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Abstract

The project Pan European Laboratory Infrastructure Implementation (PII) addresses the need for large-scale testing facilities in the communications area by implementing an infrastructure for federating testbeds among innovations clusters. It builds upon the Panlab Specific Support Action which received funding by the European Commission's Sixth Framework Programme. This document analyses the existing testbeds hosted by PII partner organizations. These testbed are the foundation of the PII federation and represent the available infrastructure.

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Executive summary

The objective of the PII project is to implement an infrastructure for federating testbeds among regional innovations clusters. It builds upon the Panlab Specific Support Action which received funding by the European Commission's Sixth Framework Programme and defined a framework for the interconnection of independent testbeds and laboratories so as to facilitate the establishment of a Pan-European Laboratory. The concept of such a Pan-European Laboratory is based on the federation of distributed test laboratories and testbeds that are interconnected and provide access to required platforms, networks and services, to demo, trial and evaluate new technologies, system solutions and telecom service concepts.

This document focuses the existing testbeds hosted by PII partner organizations. These testbed are the foundation of the PII federation and represent the available infrastructure. An extensive system analysis has been carried out to identify the involved testbeds and their offerings. Eleven PII partner testbeds are listed in this document using natural language and keywords that best describe the testbed environments.

This exercise was specifically useful to understand how to actually describe a testbed. One of the following tasks in the same work package will be to design a testbed description system that shall ultimately allow for an automated testbed setup across several PII partner domains. This requires a high level of abstraction and the use of a taxonomy describing the services offered by each individual administrative domain. This is a difficult task and requires a solid understanding of the underlying technologies that are going to be classified and described.

There will be a revised version of this deliverable which is due in month nine of the project.

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Abbreviations

3G	Third Generation
3GPP	3rd Generation Partnership Project
AAA	Authentication, Authorisation and Accounting
APRS	Automatic Packet Reporting System
AS	Application server
BSF	Bootstrapping Server Function
BSS	Business Support System
DSL	Digital Subscriber Line
DVB-H	Digital Video Broadcasting - Handheld
DVB-SH	Digital Video Broadcasting – Satellite services to Handhelds
ESP	Enterprise Service Bus
ETSI	European Telecommunications Standards Institute
FIT	Framework for Integrated Test
GBA	Generic Bootstrapping Architecture
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile (communications)
HSS	Home Subscriber Server
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
HTTP	Hypertext Transfer Protocol
I-CSCF	Interrogating Call Session Control Function
ICT	Information and Communications Technology
IDS	Intrusion detection system
IEEE	Institute of Electrical & Electronic Engineers
IETF	Internet Engineering Task Force
IMS	IP Multimedia Subsystem
IPSec	Internet Protocol Security
IPTV	Internet Protocol Television
IPR	Intellectual Property Rights
ISDN	Integrated Signalling Digital Network
MGW	Media Gateway
MIPL	Mobile IPv6 for Linux
MONSTER	Multimedia Open interNet Services and Telecommunication EnviRonment

MRF	Media Resource Function
NAF	Network Application Function
NGN	Next Generation Networks
NTP	Network Time Protocol
OCS-X	Open Communication Server for Parlay X
OMA	Open Mobile Alliance
OpenSE	Open Service Enablers
OSA	Open Services Architecture
OSIMS	Open Source IMS
OSS	Operations Support System
P-CSCF	Proxy Call Session Control Function
PEEM	Policy Evaluation and Enforcement
PSTN	Public Switched Telephone Network
PTT	Push To Talk
QoS	Quality of Service
RFID	Radio Frequency identification
SCIM	Service Capability Interaction Manager
S-CSCF	Serving Call Session Control Function
SEEPP	South East Enterprise Platform Programme
SIP	Session Initiation Protocol
SIPSEE	SIP Servlet Execution Environment
SME	Small Medium Enterprise
SMS	Short Message Service
SOA	Service Oriented Architecture
SSH	Secure Shell
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
TSSG	Telecommunications Software & Systems Group
TTCN	Testing and Test Control Notation
UMTS	Universal Mobile Telecommunications System
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
WiMAX	Worldwide Interoperability for Microwave Access
WiFi	Wireless Fidelity or 802.11b
WIMAX	Worldwide Interoperability for Microwave Access
WIT	Waterford Institute of Technology

WLAN	Wireless Local Area Network
XCAP	XML Configuration Access Protocol
XDMS	XML Document Management Server
XMPP	Extensible Messaging and Presence Protocol
XPOSER	eXtended POLicy-based, Semantically enabled sErvice bRoker

1 Introduction

The document focuses the existing testbeds hosted by PII [1] partner organizations which are the foundation of the PII federation and represent the available infrastructure. The testbeds are described in natural language. Each testbed is completely free to use any keywords that best describe the testbed environment.

The following categories are used to structure the description:

- Principal organization operating the Testbed
- Type of organization
- Principal area of activity
- Principal sector of activity
- General description
- Free classification
- Components
- Access networks
- Remote secure access
- Application keywords
- Testing keywords
- Testing resources
- Main standards
- Description of the services offered
- Planned evolution of the technologies used and services offered
- Objectives of the testbed
- Target market
- Unique offering
- Funding model
- Access policies to the testbed
- Intellectual property handling
- Repository of test results

2 PII Testbed Offerings

The following sections describe the testbeds within the different regional innovation clusters of the PII project. Please note that no specific order is given to list the testbeds.

2.1 ArcLabs (Ireland)

Principal organisation operating the Testbed: Waterford Institute of Technology, Telecommunications system and software group (WIT-TSSG)

Type of organisation: Academic institute

Arc Labs [4], hosted at the Waterford Institute of Technology is providing leadership in fostering a research, development and innovation culture from which indigenous enterprises can emerge to create sustainable career opportunities in regionally diverse locations. Arc Labs is a centre of two complementary activities, firstly research through the largest information and communications technology research groups in Ireland the Telecommunications Software & Systems Group (TSSG), which comprises of basic researchers, applied researchers and pre-product developers and secondly a centre for entrepreneurship which supports entrepreneurs involved in knowledge-based start-ups in developing and accelerating their business concept through the South East Enterprise Platform Programme (SEEPP). In this way, Arc Labs co-locates high-end postgraduate research with fledgling businesses.

The test facility is securely and seamlessly integrated with quality of service and mobility management modules, in an open environment which is flexible and accessible from any remote location. Arc Labs enables industry and research organisations, which would otherwise be unable to acquire sufficient hardware and software resources, to realise their business and strategic goals. The centre provides test and validation technologies in the following areas:

- New wireless network technologies
- New Beyond 3G infrastructure components
- New middleware and Beyond 3Gb service platforms
- Innovative hybrid and mobile applications in accordance with different business models

As part of the validation activities at the centre, a human resource component compliments the infrastructure.

End-user groups sourced from the Institute's students are engaged in early product market pilots while collaborations as part of a series of projects include end-user groups from cross-Europe local authorities, citizens plus sporting and entertainment clubs for the purpose of validation activities.

Network infrastructure & connectivity

The ICT infrastructure is maintained and scheduled by a Test Manager and a team of test engineers. The infrastructure is configured based on individual client requirements. Once configured, the client has access to all services with support from on-site engineers as is required.

The infrastructure serves organizations that wish to verify and potentially integrate appropriate prototypes into a fully equipped wireless network that incorporates the end-user dimension. These organizations would typically be SMEs, Start-Ups and Academic institutions.

The centre offers multiple access technologies and end systems: RF Radio, GSM/GPRS, UMTS, WLAN, Bluetooth, IPv4, IPv6 and Mobile IP. For maximum agility in service access and delivery capabilities, dynamic service aggregation, subscription handling, and services provisioning for the architecture, and underlying technologies the testbed uses SIP, OSA Parlay, IMS, SIP AS, AAA, Push-to-talk on top of all the service infrastructure.

Components:

OpenIMS Core: P-CSCF, I-CSCF, S-CSCF, HSS.

Enablers : OCS-X ParlayX Gateway, Presence Enabler, XDMS Database Quality Of Service, Mobility management, MIPL2.0.2 , XEN virtualisation, VMware, NTP Time Servers, SIP server.

Squidbee devices

Embedded Linux CF-booting WiFi access points

Deployment software: Modified CqureAP, Prelude Network IDS, Snort Wireless IDS, Honeyd Virtual Honeypot, Java (Kaffe), Atheros Madwifi Drivers APRS Capable VHF Radio Transmitters, MAP27-Capable SRP9130 VHF Portable Radio Transmitters with GPS receivers, GAISS GUI Software, UbiSense Ultrawideband installation (indoors), dedicated hardware, RFID reader technology (indoors), Semacode visual recognition with camera-phones (indoors and outdoors), Wifi positioning (cell based software evaluation), additional use of deployed hardware technology

Remote secure access: VPN, SSH

Service offerings:

Arc Labs enables industry and research organisations, which would otherwise be unable to acquire sufficient hardware and software resources, to realise their business and strategic goals. The centre provides test and validation technologies for various areas (for example IMS, Security, Mobility, GPS/APRS, network management, location/positioning/sensor network). The centre has a nationally unrivalled mobile communications facility which provides a Living Lab for real and rapid development, prototyping, interoperability, conformance testing and validation of wireless and mobile research. The test facility is securely and seamlessly integrated with quality of service and mobility management modules, in an open environment which is flexible and accessible from any remote location. ArcLabs contains an OpenIMS Testbed which is based on the Fraunhofer Fokus implementation including an IMS core, a Presence, XDMS and OCS-X enablers. There are two testbeds, one externally accessible and one internal. Other related ArcLabs testbeds are listed in the Classifications section.

Classification: IMS testbed, RF Radio GPS/APRS External Positioning Testbed, Mobile Ipv6, mobile communications testbed, Shim6/Ipv6 testbed, IPv6 security testbed, Redundant Positioning Testbed

Application keywords: OpenIMS, IMS, Fokus, HSS, CSCF, Presence, Parlay, XDMS, SIP, AAA, Shim6, MobileIPv6

Testing keywords: Conformance, Functionality, Interoperability, Performance, Other

Testing resources:

Dedicated validation and verification group and dedicated SPI process.

Source control: e.g. cvs, subversion

Build tools: e.g. ant, maven,

NANT Unit testing: e.g. Junit, httpUnit, Cunit

Code analysis: e.g. checkstyle,

Jalopy Test frameworks: e.g. FIT, Extractor, Abott

Code coverage: e.g. Cobertura

Architecture: e.g. Structure 101

Others: Xplanner, Bugzilla, Trac, wiki support, cruisecontrol, TTCN3, network monitoring tools

Main standards: SIP, XCAP, DIAMETER, PARLAYX

Operational information Description of the services offered: Testbed for the use of the IMS ARCS project partners and project development and testing objectives.

Planned evolution of the technologies used and services offered: Due to WIT-TSSG involvement in many new FP7 EU projects, with specific activities in integration, testing and testbed activities this will add to and evolve the offerings of the WIT-TSSG testbed over time, enabling it to provide valuable services.

Objectives of the testbed: The testbed infrastructure serves organizations that wish to verify and potentially integrate appropriate prototypes into a fully equipped wireless network that incorporates the end-user dimension. These organizations would typically be SMEs, Start-Ups and Academic

institutions. IMS Archs testbed will serve as a development and test platform for end user services and service enablers developed using IMS ARCS. Beyond the end of the project, the testbed will allow components to be tested for IMS standards compliance and may be used in other projects where IMS technologies are employed.

Governance model: WIT-TSSG is the owner of the testbed and facilitates access to the testbed.

Target market: SMEs, Start-Ups and Academic institutions.

Unique offering: The test facility is enhanced by means of a human resource component - an end user community willing to participate in application testing. We call these people Testpilots.

Funding model: Project based

Access policies to the testbed: Other

Intellectual property handling: No

Repository of test results: Yes

Access to repository of test results: Restricted

2.2 Open IMS Playground

Principal organisation operating the Testbed: Fraunhofer FOKUS, Next Generation Network Infrastructures CC

Type of organisation: Academic institute

Principal area of activity: Research

Principal sector of activity: Telecommunications

Open testbeds have ever since played a major role for Fraunhofer research activities in terms of result validation and prototype development. The term “Playground” was introduced to hide the complexity of such a laboratory even in its name. The aim is to facilitate the usage of latest technologies in the field of IMS (IP Multimedia Subsystem) and NGN (Next Generation Networks) and to provide an easy and early access, especially for smaller players that enable them to bring their ideas to life.

The Open IMS Playground [2] is:

- OPEN in a sense that it is in a constant process of evolving. It is open to new partners, new components, new technologies, as well as new concepts and paradigms.
- IMS centric. This means that it contains the latest IMS technology, conforms to the latest IMS specifications, and generally reflects the current state of the art in the field of IMS.
- a PLAYGROUND. We see a Playground as a technology focused test environment, where one can "play" around with the latest technology. However, the Open IMS Playground is more than something to toy around with. It is a mature testbed, a test laboratory, where benchmarking, conformance tests and interoperability tests are carried out for our partners, and where components resulting from own development can be deployed and operated. Driven by market needs and our partner’s requirements, the Open IMS Playground has evolved to a known test laboratory which is used in many national and international projects from industry and academia. Around the Playground we offer services such as prototyping, proof-of-concept implementations, benchmarking and consulting. The Playground includes an Open Source Project which focuses on the development of the IMS core network (HSS and CSCFs). Based on this Open Source initiative (OSIMS) we offer the instantiation of a full IMS Playground in other organizations.

Classification: IMS testbed, NGN testbed, 3G testbed, Open Source, SIP, VoIP

Components: P-CSCF, S-CSCF, I-CSCF, HSS, IMS Client, MGW, Media Server, Application Server, AS, SIPSEE, XDMS, Presence Server, GBA, BSF, NAF, OpenSE, ParlayX Gateway

Access networks: WiFi, Ethernet, xDSL, 3G/UMTS

Remote secure access: VPN, IPSec, SSH

Application keywords: SMS, VoIP, Streaming, Conferencing, Call, Internet, Messaging, E-Mail, Presence, QoS, click2dial, IPTV, mashup, Web2.0, SOA, orchestration, service broker, ESP, OpenID, Cardspace, Liberty Alliance, servlets, HTTP, SIP, converged servlets, Web Services

Testing keywords: Conformance, Functionality, Interoperability, Performance, Benchmarking, Measurement, Other

Testing resources: TTCN Simulation Tool, SIP Tools, SIP Nuke, Benchmarking, Network Measurement

Main standards: 3GPP, ETSI, TISPAN, OMA, IEEE

Description of the services offered:

- Prototyping
- Instantiation (duplication) of the Open IMS Playground
- Interconnection of testbeds
- Demo development

- Proof-of-concept implementations
- Benchmarking
- Conformance and Interoperability Testing
- Coaching / Tutorials
- Consulting / Studies
- Comprehensive Testbed Projects

Planned evolution of the technologies used and services offered: towards Web2.0, SOA, Future Internet

Objectives of the testbed: Facilitate the usage of latest technologies and application development in the field of IMS and NGN, SOA, and IPTV. Develop and provide Open Source components.

Target market: Telecommunication Industry, Operators, Application Developers, Integrators, Academia

Unique offering: The Open Source IMS Core (<http://www.openimscore.org/>) was developed here. It is a reference implementation for standardization. The developers and deployed here and can provide first hand know-how.

Fraunhofer is an independent research organization, no vendor lock-in. For most of the components we provide two solutions:

- our own developments for which Open Source licenses are available (Application Server, XDMS, Presence Server, IMS Client, etc.)
- commercial products from our partners

Funding model: Project based

Access policies to the testbed: Negotiated upon demand

Intellectual property handling: NDAs with most of our partners

Repository of test results: No

2.3 IMS TID Labs (Spain)

Name of the principal organisation that operates the Testbed: Telefónica I+D

Type of organisation: Large enterprise

Principal area of activity: Research, Development of new multimedia services.

Principal sector of activity: Telecommunications

Network infrastructure & connectivity

Components: IMS (P-CSCF, S-CSCF, I-CSCF, HSS), MGW, Generic AS, Multiconference platform, RACS subsystem, Presence Server, OMA IM Server (pager mode), Parlay X Gateway (for Presence and 3rd Party Call Control).

Access networks: WiFi, Ethernet, xDSL, 3G/UMTS, GPRS, HSDPA

Remote secure access: No for the moment

Service offerings

Operator like network architecture, from access networks to service plane, based on IMS signalling. It allows deploying IMS multimedia services that mix conferencing capabilities with Presence and IM (pager mode). Parlay X interfaces allow convergence with Web-based applications for Presence and 3rd Party Call, as well as the use of SOA techniques for service development.

Classification: NGN Testbed

Application keywords: Multimedia IP Services

Testing keywords: Conformance, Functionality, Interoperability

Testing resources: TTCN-3 Simulation Tool

Main standards: 3GPP IMS related, OMA Presence, OMA SIMPLE IM

Operational information Description of the services offered: IMS Service Platform with Multi-conference, Presence and IM (pager mode) capabilities. Parlay X interfaces allow convergence with Web-based applications for Presence and 3rd Party Call, as well as the use of SOA techniques for service development. The final service has to be developed by the user.

Planned evolution of the technologies used and services offered: FTTH access, Open Web APIs for Presence, IM and Call Control (based on REST), XDM server, OMA IM Server (session mode and large-message mode)

Objectives of the testbed: TID supported. Experimentation on new multimedia services. Web – Telco convergent services. Research on QoS assurance and policy control. Only expect financial support for resources dedicated to attend PANLAB request.

Governance model: TID internal

Target market: Service developers

Unique offering: Operator like testbed

Funding model: Project based

Access policies to the testbed: Open access

Intellectual property handling: Panlab defined mechanisms

2.4 Beyond-3G Testbed

Principal organisation operating the Testbed: TU Berlin, DAI-Labor, CC Network & Mobility

Type of organisation: University

Principal area of activity: Research

Principal sector of activity: Telecommunications

The Beyond-3G Testbed at TU Berlin's DAI-Labor is a large and complex state-of-the-art testbed which covers a wide range of emerging mobile access technologies, network components and mobile devices and provides environment where various technologies are supported: UMTS/GPRS, Flarion, WiMax, WLAN Hotspot Technology, IPv6/IPv4, RADIUS/DIAMETER, SIP, and QoS Mechanisms. The testbed was built jointly with the support of Cisco, Sun, Deutsche Telekom and other companies and serves research in access technologies such as UMTS/HSPA and IEEE 802.16 (WiMAX). The testbed is also connected to larger national and international infrastructure installations, so that sharing and transfer between different administrative domains can be investigated. Beyond-3G network infrastructure services simultaneously offer wired and wireless access and transfer between technologies of both kinds. Moreover, a carrier-grade PSTN-IP media gateway is available for generating and accommodating large amounts of VoIP and multimedia traffic.

Classification: Next generation network testbed, Heterogeneous access network testbed, Seamless mobility testbed, IPTV testbed, IMS components testbed, IPv6 testbed

Components: IMS: SIP proxy, SIP Abstraction Layer API, SIP User Agent, Open Parlay X, Message Session Relay Protocol API, SIP Media Server, Media Gateway, PSTN breakout, Callmanager. 2.5G/3G networks: SSG (Service Selection Gateway), CAR (Cisco Access Register), SESM (Subscriber Edge Service Management), HLR (Home Location Register) proxy, HLR simulator, ITP. Wifi hotspots: 802.11a/b/g access points, AZR (Access Zone Router), SSG. Flash-OFDM: Base station, Radio router, Flash-OFDM mobile devices, SSG. Mobile IP: Cisco MIPv4 home agent, Cisco MIPv6 home agent, Linux/MIPL based MIPv6 home agent. AAA: RADIUS, DIAMETER. Servers/routers: SPARC and Opteron based application servers, VPN concentrator, Cisco routers, Linux routers Testing: Navtel Interwatch 95000.

Access networks: WiFi, WiMax, Ethernet, 3G/UMTS, GPRS, HSDPA, EDGE **Remote secure access:** VPN, IPSec, SSH

Application keywords: QoS, SIP, VoIP, IPTV, Internet, Presence, AAA, Mobility, IPv6

Testing keywords: Conformance, Functionality, Interoperability, Performance, Benchmarking, Measurement

Testing resources: Navtel Interwatch 95000, Netiq Chariot, SIP stress tester, JTG, Netperf, Iperf

Main standards: 3GPP TS 23.002, 3GPP TS 23.228, 3GPP TS 23.218, 3GPP TS 24.228, 3GPP TS 24.229, RFC 2865, RFC 3220, RFC 3261, RFC 3588, RFC 3775, RFC 3776, IEEE 802.11, IEEE 802.16

Description of the services offered: Seamless mobility reasearch, next generation network infrastructure research through testbed federation.

Planned evolution of the technologies used and services offered: WiMAX, 4G/LTE, UMTS femto cell, increased user involvement

Objectives of the testbed: The objectives of DAI-Labor's Beyond-3G Testbed is to provide a test and development environment for next generation network research activity and a high-tech environment for developers and testers where various technologies are supported: UMTS/GPRS, Flash-OFDM, WiMAX, WLAN Hotspot Technology, IPv6/IPv4, RADIUS/DIAMETER, SIP, and QoS Mechanisms.

Unique offering: Combined platform of all three players; the network operator, service providers, and the users for research and development on different aspects of telecommunications.

Funding model: PPP

Access policies to the testbed: Restricted access

Repository of test results: no

Access to repository of test results: On demand

2.5 Octopus Network

Principal organisation operating the Testbed: Oulu Innovation Ltd. & Oulu University of Applied Sciences

Type of organisation: SME

Principal area of activity: Services

Principal sector of activity: Telecommunications

Octopus is an advanced and genuine testbed in which mobile technology as well as applications and services are researched, developed and tested. Since 2002 Octopus' customers have created tens of new, innovative wireless solutions and services in Octopus environment.

Classification: The core of the Octopus service is a closed operator environment - meant for developing and testing mobile applications - that functions in a nationwide Multi Access network (2G, 3G, WLAN, WiMAX). The testing environment provides Octopus' customers with a competitive advantage, which is further enhanced with comprehensive services. During this "innovation to business" process, Octopus provides its customers with training and business support, too.

Components: IMS, SIP, A-GPS, SMSC, MMSC, WAP, PoC, VoIP, Presence, Messaging, Delivery, Streaming etc.

Access networks: WiFi, WiMax, Ethernet, xDSL, 3G/UMTS, GPRS, HSDPA, EDGE

Remote secure access: VPN, IPSec, SSH

Application keywords: Wireless, Testing, Services, IMS, SIP, SMS, MMS, PoC, VoIP, Video, Streaming, Conferencing, Messaging, Presence, QoS, E2E, Web, Web2.0, SOA, Internet

Testing keywords: Conformance, Functionality, Interoperability, Performance, Benchmarking, Measurement, Other

Testing resources: More than 60 companies and communities are utilizing the Octopus Network. The leading participants are Nokia, Mobile Network Operators like DNA and TeliaSonera, Oulu University of Applied Sciences, Oulu Innovation and the City of Oulu. The group includes also other major technology houses, innovative and agile companies, competent schools and top research units, such as VTT (Technical Research Centre of Finland) and CWC (Centre for Wireless Communications) at the University of Oulu.

Main standards: 3GPP, ETSI, TISPAN, OMA, IEEE

Description of the services offered: IMS-based testbed plus full 2G/3G Mobile Operator Network, Converging Networks Laboratory, Next Generation Network, Network Measurement and Benchmarking tools, Simulators etc. (for both Air Interface and Network side).

Planned evolution of the technologies used and services offered: LTE, Mobile WiMAX, Web2.0, SOA, Future Internet etc.

Objectives of the testbed: Testing will be a globally increasing business area in the future. We want to provide our customers cost effective access to the latest wireless technologies in closed testing environments. We offer especially for SME's and their products a unique possibility to improve quality and gain faster TTM (Time-to-market).

Governance model: Testing services are available from Octopus Network, administration tasks are supplied by Oulu Innovation Ltd.

Target market: Octopus services are available for application developers, device manufacturers and network operators among others. Global access is up and running already.

Unique offering: A real, operator-level IMS infrastructure for third party testers (max. 500 000 subscribers simultaneously)!

Funding model: PPP

Other access policy: Access to Octopus Network is based on customer fees. Annual membership or timely-based services are available now, web-based services will be in use later.

Intellectual property handling: Access to Octopus Network is based on customer fees. Annual membership or timely-based services are available now, web-based services will be in use later. NDA's are signed with our key partners.

Repository of test results: yes

Access to repository of test results: Several options

2.6 Open SOA Telco Playground

Principal organisation operating the Testbed: Fraunhofer FOKUS

Type of organisation: Academic institute

Principal area of activity: Research

Principal sector of activity: Telecommunications

The Open SOA Telco Playground [3] is the north bound extension of the FOKUS Open IMS Playground (see section 2.2) [2] founded in 2004. As the IMS is considered today as the unifying architectural framework for the provision of seamless IP based services on top of converging networks and the south bound foundation for many Service Delivery Platforms (SDPs), the Open SOA Telco Playground provides the possibility to experience a Service Oriented Architecture (SOA) on top of converging networks.

However, this vendor independent playground is not only limited to NGNs, but also supports the provision of services on top of legacy fixed and mobile telecommunication networks as well as the next generation Internet.

The major focal point of the Open SOA Telco Playground is on the provisioning of telecom oriented service capabilities based on state of the art SOA principles to an open set of business domains. This vendor and provider independent technology playground represents an open testbed for research and experiencing and validating the development, orchestration, provisioning, execution, and management of converging NGN and Future Internet applications based on SOA principles. More information can be found at www.opensoaplayground.org.

Classification: NGN testbed, IMS testbed, SOA testbed, Web2.0, Telco

Components: Service Broker, OSS, BSS, Enterprise Service Bus, ESB, Service Registry, Identity Enabler, Identity Management, Web2.0 Enabler, PEEM, SCIM, Policy Enforcement, P-CSCF, S-CSCF, I-CSCF, HSS, IMS Client, MGW, Media Server, Application Server, AS, SIPSEE, XDMS, Presence Server, GBA, BSF, NAF, OpenSE, ParlayX Gateway, Telco gateway, MONSTER, IMS client framework, XPOSER, Service Broker, ANUBIS gate, Telco/Web Bridge

Access networks: WiFi, Ethernet, xDSL, 3G/UMTS

Remote secure access: VPN, IPSec, SSH

Application keywords: SMS, VoIP, Streaming, Conferencing, Call, Internet, Messaging, E-Mail, Presence, QoS, click2dial, IPTV, mashup, Web2.0, SOA, Orchestration, Service Broker, ESP, OpenID, Cardspace, Liberty Alliance, Servlets, HTTP, SIP, Converged Servlets, Web Services, Service Brokering, SOA governance, client framework, network abstraction, user centric identity management, application/network management

Testing keywords: Conformance, Functionality, Interoperability, Performance, Benchmarking, Measurement, Application

Testing resources: Test tools, TTCN Simulation Tool, SIP Tools, SIP Nuke, Benchmarking, Network Measurement, SIPwatch, WSwatch

Main standards: 3GPP, ETSI, TISPAN, OMA, IEEE

Operational information Description of the services offered

- Onsite SOA technology overview tutorials
- System and service concept and design reviews
- Roadmap consulting and feasibility studies
- Proof of concept implementations
- Design and implementation of dedicated SOA Telco components and services
- SOA Telco testbed deployments and interconnections
- Interoperability and benchmark tests of SOA Telco solutions

Planned evolution of the technologies used and services offered: To offer open Internet service environments while keeping the control over the network infrastructure and network capabilities at the operator. Open APIs with policy-based control mechanisms. Enhanced network and (third party) application management. Service provisioning.

Objectives of the testbed: The major focal point of the Open SOA Telco Playground is on the provisioning of telecom oriented service capabilities based on state of the art SOA principles to an open set of business domains. This vendor and provider independent technology playground represents an open testbed for research and experiencing and validating the development, orchestration, provisioning, execution, and management of converging Next Generation Network and Future Internet applications based on SOA principles.

Governance model: Target market: Telecommunication Industry, Operators, Application Developers, Integrators, Academia

Unique offering: This testbed integrates all necessary components for building advanced Web2.0 applications making use of Telco network capabilities. The latest example of this is a Facebook IMS/NGN application offering voice calls, messaging, location, presence, feeds, geo-tags, maps and more to the facebook community. This demo was implemented based on the infrastructure of the Open SOA Telco Playground in less than 6 weeks. We believe that this is unique.

Funding model: Project based

Access policies to the testbed: Negotiated upon demand

Intellectual property handling: We have NDAs with most of our partners.

Repository of test results:

2.7 Spatel Engine Testbed

Principal organisation operating the Testbed: Orange Labs

Type of organisation: Operator

Principal area of activity: Services

Principal sector of activity: Telecommunications

The Spatel Engine Testbed allows modelling, implementing, deploying and testing new services. Services can be of any kind but are typically mobile services, for which there is a client part to be deployed in a phone and a server part realizing the added-value logic that executes in the testbed. It is particularly useful for creating composite services from existing ones.

The Spatel Engine Testbed is a subset of the testbed produced by the IST SPICE project (2006-2008).

Classification: Service Creation Testbed, Telco

Components: Web-based execution and simulation Tool, simplified access to the enablers from Orange Partners (Presence, Messaging), code generator from SPATEL service description, client code generators to Html, Symbian S60 and Alcatel Dynamic Desktop Widgets. Web interface for managing the catalogue of deployed services.

Access networks: HTTP, 3G/UMTS, GPRS.

Remote secure access: Not for the moment

Application keywords: Testing, Services, IMS, SIP, SMS, MMS, Web2.0, SOA, Internet, MDA

Testing keywords: Functionality, Interoperability, Benchmarking

Testing resources: Web-based service execution tool, service description checker and compiler tool.

Main standards: OMA, OMG

Description of the services offered: Catalog of existing services, service generation from service models of service (interfaces, state machine), implementation code for specific components

Planned evolution of the technologies used and services offered: Support of iPhones, android phones.

Objectives of the testbed: Allow quick prototyping of new services that take advantage of telecom enablers offered by an operator and the multiplicity of other services available over the internet (mail, calendars, point of interests and so on).

Governance model: Testing services are available from Spatel Engine Testbed portal, administration tasks are supplied by Orange Labs. The testbed is a research prototype.

Target market: The testbed is available for service designers and developers for Telco or 3rd party service providers companies.

Funding model: Project based

Other access policy: None.

Intellectual property handling: The framework for service composition (Spatel Engine) is open source. Enablers from Orange Partners follow restrictions defined by Orange (see <http://www.orangepartner.com>).

Repository of test results: Execution logs are stored in a temporary location that can be accessed.

Access to repository of test results: Web-based access.

2.8 COSMOTE Testbed (Greece)

Name of the principal organisation operates the Testbed: COSMOTE S.A.

Type of organisation: Large enterprise

Principal area of activity: Services

Principal sector of activity: Telecommunications

Brief description of the testbed: The COSMOTE Testbed, that could be available for integration with PII, includes IMS network architecture, SIP VoIP infrastructure, XMPP server, Streaming Video/Audio servers for experimenting on clients/services interoperability with various service offerings and various available access networks. Open-IMS testbed accessible through various access networks available for further experimentation and interoperability testing with other platform/service and/or client developers is available, as well.

Classification: NGN testbed.

Components: IMS architecture: P-CSCF, S-CSCF, I-CSCF, HSS, Presence AS, PTT AS, MRF provided (only) for user-oriented experimentation;

Open-IMS: P-CSCF, S-CSCF, I-CSCF, HSS;

SIP/VoIP: SIP/VoIP Registrar/Proxy;

XMPP: XMPP server;

Streaming Video/Audio: Streaming Server

Access networks: WiFi, Ethernet, DSL, 3G/UMTS, GPRS, HSDPA/HSUPA, Femtocells

Remote secure access: Not available at the moment

Application keywords: Multimedia IP Services including IMS and SIP/VoIP infrastructure.

Testing keywords: Functionality, Interoperability, Performance

Testing resources: SIP tools, Wireshark

Main standards: 3GPP IMS related, IETF SIP related, OMA XMPP, 3GPP R5/6 for Mobile Access Networks.

Description of the services offered: Usability/functionality experimentation with services/applications offered and interoperability experimentation with open-source resources.

Planned evolution of the technologies used and services offered: Evolution of the technologies and services offered through PII will be decided prior to integration with PII.

Objectives of the testbed: Experiment with IP multimedia services' access through different interconnection networks, interoperability of services/clients, interoperability of components

Governance model: COSMOTE internal

Target market: Application/service developers

Unique offering: Operator testbed, multiple access networks available for experimentation

Funding model: Project based

Access policies to the testbed: Access policy will be decided upon Testbed integration to PII architecture

Intellectual property handling: Access policy will be decided upon Testbed integration to PII architecture and IPRs will be decided upon Testbed integration to PII mechanisms

Repository of test results: No

2.9 NGN & IMS Italtel Labs (Italy)

Name of the principal organisation that operates the Testbed: Italtel

Type of organisation: Large enterprise

Principal area of activity: Research & Development, new products and network solution in the NGN and IMS scenarios.

Principal sector of activity: Telecommunications

Network infrastructure & connectivity

The testing infrastructures currently available are organized and scheduled for internal testing activities. Therefore, they are not open for being accessed from third party for performing testing activities. Nevertheless, the aim is to use from the know-how and the infrastructures in NGN and IMS environments so to individuate a sub-set of testing resources (physical nodes) and testing experts that can be prepared for implementing a separate testbed (at present denominated: Lab-Y testbed). This separate testbed shall be used within the Panlab domain and it is foreseen to perform this activity in the Italtel premises at Carini (Italy) in strict cooperation with the University of Palermo.

The infrastructures below described are the core nucleus of the new project that starts under the Panlab initiative. It is still to be verified how this project tackles the need of internal research activities (cooperative research projects executed by Italtel and partners) and the possibility to provide services to customer external to the company (such as SMEs, Start-Ups and Academic institutions).

Classification: IMS testbed, IMS components, NGN testbed, 3G testbed, Open Source, SIP, PSTN/ISDN testbed.

Components: IMS: P-CSCF, S-CSCF, I-CSCF, BGCF, IBCF, IWF, MGCF, HSS, SLF, DNS/ENUM, CLF, ASF, PS, IM-MGW, Telephony AS for PSTN Emulation and PSTN Simulation, AGCF, IMS-based PES, I-BGF, C-BGF, SGW, RACS, NASS, Telephony API for Web 2.0, MRF, MRFC, MRFP, PCC; NGN: Softswitch, Softswitch-based PES, SIP proxy/registrar, SIP Media Server, Media Gateway, PSTN breakout. Enterprise communication services. 2.5G/3G networks. Wifi hotspots.

Access networks: WiFi, xDSL, Ethernet, Legacy.

Remote secure access: VPN, IPSec, SSH.

Service offerings

Testing facilities shall be made available for different services, applications and network technologies even the main interest and the focused areas should be related to IMS and NGN networks and to NGS. Within these areas we can foresee to provide the following:

- testing and validation of network protocols, network and system architectures with the availability of testing tools such as protocol emulators for conformance testing;
- IMS network solutions and NGS feasibility considering interoperability aspects and so providing an heterogeneous network environment;
- IMS network and system architectures solutions with carrier grade requirements with emphasis on reliability, distributed systems guaranteeing disaster recovery, redundancy, etc.

Services should cover prototype services in order to distribute services that are still at the conceptual stage considering the evolution in voice services, video-telephony, IP television, Fixed Mobile Convergence, security, domotic and including innovative functions such as convergence with Web-based applications for Presence and 3rd Party Call, as well as the use of SOA techniques for service development. etc. These services should be accessed from existing and new kind of terminals (e.g.: video-phones, palmtop, smart-phones) with different access technologies (e.g. WiFi, UMTS, fixed networks) and implemented with different network protocols. Tools offering can be related to the testing activities (protocol emulators, network simulation) and specific testing tools can be developed on demand for covering specific customer requests.

Classification: IMS and NGN Testbed

Application keywords: Multimedia IP Services

Testing keywords: Conformance, Functionality (function, security, volume test), Usability, Reliability, Performance (benchmarking, load test, performance profile), Supportability, Interoperability.

Testing resources: Test management tools, Simulators, measurement tools, etc,

Main standards: ETSI (and specifically TISPAN), 3GPP, OMA, OASIS, W3C, ITU, IETF, etc.

Planned evolution of the technologies used and services offered: FTTH access, Open Web APIs for Presence, IM and Call Control (based on REST), XDM server.

Objectives of the testbed: Experimentation on new multimedia services.

Governance model: Testing services are available from Italtel.

Target market: Service developers

Unique offering: Operator like testbed.

Funding model: Project based

Access policies to the testbed: to be defined.

Unique offering: A real, operator-level IMS infrastructure for third party testers.

Repository of test results: yes

Access policies to the testbed: Access policy will be decided upon Testbed integration to PII architecture

2.10 UoP TestBed (Greece)

Principal organisation operating the Testbed: Electrical Engineering and Computers Technology Department, University of Patras (ECE)

Type of organisation: Academic institute

Principal area of activity: Research and Education

Principal sector of activity: Telecommunications

The testbed provides test and validation technologies in the following areas:

- IMS-based Technologies
- Wireless Network Technologies
- Ethernet Network Technologies

It is used for testing of new protocols and algorithms as well as for educational purposes in the form of lab exercises. It is also used for development of new tools in the context of final year and postgraduate projects.

Access networks: WiFi, Ethernet. There are also plans to be extended with WiMax and 3G

Components: x-CSCF, IP-PBX, Media Application Server

Deployment software: Wide variety of Software SIP phones in Linux and Windows OS.

Remote secure access: VPN, IPSec, SSH

Service offerings:

- Interconnection of testbeds
- Demo development
- Benchmarking
- Conformance and Interoperability Testing

Classification: NGN testbed, IMS testbed

Application keywords: SIP, AAA, Multimedia IP Services, Media Application Server, VoIP, Streaming, Conferencing

Testing keywords: Conformance, Functionality, Interoperability, Performance, Benchmarking, Measurement, Application

Testing resources: SIP tools, Wireshark

Main standards: 3GPP, ETSI, IEEE

Objectives of the testbed: Experimentation on new multimedia VoIP services through different interconnection networks, interoperability of services/clients, interoperability of components.

Governance model: UoP Internal.

Target market: Users for research and development on different aspects of telecommunications.

Funding model: Project based.

Repository of test results: Not currently supported but it can easily be added upon request.

2.11 Im@g'in Lab (France)

Name of the principal organisation that operates the Testbed: Media and Networks Cluster

Type of organisation: Association

The Media & Networks cluster brings together players (SMEs, Start-Ups, Academic institutions and large enterprises) from information, telecommunications and audio-visual technologies, established in Brittany and Pays-de-la-Loire French regions. Jointly, they design the key technologies, products and services that best suit new media networks and uses.

Principal area of activity: Research & Development, new products and network solutions, new services.

Principal sector of activity: Information, telecommunications and audio-visual technologies

Network infrastructure & connectivity

Im@g'in Lab will offer 3 kinds of infrastructures:

- A fixed infrastructure high and very high speed connected to a heart of IMS network technology.
- A broadcasting infrastructure for personal mobile television based on DVB-H, DVB-SH technologies
- A broadband wireless infrastructure based on Wimax and others radio technologies

All these facilities will be interconnected to build a seamless network.

Classification: NGN testbed, IMS testbed, broadband wireless testbed, broadcast testbed

Components: IMS: P-CSCF, S-CSCF, I-CSCF, BGCF, IBCF, IWF, MGCF, HSS, SLF, CLF, ASF, PS,

Access networks: Wimax, FTTH, WiFi, xDSL, DVB-H, DVB-SH, Ethernet.

Remote secure access: VPN, IPSec.

Service offerings

Services for companies and for innovative projects :

- Tests of integration, interoperability
- Recruitment and selection panels users
- Usability testing of new services
- Access to content
- Measuring quality of service

Application keywords: Multimedia IP Services, IMS, WIMAX, DVB-H, DVB-SH, VOIP, Video, Web 2.0, UDI, ...

Testing keywords: Conformance, Functionality, Usability, Reliability, Performance (benchmarking, load test), Supportability, Interoperability.

Testing resources: Test management tools, Simulators, measurement tools, etc,

Main standards: ETSI, TISPAN, OMA, DVB-H, DVB-SH, T-DMB, Mediaflo, IP V6

Planned evolution of the technologies used and services offered: LTE,

Objectives of the testbed: Provide our customers (SMEs, Researchers, Universities, Operators, ...) effective access to the latest fixed and wireless technologies and to panel of end-users; so that they can improve the quality of their products and services, and the time to market delay

Governance model: To be defined

Target market: Service developers, network operators, device manufacturers, especially SMEs

Unique offering: Operator like regional testbed offering three different technologies.

Funding model: Project based

Access policies to the testbed: to be defined.

Repository of test results: yes

Access policies to the testbed: Access policy will be decided upon Testbed integration to PII architecture

References

- [1] PII project website, <http://www.panlab.net>
- [2] Open IMS Playground website, www.open-ims.org/
- [3] Open SOA Telco Playground website, www.opensoapplayground.org
- [4] ArcLabs website, <http://www.arclabs.ie/>
- [5] Panlab testbed repository, <http://www.panlab.net/repository>