

# *The FOKUS Home Subscriber Server as part of the*



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**Internet: [www.open-ims.org/core](http://www.open-ims.org/core)**

# *Agenda*

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- **The Open IMS Core project**
  
- **Components**
  - **The Call Session Control Functions**
  - **The FOKUS Home Subscriber Server**
  
- **The FOKUS Open IMS Playground**

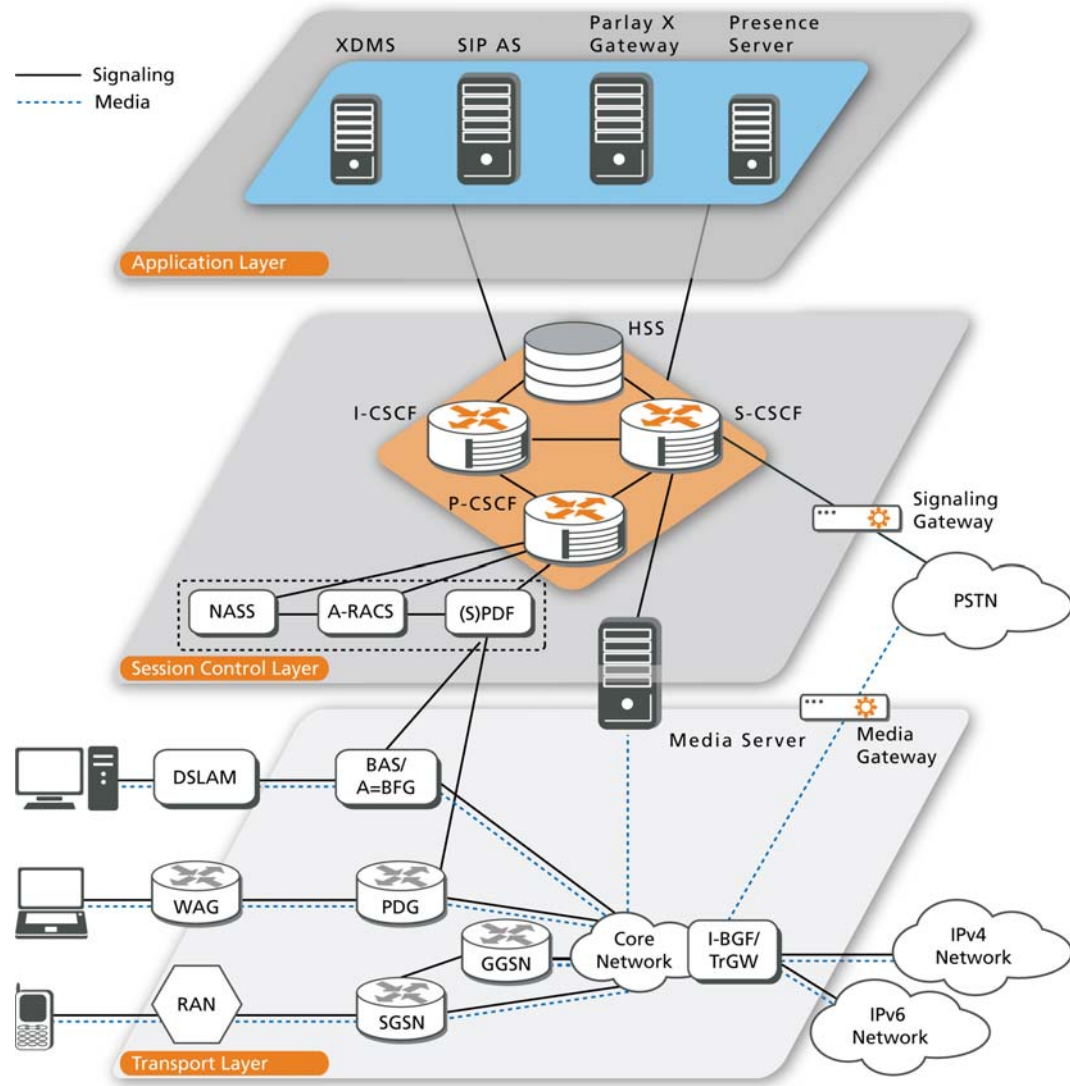
# Fraunhofer Institute FOKUS - Overview

- established 1988 in Berlin (HMI -> GMD -> FhG)
- **220 employees**: scientists, technicians, students, plus some administrative staff
- FOKUS is doing applied research in the field of convergence; **80% of revenues from industry projects**, 20% government funding
- FOKUS is developing concepts, prototypes based on own technology testbeds – Motto is **Demo or Die!**
- Strategic partnerships are key; FOKUS is known as competent independent technology partner
- international cooperations / strategic partners in industry, research and governmental environments
- **cooperation with Technical University Berlin** guarantees flow of talented human resources: 3 Chairs at TU-Berlin: OKS, AV, ETS



# NGN Layers

- **Clear interfaces in between the layers**
- **IMS components in the center**
- **Re-usable service provisioning infrastructure**
- **Support for charging (not depicted here)**
- **QoS enforcement possible (if the access network supports it)**



# Project Launch @ the 2<sup>nd</sup> FOKUS IMS Workshop

Fraunhofer FOKUS invites

[www.fokus.fraunhofer.de/event/ims](http://www.fokus.fraunhofer.de/event/ims)

## 2<sup>nd</sup> FOKUS IMS Workshop

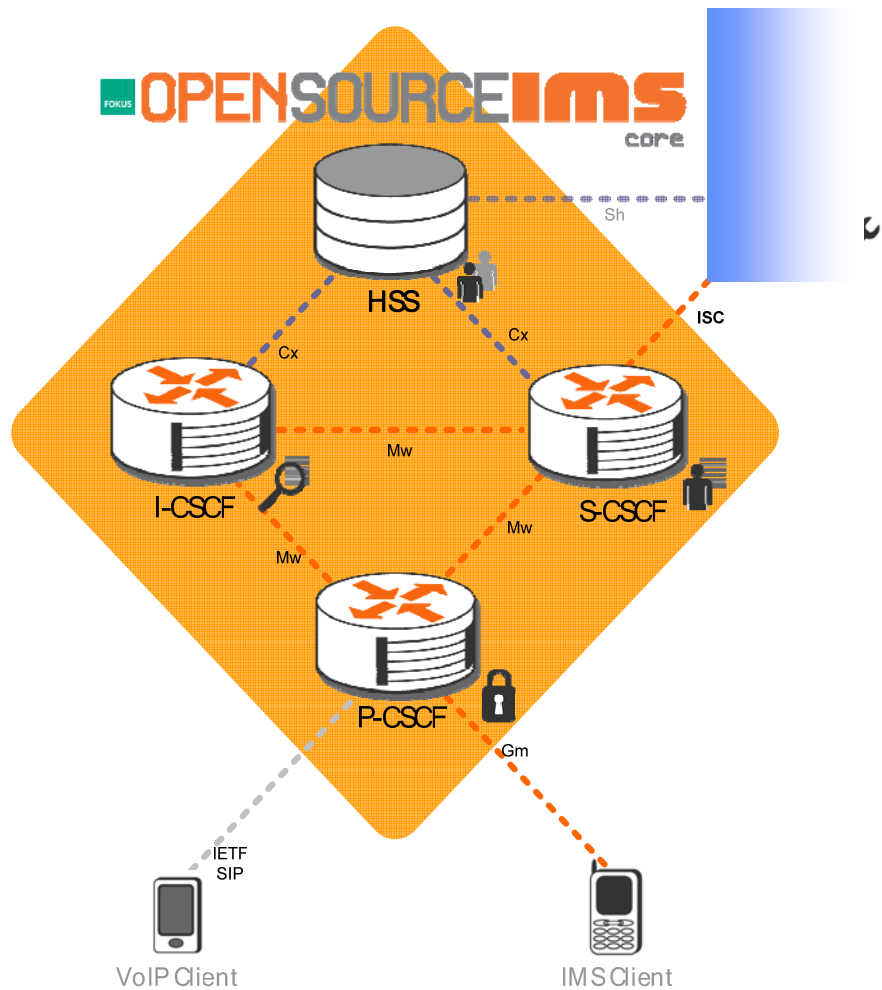
From FMC towards Triple Play and NGN

Berlin, November 16–17, 2006

*16 Sponsors supported the event.  
More than 260 delegates from 29 nations spanning four continents attended the event!  
Obtain the workshop summary and audio podcast from our website  
Tutorials & Presentations are available on request!*

**More details at: [www.fokus.fraunhofer.de/event/ims](http://www.fokus.fraunhofer.de/event/ims)**

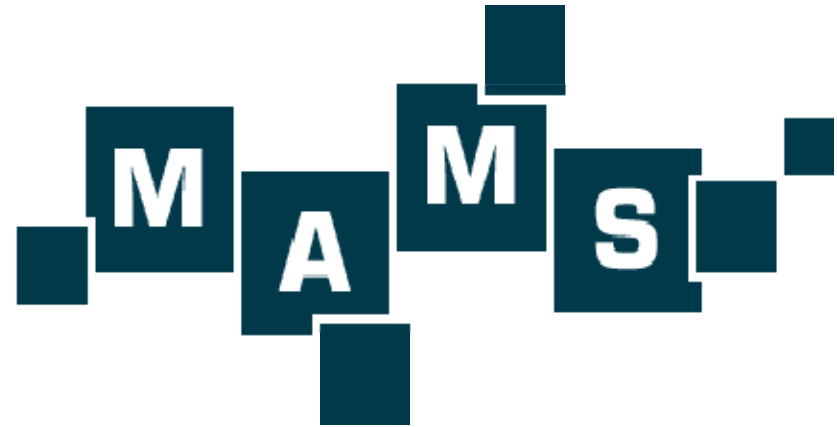
# OSIMS – Components & Licensing



- a Home Subscriber Server
  - GNU General Public License v.2
- 3GPP compliant IMS Call Session Control Functions (CSCFs)
  - Proxy-CSCF
  - Interrogating-CSCF
  - Serving-CSCF
  - GNU General Public License v.2

# *OSIMS has been developed within the MAMS Project*

- **BMBF R&D Project MAMS = Multi-Access, Modular-Services Framework**
- **Consortium:**
  - DTAG Laboratories
  - Infineon
  - Alcatel SEL
  - TU Berlin, DAI Labor
  - TU Berlin, Lehrstuhl für Marketing
  - FhG Fokus
  - FhG SIT
  - FhG First
- **Kick-off: March 2006, Duration: 18 months**
- **Resources: ~70 MYs**
- **Details can be found at**  
<http://www.mams-platform.de>



Bundesministerium  
für Bildung  
und Forschung

## *the Base of the OSIMS CSCFs*

- Each CSCF implemented as a SER module
- SER = SIP Express Router
  - a high-performance, carrier-grade, open source, configurable SIP server written in C
  - ported to Linux (PC, iPaq) and Solaris (Sun)
  - throughput thousands of CPS (calls per second) on a dual-CPU PC (capacity needed to cover San Francisco's Bay Area) and hundreds of CPS on Compaq iPaq
  - support for both IPv4 and IPv6
  - small footprint size: 300k core, all common modules around 600k
  - extended flexibility through script-like configuration

- Usage example:
  - Excerpt from the Proxy-CSCF configuration file
  - steps are applied in order in the routing script:

```
if (method=="INVITE" || method=="SUBSCRIBE" ||
method=="MESSAGE") {
    if (!P_is_registered("open-ims.org")){
        sip_send_reply("403", "Forbidden - You must
register first");
        break;
    }
    P_add_P_Charging_Vector();
    P_add_P_Visited_Network_ID("Visited Network Number
1");
}
```



## Beyond SER - The FOKUS **OPEN** SOURCE IMS Core

- The Open IMS Core (OSIMS) is constantly being developed and was already successfully tested with commercial IMS products.



- provides first time implementations of open IMS core components
- offers an Open Source IMS platform to make use of the ISC interface
- can act as a tool for IMS services proof-of-concept
- allows to test alpha/beta versions of commercial IMS products
- **does not intend to compete with carrier grade developments but wants to create an Open IMS community and to accelerates IMS adoption**
- ***This software is meant for establishing IMS testbeds only, not for implementing commercial IMS systems !***

# Check it out (literally) – [www.openimscore.org](http://www.openimscore.org)

- Lists all details on
  - SVN checkout
  - Installation
  - Configuration
- Provides
  - FAQ section
  - Project Wiki
  - Mailinglists
  - Feature tracking
  - Open Source IMS landscape
  - ...

The screenshot shows the Open Source IMS Core website. The browser address bar displays 'http://www.openimscore.org/'. The website header includes the FOKUS logo and the text 'OPENSOURCEIMS core'. A navigation menu contains 'Home', 'Mailing Lists', 'Sources', 'Documentation', and 'Development'. The main content area features a 'Section' sidebar with links like 'Home', 'Welcome', 'IMS Open Source Landscape', 'Mailing-Lists', 'Subscribe', 'Users', 'CSCF', 'HSS', 'Archives', 'Source Code', 'SVN', 'Snapshots', 'Documentation', 'Index', 'FAQ', 'Installation-Guide', 'Development', 'Report a bug', 'Request a feature', 'Wiki', and 'Index'. The main content area says 'Welcome to Open IMS Core' and lists links for 'Welcome to Open IMS Core's Homepage', 'Mandatory disclaimer, before any usage', and 'General Public License v2'. Below this is a blue banner with the text 'Welcome to Open IMS Core's Homepage'. The text 'So you have found us! Good!' is followed by 'If you are here, you could also be interested in one of the following pages:' and links to 'The Open IMS @ FOKUS Playground' and 'A short overview of the Open IMS Core Components'. A network diagram illustrates the IMS architecture with components: HSS, I-CSCF, S-CSCF, P-CSCF, SIP2IMS GW, VoIP Client, and IMS Client. The diagram shows connections between these components, including 'Cx' (Control Plane) and 'Mw' (Media Plane) interfaces. A 'SIP AS' (SIP Application Server) is also shown connected to the HSS. The diagram is set against a diamond-shaped background with the 'OPENSOURCEIMS core' logo.

Mandatory disclaimer, before any usage

It has to be noted that this Open Source IMS Core System is not intended to become for IMS technology testing and IMS application prototyping for research purposes, typical

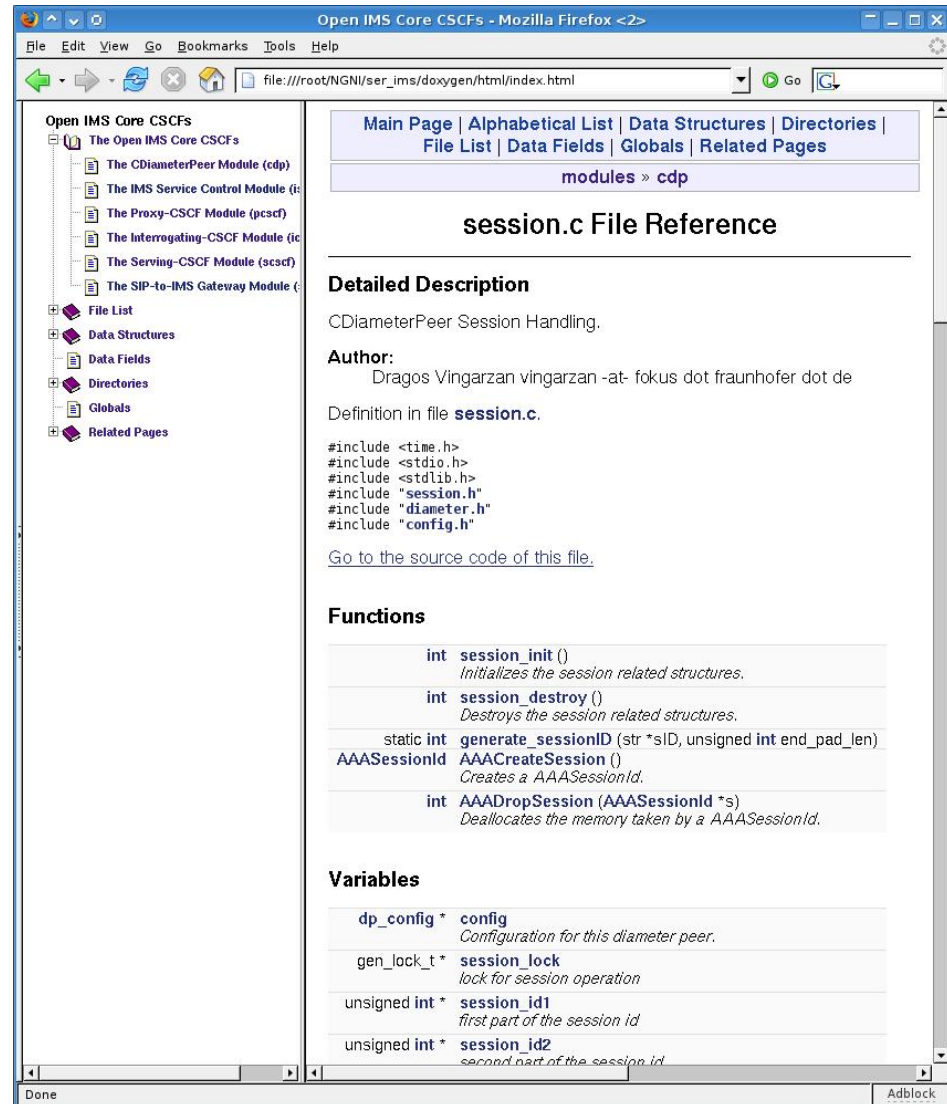
# Open Source IMS Core Project

- Development hosted on <http://www.berlios.de>
  - **Web:** [www.openimscore.org](http://www.openimscore.org)
  - **SVN:** <http://svn.berlios.de/svnroot/repos/openimscore>
  - **Mailing-lists for the specific topics:**
    - [openimscore-users@lists.berlios.de](mailto:openimscore-users@lists.berlios.de)
    - [openimscore-hss@lists.berlios.de](mailto:openimscore-hss@lists.berlios.de)
    - [openimscore-cscf@lists.berlios.de](mailto:openimscore-cscf@lists.berlios.de)
- **CDiameterPeer**
  - branches
  - tags
  - trunk
- **FHoSS**
  - branches
  - tags
  - trunk
- **JavaDiameterPeer**
  - branches
  - releases
  - tags
  - trunk
- **ser\_ims**
  - branches
  - sip\_router
  - tags
  - trunk

berlios

# Open Source IMS Core - Documentation

- There is NO standalone documentation, but the code is documented
- Because the code is so volatile standalone documentation doesn't make sense
- Documentation extractable with Doxygen
  - Java documentation is also Javadoc compatible






# *Specification Guidelines for OSIMS so far*

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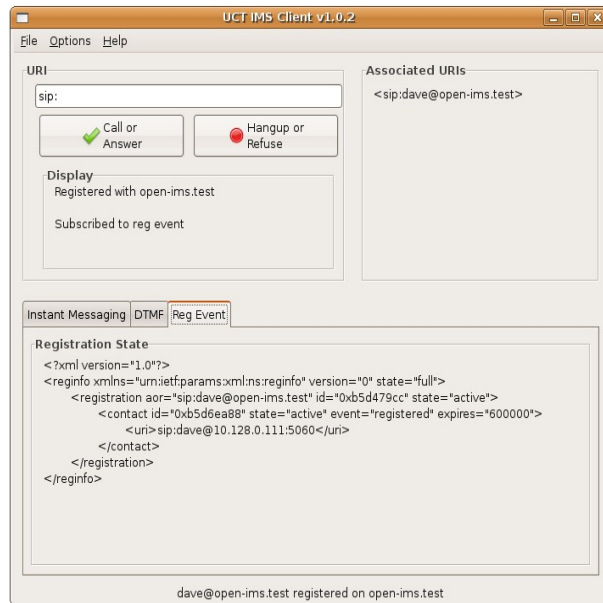
- IETF RFCs (**selection**)
  - RFC 3261 – SIP: Session Initiation Protocol
  - RFC 3310 – Hypertext Transfer Protocol (HTTP) Digest Authentication Using Authentication and Key Agreement (AKA)
  - RFC 3455 – SIP Private Header Extensions
  - RFC 3588 – Diameter Base Protocol
  - RFC 3680 – SIP Event Package for Registration
- 3GPP IMS Release 6 Specifications (**selection**)
  - TS 23.228 – IMS Stage 2
  - TS 24.229 – IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
  - TS 29.228 – Cx and Dx Interfaces, Signalling flows and message contents
  - TS 29.328 – Sh Interface; Signalling flows and message contents
  - TS 33.102 – 3G Security; Security architecture
  - TS 33.203 – Access security for IP-based services
  - TS 33.210 – 3G Security; Network Domain Security
  - TS 35.205 – 3G Security; Specification of the Milenage Algorithm

## Some R & D projects that (we know of ;-)) which use the software

-  <http://www.ist-spice.org>
  - **FP6 EU project** which will research, prototype and evaluate an extendable overlay architecture and framework to support, easy and quick service creation, test and deployment of intelligent mobile communication and information services.
    - <http://www.mams-platform.net> 
    - **German BMBF R&D project**, MAMS (Multi-Access, Modular-Services Framework) that aims at providing an easy to use SCE for NGNs
      - Large parts of the OSIMS project have been sponsored by MAMS
-  **ETSI tispan** WG 6, IMS Benchmarking, <http://www.tispan.org>
  - **Specification validation** for IMS benchmarking concepts
  - **OSIMS** works as the reference IMS core implementation for WI 06024
- Additionally, OSIMS is part of some FP7 proposals that deal with NGNs and IMS for demonstrations ...

# Open Source IMS component development ...

- ... from the community – IMS clients under the GPL



- **GTK**

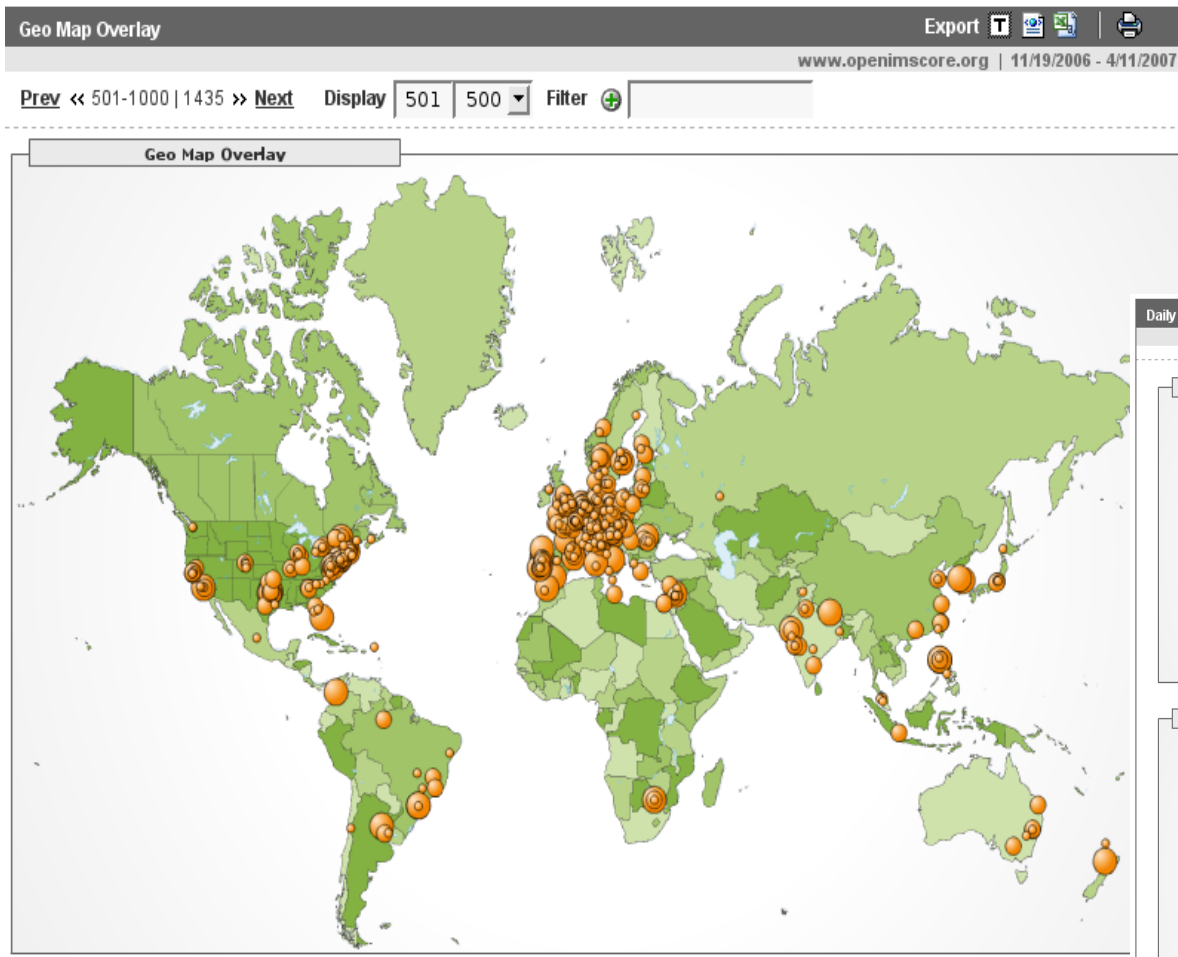
- <http://uctimsclient.berlios.de/>

- **Java**

- <http://developer.berlios.de/projects/imscommunicator/>



# Some feedback so far ... from Google Analytics



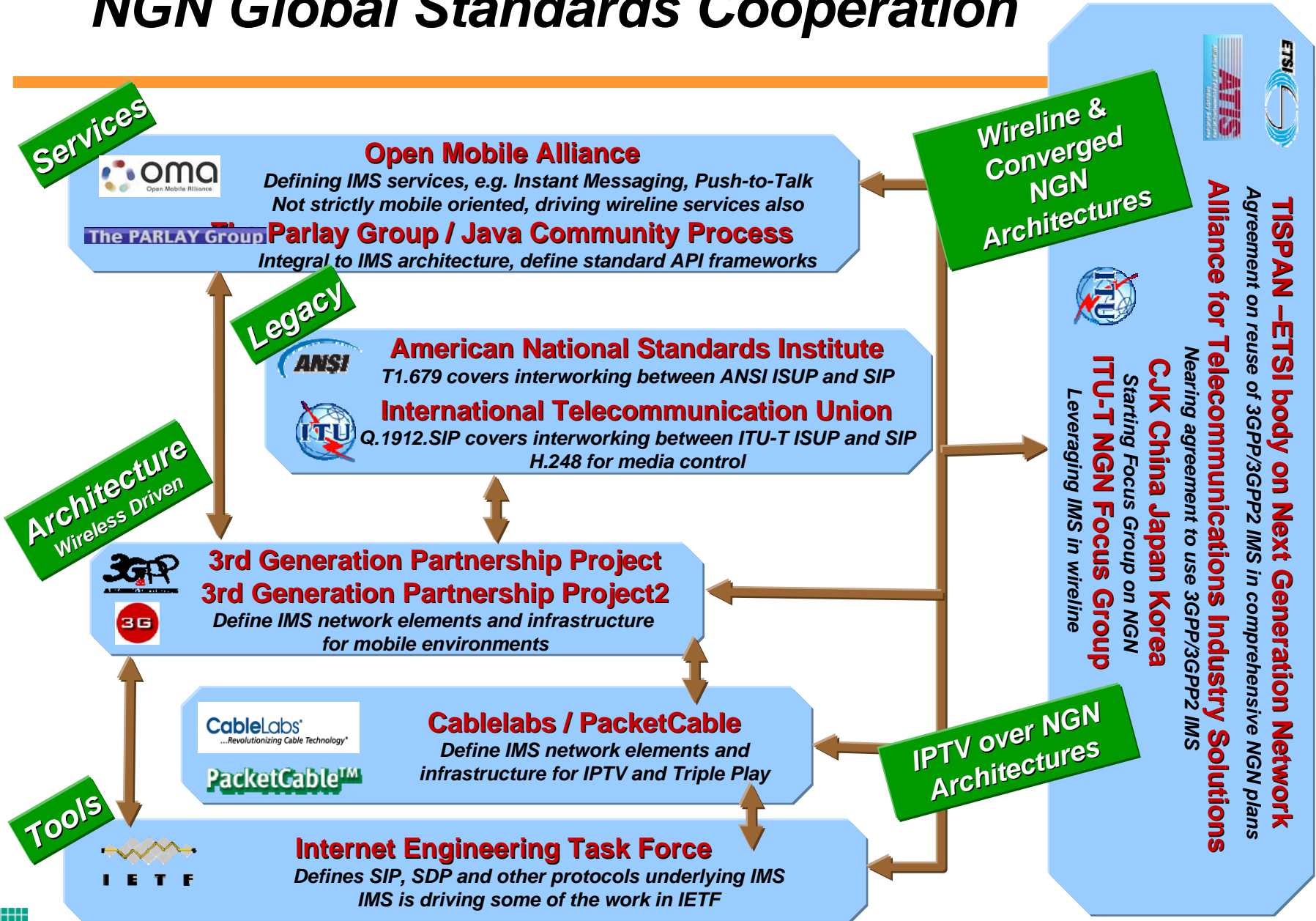


# OSIMS - What is next ?

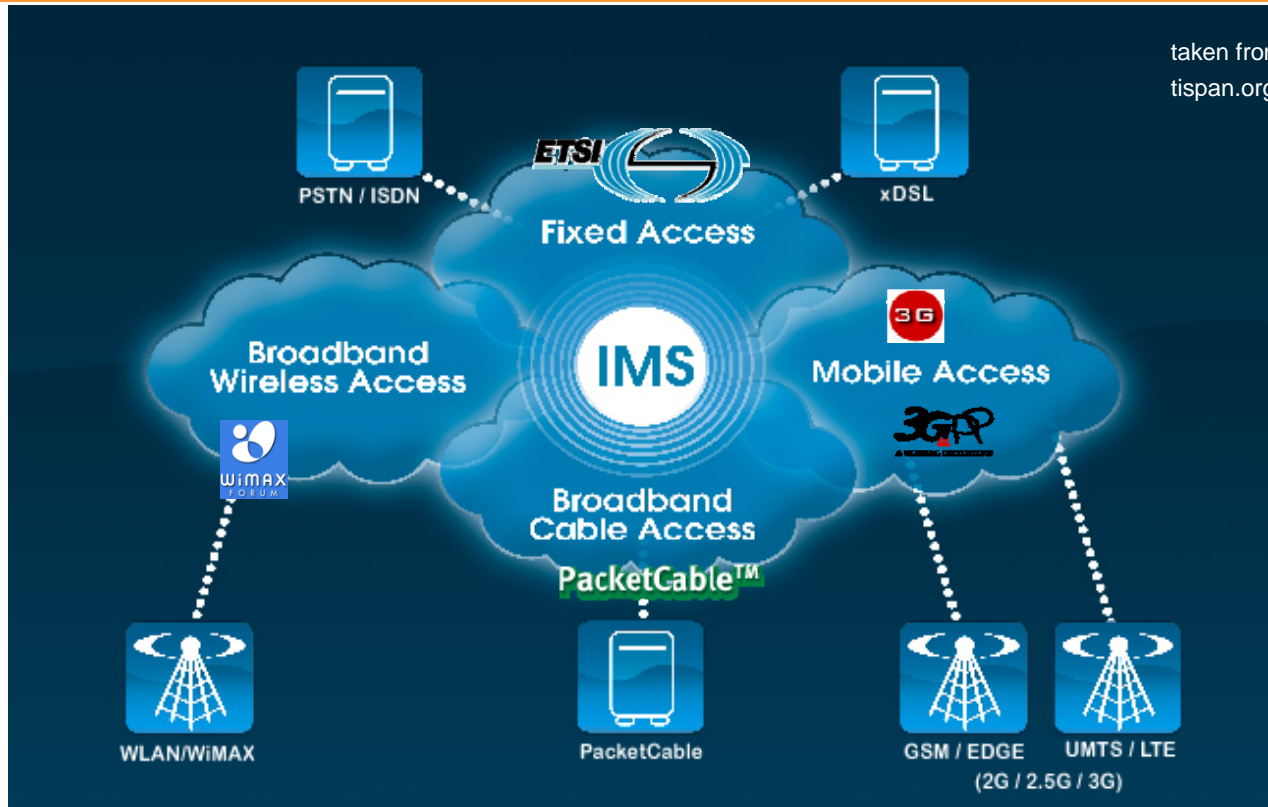
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- **Extend the developers community interested in IMS Core**
  - from universities
  - from company R&D departments
  - from software vendors
- **Extend the OSIMS**
  - for targeting the requirements coming from current ETSI TISPAN NGN Rel. 2 standardization
    - NASS bundled authentication scenarios
    - IPTV signaling support
  - to integrate the ideas coming from the PacketCable 2.0 specs
  - for 3GPP IMS Rel. 7 or Rel. 8 features
    - not 100% compliance is the goal but to support essential functionality
- **Trace back bugs**
  - Nobody's perfect, please mail us feedback to the bug tracking system on [www.openimscore.org](http://www.openimscore.org) or via the mailing-lists

# NGN Global Standards Cooperation

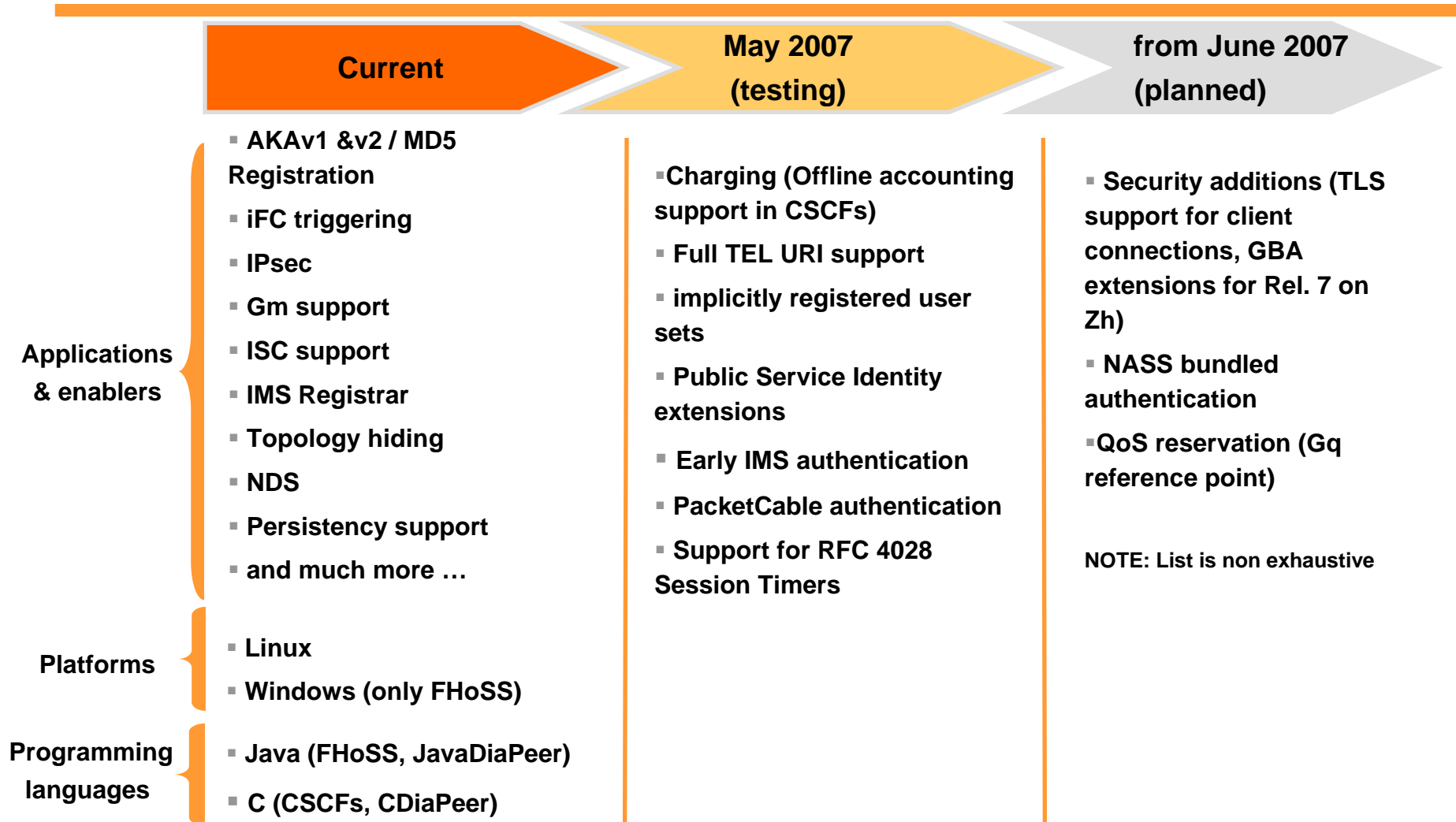


# IMS today - One Language but different Dialects



- While the IMS core specifications started in the mobile domain, they are now adopted in different flavours in other domains as well
- 3GPP should react to these new requirements in 2007

# Open IMS Core - Roadmap



Feature requests are partly coming from dedicated project requirements and from the Open Source community (see [http://developer.berlios.de/feature/?group\\_id=7589](http://developer.berlios.de/feature/?group_id=7589) for details)

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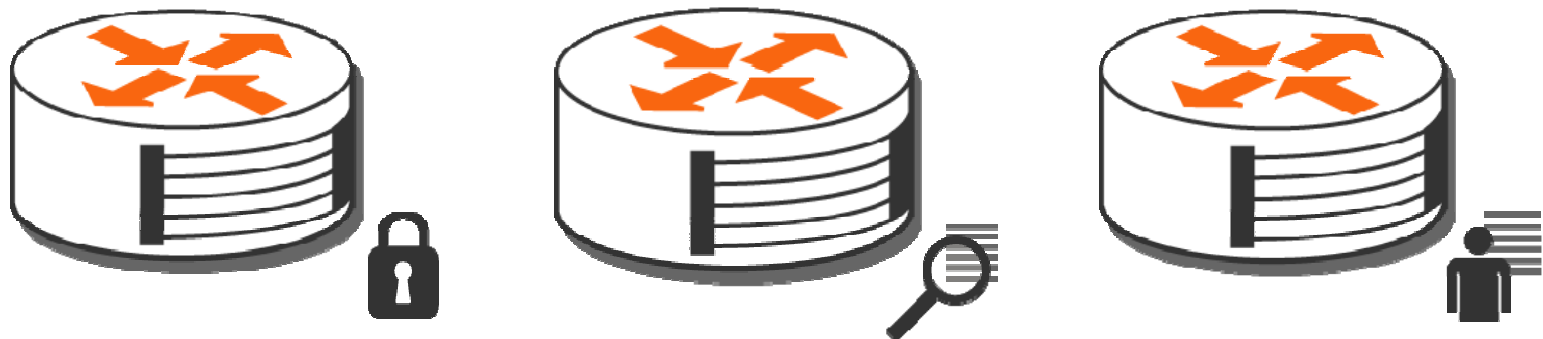


# OPENSOURCEIMS

core

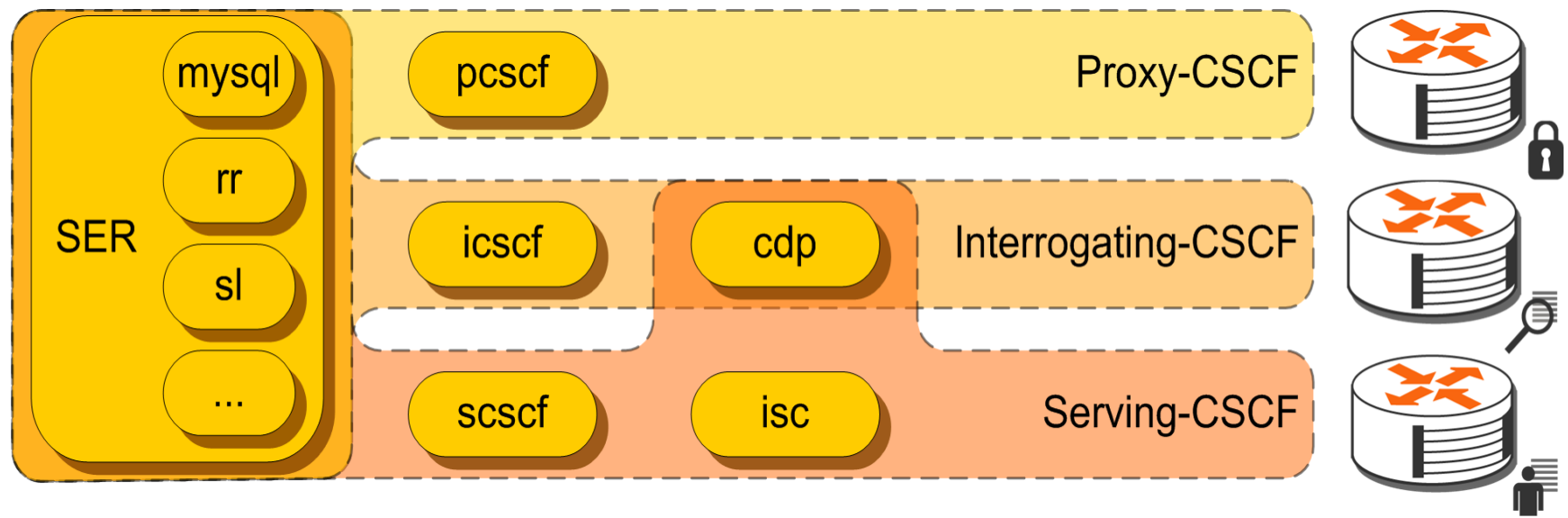
## *The Components*

### *Call Session Control Functions*



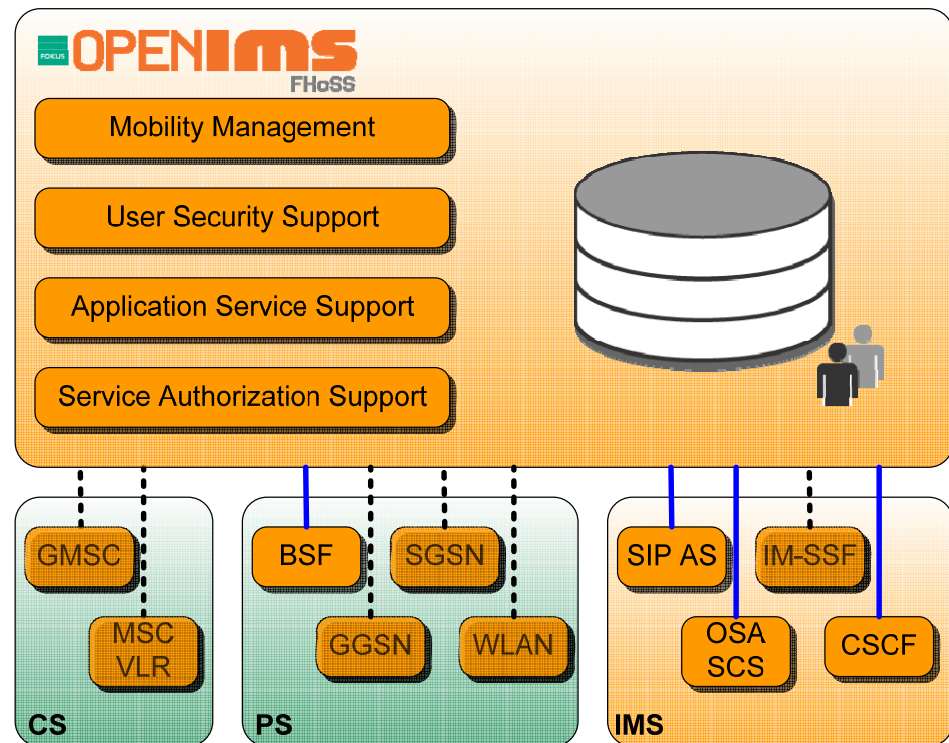
# Call Session Control Functions

- Central routing nodes for IMS
  - Implemented as SER modules:
    - pcscf, icscf, scscf, cdp, isc
  - Logical components
    - Proxy-CSCF = SER + pcscf
    - Interrogating-CSCF = SER + icscf + cdp
    - Serving-CSCF = SER + scscf + cdp + isc
- **Note:** The CSCFs are in a continuous state of evolution
- Not all features are 100% standard compliant or complete
  - See [http://developer.berlios.de/feature/?group\\_id=7589](http://developer.berlios.de/feature/?group_id=7589) for features currently worked on



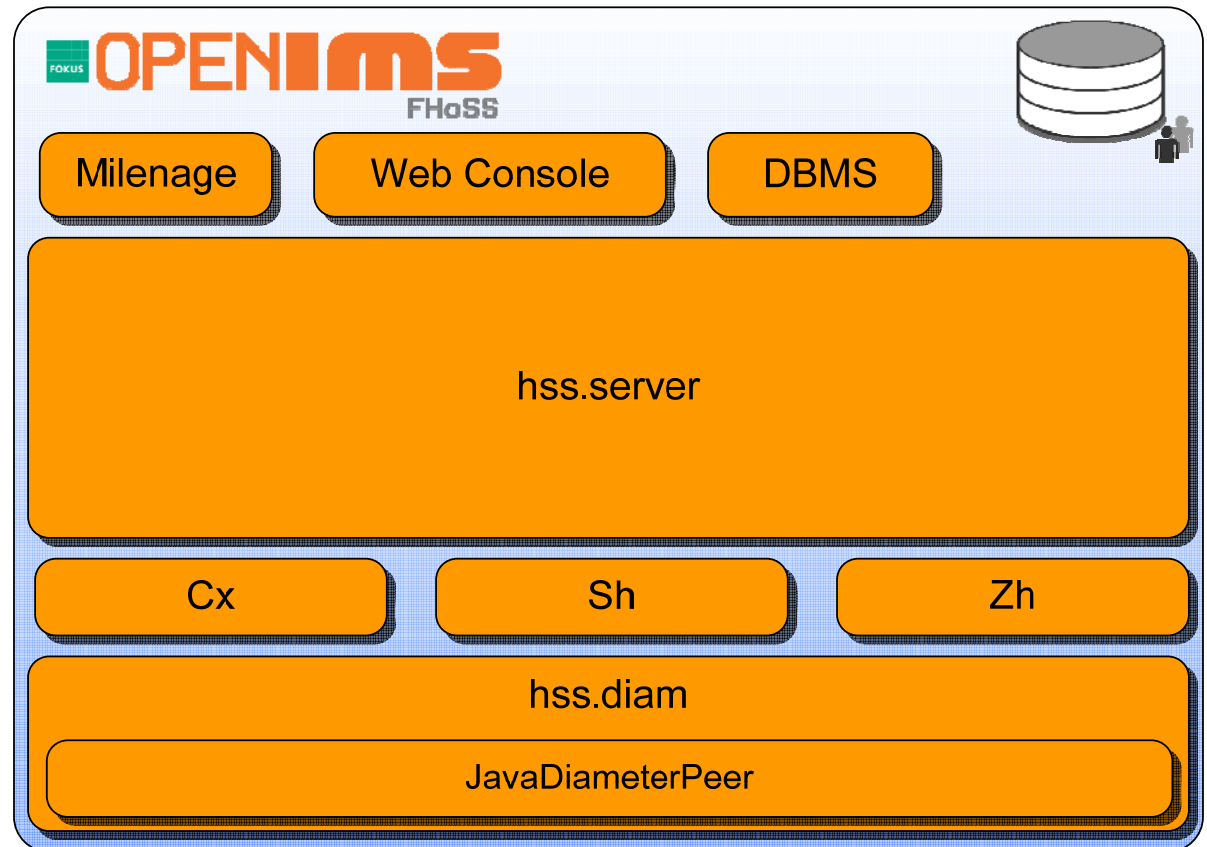
# FHoSS – The FOKUS Home Subscriber Server

- Prototypical implementation of a Home Subscriber Server
  - Realized as a Java project
  - Based upon Open Source Software (e.g. MySQL, Tomcat)
- Blends out all HLR related interfaces
- **Diameter** reference points supported so far
  - Cx for IMS registration processes
  - Sh for IMS application platform support
  - Zh for setting up HTTPS channels towards applications
- Web-based management console



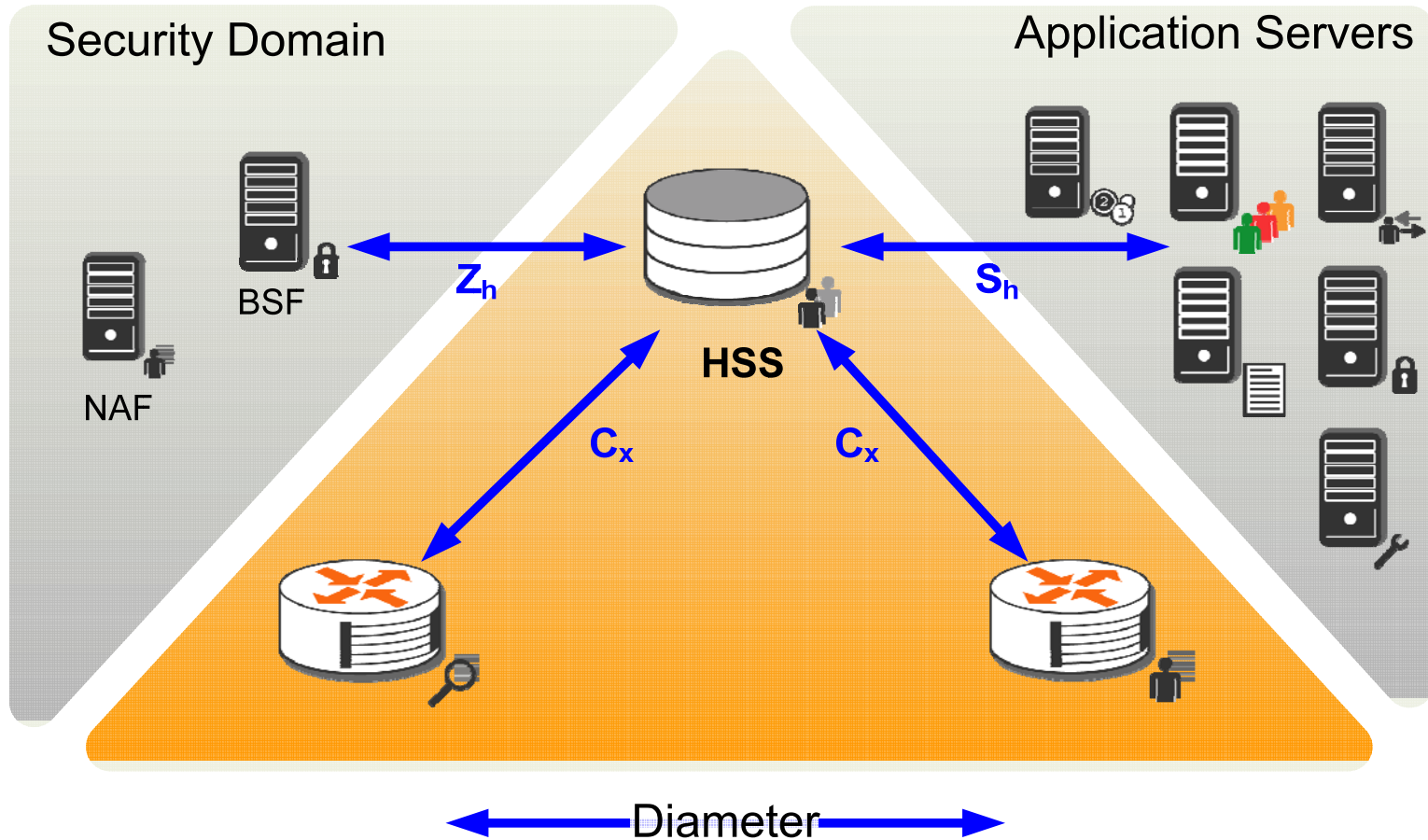
# Structure of FHoSS

- Package **hss.diam**
  - Builds upon the JavaDiameterPeer
  - Realizes interface command listeners
- dedicated interface definitions (e.g. de.fhg.fokus.cx) allow abstraction
- Package **hss.server**
  - implements the specific interface behavior to DB commands
  - currently Cx, Sh and Zh are supported
- Package **Milenage**
  - Implements the AuC functionality of the FHoSS





# What interfaces need to be supported ?

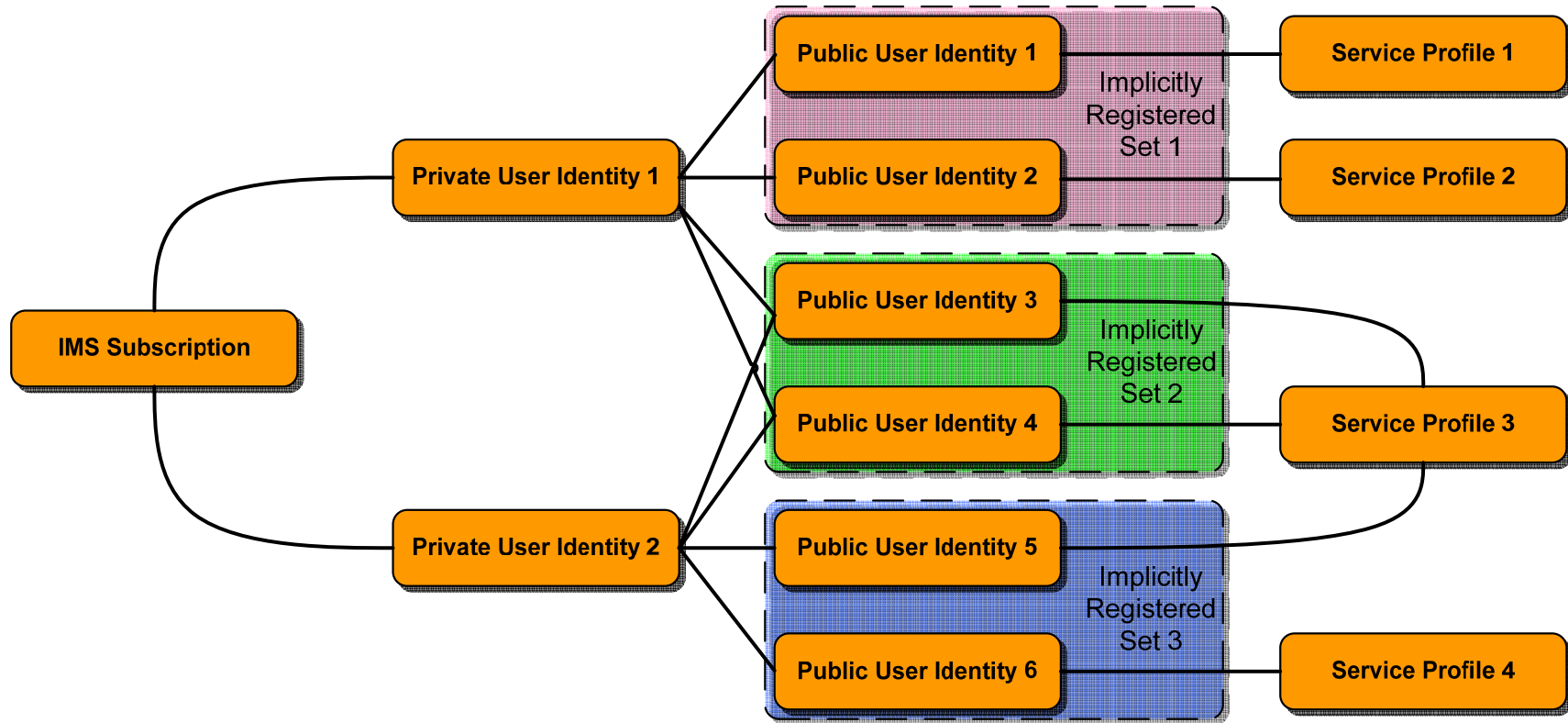


# Cx Interface

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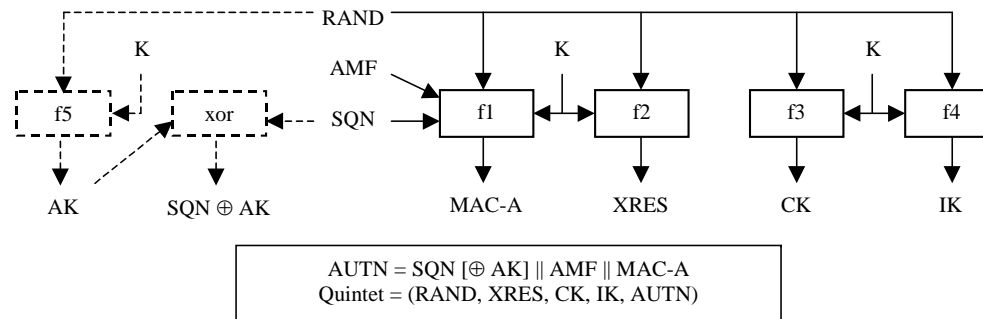
- The Cx interface supports information transfer between CSCF and HSS.
- The main procedures that require information transfer between CSCF and HSS are:
  - to exchange location information
  - to authorize a user to access the IMS
  - to exchange authentication information
  - to download and handle changes in the user data stored in the server
- Further information on the Cx (and Dx) reference point versions is provided in
  - **3GPP** TS 29.228, 3GPP TS 29.229
  - **ETSI TISPAN** [ETSI TS 183 033](#)
  - **PacketCable 2.0** IMS Delta (PKT-SP-29.228-I01-060914)

# Implicitly Registered Sets



# Authentication Vector Generation

- Cryptography based on the MILENAGE algorithm
  - See TS 35.205 for details
  - set Authentication Management Field (AMF) and operator ID as configuration parameters
  - Password (K) is stored for each IMPI in the DB



- On the handset side
  - emulated SIM card hardware with a „soft ISIM“ solution
    - temporary fix to overcome the shortage of available hardware ISIMs
    - very flexible solution to become a simple operator
  - **BUT: unsecured storage of sensitive authentication information in software on the client device makes this approach an easy target for attackers**

# Screenshot - Service Profile Setup

The screenshot shows the FHoSS Management Console interface in a Firefox browser window. The address bar displays the URL `http://fhoss.open-ims.org:8080/hss.web.console/`. The page header includes the Fraunhofer logo and the FOKUS testbeds logo. The main navigation bar contains links for HOME, USER PROFILES, SERVICE PROFILES, NETWORK INFRASTRUCTURE, and INFO, along with a help link.

The left sidebar contains a navigation menu with the following items:

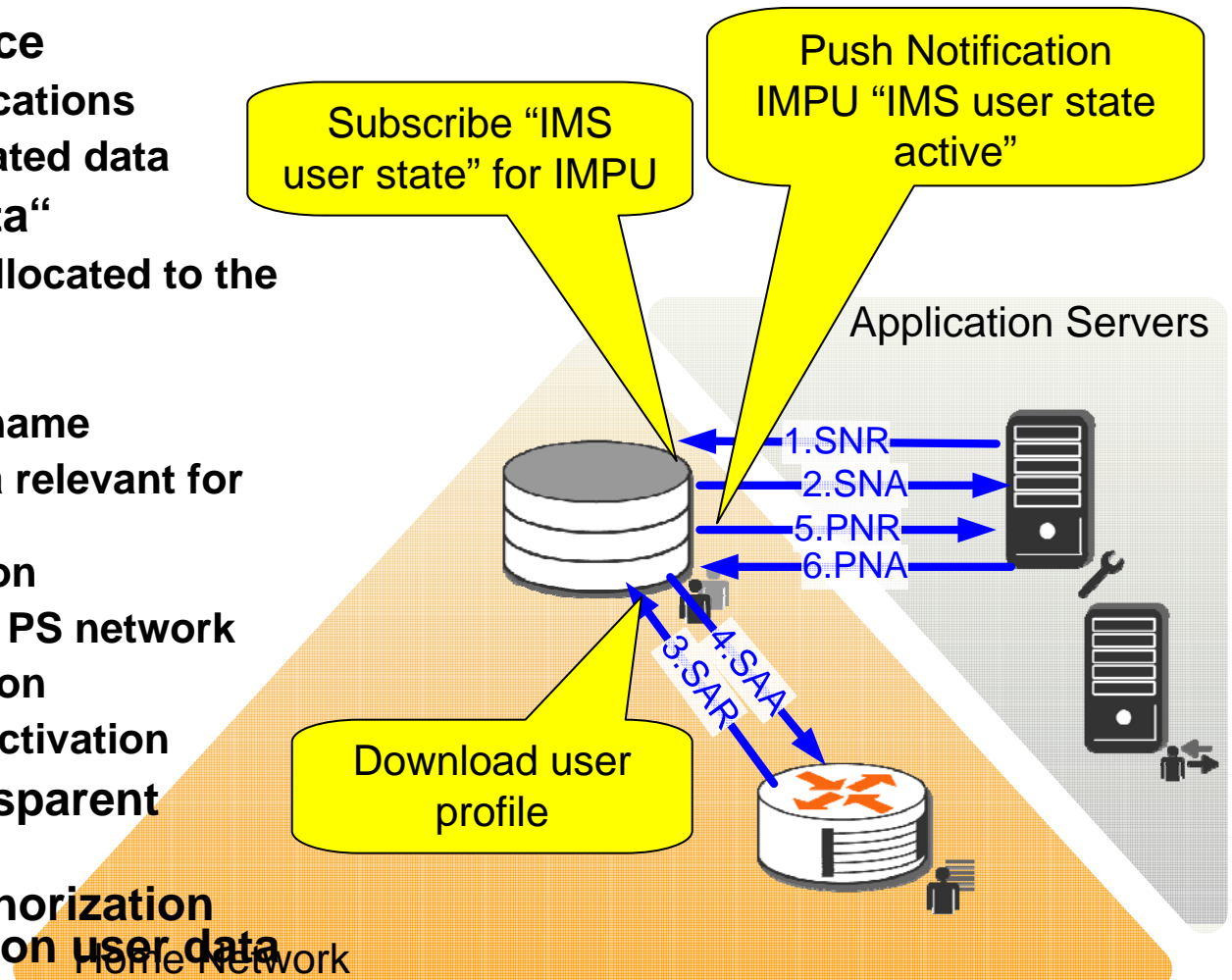
- Service Profile
  - SEARCH
  - CREATE
- Application
  - SEARCH
  - CREATE
- Server
  - SEARCH
  - CREATE
- Trigger Point
  - SEARCH
  - CREATE
- Initial Filter Criteria
  - SEARCH
  - CREATE
- Public Service
- Identity
- Template

The main content area displays the "Service Profile" setup page. The "Service Profile Name\*" field is filled with "Default IP OpenIMS.org". Below this, the "Initial Filter Criteria" section contains a table with the following data:

IFC Name	Priority	Action
Presence.Subscribe	0	
PresencePublish	1	
Subscriber.WatcherInfo.Presence	2	
smartcenter_login	3	
Smartcenter	4	
MessengerBot	5	
VoiceRecording	6	
Beta-Charging	7	
PTT	8	
Messagiung2PLMN	9	
FloTestsSIPSEE	10	
HBMA-iFC	11	

# HSS – Application support via Sh

- Diameter based interface with no IETF counterpart
- Intra-operator interface
  - Subscribe to notifications
  - Download user-related data
- Transports „User Data“
  - Public Identifiers allocated to the user
  - IMS user state
  - assigned S-CSCF name
  - Initial Filter Criteria relevant for the AS
  - Location Information
  - User state in CS or PS network
  - Charging information
  - Dynamic Service Activation
- Allows to store „transparent repository data“
- HSS applies own authorization scheme for requests on user data



# Screenshot – Permission List

The screenshot shows the FHoSS Management Console in a Firefox browser window. The address bar shows the URL: `http://fhoss.open-ims.org:8080/hss.web.console/`. The page header includes the Fraunhofer logo and the text "Institute for Open Communication Systems" on the left, and the "FOKUS testbeds" logo on the right. Below the header is the "FHoSS" title and a navigation menu with items: HOME, USER PROFILES, SERVICE PROFILES, NETWORK INFRASTRUCTURE, INFO, and help.

The main content area is divided into a left sidebar and a main panel. The sidebar contains several sections, each with "SEARCH" and "CREATE" links:

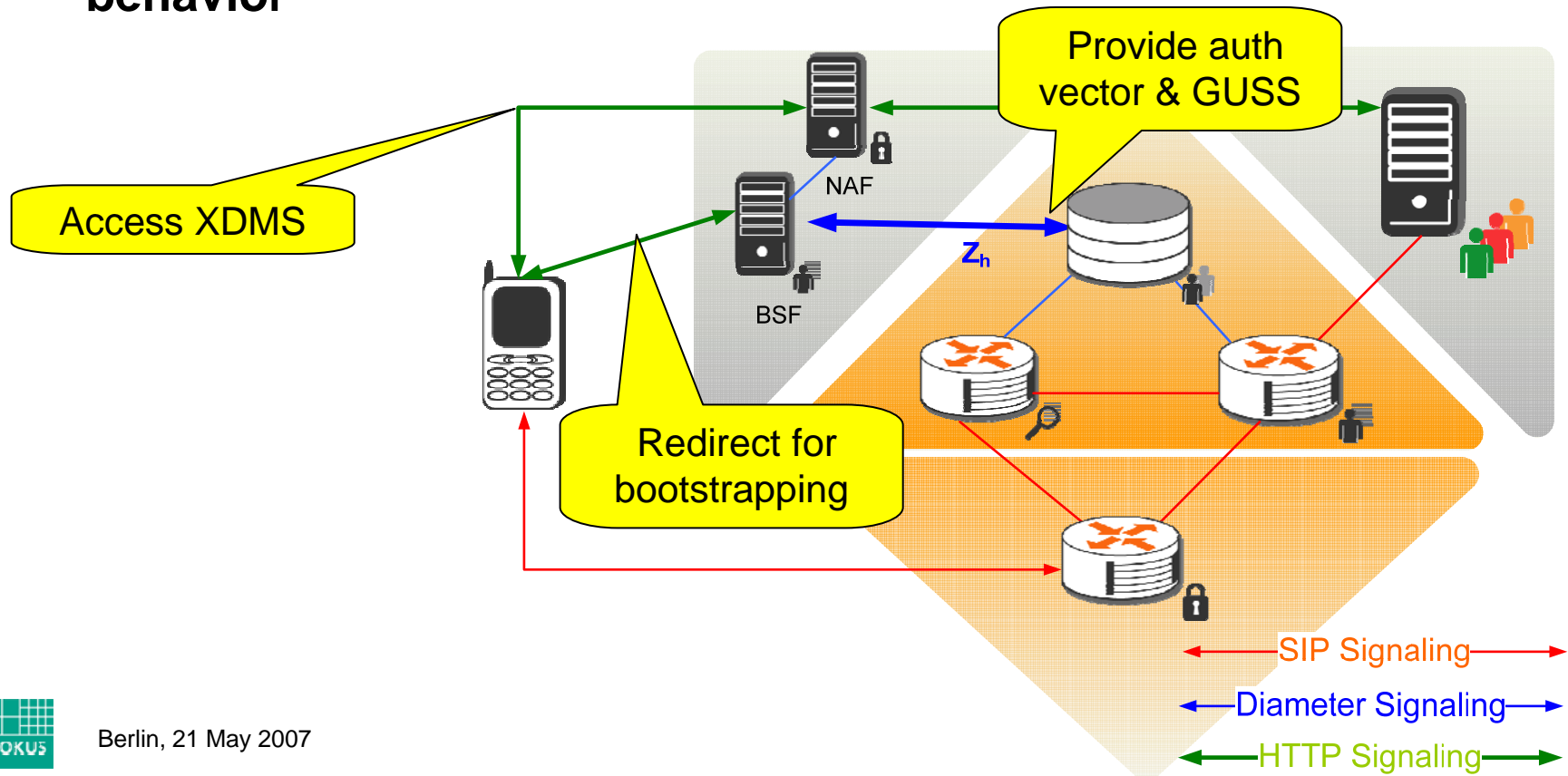
- Service Profile
- Application Server
- Trigger Point
- Initial Filter Criteria
- Public Service Identity Template

The main panel displays the configuration for an "Application Server". The "Application Server Name" is "FHG AS 2", the "AS Address" is "sip:lupine@open-ims.org:6060", and the "Default Handling" is set to "continued". Below this is the "Permission List" table:

XML Tag	Sh-Pull	Sh-Update	Sh-Subs-Notif
Repository Data	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
IMS User Identities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IMS User State	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S-CSCF-Name	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Initial Filter Criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location Information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UserState	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Charging Info	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MSISDN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PSI	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

# HSS – Zh Support

- Connection to support the setup of application layer security
- Zh defines one Diameter request /answer pair to carry out AKA over HTTP
- Dedicated GBA User Security Settings (GUSS) define the NAF behavior



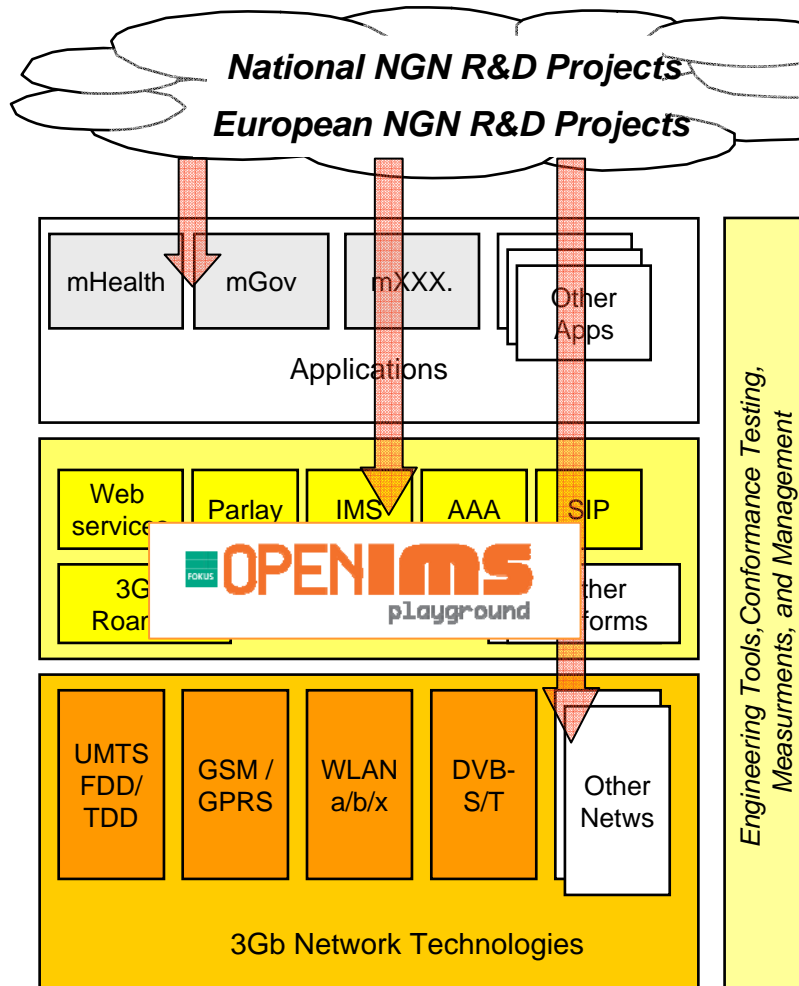


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**OPENIMS**  
playground

# Open NGN / IMS Testbed @ Fraunhofer FOKUS



## Open NGN Test & Development Center

- Has been launched in 2001
- Provides all NGN layers but focus on service platform layer
- IMS Playground has been launched 2004
- Foundation for industrial and academic projects
  - Applications development support
  - Applications validation
  - Service Platform prototyping
  - Infrastructure component testing
  - Network Technologies integration
- Officially supported by

<http://www.fokus.fraunhofer.de/ims>

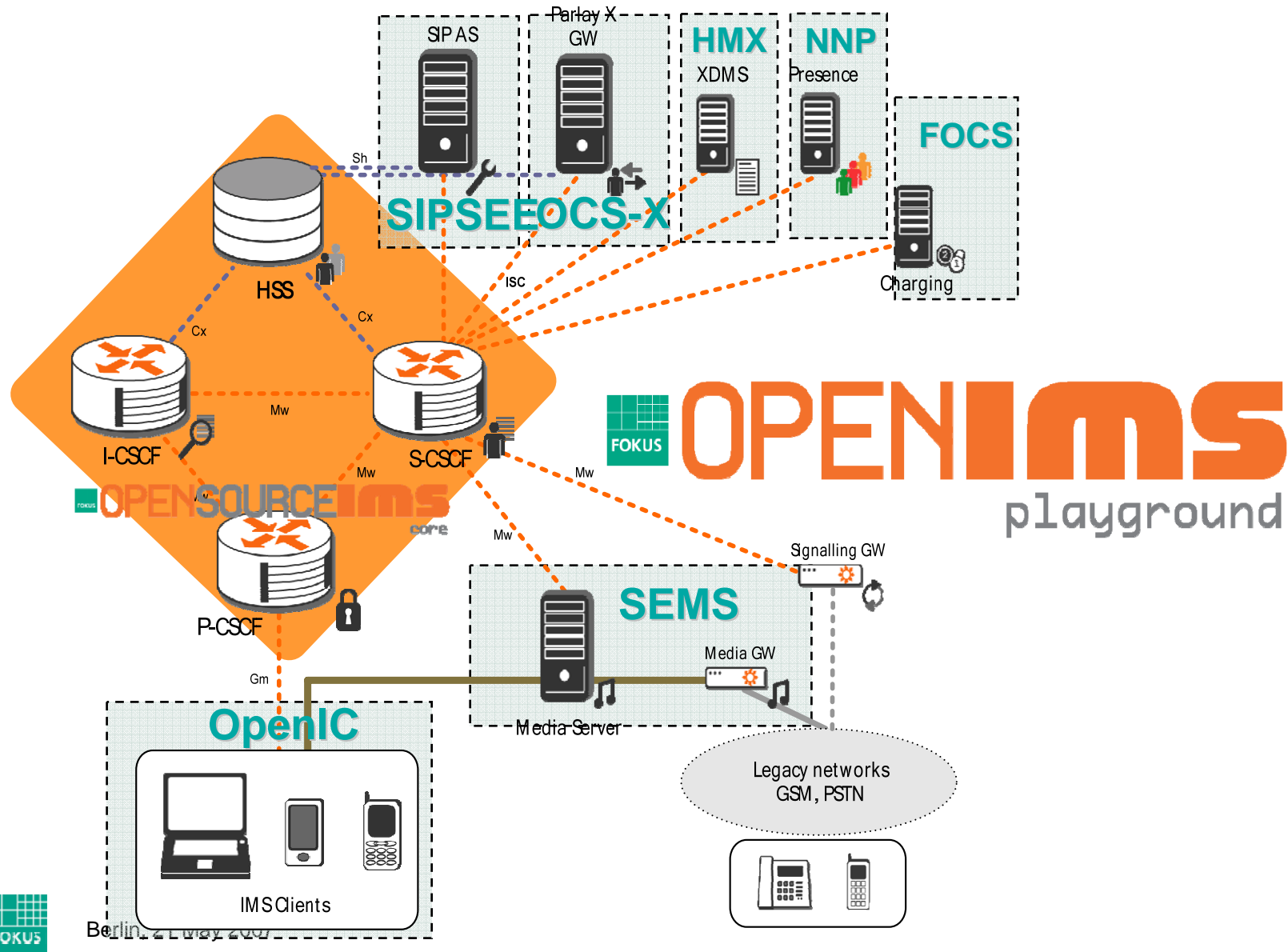


# *Open IMS Playground @ FOKUS*

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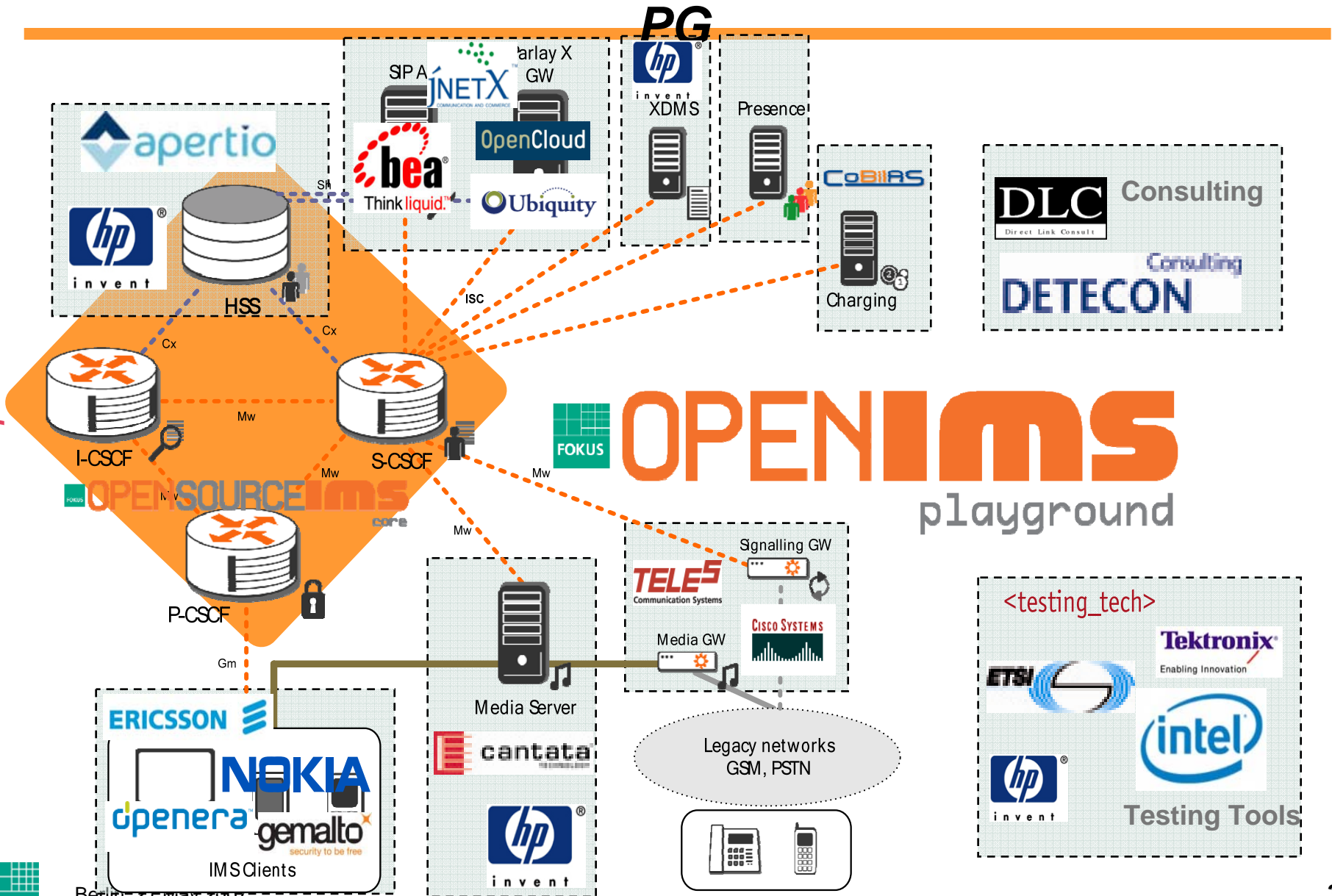
- forms a globally unique state of the art IMS infrastructure featuring all major IMS components and interfaces
- is a key infrastructure of the FOKUS NGN Service Delivery Platform test and development center
- comprises
  - a full IMS based on own developments
  - additional best of breed carrier grade components from partners
- Goals:
  - Provision of an open IMS platform and planned interconnection to Operator IMS test beds
  - Interoperability test of IMS components (S-CSCFs, Media Gateways, SIP AS, etc.)
  - Environment for development of new MM applications, application platform extensions and IMS mobility, QoS and security research
- Contact: [www.fokus.fraunhofer.de/ims](http://www.fokus.fraunhofer.de/ims)

# FOKUS Components in the Open IMS Playground



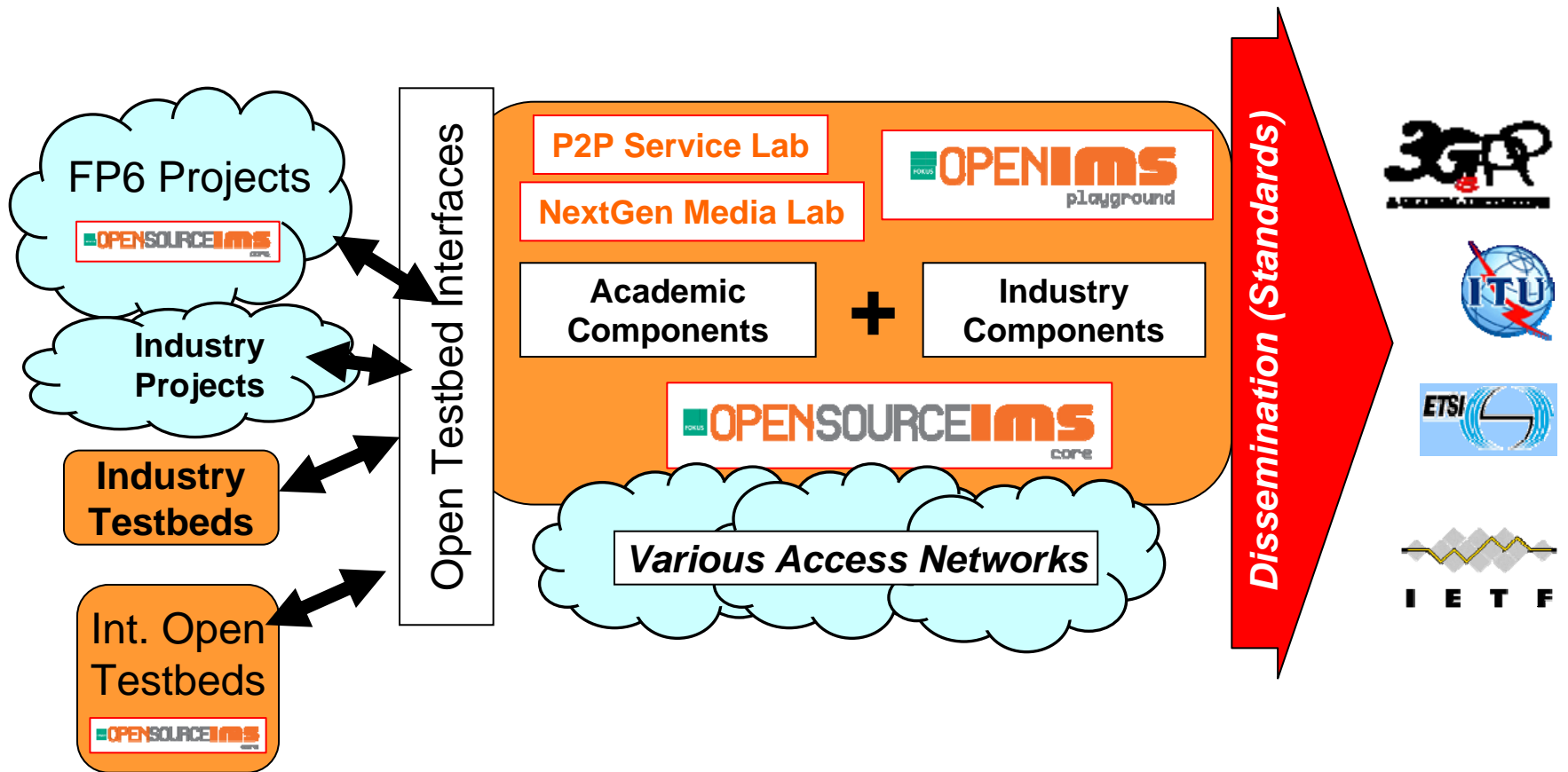
# Integration of Partner Components @ FOKUS IMS

Note: This is not a complete Partner List!



# FOKUS NGN Services Testbed

*Academic and Industry R&D Projects for Applications and Service Platforms  
(Proofs of Concept Validation, Interworking, Benchmarking, etc.)*



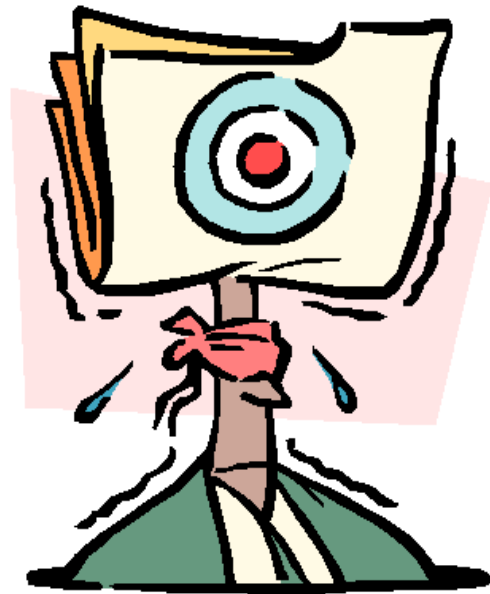
# Summary

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- **Open source software is getting popular in the telecommunications field**
- **The FOKUS Open Source SIP Express Router has paved the way for high performance low cost VoIP solutions**
- **The FOKUS Open Source IMS (OSIMS) Core represents an evolution of SER in face of the extended IMS scope compared to VoIP to validate concepts and ideas around it**
- **OSIMS forms the heart of the globally recognised Open IMS Playground at FOKUS and is already used in many NGN projects**
- **You can start your own testbed by downloading the OSIMS core**
  - **for more information visit**  
**[www.fokus.fraunhofer.de/ims](http://www.fokus.fraunhofer.de/ims) or [www.openimscore.org](http://www.openimscore.org)**
  - **or write us at [info@open-ims.org](mailto:info@open-ims.org)**

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**FOKUS** **OPENSOURCE** **ims**  
core



***Questions ?***