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ScaleNet - Fixed, Mobile & Wireless IP-optimised converged Next Generation Access Networks
FMC & architecture discussion

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Dr. Bangnan Xu, Andreas Roos, et al., T-Systems „Mobile & Wireless Solutions”
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Agenda.

- Introduction
  - Definition and motivation of FMC
  - ScaleNet architecture – Network convergence
  - Demonstrator
    - MeshBed
    - CeBit 2007
- Conclusions
ScaleNet – Benefits.
Addressing User, Operator and Manufacturer requirements.

**User:**
- to make life better
- Attractive value-added multimedia services
- Independent, mobile and flexible network access
- Simple and secure usage

**Operator:**
- to increase EBIT
- Cost reduction (CAPEX und OPEX)
- Network complexity reduction (unified platform and interfaces)
- Rapid introduction of new services and new business fields

**Manufacturer:**
- to sell more products
- Unified infrastructure and interfaces
- Rapid development of new functions
- Flexibility and new technologies

ScaleNet – Project organisation.
BMBF funded research project.

**ScaleNet partners**
- DTAG ScaleNet team
- T-Systems
- DT-Labs
- Fixed access network technologies
- Mobile & Wireless solutions
- RATH
- ComNets
- Siemens
- Ericsson
- Qualcomm
- Alcatel

**Time plan**
- **M1**
  - Q3 2005
- **M2**
  - Q4 2005
  - Q1 2006
- **M3**
  - Q2 2006
  - Q3 2006
  - Q4 2006
- **M4**
  - Q1 2007
  - Q2 2007
  - Q3 2007
  - Q4 2007
- **M5**
  - Q1 2008
  - Q2 2008
  - Q3 2008
- **M6**
  - Q4 2008
Agenda.

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Definition of Fixed Mobile Convergence (FMC).

FMC areas identified in ScaleNet.

- **Network convergence**
  - The same physical infrastructure is used for both fixed and mobile services.

- **Terminal convergence**
  - One terminal could access to services by different technology.

- **Service convergence**
  - Same services are offered in fixed and mobile networks.

- **Commercial convergence**
  - The marketing and administration personnel of both the fixed and mobile departments are pooled together.

In general, FMC enables the combination of wireline and wireless/mobile networks to provide multiple services to the customer independently of location, access technology and device. (Source: ScaleNet)
Motivation.
Operator’s perspective on FMC.

- **Cost reduction (CAPEX and OPEX)**
  - Common network infrastructure (aggregation and core networks) and control functions (e.g. QoS, Mobility, AAA, ...)

- **Attractive new services and increasing usability for customers**
  - Bundle services and subscriptions to simplify the service delivery
  - Always-best-connected

- **Future proof network evolution**
  - Simple, scalable, efficient network architecture
  - Meet the ever-increasing demand of bandwidth in mobile communications.

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ScaleNet architecture – Network convergence.

Requirements.

<table>
<thead>
<tr>
<th>Common Capabilities</th>
<th>ScaleNet supports a variety of different access networks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Services must be accessible on all considered access networks</td>
</tr>
<tr>
<td></td>
<td>Scalability</td>
</tr>
<tr>
<td>QoS Management</td>
<td>Overarching end-to-end QoS</td>
</tr>
<tr>
<td></td>
<td>Support different QoS ensuring methods within and across the ScaleNet</td>
</tr>
<tr>
<td>Resource Management</td>
<td>Provide optimal usage of system and network resources</td>
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<tr>
<td></td>
<td>Ensuring that scarce radio resources are utilized as efficiently as possible</td>
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<tr>
<td>Mobility Management</td>
<td>Mobility support across different access network technologies</td>
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<td></td>
<td>Support of session mobility with parameter adaptation</td>
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<td></td>
<td>Support of quadruple play (mobility + triple play)</td>
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<tr>
<td>AAAC / Security</td>
<td>Single Sign-on for all subscribed accesses and services</td>
</tr>
<tr>
<td></td>
<td>Unified and secure AAAC methods</td>
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<td></td>
<td>Single bill independent of the used terminal, access and services</td>
</tr>
</tbody>
</table>

Today’s logical view

There is a common set of requirements and functions like QoS, AAA, …
...but very different implementations:
- Costly, ineffective
- Mobility is major difference
- Mobility will become also a requirement in fixed networks

Solution:
- Converged access aggregation network and universal access node functions
- High flexibility and cost effective deployment
ScaleNet architecture – Network convergence.
Toward a packet optimized, modular and flexible architecture.

“Any service, any terminal, anywhere, anytime, to anyone”

Vertical
(service specific)

Horizontal
(service integration)

Existing
Multiple networks
Simple devices
Disparate Services

Transition
Converged packet network
Multimedia devices
Linked services

Evolution
Dynamic packet/ optical network
Secure multimedia services
Ubiquitous broadband
Integrated functionality

Customers

Traditional
PSTN/ISDN
Services
ATM/FR
Mobile
Horizontal
(service integration)

Customers

Fibre
WLAN
Cellular
DSL
Aggregation/core

Applications/cont
ent

Voice
Web
Mail
IN
SIP
IMS
Stream
Long term vision

Service enabler

Relations with 3rd parties

ScaleNet architecture – Network convergence.
Network evolution.
ScaleNet architecture – Network convergence.
IMS in 3GPP and ETSI TISPAN – Network & service convergence.

- IMS in 3GPP
- ETSI TISPAN
- Network & service convergence

IMS – IP Multimedia Subsystem
TISPAN – IP Multimedia Subsystem

**Services**
- RACS - Resource and Admission Control
- TISPAN – Network Attachment Sub-System
- PDF - Policy Decision Function
- MGCF - Media Gateway Control Function
- MGW - Media Gateway
- IMS – IP Multimedia Subsystem

**Networks**
- Mesh Access
- B-RAS
- DSLAM
- Optics
- ONU

**Protocols**
- IP Backbone
- AAA
- Mobility

**Application layer**
- IMS
- IPTV
- Web Services
- EiBONE

**Control layer**
- IMS/TISPAN
- Access Border Controller
- ABC - Access Border Controller

**Mesh Access**
- Mesh Access

**Converged Access Aggregation Network**
- ScaleNet
ScaleNet architecture.
Toward a converged network architecture.

- The Network of the future features convergence, high capacity and seamless services.
- A converged network architecture facilitates Fixed & Mobile network convergence.
- IMS based control layer with overarching network functions enables converged seamless services, e.g. Quadruple Play.
- GPON based converged access network reduces investment and operating costs, but increases network capacity

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Demonstrator
- MeshBed
- Cebit 2007

Conclusions
Demonstrator – MeshBed.
Scenario: Broadband Wireless Access.

<table>
<thead>
<tr>
<th>Topology</th>
<th>Technology</th>
</tr>
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<tbody>
<tr>
<td>Mesh Base Station (M-BS)</td>
<td>Multipoint-to-Multipoint communication</td>
</tr>
<tr>
<td>Mesh Access</td>
<td>Forwarding functionalities on every node</td>
</tr>
<tr>
<td>Mesh Subscriber Station (M-SS)</td>
<td>Nodes are connected via wireless links</td>
</tr>
<tr>
<td>Mobile access (Nomadic)</td>
<td>Self-organizing – distributed intelligence</td>
</tr>
<tr>
<td>Fixed access</td>
<td>Network consists of infrastructure components like base stations (BSs) and access points (APs)</td>
</tr>
<tr>
<td>Internet</td>
<td>Advantages of mesh technology:</td>
</tr>
<tr>
<td></td>
<td>- cost efficient</td>
</tr>
<tr>
<td></td>
<td>- reliable</td>
</tr>
<tr>
<td></td>
<td>- fast and easy deployable</td>
</tr>
<tr>
<td></td>
<td>- easy extendable</td>
</tr>
<tr>
<td></td>
<td>- increased performance, etc.</td>
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</tbody>
</table>

Objectives.
The aim of the testbed is to investigate carrier grade aspects of mesh networks for BWA scenarios, e.g.:

- Network architecture based on standardized equipment
- QoS support including admission control
- AAA & Security concepts
- Integration into network operator’s core networks
- Support of “Triple Play” services with comparable quality compared to fixed networks

Current mesh deployments lack carrier grade services support

- IEEE 802.11 based community networks without QoS support
- Proprietary mesh solutions based on WiMAX equipment
- Only insufficient AAA & Security support
MeshBed features.
“Triple Play” services via Mesh.

MeshBed integration into a NGN network architecture based on the IP Multimedia Subsystem (IMS).

MeshBed features.
Overarching network control.

Mesh network control managed by IMS.
MeshBed features.
Security mechanisms.

Secure mesh network access for customers and secure mesh backbone communication.

ScaleNet Demonstrator on the CeBit 2007.
Broadband, FMC and Quadruple Play.

www.bmbf.de/de/cebit2007.php
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Conclusions.

ScaleNet proposes an integrated FMC network addressing Network and Service convergence

- Integrated FMC approach enables new attractive services bundles, increasing revenues, retaining and winning customers, cost reductions (CAPEX and OPEX)
- Integrated Fixed/Mobile operator needs an strategy considering both Fixed and Mobile Network

Converged Access Aggregation Network

- Enables Network convergence
- Data processing of Fixed and Mobil access without pure tunnelling
- Uniform methods for traffic forwarding, QoS, Mobility, AAA, ...
- Universal Access node function/Interface used for adaptation to different Access solutions enabling flexible and scalable network utilisation
- Flat and cost efficient IP aggregation
- Access Border Controller enables interworking with the control layer regarding QoS, Mobility,...

Control layer (IMS-3GPP/TISPAN)

- Enables Service convergence
- Standardised service control overlay for easy and fast service creation and delivery in an IP based environment
- Offers a set of basic control mechanisms necessary for every service, common functions can be reused for multiple applications, e.g. AAA, QoS, Security, ...
Thank you. Are there questions?

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