Presentation Outline

What is NGN and how it applies in Mobile Networks?

- Mobile Networks Architectures
- Why NGN?
What is NGN?

NGN: Next Generation Networks

- Separation of
  - Access Layer
  - Transport Layer
  - Control Layer
  - Service Layer

- with Control & Transport Layers being shared by
  - the different Access Type (RAN, Fixed...)
  - and Service Layers

- with Packet (ATM, IP) Transport converging toward IP transport

- for provision of Multimedia Services (Real Time, Presence, Messaging, Voice, Video, Data...)
What is NGN?

Service

Control + Transport

Access

How NGN applies in Mobile Networks?
How NGN Applies in Mobile Networks?

- UMTS R99:
  - Largely derived from GSM
  - Last non-NGN Release
  - Features content functionally frozen 12/2000
  - Still Change Requests

- UMTS R4:
  - NGN in Cs Domain with Separation of Control and User layers
  - Introduction of Call Server & MGW
  - Introduction of ATM and IP transport instead of TDM
  - Standard completed in March 2001

- UMTS R5:
  - NGN for IMS
  - Introduction of MM Call Server with SIP Call Control Protocol
  - Standard Content frozen in June 2003

GSM Radio Technology Evolution

- EDGE is upgraded from GSM/GPRS
- UMTS overlays from GSM/GPRS
- UMTS is upgraded from GSM/GPRS
How NGN Applies in Mobile Networks?

- **CDMA 1x RTT:**
  - Extended radio technology from IS95
  - Last non-NGN Release
  - Release 0 in commercial service since Oct 2000
  - New overlay Packet Data Serving Node
- **CDMA 1x EV-DO:**
  - Hybrid CDMA+TDMA technologies for bursty applications (High Speed Data)
  - Requires a separate carrier (1.25MHz), mainly deployed for hot zones.
  - Could be developed independent of IS95/1xRTT. (No MSC/VLR needed)
  - Commercial service in SK, China, Japan, USA
- **CDMA 1x EV-DV:**
  - NGN in Cs Domain with Separation of Control and User layers
  - Backward compatible with CDMA2000 1xRTT
- **Field Trials ongoing**
CDMA2000 Radio Technology Evolution

EV-DO: 1x Evolution Data Only, now also called HDR (high data rate)
EV-DV: 1x Evolution Data and Voice
Dates are publication day of version 1.0 standard. (E.g. CDMA2000 Rel. A published version 1.0 in June 2000, and version 6.0 in Feb 2002.)

- 1xRTT is upgraded from IS95
- 1xEV-DO overlays IS95/1xRTT
- 1xEV-DV is upgraded from 1xRTT
3GPP2 Network Evolution

1995 2000 01 02 03 04 05 06 07 Year of Deployment

2G CDMA
- Legacy Network Architecture
- IS95 Radio

3G - Step 1 (1xRTT)
- Packet Core Network
- CDMA2000 1x Radio

3G - Step 2 (EV-DO)
- 1xEV-DO access added for high speed data service

3G - Step 2’ (NGN)
- Legacy CS upgrade to NGN architecture (LMSD)

3G - Step 3 (MMD)
- 1xEV-DV Radio Access
- Multimedia Domain

Presentation Outline

- What is NGN and how it applies in Mobile Networks?

Mobile Networks Architectures

- 2G/3G Mobile Networks
  - NGN Evolution

- Why NGN?
### 2.5G GPRS/EDGE

**Data Rates**
- GPRS 40 - 144 kbps
- EDGE 384 - 473 kbps

### 2.5G CDMA 1XRTT

**Data Rates**
- 60 - 288 kbps
Presentation Outline

> What is NGN and how it applies in Mobile Networks?

> **Mobile Networks Architectures**
  > 2G/3G Mobile Networks
  > NGN Evolution

> Why NGN?
3G W-CDMA R4

Data Rates 384 Kbps - 2 Mbps

3G W-CDMA R5/R6 (IMS)

Data Rates 384 Kbps - 2 Mbps
5 Mbps (HSDPA)
Presentation Outline

> What is NGN and how it applies in Mobile Networks?

> Mobile Networks Architectures

> Why NGN?

Why NGN?

1 - Transport Network Simplification

2 - Higher Network Scalability

3 - Bandwidth Saving

4 - New Services
Why NGN?
1- Transport Network Simplification - Common Cs/Ps Backbone

- Only one transport backbone for Voice, Data on ATM or IP
- Improved resources use efficiency
  - Resources sharing
  - One network management

Why NGN?
1- Transport Network Simplification - No Transit Layer

- No need for Transit Layer MSC
  - Dynamic connection establishment between nodes
  - In ATM through SVC, in IP through routing
Why NGN?
1- Transport Network Simplification - Common Signalling/Packet Backbone

- With Signalling over IP, no Need for Dedicated Signalling Network
  - simplification of transport network
  - improved resource use efficiency

Why NGN?
1- Transport Network Simplification - Common CN/RAN backbone

- With IP in RAN in R5, Merge of CN & RAN IP Transport Networks
  - simplification of transport network
  - improved resource use efficiency
Why NGN?  
2- Bandwidth Saving

- End to End AMR voice transport (3G/3G Call)
- Bandwidth optimisation
- Transcoder saving
- Voice quality improvement

R99

NGN

AMR

G711 (64 K bits/s per channel)

AMR (down to 15 K bits/s with ATM AAL2 per channel)

Why NGN?  
2- Bandwidth Saving

- AMR in CN for 3G<>PSTN/2G PLMN Voice Call (R4)
- Bandwidth optimisation

R99

NGN

AMR

G711 (64 K bits/s per channel)

AMR (down to 15 K bits/s with ATM AAL2 per channel)

G711 (64 K bits/s per ch.)
**Why NGN?**

3- Bandwidth Saving (CS domain)

**Transport Bandwidth Efficiency (from R4 & beyond)**

<table>
<thead>
<tr>
<th>transport type</th>
<th>G711 over TDM (reference)</th>
<th>AMR over ATM AAL2</th>
<th>AMR over POS IP V4</th>
<th>AMR over GE IP V4</th>
<th>AMR over IP V4 over ATM AAL5</th>
<th>AMR over IP V6 over ATM AAL5</th>
<th>G711 over ATM AAL2</th>
</tr>
</thead>
<tbody>
<tr>
<td>kb/s per voice channel</td>
<td>64</td>
<td>15</td>
<td>34</td>
<td>44</td>
<td>49</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>kb/s per 64kb data ch.</td>
<td>64</td>
<td>85</td>
<td>121</td>
<td>141</td>
<td>151</td>
<td>171</td>
<td>153</td>
</tr>
</tbody>
</table>

- **ATM AAL2**: the most efficient for both Voice and 64kb/s Data
- **POS**: the most efficient of the IP transport
- **64kb/s Data**: Packet transport brings degradation  
  but data traffic on Cs should be low w/r to voice traffic

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**Why NGN?**

3- Bandwidth Saving (PS domain)

**Transport type**

<table>
<thead>
<tr>
<th>Byte per packet</th>
<th>IP over SDH</th>
<th>IP over ATM AAL5</th>
</tr>
</thead>
<tbody>
<tr>
<td>256 byte IP packet</td>
<td>267</td>
<td>318</td>
</tr>
<tr>
<td>512 byte IP packet</td>
<td>525</td>
<td>583</td>
</tr>
</tbody>
</table>

- **IP over SDH** more efficient than **IP over ATM** (10 to 20%)
Why NGN?

4- New Services Unified Services through standardized Interfaces

- services independent of access layer type
  (fixed, mobile, PC, PDA, Phone)

- one Service Platforms whatever the access layer types
  (unlike IN, Voice Mail for Mobile, email for fixed Internet...)

Applications activity overview

- Push-to-Talk Over Cellular (PTT)
- PTT to conference
- Personal Voice Assistant
- Media Push
- Movie Renting
- Web Chat-to-Talk/Conference
- Push-to-Watch
- Audio Conferencing
- Mobile Conferencing
- Location Based Services
- Multi-Person Gaming
- Prepaid Calling
- Virtual Receptionist

- IVR, Multi Languages
- Click-to-Dial/Help/Conference
- Ringback Tones
- Toll Saver (Call Back)
- Email Dial-In & Listen
- Picture Sharing
- Ringback Pictures
- Video Conferencing
- Voice Activated Dialing
- IP Contact Center
- Audio Conferencing with Video
- Click to services
Why NGN?
4- New Services

- IP as target transport layer with benefit of existing IP services
- Merge and combination of existing services
  - Standardized Video Communication (between fixed & mobile, video conferencing & video mail)
  - Unified messaging: one mailbox whatever the message (voice, text, video) & device type
  - Multimedia Messaging
  - Instant Messaging

Why NGN?

<table>
<thead>
<tr>
<th>Summary</th>
<th>CAPEX OPTIMIZER</th>
<th>OPEX OPTIMIZER</th>
<th>REVENUE ASSURANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Network Simplification</td>
<td>⦿</td>
<td>⦿</td>
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<tr>
<td>Higher Network Scalability</td>
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<td>⦿</td>
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<td>Bandwidth Saving</td>
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<td></td>
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<tr>
<td>New Services</td>
<td>⦿</td>
<td>⦿</td>
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</table>
Conclusion

- NGN is the separation between Control and Transport
- NGN is mainly introduced in 3G UMTS R4/R5 and CDMA2000 1x EV-DV
- Only one transport backbone for Voice, Data on ATM or IP
- Bandwidth optimisation, Transcoder saving & Voice quality improvement when Mobile to Mobile/PSTN calls using TrFO
- Unified Services through standardized Interfaces independent of access layer type (fixed, mobile, PC, Phone)

- News Services (Merge and combination of existing services):
  - Standardized Video Communication
  - Unified messaging
  - Multimedia Messaging
  - Instant Messaging