NGN Market Trend and NEC Solutions

April 2010
NEC Corporation
Contents

• Trends in the Japanese Telecom Market
• NGN migration
• NEC’s NGN products introduction
Trends in the Japanese Telecom Market
# Three Major Network Operators

NEC supports all three Tier-1 Japanese carrier Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Mobile</th>
<th>Fixed</th>
<th>ISP</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTT Group</td>
<td>NTT DoCoMo</td>
<td>NTT 東日本</td>
<td>OCN</td>
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<tr>
<td>KDDI</td>
<td>au by KDDI</td>
<td>KDDI</td>
<td>DION</td>
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<tr>
<td>SoftBank</td>
<td>vodafone</td>
<td>SoftBank Telecom</td>
<td>SoftBank BB</td>
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**Competitors:**
- Power companies
- CATVs
Segment Share of Japanese Operators

**NTT Group**

- **FY 2008** $112 billion
- Source: NTT Annual Report 2009

- Fixed
- Mobile
- IP&Packet
- H/W sales
- SI
- Others

**KDDI**

- **FY 2008** $38 billion
- Source: KDDI IR library

- Fixed
- Mobile
- Others

**SoftBank**

- **FY 2008** $29 billion
- Source: Softbank Annual Report 2009

- Fixed
- Mobile
- Broadband
- Internet Culture
- e-Commerce
- Others

- **FY 2006** $9.4 billion

- Mobile is main business (Single Company)
- Smaller. Operating in several domains (Synergy)

- Big but balance of Fixed and Mobile (Separate Companies)
BB Growth in Japan (xDSL, CATV & FTTH)

- Subscribers grew 725% in 5 years following deregulation and the entry of aggressive new players to the market.
- xDSL market is saturated in 2005 and BB growth is shifting to FTTH.

Source: Japanese Ministry of Internal Affairs and Communications
Broadband Subscribers

- BB market still expanding
- The increasing rate of the fiber caught up with DSL in 2005.
- The number of subscribers of fibers overcame DSL in 2007.

<table>
<thead>
<tr>
<th>Year</th>
<th>DSL</th>
<th>FTTH/B</th>
<th>CATV</th>
<th>FWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
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<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td>12,966</td>
</tr>
</tbody>
</table>

FWA: Fixed Wireless Access
DSL: Digital Subscriber Line
FTTH/B: Fiber to the Home/Building
CATV: Cable Television
Drivers of Broadband in Japan

- **Unbundling of Local Loop since 1997**
  - Regulator actively push it.

- **Aggressive and competent new comer “SoftBank”**
  - Aggressive tariff plan and sales promotion attracted users.
  - Financially capable to execute mass deployment based business model.

- **Operators pursued broadband access revenue**
  - Fixed operators followed SoftBank’s strategy to keep the market share.

And now,

**FTTH is driving Broadband access growth**

*Note: In Japan FTTH includes FTTB*
Why is FTTH driving BB access growth now?

- **Government support for FTTH deployment**
  - Plan to realize nationwide FTTH service coverage by 2010
  - Expected as a supplement to broadcast Terrestrial Digital TV

- **NTT’s aggressive promotion of FTTH service**
  - Strategic long-term plan to deploy FTTH
  - Offensive strategy to beat SoftBank
  - Increase the cost of maintaining the copper network

Tariff plan is competitive with ADSL and Cable

**ADSL Market Share in Japan**

- NCC (39%)
- NTT

**FTTH Market Share in Japan**

- NCC (61%)
- NTT
FTTH Promotion

NTT pushes FTTH hard.
The main strategies are:

1. Aggressive pricing
2. 0AB-J numbered VoIP service with Number Portability
3. Service Bundling:
   • Hikari Denwa
   • Hikari TV
   • Digital terrestrial TV by IP Multicast
   • Nintendo Wii Package
NGA Trends (In Sum)

- Fixed voice services is decreasing because of the competition from other communication services (e.g. mobile, PC)

- Next Generation Access (aDSL, FTTH) deployment is an important step towards NGN...

- ...but it is also a response to falling voice revenues: a need to cut operational costs and generate new revenues

- Broadband access is not enough in itself. It needs a bundle of solutions such as voice and video.
Fixed Voice Revenue and Profit in NTT

Fixed Voice Revenue and Profit have been gradually declining year by year after 2003
- Drop in the price of Fixed Voice Service: 30% down over the last 15 years
- Number of subscriber is declining: 15% down over the last 10 years

Source: Nikkei Communication
ARPU of Fixed-line Telephone Services

NTT presentation
ARPU of Mobile Services (FOMA + mova)

NTT presentation
ARPU of FLET’S Hikari

NTT presentation
# NTT NGN Strategy

- **20M fiber access customers by 2010**
- **Increase NGN sales to 4.5B$ by 2010**
- **Fixed-line OPEX savings of 7.2B$ by 2010**

## Strategy Overview

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2006</th>
<th>2007</th>
<th>2008~</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steps introducing the next generation network</strong></td>
<td><strong>STEP1</strong></td>
<td>Field trials</td>
<td><strong>STEP2</strong></td>
</tr>
<tr>
<td><strong>Core network</strong></td>
<td></td>
<td></td>
<td><strong>STEP3</strong></td>
</tr>
<tr>
<td><strong>Service control functions</strong></td>
<td>Construction of relay network (deploy optical wavelength transmission equipment)</td>
<td><strong>STEP2</strong></td>
<td>Construction of subscriber network (deploy edge nodes)</td>
</tr>
<tr>
<td><strong>Service development</strong></td>
<td>Trial services (Field trials with limited regions and users)</td>
<td>Full scale development of next generation services</td>
<td></td>
</tr>
</tbody>
</table>

Source: NTT annual report 2006 (2007.03)
Carrier-grade VoIP services in Japan

- Two types of carrier-grade VoIP telephone (NOT internet telephone), “0AB ~ J” and “050” IP telephone services are regulated in Japan.

<table>
<thead>
<tr>
<th></th>
<th>0AB ~ J IP Telephone</th>
<th>050 IP Telephone</th>
<th>Internet Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice Quality (R value [ITU-T G.107])</td>
<td>&gt; 80</td>
<td>&gt; 50</td>
<td>Not guaranteed</td>
</tr>
<tr>
<td>End-to-End delay [ITU-T G.114]</td>
<td>&lt; 150 m sec</td>
<td>&lt; 400 m sec</td>
<td></td>
</tr>
<tr>
<td>Message area identification</td>
<td>OK</td>
<td>NG</td>
<td></td>
</tr>
<tr>
<td>Emergency call</td>
<td>mandatory</td>
<td></td>
<td>unnecessary</td>
</tr>
</tbody>
</table>

(Source) MIC report, 2006, etc.

- **Internet telephone**: No telephone number, PC basis, best-effort QoS

- **“050” IP telephone**: via ADSL or CATV, limited QoS, limited functions
  - Softbank BB (49.0% shares), NTT communications (25.4%), KDDI (9.8%)
  - Provider’s profit worsening due to price competition is very severe.

- **0AB ~ J IP telephone**: PSTN level QoS, MA identification, Emergency call
  - Substitute PSTN and 050 IP telephone as FTTH become increasingly popular.
  - NTT provides Hikari Denwa service
NTT NGN Service

- **Optical broadband services**
  - FLET’S Hikari Next
  - Hikari TV, FLET’S TV
- **Optical telephony services**
  - Hikari Denwa
  - Hikari Denwa Office Type
- **Security services**
  - FLET’S Virus Clear v6
- **Services for corporate customers**
  - Business Ether Wide
  - FLET’S VPN Gate
- **Services for content providers**
  - FLET’S Cast
  - Services for digital terrestrial television IP retransmitting companies
NTT has introduced IMS

NTT presentation
NGN migration
General Aspect Of NW Revenue

- Legacy switching system is nearing end-of-service, so the migration scenario must be considered.
- The trend is that fixed voice revenue and profit have been gradually declining year by year, so the investment to fully develop PSTN emulation services alone will not pay.
- Enabling new revenues and services to be developed and deployed as well as to support TDM based voice is an issue.

<table>
<thead>
<tr>
<th>TDM Oriented</th>
<th>Transformation</th>
<th>NGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDM based Fixed Voice</td>
<td>Mobile Voice / FWA</td>
<td>Non-Traffic Business</td>
</tr>
<tr>
<td>IP Multimedia Services</td>
<td>VoIP</td>
<td>New Service</td>
</tr>
</tbody>
</table>

Current Service

New Service

Revenue

Time

Telkom is here now.

- Broadcasting
- Digital Signage
- Retail
- Security
- Telemedicine
- e-Learning
- SNS / Community
- Auction
- VoD
- Music / Gaming
- Home Gateway
- Video Telephony
- Corporate VPN
- IP Centrex

- Voice Telephony
- FAX

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Migration to NGN Network

C&C Cloud Mega Platform

Service Stratum

Other IP Networks

PSTN

NGN

Transport Stratum

Access independent
According to operator strategy and network situation, 3 possible migration scenarios exist to migrate the current voice service.

**Scenario 1: Soft switch (Emulation) oriented Migration**
- Soft switch replaces legacy TDM switches and provide the voice telephony services to legacy POTS users
- Less impact for the experience of current PSTN users

**Scenario 2: Broadband (Simulation) oriented Migration**
- IMS based SIP server provides VoIP and multimedia applications for BB users
- The first step for the enhancement of user experience and revenue structure
- Keep TDM switches in operation and gradually guide the users to IMS

**Scenario 3: Both Simulation and Emulation oriented Migration**
- IMS based SIP server interworking with AGW replaces legacy TDM switches and provides voice telephony services to legacy POTS users
- Smooth migration path to the future full IMS-based all-IP network
Full-NGN Architecture

- PSTN
- Internet
- Mobile
- SGW
- MGCF
- NACF
- RACF
- DVLAM MSAN
- S-CSCF
- Applications
- POTS
- Internet
- Mobile
- Videophone
- IP Phone
- Softphone
- SIP-based AGW
- MEGACO-based AGW
- Soft switch

Scenario 1
- Emulation
- TS
- PSTN
- LS

Scenario 2
- Simulation
- TS
- PSTN
- LS

Scenario 3
- Simulation & Emulation
- TS
- PSTN
- LS

NEC's proposal

PSTN Migration scenario (2/2)
Why “Scenario 3”?

- Simple and smooth migration toward full IMS-based all-IP network 1Step
- IMS based solution has a high affinity with broadband services
- SIP-based AGW can accommodate legacy POTS users as well

For operator’s further growth, there are number of advantages of IMS-based solution toward future full IMS-based all-IP network.
NEC’s NGN products introduction
NEC’s network products for NGN

NEC provides solutions which cover from service to transport, the end to end, full-line and full-layer of NGN.
NEC’s full IMS product line

Service application

Service stratum

Transport stratum

NC7000 Series

NC9000 Series

NC5000 Series

Access Node
Edge Node
IP Backbone
Interworking

IP Transport

RAN
WiMAX
WLAN
FTTH

Services
SDP (Service Delivery Platform)
IMS Core
QoS/Authentication

Transport

Access

xDSL

NEC’s full IMS product line

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NEC’s Advanced Technology for NGN

Service Application

Service Stratum

SDP: NC7000 Series
- Providing effective development of service and operation
- Call Control, Messaging, Presence, Media Resources
- Supporting aTCA, UNIX (Not depend on Hardware)

IMS: NC9000 Series
- SIP Server with High Capacity and Reliability
- Realized reliability of 99.9999%
- Supporting aTCA, UNIX (Not depend on Hardware)

Transport Stratum

RACF/NACF: NC5000 Series
- High Quality, Security & Reliability for Transport Control
- Guarantee of bandwidth and priority with NC9000
- Supporting aTCA, UNIX (Not depend on Hardware)

Mobile, WiFi, WiMAX, xDSL, FTTH

Optical IP Transport

SDP: Service Delivery Platform

IMS: Network Service Control

Transport Control Platform
Thank you!

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