IMS, Peer-to-Peer and Beyond

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Outline

**Prologue**

- IP – Disruption for Service Providers
- Operators’ Motivation for NGN & IMS
- Peer-to-Peer Threat and Chances
- Thinking User Centric
- Beyond IMS – Service-aware Networks
IP Represents a Major Disruption

It provides flexibility, simplicity and openness

Dedicated → Any device
Basic services → Rich services
Broadcast → On-demand
Proprietary → Open
Complex → Simple
Transformation of the Telco Market

- Service Providers radically transforming their business models
  - IP network transformation
  - New customer interaction models
  - Changing their business DNA

- A massive industry shift – triggering strong upturn in vendor markets

- Two main drivers
  - Simplify networks / increase operational efficiency ("One Factory")
  - Be first on the market with new services
IP Revolution in a Nutshell

*IP networks started with Internet*

Best effort

IP network

High Speed Internet

High Speed Internet
IP Revolution in a Nutshell

*IP networks have grown with extended broadband services*

IP network with QoS

Multi-service Broadband everywhere

Multi-service Broadband everywhere
IP Revolution in a Nutshell

*IP networks have enabled Telephony with NGN*

- Fixed Soft Switch
- Mobile Soft Switch
- GW
- GW
- GW

**IP network with QoS**

- Multi-service Broadband everywhere
- Multi-service Broadband everywhere

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IKR/VFF-IND Workshop “Dienste im NGN”
University of Stuttgart, 03 March 2006
IP Revolution in a Nutshell

Fixed and Mobile IP networks converge with IMS

Service delivery platforms

Soft Switch

Subs Mgmt

IP network with QoS

Multi-service Broadband everywhere

Multi-service Broadband everywhere

IKR/VFF-IND Workshop “Dienste im NGN”
University of Stuttgart, 03 March 2006
Network economics are transformed

- Equipment costs are shrinking fasts
  - Cost per Gig declining by factor 10 with each generation: LL, ATM, IP

- Network architectures are being collapsed
  - From many dedicated and multi-layered networks
  - to streamlined multi-service IP network

- Service proliferation can be accommodated
  - SDPs to replace hundreds of service OSS-BSS silos

- Operating costs can be dramatically reduced
  - Centralization, simplification,…
IP has a Dramatic Impact on Operators

IP puts Enterprise revenues under pressure

- Price erosion of data services with conversion to IP & Broadband
- Fixed voice revenues declining due to VoIP
- Flat mobile revenues in mature markets

Typical case:

Enterprise in 2005

<table>
<thead>
<tr>
<th>Revenues (euro millions)</th>
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</thead>
<tbody>
<tr>
<td>FY04</td>
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<tr>
<td>8,235</td>
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</tbody>
</table>
Incumbent Operators Challenged by IP

Market Pressures

- **NEW ENTRANTS**
  - Google-type entrants
    - Skype, Vonage, Talk, Gizmo

- **MEDIA**
  - Content providers’ distribution channels multiplying

- **TECHNO**
  - Proliferation of new technologies and evolution towards all IP

- **USER**
  - Mass customization of new services

- **STOCK MARKETS**
  - Investments’ shorter payback and better risk control

Network Challenges

- Improve time-to-market
- Innovation
- Future-safe
- Open network
- Improve cost effectiveness
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**IMS Motivation**

- **Standardized multimedia architecture for mobile and fixed services**
  - Heterogeneous Access Technology – Unified IP Packet Transport
  - Based on SIP, DIAMETER and MEGACO controls
  - Developed in 3GPP but now adopted by 3GPP2 / LTE, ETSI
  - Operator requirements: Roaming, Security, Quality of Service, Service Billing
This is only a logical (functional) architecture, not a physical one.
IMS Call Control Principle

**SIP call flow: Simple UNI – Complex NNI**
- QoS & Security Enforcement
- Application and Supplementary Services Invocation
- Discovery of Call Server
- Optional: Media Resources
Carrier’s Low Cost VoIP Playgrounds

- **Pre-IMS in Germany**
  - DT
  - Arcor
  - Freenet.de, ...
  - free IP-IP calls
  - 1..2 ct/min IP-PSTN
  - free voice box
  - free web interface
  - integration VoIP - Email

Based on Open Source SIP Proxy

Portal Integrated

Free Client SW

Open Source Software

Voice Box

SIP Express Router

IP Phones

PSTN gateways

Soft-Phones
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In the world of "End to End Application" there is little "lock-in" for carriers except doing the job the customer wants done.

That’s the "constraint," control is now, and increasingly, in the customers hand.

» Somewhere from the blogosphere «
What does P2P really mean?

- Nothing really new?
  - Turn the internet to its original version
  - Early email systems, Usenet fora, ...

- A design philosophy stressing decentralization?
  - Self-organization
  - Scalability and robustness

- An IT architecture?
  - Middleware for distributed systems
  - A set of protocols focusing high dynamics

- Intelligence shifted to the end devices?
  - Network of equals – client and server at the same time (SERVENT)
  - Today the driver for “sexy” internet applications is at the edge

- New business model?
  - Content distribution, service / user / resource discovery
  - Skype – “telcoland attacked from cyberspace”

- Merely a fad?

Along a viewpoint article of D. Schoder / K. Fischbach
~ 20M $ investor funding*
~ 20M $ annual revenue from PSTN interconnect*
~ 5M $ R&D investment (3 years, 20...100p)*

Market value: eBAY bought Skype
- 1,3b $ cash
- 1,3b $ in stocks
- up to 1,5b $ in 2008/2009

Brand name: “to skype”
Advanced technology
2 successful Internet entrepreneurs

Skype Growth

“Viral” growth since 2003: 5,5M users online today

* estimations
The Standardization Answer: IETF P2P-SIP

Proprietary P2P VoIP

- eBay
- PayPal
- VeriSign
- Skype
- PeerMe
- Jajah

... and growing on a weekly basis.

Standardization
(started 2005)

- P2P-SIP
- IETF
- Panasonic
- Siemens
- Avaya

Open Source Community
Client SW variety

Industry Forum?

- Successful model for closed user groups (see Skype): eCommerce, buddies, B2B / B2C calls
- Open issues for public networks: security, regulation, E911/112, LI, QoS
- IETF P2P-SIP evolution has potential to become the new worldwide standard for VoIP/MMoIP
P2P IMS solution – Fat Clients

- NAT Traversal Helper
- Registrar - Authentication
- Network Presence
- Subscriber Directory
- Service Peers
  - Low perf. terminals
  - Offline users
  - Value added services
- PSTN Gateway
- Peering Gateway
- Registrar
- Network Presence
- Subscriber Directory
- Service Peers
  - Low perf. terminals
  - Offline users
  - Value added services
- PSTN
- Other IMS
- NNI Middleware
- Flexible UNI
- Invoke application servers
- SIP
- HTTP/SOAP
- Personal Services
- Profile Management
- Personal Services
- Failure Reaction
- Register
- Request address of B party
- Lookup Services
- Discover NAT traversal relay
- Establish call
- Keep buddy relations
- Transfer Messages
Let’s call it the Internet business model: Basic voice is free!

<table>
<thead>
<tr>
<th>Service</th>
<th>Paid</th>
<th>Paid</th>
<th>Free</th>
<th>Paid</th>
<th>Paid</th>
<th>Paid</th>
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<tbody>
<tr>
<td>Personal Ringing (Ringback) Tones</td>
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<tr>
<td>Audio / Video on Demand</td>
<td>Paid</td>
<td></td>
<td>Free</td>
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<tr>
<td>Push To Talk</td>
<td>Free</td>
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<td></td>
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<tr>
<td>Voice box</td>
<td></td>
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<td></td>
<td>Paid</td>
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<tr>
<td>Offnet/PSTN interworking</td>
<td></td>
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<td>Paid</td>
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<tr>
<td>Operator Assisted Services</td>
<td></td>
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<td></td>
<td></td>
<td>Paid</td>
</tr>
<tr>
<td>Intelligent Mobile Redirect</td>
<td>Free</td>
<td></td>
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<tr>
<td>Virtual Secretary (IVR/UMS)</td>
<td></td>
<td>Paid</td>
<td></td>
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<tr>
<td>SPIT (voice spam) and other Security</td>
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<tr>
<td>STB Telecom Dashboard</td>
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<tr>
<td>Enhanced Presence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Paid</td>
</tr>
<tr>
<td>Enhanced Suppl. Services</td>
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</tbody>
</table>

P2P conversational service, presence, IM, some supplementary services, ... (largely terminal based)

Broadband Internet Access

Competition erodes revenues

Very dynamic creation of new bundles

P2P offers call control and HSS at lowest cost
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The German Case: More for Less

- Limited media budget per household
- Germany: strong consumer reticence
  - Embrace cheap communications (Skype, etc.)
  - Rather interested in cheap mobile minutes than new services
- Germany: relatively low Broadband penetration (21%)
- Germany: excellent free-TV
  - No “simple” standard Triple Play approach feasible

The race to the bottom is on!

Need to offer added value!
Convergence from a User’s Perspective

- Convergence?
  - Different network types
    - fixed / mobile
    - public / private
  - Different services
    - same service on different terminals
    - different services on same terminal
    - growth beyond voice
  - Different operators
    - TelCos
    - Internet companies
**Internet’s Way of Business**

**Internet Companies – Leading Global Communication Hubs**

<table>
<thead>
<tr>
<th>Internet Sites</th>
<th>Search Engines</th>
<th>Email Providers</th>
<th>IM Services</th>
<th>VoIP Services</th>
<th>Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSN</td>
<td>Google Search (1) (218MM)</td>
<td>Yahoo! Mail (1) (219MM)</td>
<td>MSN Messenger Active Accounts (2) (175MM)</td>
<td>Skype / eBay Registered Users (54MM)</td>
<td>PayPal / eBay Accounts (79MM)</td>
</tr>
<tr>
<td>Unique Visitors (420MM)</td>
<td>Google (1) (384MM)</td>
<td>Yahoo! Search (1) (207MM)</td>
<td>MSN Hotmail Active Accounts (2) (205MM)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Google (1) (384MM)</td>
<td><em>msn</em></td>
<td><em>Yahoo!</em></td>
<td><em>msn</em></td>
<td><em>skype</em></td>
<td></td>
</tr>
<tr>
<td>Yahoo! Unique Visitors (379MM)</td>
<td><em>Yahoo!</em></td>
<td>Google GMail (1) (27MM)</td>
<td>Yahoo! Messenger (1) (79MM)</td>
<td>eBay (1) (64MM)</td>
<td>eBay (1) (31MM)</td>
</tr>
<tr>
<td>eBay (1) (187MM)</td>
<td><em>Yahoo!</em></td>
<td></td>
<td>AQI Instant Messenger (AIM) (1, 3) (64MM)</td>
<td>eBay Accounts (2) (79MM)</td>
<td></td>
</tr>
<tr>
<td>Amazon.com</td>
<td>Active Customers (2) (50MM)</td>
<td></td>
<td>ICQ (1) (31MM)</td>
<td>eBay Accounts (2) (79MM)</td>
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<tr>
<td>AOL</td>
<td><em>AOL</em></td>
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<tr>
<td>Subscribers (2) (30MM)</td>
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<tr>
<td>MySpace.com (1) (21MM)</td>
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</table>

**Number of Users**

<table>
<thead>
<tr>
<th></th>
<th>C2003</th>
<th>C2004</th>
<th>C2005E</th>
</tr>
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<tbody>
<tr>
<td>Google</td>
<td>$177</td>
<td>$319</td>
<td>$700</td>
</tr>
<tr>
<td>Y/Y</td>
<td>375%</td>
<td>80%</td>
<td>104%</td>
</tr>
<tr>
<td>Yahoo!</td>
<td>$117</td>
<td>$246</td>
<td>$405</td>
</tr>
<tr>
<td>Y/Y</td>
<td>128%</td>
<td>109%</td>
<td>65%</td>
</tr>
<tr>
<td>eBay (1)</td>
<td>$365</td>
<td>$293</td>
<td>$396</td>
</tr>
<tr>
<td>Y/Y</td>
<td>163%</td>
<td>(20%)</td>
<td>35%</td>
</tr>
<tr>
<td>Amazon.com</td>
<td>$46</td>
<td>$89</td>
<td>$172</td>
</tr>
<tr>
<td>Y/Y</td>
<td>17%</td>
<td>94%</td>
<td>93%</td>
</tr>
</tbody>
</table>

Source: Company Reports, as of Q2:05. Figures exclude capital expenditures from acquired companies.

*indicates Morgan Stanley Research estimates.
Value shift from call routing towards
- creating and keeping large customers communities
- seamless communication integration
From 3-Play to Community Services

Time shifting & VOD for TV consumption

Development of personal & communities content

Microsoft TV

amigo tv

my Own TV

Audience per title

Films

Sport

Soaps

Reality TV

Local TV

Community content

Pictures & videos (friends & family)

Number of Titles

GUIDE

GUIDE

GUIDE

11 NBC Quest for the holy grail
12 TBT Where happens
13 TBS Midnight
14 BTI The Peach Sisters
15 ABC Summer Vacations
16 FOX Feed's Birthday
17 FOX A classic: the '84 Olympics
18 NBC Summer vacation 2005

Summer vacation 2005
A compilation of the best clips from our Malta trip - compiled by Fred
Change in Business Model

*Telco Operators assets: interactivity & personalization*

Today revenue split → Tomorrow revenue split

Voice & data services → Advertising
Voice & data services → Content
Achieving IMS: IP Architecture + Broadband

- Presence
- Real-time video monitoring
- Messaging
  - Video push
  - A-GPS
  - Messaging
  - Voice

Maps with A-GPS Location Tracking

Voice Calls

WORK FORCE MANAGER

ICT SOLUTIONS B.V.

- Mobile Workforce
- Presence
- Standard Java API / SIP Servlet
- Run Time Layer

ALCATEL 5350 IMS

IMS

Convergent Charging

HSS

CSCF

MEDIA

BWA

xDSL
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Telecom Providers under Pressure

New players, new deals: it’s time for operators to react!

on fixed segment ...
... and soon on mobile market

MVNOs arrival ...

Telecom Providers under Pressure

Telecom
Service Providers
From Voice Service to Voice Component

Revenue


Data  Voice  Enhanced services: music, video  Enhanced services using voice
Orchestrating User-Centric Services

The long way to User-Centric Broadband
... a lot of work to be done

Fixed Mobile IP

Common Platform: Internet
New methods to provide multiple new services economically

- Framework of components: increased efficiency by synthesizing new services through reuse of existing (distributed) basic components
  - implementing only few new components and reuse the majority available components
- Provisioning a multitude of short-lived new services on demand requires autonomic behavior of the network infrastructure
  - service requirements to be mapped on available resources (middleware technology)
  - dynamic self-organization

Shift of business models in communications

- Value of the terminal increasing → peer-to-peer technologies
  - new capabilities of end user devices
  - multi-functional intelligent devices as user gadgets
- Federation of data base, search and communication realms
  - lightweight communication technology embedded into global knowledge base
Multimedia Services Grid

- Application of grid middleware technology - not related to L2/L3 grids
- Maturing of great research results on distributed computing

- Networked Media and Application Server Infrastructure
- Flexible deployment of carrier services beyond IMS
- Value creation by combined services

Multitude of isolated service-specific overlays ...

... mapped on network distributed resources
Value Add in a User-Centric World

Application overlay networks

Aggregate (Yahoo, MSN, AOL)
Find (Google, Yahoo, MSN)
Buy (eBay, Amazon, Kelkoo)

Seamless integration of application overlays with communication overlays

Communications media overlay networks

Voice
Video streaming (IPTV)
Messaging & data (Web, email, IM)
Content download (eBooks, music, video)