FTTH in Japan: Strategy, Technology and Implementation

19th, September 2011

Hiromichi Shinohara
Senior Executive Director
R&D Strategy Department
NTT
• Restoration from the Earthquake Disaster
• FTTH Market in Japan
• NTT’s Business Strategies
• NTT’s Technology Innovations
Restoration from the Earthquake Disaster
Damage Status of NTT’s Facilities

**Telecom office buildings**
- Demolished: 18 buildings
- Flooded: 23 buildings

**Telephone poles**
- Flooded/collapsed: 65,000 poles

**Trunk line**
- Trunk lines: 90 routes disconnected
- Flooded/damaged: ~ 6,300 km

**Base stations**
- Requiring restoration: 375 stations

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
Restoration Status of NTT’s Service

**Fixed-line:**
- Renew power supplies and equipments in telecom offices
- Re-install trunk transmission lines

**Mobile:**
- Repair base stations’ trunk lines using emergency FO cable and entrance microwave system
- Area remedies using large zone schemes

<table>
<thead>
<tr>
<th>After disaster</th>
<th>March 28</th>
<th>End of April</th>
<th>End of May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed offices</td>
<td>385</td>
<td>55</td>
<td>5</td>
</tr>
<tr>
<td>Mobile</td>
<td>4,900</td>
<td>375</td>
<td>34</td>
</tr>
</tbody>
</table>

Nuclear power plant area etc.

Area with construction difficulties
Interruption in Power-Supply

# of affected circuits for fixed-line services

- Power outage:
  - Out of battery
  - Exhaustion of fuel for generator

- Power restoration:
  - Power-supply car
  - Fuel delivery

# of base stations with discontinued mobile services

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
Key Lessons Learned

Tsunami:
• Severe damages to telecom. facilities
• Large qnty. of debris and severed roads blocking access to & within the affected areas

Electricity:
• Widespread and long-term power outages
• Brownout (scheduled blackout)
• Risk to over-depend on the utility power

Emerging ICT Services:
• Voice service: unprecedented congestion
• E-mail and the Internet played key role
Future Disaster Countermeasures

- Development of disaster-resistant networks and prompt recovery methods
  • Key function dispersion across the country
  • Multiple route Implementation
  • Increasing Reserved power capacity

- Secure prompt reconnection for local relief sites
  • Satellite and wireless communication

- Secure means of info. distribution after disaster
  • Enhancement of existing answering service
  • Encouraging users to use email & Internet

- Provide services and solutions useful during a disaster and during recovery
  • Local government support, medical care, schools etc.
FTTH Market in Japan
Telecom Service Subscriptions

As of March ‘11

Mobile 123 M
Adoption Rate 89% (per population)

3G mobile 113 M

PSTN/ISDN 40 M
Adoption Rate 68% (per household)

Fixed Broadband 34 M

Source: Ministry of Internal Affairs and Communications (MIC) and the Telecom Carriers Association

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
Fixed Broadband Market

Total Fixed BB: 34 mil subs.

As of March ‘11

- 8.2 M ADSL
- 5.7 M CATV
- 20.2 M FTTH (15 M in NTT)

Source: Ministry of Internal Affairs and Communications (MIC)
• NTT’s nationwide share of FTTH is above 70%.
• In urban areas, NTT struggle with smaller market
• BB providers basically use their own fiber
FTTH Market Growth in Japan

- Strong Demand for Broadband
- Facility-based Competition
- FTTH Market Growth
- Unbundling Regulations
- Government-Subsidies

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
NTT’s Business Strategy
NTT’s FTTH Access Services

MDU Type ~ 40%
- MDU: Multi Dwelling Unit
- MC
- EPON
- ONU
- OLT
- 1:8 splitter

SDU Type ~ 60%
- SDU: Single Dwelling Unit
- OLT
- 1:4 splitter

MDU Type
- ONU
- VDSL
- MC
- EPON
- 1:32 splitter

SDU Type
- ONU
- EPON
- 1:8 splitter

FTTB ~ 40%
- FTTB
- MDU Type
- ONU
- VDSL
- MC
- EPON
- 1:32 splitter

FTTH ~ 60%
- FTTTH
- SDU Type
- ONU
- EPON
- 1:8 splitter

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
NTT’s FTTH Service Development

Service Development

Year

Enhanced Service

200M Service

Metered Charge Service

Additional Services

Flat-rate Data Service

100M Internet Access

IP Telephony

Video
NTT’s FTTH Business Strategy

Opportunity

Expand Area Coverage

Reduce CAPEX/OPEX

Create New Services

Profitability

Revenue

FTTH Business
Fiber penetration in NTT

Fiber coverage rate = Fiber serving area / Total area
Service offering in depopulated areas: Indefeasible Right of User Contract Scheme

Provide FTTH to 650,000+ households by leasing fiber from local government under IRU contract

Extended PON reach: Normal reach (7km), Long Reach (50km)
ARPU from FTTH Services

<table>
<thead>
<tr>
<th>Year</th>
<th>NTT EAST</th>
<th>NTT WEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/3</td>
<td>4,650</td>
<td>4,890</td>
</tr>
<tr>
<td>2007/3</td>
<td>5,050</td>
<td>5,120</td>
</tr>
<tr>
<td>2008/3</td>
<td>5,310</td>
<td>5,460</td>
</tr>
<tr>
<td>2009/3</td>
<td>5,580</td>
<td>5,620</td>
</tr>
<tr>
<td>2010/3</td>
<td>5,740</td>
<td>5,780</td>
</tr>
<tr>
<td>2011/3E</td>
<td>5,890</td>
<td>5,910</td>
</tr>
</tbody>
</table>

Addnl. Rate
Basic Rate

Diverse additional services

- IP Telephony
- Remote Support
- RF overlay video
- Virus clear
- Local information
- Mobile Wi-Fi router
- File hosting
- Personal Health Record
- Earthquake alert

Our FTTH business is turning profitable !!
IP telephony
“Hikari-denwa” : Optical telephone

• Low-price
  – Monthly charge : JPY 525 (cf. POTS : JPY 1,785)
  – Dialing charge : JPY 8/3min. to any fixed telephone

• Geographically assigned telephone number of 0AB….J
  – Current telephone number can be used

• Existing telephone terminal can be used

• Voice quality is equivalent to POTS

• 2-lines & 5 telephone numbers

• Emergency calls (Fire & Police) can be made
  - # of users : 12.2 million
  Take-up rate exceeded 80%
Video Services

# of subscribers

- IPTV : 1.4 million
  - retransmission of terrestrial broadcasting
  - video
  - VOD

- RF Overlay : 0.6 million
  - CATV-like service

Total : 2 million

Future plans:
- Interconnection with mobile phone
- Enrichment of High-Definition Programs
- IP retransmission of satellite broadcasts
- IPTV Enabled LCD TV
- Video Recording
- 3D contents
- TV shopping

2009/3

2011/3

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
“Broadband” x “ICT app.” at “Home”

- Security/Fire Prevention
- Customer Support
- Healthcare
- Entertainment
- Energy

Any-devices
Home-ICT Platform

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
Technical Aspects of NTT’s FTTH
Reduce product costs

- Multi-fiber ribbon
- 0.3 mm fiber for ribbon
- Single slot (1,000 fibers)
- Multi-cable installation (2,000 fibers)
- Multi-cable installation (3,000 fibers)
- Multi-fiber fusion splicing
- Mechanical splicing

Main cable

Fiber splicing

PON system

BPON ↔ EPON

ONU

4 service classes

Reduction in power consumption & size
**FTTH Technology Innovations**

**Reduce product costs**
- Multi-fiber ribbon
- 0.3 mm fiber for ribbon
- Single slot (1,000 fibers)
- Mechanical splicing
- Multi-cable installation (2,000 fibers)
- Multi-fiber fusion splicing

**Reduce cost and time for service provisioning**
- Field assembly connector
- Low-friction indoor cable
- Freely bendable cord
- Cabling in small gaps

**Develop easy const. techs.**
- Multi-cable installation (3,000 fibers)
- Main cable
- Indoor cable
- Fiber splicing

**PON system**
- BPON
- EPON
- 4 service classes
- Long reach
- DIY installable ONU
- auto authentication, configuration, registration
Easy construction techs. for MDU

- Low-friction indoor cord
- DIY Installable fiber cord
- Space-saving splitter
- Common space
- PT
- ONU+
- HGW
- Connector plug
- Connector
- Bendable
Low-friction indoor cable

1 to 1 fiber wiring

Existing MDU

Conventional cable

Optical cable
2.0mm
3.1mm

< 5-6 cables

New indoor cable

Pipe (22mmφ)

Metallic cable (30 pairs)

Optical cable
1.4~1.6mm
1.9~2.0mm

> 20 cables

Downsizing (by 50%)
Applying low-friction material to cable sheath

Pipe for wiring

- Narrow pipe
- Existing metallic cables in pipe
- No spare pipe
Easy construction techs. for MDU

- Low-friction indoor cord
- DIY Installable fiber cord
  - Freely bendable optical cord
  - Easy-to-Plug Connector
  - Shutter

- Hole or Core or Clad pipe
- Outlet

- Clinched
- Bent at right angle
- Bundled
- Knotted

Copyright(c) 2011 Nippon Telegraph and Telephone Corporation
Provisioning Time of FTTH Services

Annual net increase in subscription for FTTH:
- 2005: 1 (800K)
- 2010: 2.5 (2M)

Provisional time for a subscription:
- 2005: 1
- 2010: 0.5

Rate of FTTH access failure:
- 2005: 1
- 2010: 0.5
**FTTH Technology Innovations**

- **1990**
  - Multi-fiber fusion splicing
  - Mechanical splicing
  - Single slot (1,000 fibers)

- **2000**
  - Multi-cable installation (2,000 fibers)
  - Field assembly connector
  - Low-friction indoor cable
  - Freely bendable cord
  - Cabling in small gaps

- **2010**
  - Multi-cable installation (3,000 fibers)
  - Remote & hitless switching
  - Easy repairing
  - Non-dispatch testing

**Reduce product costs**
- Multi-fiber ribbon
- 0.3 mm fiber for ribbon

**Facilitate operation and maintenance**
- Optical facility maintenance
- PON system
- BPON, EPON

**Reduce cost and time for service provisioning**
- Multi-cable installation
- Main cable
- Single slot (1,000 fibers)

**Indoor cable**
- Freely bendable cord
- Cabling in small gaps

**Fiber splicing**
- Mechanical splicing
- Multi-fiber fusion splicing

**PON system**
- BPON, EPON
- ONU
Summary

- Strong demand & facility-based competition were driving force behind FTTH growth
- Investment in fiber, service creation & cost reduction are keys for growth & profitability of FTTH business
- Easy construction techs. are keys to spread FTTH service
- R&D activity is shifting its direction to O&M for sustainable devlpmnt. of FTTH service
- A major challenge after the rapid market growth & the earthquake disaster is energy-efficient network