups had even new spin offs as new projects (FORGE, CI-FIRE, Fantaastic). The existing user community consists of hundreds of active researchers. The interest is growing in testbeds associated to various nodes to join the federation initiative and to achieve economies of scale, new user groups, new tools, means for sustainability through it (FIRE collaboration, so called Madelin report, FIRE session at the BP event in Berlin in April 2014, etc.) We have witnessed that what we done in FITTING have been picked up and will lead to re-use and shared best practices across the dozens of testbeds run by national initiatives and under the auspices of the FIRE unit in Europe, as well as across the world.

4 Pubilcations

4.1 Standardisation

text

4.2 Scientific papers and given talks

P. Casoria, D. Rossi, J. Auge, M-O. Buob, T. Friedman, A. Pescape: "Actively monitoring bufferbloat, at a large-scale from PlanetLab", http://crp.mytestbed.net/tma14/paper/28?cap=028a91lV1JCoKdo The 6th Traffic Monitoring and Analysis Workshop (TMA 2014).

R. Mazloum, M-O. Buob, J. Augé, B. Baynat, T. Friedman, D. Rossi: "Violation of Interdomain Routing Assumptions", PAM 2014 - March 10-11 2014 - Los Angeles (CA)

J. Auge, T. Parmentelat, N. Turro, S. Avakian, L. Baron, M.A.Larabi, M.Y. Rahman, T. Friedman, S. Fdida: "Tools to foster a global federation of testbeds", Computer Networks, The International Journal of Computer and Telecommunications Networking, Publisher: Elsevier, 2013.

J. van der Ham, J. Steger, S. Laki, Y. Kryftis, V. Maglaris, C. de Laat: "The NOVI Information Models", In Future Generation Computer Systems 2013, Accepted paper, doi: http://dx.doi.org/10.1016/j.future.2013.12.017

A. Puszta, J. Szüle, S. Laki: "Near Real-Time Thematic Clustering of Web Documents and other Internet contents", In proceedings of the 4th IEEE Intl' Conference on Cognitive Infocommunications, December 02-05, 2013, Budapest, Hungary.

L. Baron, J. Augé, C. Scognamiglio, M.Y. Rahman, T. Friedman, S. Fdida, S. Avakian, A. Garcia, M.A. Larabi, T. Parmentelat, F. Saint-Marcel, B. Vermeulen, D. Stavropoulos, H. Niavis, J. F. de Rezende: "MySlice, the portal solution for FIRE facilities", GENI Engineering Conference, GEC18, October 27-29, 2013, Brooklyn, New York.

S. Fdida, L. Baron: "The OneLab facility and intercontinental federation", GENI Engineering Conference, GEC18, October 27-29, 2013, Brooklyn, New York.

S. Laki, T. Lukovszki: "On a Balanced Neighbor Selection Strategy for Tracker-Based Peer-to-Peer Networks", In Proceedings of the 13th IEEE International Conference on Peer-to-Peer Computing (P2P'13), September 9-11, 2013, Trento, Italy.

S. Laki, T. Lukovszki: “Balanced Neighbor Selection for BitTorrent-like Networks”, In Proceedings of the 21st European Symposium on Algorithms (ESA 2013), September 02-04, 2013, Sophia Antipolis, France (2013), Springer LNCS, vol. 8125.

J. Stéger, S. Laki, P. Mátray: “A Monitoring Framework for Federated Virtualized Infrastructures”, In Book entitled "Measurement Methodology and Tools" (Editors: Lluis-Fabrega, Pere Vila, Davide Careglio, Dimitri Papadimitriou), Springer Lecture Notes in Computer Science (LNCS), vol. 7586, Aug. 2013, doi: 10.1007/978-3-642-41296-7_11

C. Jouis, M. Y. Rahman, J-G. Ganascia: “A neo-Topological Approach to Reasoning on Ontologies with Exceptions and Comparison with Defeasable Description Logics”, The 26th International FLAIRS Conference, May 22 - 24, 2013, St. Pete Beach, Florida, USA.

R. Mazloum, M-O. Buob, J. Augé, B. Baynat, T. Friedman, D. Rossi: “On multi-exit routings and AS relationships”, ISMA'2013 - 5th AIMS workshop - February 6-8, 2013 - San Diego (CA).

T. Sebők, Z. Kallus, S. Laki, P. Mátray, J. Stéger, L. Dobos*, I. Csabai, G. Vattay: “The Network Measurement Virtual Observatory: An Integrated Database Environment for Internet Measurements and Data Analysis presentation”, SSDBM 2013 Conference, Baltimore, USA.

L. Baron, J. Augé, T. Friedman, S. Fdida: “Towards an integrated portal for networking testbed federation, an open platform approach”, FIRE Engineering workshop, Nov 6-7, 2012, Ghent, Belgium.

C. Jouis, M. Y. Rahman, J-G. Ganascia, C. Jouis, F. Guy: “Dealing with Atypicality using neo-Topology: Application to Paleontology” Terminology & Ontology, Theories and Applications (TOTH), June 6-7 2012, Chambéry, France.

Presentation for EIT ICTLabs master and other ELTE students:

Sándor Laki: “Future Internet playgrounds for early prototyping - An IP geolocation case study”

Date: November 21, 2013

Location: ELTE, Budapest, Hungary – Organized by the Budapest Assoc. Partner of EIT ICTLabs

Balázs Lajtha, Rolland Vida: „DroidLab – Smart Experiments”, Conference on ICT and Knowledge Innovation Community in Europe, Budapest, March 2013.

Balázs Lajtha, „DroidLab – Use my phone!”, Hungarian Science Day lecture series, November 2013.

5 Budget assumptions

FITTING builds strongly on big European and national carriers which provide the infrastructure and the core research budget. The 2013 budget assumed both the directors and professors to participate in addition to research engineers that produce the shared software. The budget anticipated some researcher engineer exchange between the nodes. The 995K activity budget (240k€ EIT funding) was planned as follows: 460k€ dedicated to the federation extension (3.9 FTE); 400k€ for building services and tools to access and manage measurement campaigns on the testbed (2.4 FTE) and 135k€ (0,9 FTE) for optimising the data repositories for measurement results. 0.3 FTEs is allocated for the Activity Management.

The final cost reports will follow, but no deviations have been reported to the date and all work has been carried out as planned and by parties initially anticipated.

6 Carriers

T1301C OpenLab brings together the essential ingredients for an open, general purpose and sustainable large scale shared experimental facility serving the demands of Future Internet Research and Experimentation. OpenLab delivers control and experimental plane middleware to facilitate early use of our testbeds by researchers in industry and academia, exploiting proven technologies, developed notably in the OneLab and Panlab initiatives, as well as drawing upon other initiatives' best work, such as the SFA control framework and OpenFlow switching. Provides various experimental platforms and tools. U Paris 6 (UPMC), INRIA, Fraunhofer Gesellschaft

T1302C Fed4FIRE will deliver a demand-driven common federation framework, based on an open architecture and specification. It will support dynamic federated identities by offering brokering, user access management, SLA management, measurements, first-line and second-line technical support for users. A federation authority will be established to approve facilities, promote desirable operational policies that simplify federation, and prepare for sustainable standardization beyond the end of the project. The project will use open calls to support innovative experiments from academia and industry and to adapt additional experimentation facilities for compliance with Fed4FIRE specifications. Fed4FIRE (FP7) Provides demand-driven processes for federated experimental infrastructures. UPMC, INRIA, Fraunhofer FOKUS.

T1303C F-Lab builds on the OneLab federation of testbeds by enhancing the OneLab federation model with the addition of SensLAB's unique sensor network and LTE-based cellular systems, and by developing tools to conduct experiments on these enriched facilities. F-Lab (French national ANR - VERSO programme) UPMC, INRIA, ALBLF.

T1304C FIT (French national ANR - Equipex programme), in addition to the technologies already listed in F-Lab, works on Cognitive radio experimentation. FIT's Cognitive Radio component will foster significant scientific progress by allowing users to design, benchmark, and tune their cognitive radio protocols. It will enable evaluation of different aspects of cognitive radio in a real environment. It will foster developing application-driven research aimed at validating some promising theoretical concepts. UPMC, INRIA, Mines Télécom.

T1305C Tender of the Hungarian Research and Technology Innovation Fund for supporting the Hungarian participation in EIT KIC programs. This project focuses on

developing novel network measurement techniques not only for monitoring federated testbeds, but for IP geolocation, network tomography and efficient topology discovery as well. To this end, we are going to extend the SONoMA network measurement platform with new capabilities that enables it to serve as a slice monitoring infrastructure for federated Future Internet testbeds. Using this extended platform, the changes of different network characteristics could be followed in an online way. To store and share the new type of virtualized resources (slices, etc.) and measurements to be introduced, our data repository called NMVO (Network Measurement Virtual Observatory) will also be extended according to the needs appearing in the heterogenous environments. This project provides novel cross testbed network measurements and fundamental elements for a more advanced monitoring infrastructure. ELTE

T1306C Tender of the Hungarian Research and Technology Innovation Fund for supporting the Hungarian participation in EIT KIC programs. In this project we will integrate tens of smart phones using the Android operating system into a publicly accesible testbed, called DroidLab. Then, crowdsourcing applications can be installed and tested on this infrastructure. DroidLab will be part of the federated testbed built in FITTING, so a remote user will be able to access it in the same way it does for other FITTING testbeds.This project supports the setup of the DroidLab experimentation testbed. The federation of this testbed will be done in FITTING. BME

T1307C EFIPSANS FP7 IP project aimed at exposing the features in IPv6 that can be exploited or extended for designing and building autonomic networks and services. A Generic Autonomic Network Architecture (GANA) was defined for a set of wired and wireless networking environments, among which BME analysed the special cases of wireless sensor networks and vehicular networks. This project was related to communication in various ad hoc networks (sensor and vehicular) which have many things in common with the Android based smart phone testbed targeted in FITTING. BME

T1308C WOTBL (Wireless and Optical TestBed Laboratory) is a jointly initiative among three partners: University of Trento, CREATE-NET and Trentino Network, a public-owned network operator which is providing high-speed connectivity services to all Public Administration offices all over the province. WOTB is an ICT infrastructure devoted to the experimentation and deployment of Future Internet technologies, services, applications and prototypes located in the Province of Trento.