

Competence Center NGNI Fraunhofer FOKUS

Euroview 2009, Würzburg, Germany, July 27, 2009

Special Session:
Experimentally-driven research taking a holistic view of the future internet: European perspectives

FIRE FACILITY INFRASTRUCTURE PROVISIONING *PII - A CROSS-LAYER AND CROSS-DOMAIN APPROACH*


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FOKUS / TUB are participating in major NGN and FI Testbed Initiatives




- Deep-G Project
- Work on FI Security

→ www.german-lab.de



- Open FI Testbed
- Work on FI Security, Monitoring, Service Composition, Federation


→ www.fokus.fraunhofer.de/go/fi-lab.de




FIREWORKS

- Fireworks Expert Meetings
- Official multiplier
- Several workshops

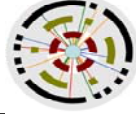
→ www.ict-fireworks.eu






- MAMS and MAMSpus
- Open Environment

→ www.mams-platform.net





- Beta-Plattform
- Research Cluster

→ www.beta-plattform.de




- Lead in Teagle development
- Testbed management

→ www.panlab.net

- Development of AC testbed

→ www.onelab.eu



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The Federation Challenge: Different Testbed Scopes

- Innovative multimedia applications
 - eHealth, eGovernment, e/mCommerce, interactive TV, web 2.0, telco2.0, etc.
- Service delivery platforms
 - IP Multimedia System, P2P systems, broadcasting systems, etc.
- Network technologies
 - 3G beyond, Wimax, LTE, Fixed Broadband, etc.
- Sometimes also beta test user communities
- Sometimes mixture of all above domains

The diagram shows three overlapping circles. The top circle is labeled 'Scope 1' and contains the word 'Application'. The middle circle is labeled 'Scope 2' and contains the words 'Service Platform'. The bottom circle is labeled 'Scope 3' and contains the word 'Network'. The circles overlap in various combinations, illustrating the intersection of different testbed scopes.

➔ **Technology specific vs. cross technology testbed federation**

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Testbed and Experimental Facility Federation

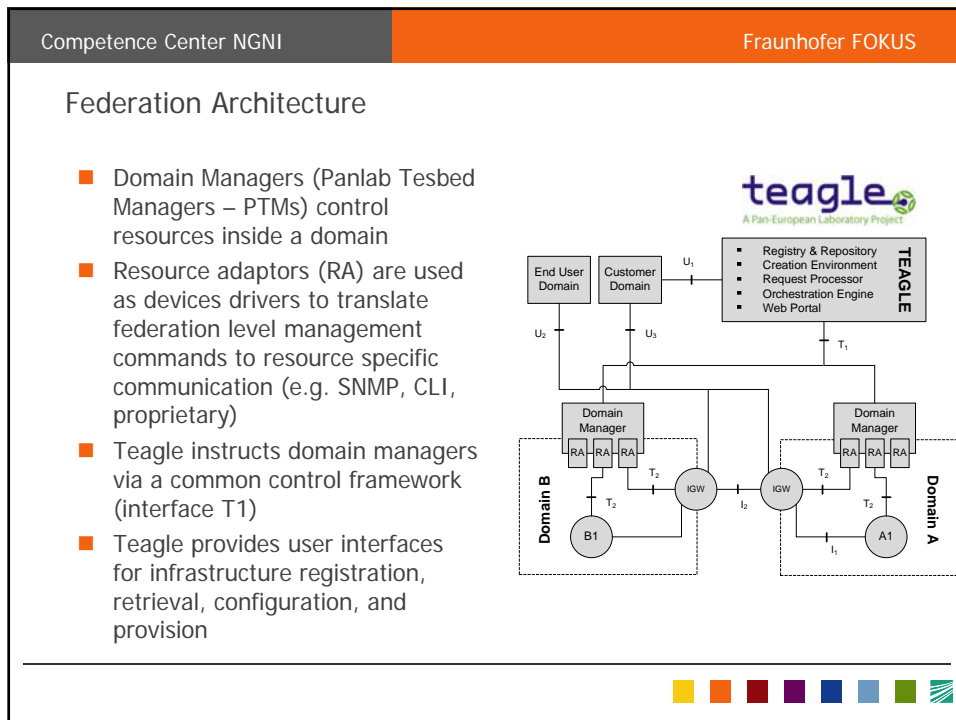
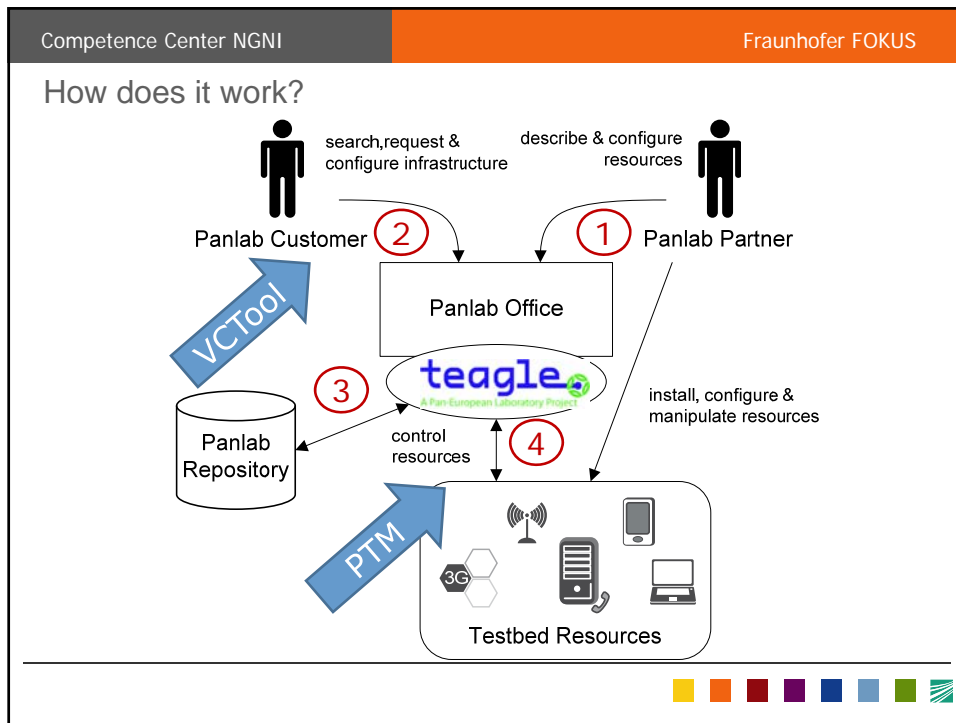
- Heterogeneous resources are offered by several network domains
- Domains engage in federation and share resources
- Federation Organization represents the federation to 3rd parties
- A federation control tool called *Teagle* executes management operations via a control framework
- This is needed to support broad Future Internet research
 - Re-use resources across the boundaries of domains and communities instead of re-building infrastructure
 - Infrastructure as a Service (IaaS)

Virtual Customer Testbed (VCT) View

The diagram shows a 'Federation Organization' box containing a 'Search & Match SOA Service Composition' process with nodes A, B, C, and D. Below this is an oval labeled 'teagle Federation Control'. Arrows point from the teagle control to four separate 'Testbed' boxes. Each testbed contains a subset of the nodes A, B, C, and D, illustrating how resources are shared across different federated testbeds.

Different Federated Testbeds

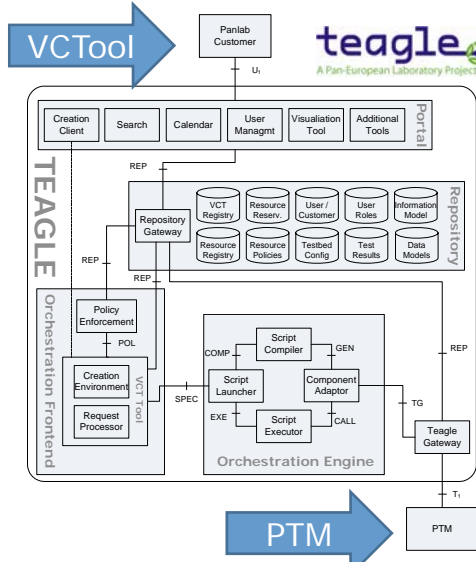
■ <http://www.panlab.net>




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TEAGLE Design

- Teagle provides
 - A portal for customer interaction
 - An orchestration frontend for Virtual Customer Testbed (VCT) design
 - An orchestration Engine for resolving dependencies and building an executable deployment script
 - A registry and repository as database for resource descriptions, VCT configurations, result storage, etc.
- **VCT is a set of resources (from arbitrary domains) booked for a specific user**



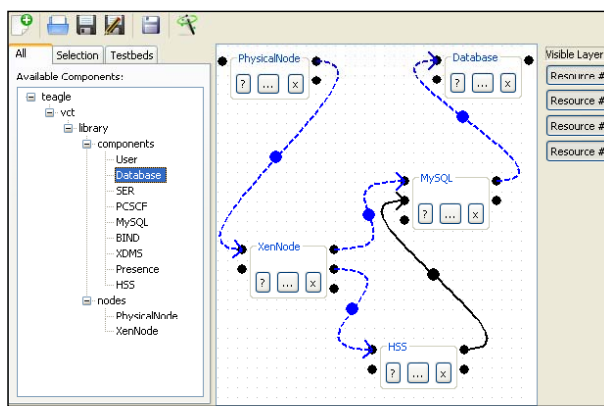
The diagram illustrates the TEAGLE architecture. At the top, a 'Panlab Customer' (U_i) interacts with a 'teagle' portal. The portal includes modules for Creation Client, Search, Calendar, User Managment, Visualisation Tool, and Additional Tools. Below the portal is the 'Repository', which contains various registries: VCT Registry, Resource Reserv., User / Customer, User Roles, Information Model, Resource Registry, Resource Policies, Testbed Config, Test Results, and Data Models. The 'Orchestration Frontend' (VCT Tool) includes Policy Enforcement (POL), Creation Environment, and Request Processor. The 'Orchestration Engine' consists of a Script Compiler (COMP), Script Launcher (EXE), Script Executor, and Component Adaptor (CALL). A 'Teagle Gateway' (TG) connects the engine to a 'PTM' (Physical Testbed Manager) via a T_i interface. A large blue arrow labeled 'VCTool' points to the top, and another labeled 'PTM' points to the bottom right.




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VCT design using the VCTtool

- Search for available resources
- Receive detailed information on offered resources
- Receive contact information for expert help and consulting
- Reserve physical nodes
- Deploy Virtual Machines
- Deploy software resources (e.g. MySQL, HSS) on physical or virtual nodes
- Configure resources for specific setups or use standard templates



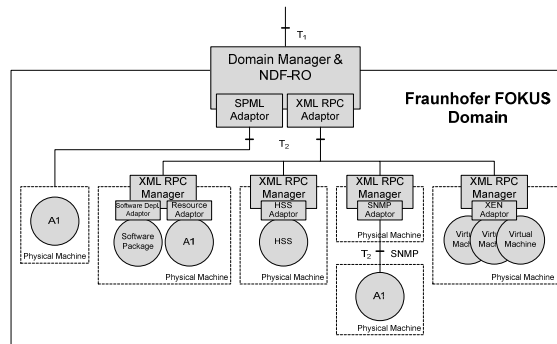
The screenshot shows the VCTtool interface. On the left, a tree view shows 'Available Components' under 'teagle' and 'vct', including 'library' (User, Database, SER, PCSCF, MySQL, BIND, XDMS, Presence, HSS) and 'nodes' (PhysicalNode, XenNode). The main workspace shows a graphical design of a testbed with nodes like 'PhysicalNode', 'Database', 'MySQL', 'XenNode', and 'HSS' connected by dashed lines. A 'Visible Layers' panel on the right shows 'Resource #1', 'Resource #2', and 'Resource #3'.





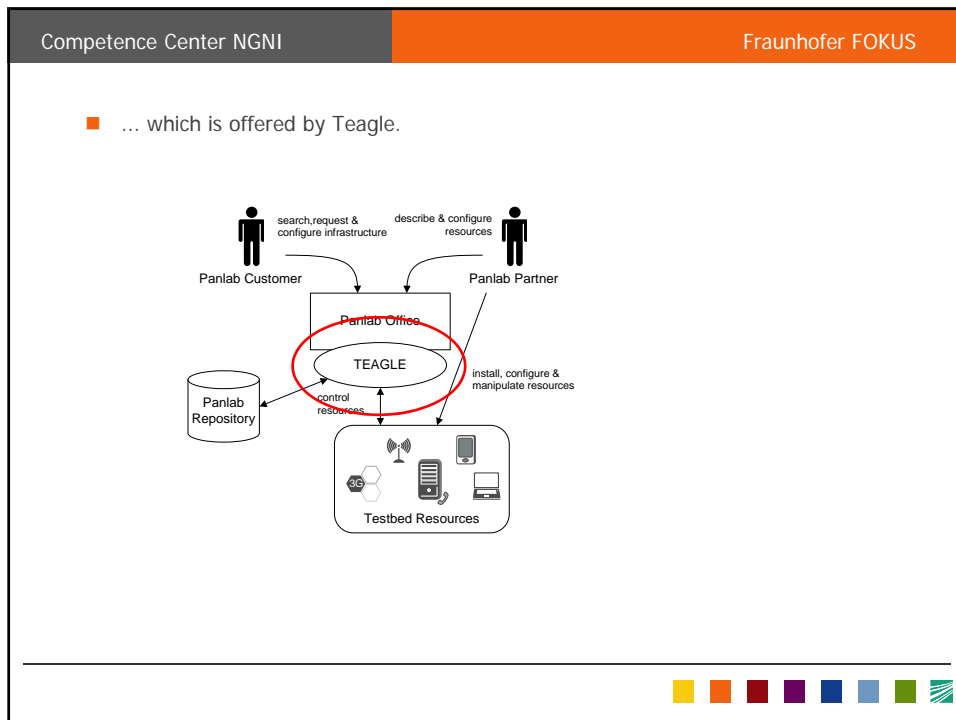
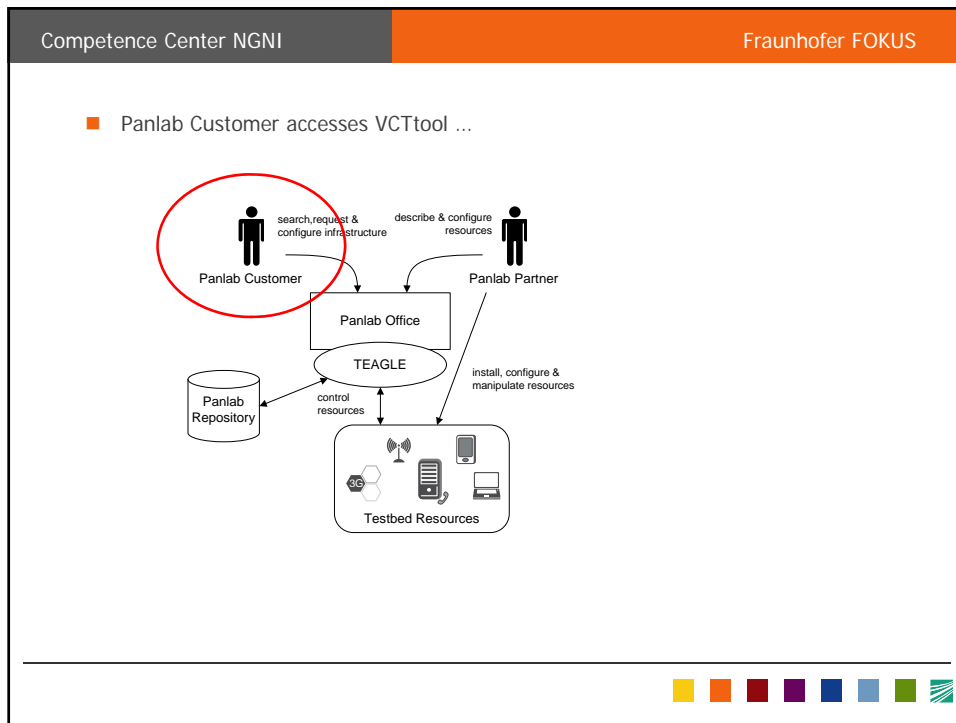
Domain Manager (= Panlab Testbed Manager – PTM)

- Deployment of virtual machines with public IP
- Support for various resources, for example:
 - BIND DNS server
 - MySQL Server
 - Mailserver
 - Postfix/Courier IMAP
 - Apache webserver
- Support for NGN related software resources such as XDMS, HSS, etc.
- Proprietary XML-RPC provisioning schema & support for SPML

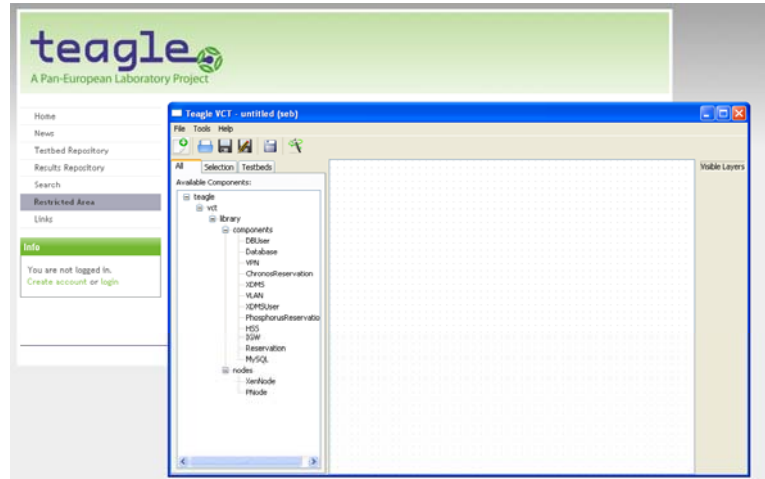


How does it work?

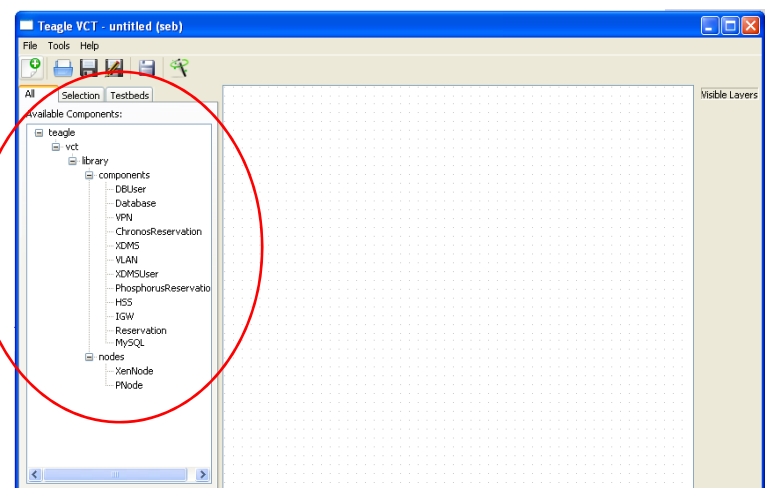




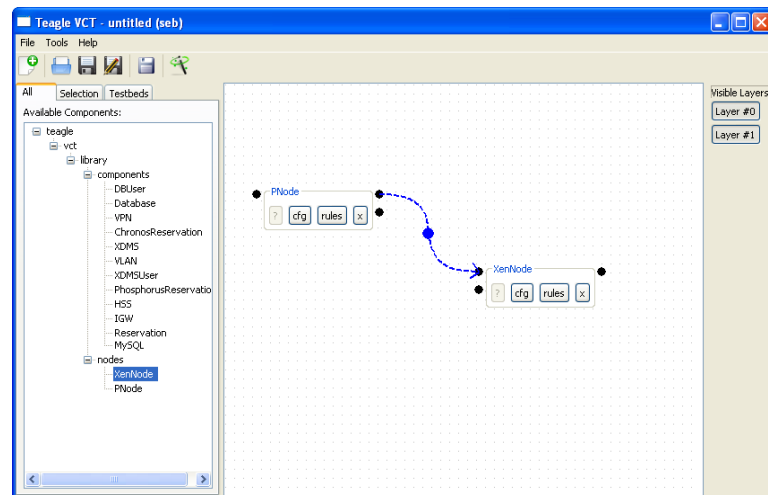
- This looks like this:



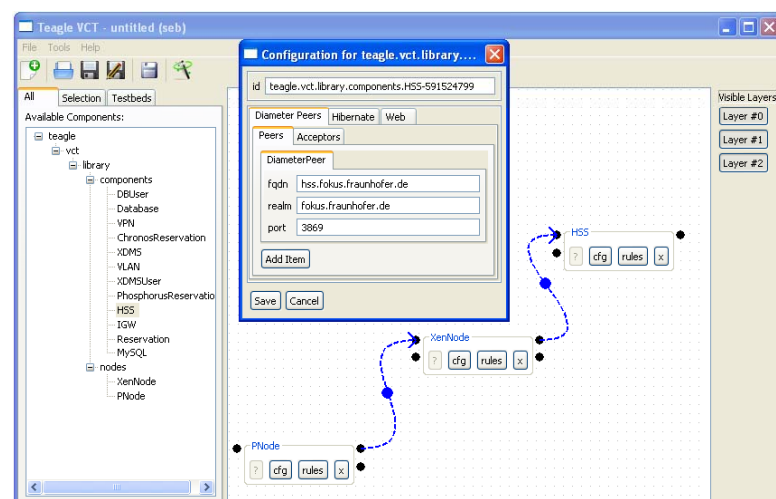
- On the left we see resources offered by Panlab Partners



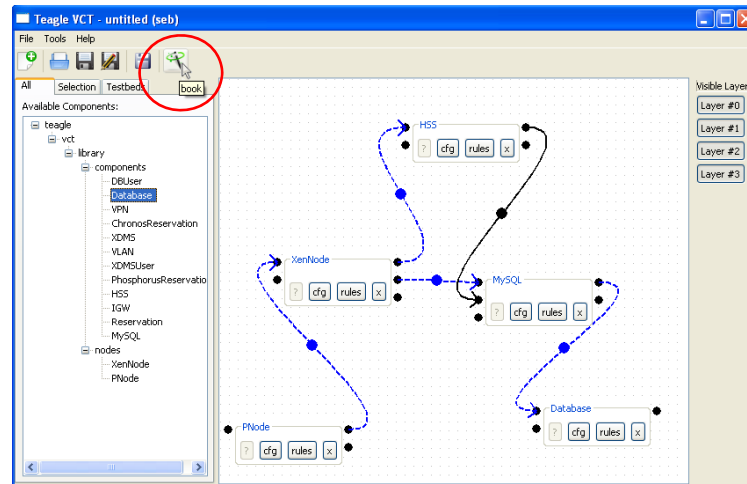
- The customer selects resources and adds them to the VCT design workbench ...



- The customer can configure resources ...



- Once the desired VCT has been designed and configured, the customer is ready to book it!



- Upon booking a XML document is generated ...

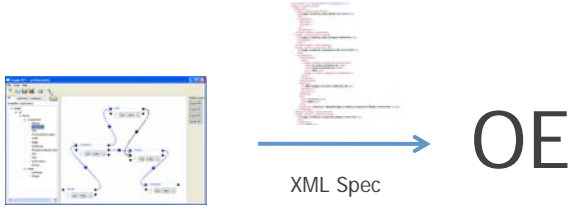
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              <port>3809</port>
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        </hibernate>
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    </teagle.vct.library.components.MySQL>
  </components>
</teagle.vct.model.Testbed>


```

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- ... and passed to the Orchestration Engine (OE).



The diagram illustrates the process of passing an XML specification to the Orchestration Engine (OE). On the left, there is a screenshot of a workflow editor showing a complex flow of tasks and connections. An arrow labeled 'XML Spec' points from this editor to the text 'OE' on the right. Above the arrow, there is a small icon representing a document with lines of code or text, indicating the XML specification being generated or processed.



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- The Orchestration Engine is looking like this:

Service index - Mozilla Firefox


http://mdasoa.elbel.tm.fr/spatelrunner/cgi-bin/clientMyRD.py?step=welcome&siteid=teagle

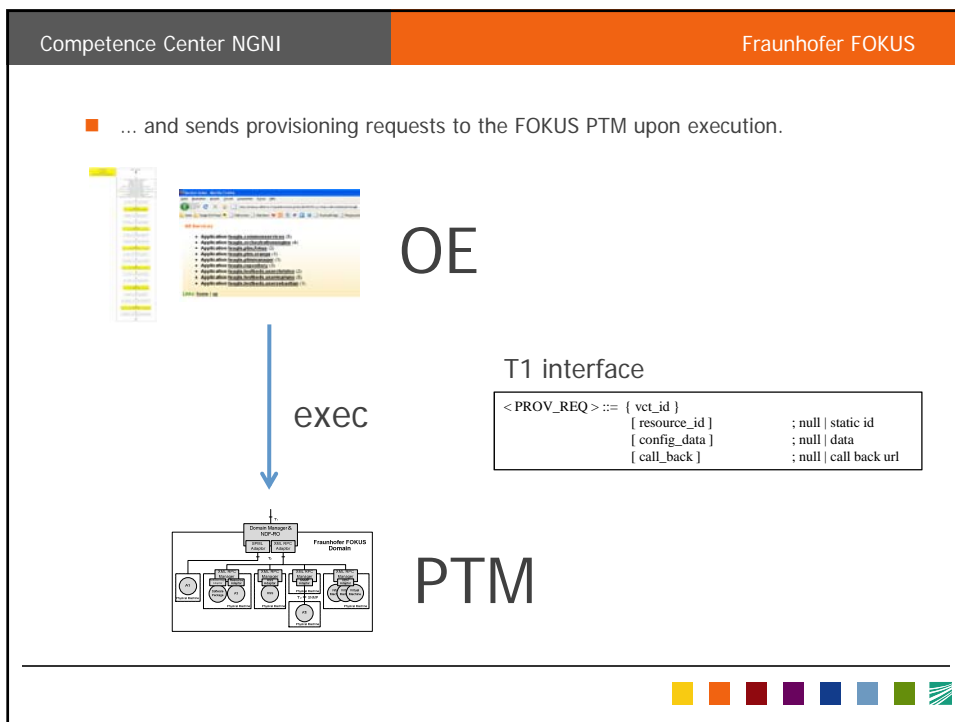
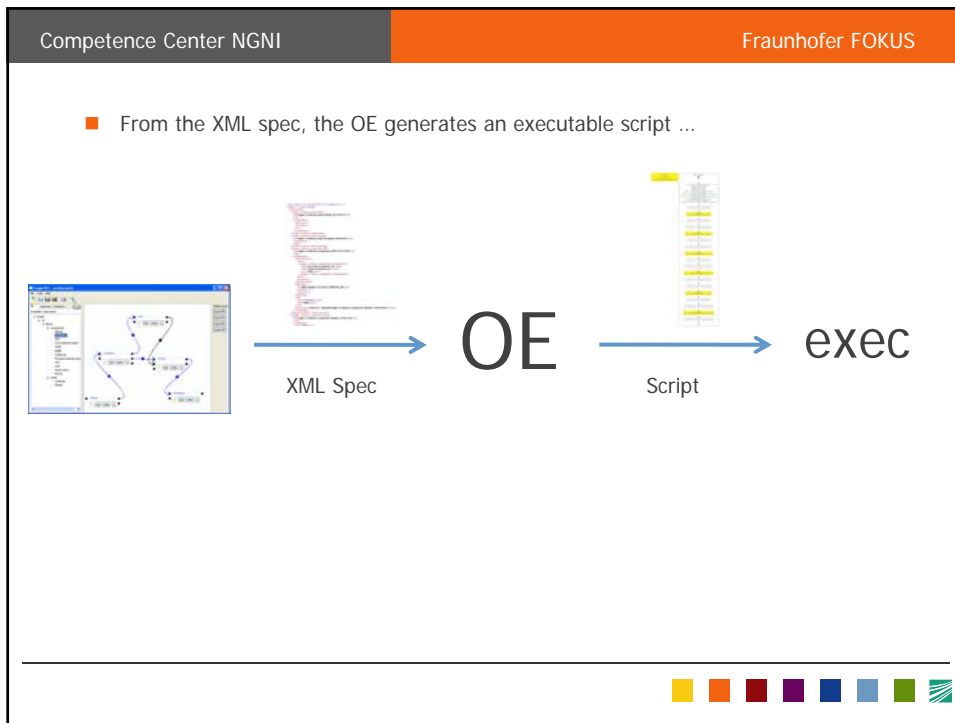
heise Teagle RSS Feed Mail extern Mail intern Druckaufträge Playground

All Services

- Application [teagle.commonservices](#) (5)
- Application [teagle.orchestrationengine](#) (4)
- Application [teagle.ptm.fokus](#) (3)
- Application [teagle.ptm.orange](#) (1)
- Application [teagle.ptmmanager](#) (1)
- Application [teagle.repository](#) (3)
- Application [teagle.testbeds.userchristos](#) (2)
- Application [teagle.testbeds.usermariano](#) (5)
- Application [teagle.testbeds.usersebastian](#) (1)

Links: [home](#) | [up](#)





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- The FOKUS PTM deploys and configures the requested resources.

T2 interface inside the FOKUS domain

Physical Node Virtual Nodes Software Resources


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- Distributed deployment

OE

PTM PTM PTM

A1 B1 B2 C1 C2 C3

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<p>Please mark your Calendar</p> <p>TridentCom 2010</p> <p>The 6th International Conference on Testbeds and Research Infrastructures for the Development of Networks & Communities</p> <p>18-20 May 2010, Berlin, Germany</p>											
Sponsored by:		Technically co-sponsored and supported by:									
		    									
		   									
<p>Important Dates</p> <table> <tr> <td>Papers due:</td> <td>30 October 2009</td> </tr> <tr> <td>Demo and workshop proposals due:</td> <td>27 November 2009</td> </tr> <tr> <td>Notification of paper acceptance:</td> <td>15 January 2010</td> </tr> <tr> <td>Submission of camera-ready papers:</td> <td>15 February 2010</td> </tr> </table> <p><i>More details can be found at: www.tridentcom.org</i></p>				Papers due:	30 October 2009	Demo and workshop proposals due:	27 November 2009	Notification of paper acceptance:	15 January 2010	Submission of camera-ready papers:	15 February 2010
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<p>Questions ???</p>			
			

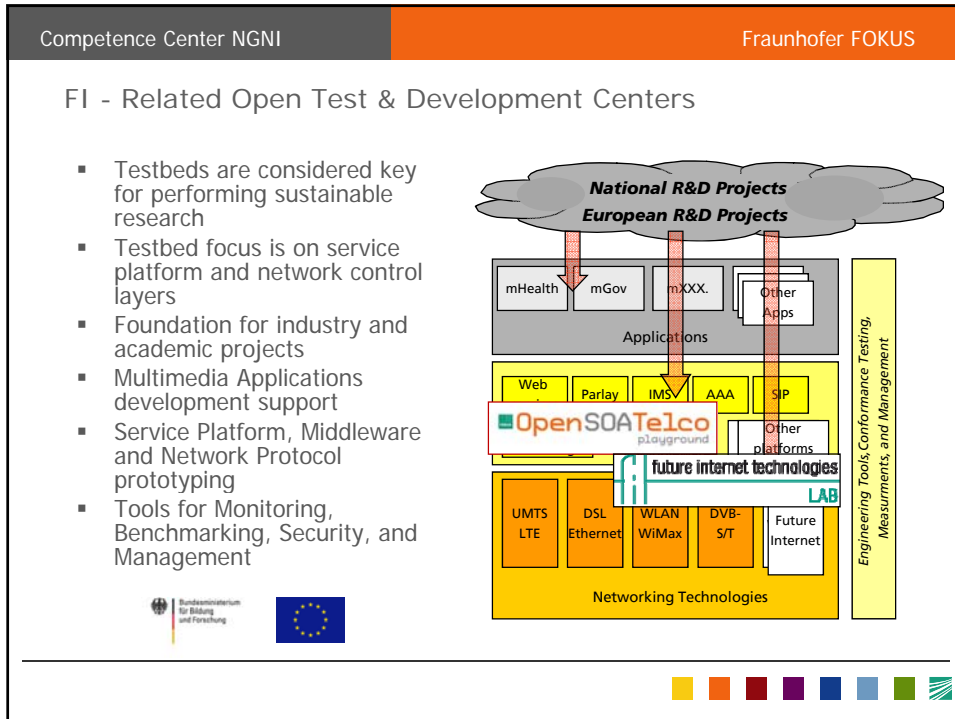
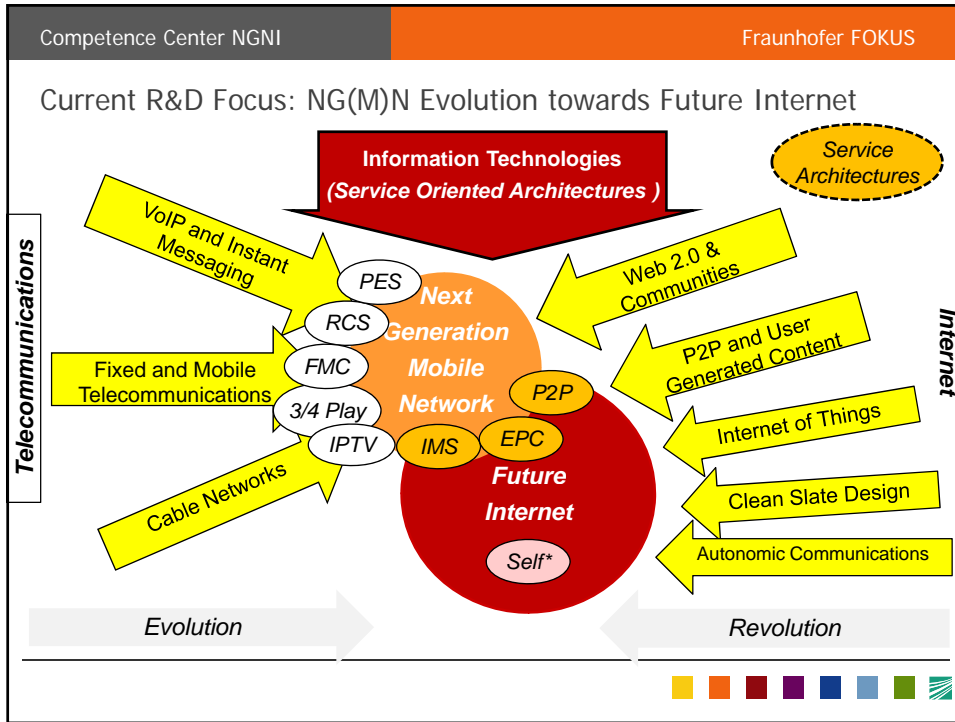
Related Publications

- Konrad Campowsky, Anastasius Gavras, Bogdan Harjoc, Thomas Magedanz, and Sebastian Wahle. Pan-European Testbed and Experimental Facility Federation – Architecture Refinement and Implementation. *Inderscience International Journal of Communication Networks and Distributed Systems (IJCNDS)*, Special Issue: Recent Advances in Test-bed Driven Networking Research. Accepted for publication in 2009.
- Thomas Magedanz and Sebastian Wahle. Control Framework Design for Future Internet Testbeds. *e & i Elektrotechnik und Informationstechnik*, 07/08, August 2009. ISSN: 0932-383X (print) ISSN: 1613-7620 (online), accepted for publication in 2009 (August).
- Thomas Magedanz, Florian Schreiner, and Sebastian Wahle. Service-Oriented Testbed Infrastructures and Cross-Domain Federation for Future Internet Research. In *2009 IFIP/IEEE International Symposium on Integrated Network Management Proceedings*, New York, USA, June 2009. IEEE.
- Anastasius Gavras, Halid Hrasnica, Sebastian Wahle, David Lozano, Denis Mischler, and Spyros Denazis. *Towards the Future Internet - A European Research Perspective*, chapter Control of Resources in Pan-European Testbed Federation, pages 67 - 78. IOS Press, May 2009. ISBN 978-1-60750-007-0.
- Sebastian Wahle, Thomas Magedanz, Anastasius Gavras, Halid Hrasnica, and Spyros Denazis. Technical Infrastructure for a Pan-European Federation of Testbeds. In *Testbeds and Research Infrastructures for the Development of Networks & Communities and Workshops, 2009. TridentCom 2009. 5th International Conference on*, pages 1-8, Washington DC, USA, April 2009. IEEE. ISBN: 978-1-4244-2846-5.
- Sebastian Wahle, Anastasius Gavras, Fabricio Gouveia, Halid Hrasnica, and Thomas Magedanz. Network Domain Federation - Infrastructure for Federated Testbeds. In *2008 NEM Summit - Towards Future Media Internet*, pages 179 - 184, Saint-Malo, France, October 2008. Eurescom GmbH. ISBN 978-3-00-025978-4.
- Sebastian Wahle and Thomas Magedanz. Network Domain Federation - An Architectural View on How to Federate Testbeds. In *Fireworks Strategy Workshop - Position Statements*, Paris, France, September 2008.
- Florian Schreiner, Sebastian Wahle, Niklas Blum, and Thomas Magedanz. Modular Exposure of Next Generation Network Services to Enterprises and Testbed Federations. In *Second International Conference on Communications and Electronics (HUT-ICCE 2008)*, pages 98 - 103, Hoi An, Vietnam, June 2008. IEEE. ISBN: 978-1-4244-2425-2.
- Sebastian Wahle, Niklas Blum, and Thomas Magedanz. Evolution of the Open IMS Playground - Open Next Generation Network Testbeds in Face of Service Oriented Architectures, Web2.0 and European Testbed Federations. In *Mobilitfunk - Technologien und Anwendungen, ITG-Fachbericht 208*, pages 49 - 54. VDE VERLAG GmbH, May 2008. ISBN: 978-3-8007-3104-6, ISSN: 0932-6022.
- Thomas Magedanz, Florian Schreiner, and Sebastian Wahle. From NGN to Future Internet Testbed Management - Collaborative Testbeds as Enabler for Cross-Technology, Cross-Layer, and Cross-Domain Communication and Network Research. *Tele Kommunikation Aktuell*, 62(5-6):20-40, 2008. ISSN 1619-2036.




Background Slides







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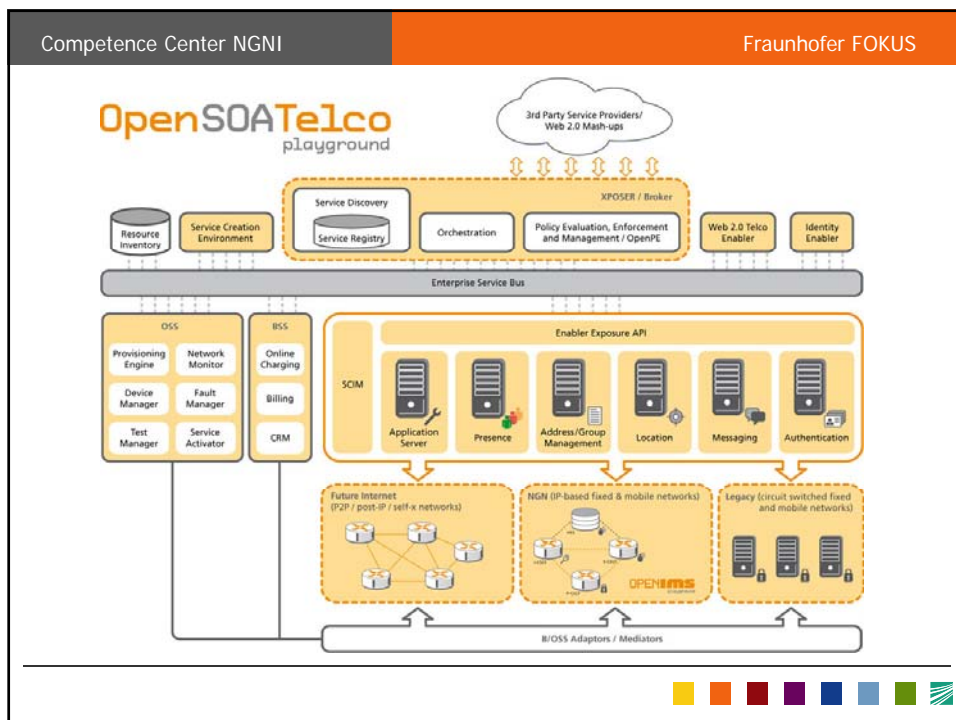
FI - Related Testbeds





- Since 2007 the FOKUS Open SOA Telco Playground enables R&D at the application layer of legacy, NGN and FI networks
 - www.opensoaplayground.org
 - Extends the R&D activities above the Open IMS playground in regard to Telco/Web 2.0 convergence, SOA SDPs, open service APIs, emerging OMA service enablers and Web 2.0 APIs, service brokering
 - Fokus is on service creation, provision, brokering, monitoring, and management
- Since 2006 the FOKUS Future Internet Lab investigates future internet principles and technologies
 - www.fokus.fraunhofer.de/go/fi-lab
 - R&D activities center around autonomic communications, self management, monitoring, security, service composition







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Major Activities within the Future Internet Lab


- Participation in Major BMBF and EU Projects
 - BMBF G-Lab, PII, Onelab2, Vital++ ,
- Focal points of research
 - Evolution from NGN toward Future Internet
 - Service composition and Brokering above Future Internet Infrastructures
 - Future Internet Testbed Federation (→ Teagle)
 - Peer to Peer Service Architectures (and integration with NGN)
 - NGMN Evolved Packet Core Introduction and Evolution



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the Future Internet – Towards Rich
Communications and Interactive Media

Berlin, November 11–12, 2009



Featuring:

- Four tutorials and interactive Workshops on Day 1 related to Rich Communications, Rich Media, Future Internet, and Next Generation Mobile Networks
- Social evening event for Networking
- Full day NGN2FI Conference on Day 2
- Many Operator Talks and Vendor Expo
- FOKUS Playground Visits and Technology Demonstrations

More than 290 people from
29 nations attended last
years event

www.fokus.fraunhofer.de/go/ims-event/

