Convergence Towards Ubiquitous Network Societies
Outlook

- Market drivers
- Operator challenges
- Spectrum and regulatory
Market Drivers for Ubiquitous Networks

• Electronic customer support any time, everywhere
• Emerging bandwidth-intensive applications and services
• Continuing innovations and cost reductions of infrastructure and active equipment
• Increasingly extended capacity of traditional access networks
• Ability to use existing infrastructure to capture incremental revenues and an accelerated RoI
Vision of Ubiquitous Networks

- Transient, spontaneous “composition” of networks
- Competitive & Cooperative networking (limited sharing of resources & functions)
- Scalability & Manageability of the concept (easy to use/deploy, many networks everywhere)
- Integration of legacy technologies & networks

Source: WWI – Ambient Networks
The subscriber wants …

... it cheap, wants it now and wants to choose:
- to get one bill, one number
- to have one phone book
- to check one mailbox instead of many
- to communicate immediately in real-time
- to communicate cheaply
- to communicate with many people who are using different media at the same time

... his services anytime, anywhere, on his device:
- Personalized and highly customized
- More individual bandwidth
- Always-on
- Global roaming
- Seamless network, GSM-EDGE-UMTS-beyond IMT-2000
- Rich multimedia services: information, transaction, entertainment

Loss of subscriber loyalty
Increase of subscriber knowledge
Increase of subscriber sovereignty
Ubiquitous Networks are subject to a number of opposing forces.
### Changing lifestyles and end-user habits

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
<th>&gt;2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sending a “hello” from vacation</strong></td>
<td>Phone, postcards &amp; pictures</td>
<td>E-mails, attachments, SMS, videos etc.</td>
<td>Video-telephony, Photo messaging via mobile</td>
</tr>
<tr>
<td><strong>Gaming Service</strong></td>
<td>Board games</td>
<td>Gameboy, Playstation etc.</td>
<td>(Interactive) Mobile gaming</td>
</tr>
<tr>
<td><strong>Find out a nice movie and buy a ticket</strong></td>
<td>Paper guide &amp; telephone</td>
<td>Online guide &amp; online ticket reservation</td>
<td>Real-time guide with nearest cinema &amp; mobile ticketing</td>
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New mobile services will have a strong impact on everyday life of end-users
Operators’ needs: Deploying Profitable Multimedia Networks

- New revenues
- Optimized utilization of networks
- Harmonized & standardized infrastructure

User experience

Revenue-generating Applications

Self-managing Networks

Demand-oriented Infrastructure & Technology

Integration

Services
Operators’ Challenges: Shift of Revenues’ Sources

- Messaging
- Multimedia Conference
- Video/Audio-On-Demand
- Video Telephony
- Online Gaming

Add application revenues to boost profits

Basic Telecom Service

Value-added Applications

Today

Revenue

Time

Self-managing Networks

Demand-oriented Infrastructure & Technology

Revenue-generating Applications
Operators’ Challenges:
More Bandwidth = Increased Revenue?

Bandwidth capacity is multiplying
➢ Deployment of xDSL, UMTS, WLANs

Bandwidth demand is growing even faster
➢ Gaming and Video Services are bandwidth intensive

Bandwidth & Demand are both exploding
➢ Near real-time & real-time traffic puts more stress on the BW
➢ The nature of traffic is changing to more dynamic with QoS orientation

• Most European operators are loosing money on flat-rate concepts
• Peer 2 Peer is major driving force
• Each household has a limited amount of money to spend
• Adding further BW does not resolve the QoS problem, generally worsens it by attracting more QoS-sensitive applications eg. Broadcast Video
• Increased bandwidth is NOT increasing ARPU automatically!
## Operators’ Challenges: Complexities

<table>
<thead>
<tr>
<th>Set Top</th>
<th>DRM</th>
<th>Encryption</th>
<th>Piracy in Territory</th>
<th>Network</th>
<th>Partners</th>
</tr>
</thead>
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<tr>
<td><strong>Commercial Opportunity</strong></td>
<td><strong>Paradigm shift</strong></td>
<td><strong>Market unsure</strong></td>
<td><strong>PC or TV centric?</strong></td>
<td><strong>Open MPEG4 Issue</strong></td>
<td><strong>What is good video quality?</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Individual “TV culture”</strong></td>
<td><strong>Young market</strong></td>
<td><strong>Proprietary solutions</strong></td>
<td><strong>Fixed to mobile substitution</strong></td>
<td><strong>VoIP telephony</strong></td>
</tr>
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<td></td>
<td><strong>60+% Hollywood margins</strong></td>
<td><strong>Investment delays</strong></td>
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*Ch. Legutko, Siemens Communications, 03/2005, #11*
## Technical Challenges and Enhancements

<table>
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<th>Challenges</th>
<th>Enhancements</th>
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<tr>
<td>Higher frequencies increase processing requirements</td>
<td>Microelectronics innovation (Moore‘s Law) delivers increased performance</td>
</tr>
<tr>
<td>Coexistence of different radios requires sufficient separation</td>
<td>Improved filter technologies</td>
</tr>
<tr>
<td>Underlay of ultra wide band (UWB) raises the noise floor for other users</td>
<td>Radio technology improvements</td>
</tr>
<tr>
<td>Higher data rates require wider bandwidth and new radio principles</td>
<td>Higher order modulation schemes and smart / MIMO antenna systems</td>
</tr>
<tr>
<td>Seamlessness and ubiquitous use imply multimode &amp; multiband devices</td>
<td>Software configurable radio</td>
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Innovation is able to compensate many challenges but complexity and cost increase in the process
Upside Potential through Fixed-Mobile Convergence

Increasing ARPU by

- Attractive service packages
  - Convenience
  - Common look & feel
  - Transparent pricing by unified charging

- Faster uptake of new services
  - Increasing critical mass of users
  - Especially for person-to-person services
  - Like Peer-to-peer Real time Multimedia

- Stimulation of additional voice calls
  - Induced by increased usage of data

All kind of services are suitable to be offered simultaneously in fixed & mobile
Different Categories of Convergence

- **Service Convergence**
  - same service offering for fixed and mobile user access (e.g., SMS / MMS, multimedia conferencing, gaming)
  - universal numbering
  - one bill

- **Product Convergence**
  - common application server
  - common service enabling solution (incl. charging)
  - common session control
  - common interworking functions

- **Network Convergence**
  - common core network (control, user and transport plane)
  - common operation
  - support of any access network
Data Rates and Access Technologies

- PSTN-Modem
- FTTH
- VDSL
- ADSL
- ISDN
- GP
- RS
- GS
- M
- UMTS
- WLAN
- WiMAX
- Unified IP Multimedia Network
- Unified IP Multimedia Network

Mbit/s per user

Year

1960 1980 2000 2020

© Siemens AG, October 2004
All-IP: ...hype or necessity?

Hybrid networks rule today in for long time
- High OPEX
- Service convergence slow
- Service evolution slowed-down by the hybrid infrastructure (physical, logical and operational)
- Slow terminal equipment price erosion in hybrid environment

It is a must, to come to a common denominator:
- IP infrastructure
- IP control (SIP)
- IP-based terminals
- IP-based services

All-IP is necessity to decrease overall communication costs
Radio spectrum is a precious asset

- Spectrum is the raw material for mobile business. It is of strategic importance for the entire industry.

- The largest economic value per radio spectrum unit is generated by the mobile network user.

- Many new players want a piece of this billion dollar pie.

- We cannot generate new spectrum, only optimize its use and only harmonized spectrum is valuable.

- Spectrum is licensed nationally, but has global issues: radio waves do not recognize geopolitical boundaries, therefore harmonization and coordination are required.

- Major regulatory decisions in the next four years will affect the mobile industry for many years to come.
Spectrum for mobile telecommunication services

- **GSM 1800**
  - 1710-1785
  - 1805-1880
  - \( \Sigma = 150 \text{ MHz} \)
  - 40 Countries

- **Japan**
  - ↓ CDMA ↑
  - 832-834, 887-889
  - 843-846, 898-901
  - 860-870, 915-925
  - 810-828, 893-898
  - 838-843, 925-958
  - 870-885
  - 1429-1453/1477-1501
  - \( \Sigma = 144 \text{ MHz} \)

- **GSM 900**
  - 880-915 / 925-960
  - \( \Sigma = 70 \text{ MHz} \)
  - 142 Countries

- **NMT**
  - 450-455,74
  - 460-465,74
  - \( \Sigma = 11,48 \text{ MHz} \)

- **Cellular (AMPS)**
  - 824-849 / 869-894
  - \( \Sigma = 50 \text{ MHz} \)

- **PCS 1900**
  - 1850 - 1910
  - 1930 - 1990
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- **IMT-2000**
  - 1885 - 1980
  - 1980 - 2025
  - 2110 - 2200
  - \( \Sigma = 230 \text{ MHz} \)
  - 50 Countries

- **IMT – 2000**
  - 2500 - 2690
  - \( \Sigma = 190 \text{ MHz} \)

- **4G**
  - 3600 – 4200
  - 4400 – 5000
  - \( \Sigma = 1200 \text{ MHz} \)

- **WLANs**
  - 2400 - 2483,5
  - 5150 – 5350
  - 5470 – 5725
  - \( \Sigma = 538,5 \text{ MHz} \)

- **WiMAX**
  - 3400 – 3600
  - 5725-5850
  - \( \Sigma = 325 \text{ MHz} \)

- **Unpaired (China)**
  - 2300 – 2400
  - \( \Sigma = 1200 \text{ MHz} \)

- **Broadcast**
  - 47 – 68
  - 87,5 – 108
  - 174 – 240
  - 470 – 862
  - \( \Sigma = 499,5 \text{ MHz} \)

- **1970**
  - **1980**
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  - **2020**
  - Time

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The regulatory framework is under discussion to increase efficiencies and take advantage of innovations.

- Success of GSM and UMTS is built upon concerted industry approach.
- Today’s regulators are reluctant to influence technology choices.
- „Technology Neutrality“ is supposed to provide a level playing field, but endanger economies of scale.
- Spectrum Trading provides new options for underutilized frequencies, but increases risk of incompatibility and fragmentation.
- Suitable (harmonized) spectrum is hard to find, therefore very valuable and in high demand.
- New applications and usage scenarios blur the boundaries.
Vision of (De-)Regulation

Source: FCC

Digital Migration

Analogue World
Narrowband  Transition  Digital World
Broadband

CHANGING ENVIRONMENTS:

- Competition
- Innovation
- Networks
- Regulatory
- Market Structure
- Consumer

Voice, Video, Audio, Data, etc.

Applications

Platforms
- Cable  Wi-Fi
- FTTH  DSL
- WiMax  3G
- Satellite  4G
- DTV  UWB
- Fixed  Mesh
- Anything else!

Potholes

Voice, Video, Audio, Data, etc.

RISKS:

- Consumer Confusion
- Risk & Uncertainty
- Incumbent Dilemma
- Massive Capital Investment
- Political Anxiety

Voice  Video  TV Radio  Cellular
Copper  Coax  Spectrum  Spectrum
Harmonized environment is economically superior

- Worldwide roaming and plug & play require consistent standards and comprehensive interoperability.
- Uncontrolled system competition fragments the market and leads to wasting of economic resources.
- Potential benefits of proprietary solutions are short-lived since they do not reach economies of scale.
- Harmonized standards provide sufficient room for competition.
Summary / Conclusion

- Telecommunication market is here to stay as growth engine of global economy
- Generating new revenues is still the major challenge
- Customers like the variety of services, but not the burden of technology details
- Harmonised standards and inter-operability of multiple interfaces provides the optimal response to the end-users needs
- Migrating towards customer centric networks: continuous process, solid performance and reliability
Thank You!
Any Questions?

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