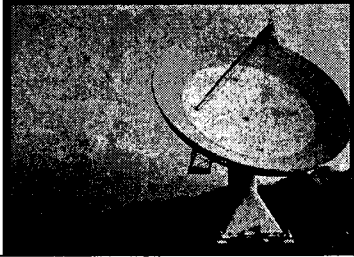


Session 2: FTTH 기술개발 현황

---



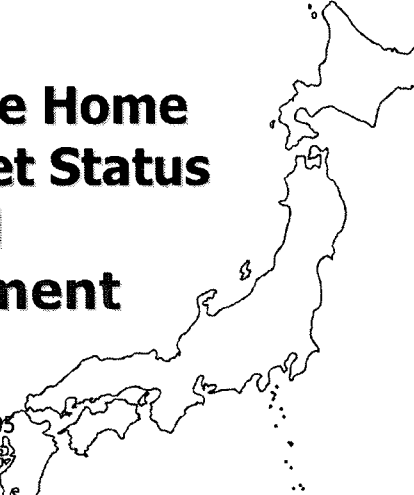
**일본의 광통신 자재  
개발 현황**

---

**일본 3M Masahiro Yamaguchi**



**Fiber To The Home  
Japan Market Status  
and  
Deployment**




June.2 2005  
3M Company  
Communication Markets Division  
Masahiro Yamaguchi

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 257th 2005

**3M Innovation**

**Fiber To The Home  
Japan Market Status  
and  
Deployment**



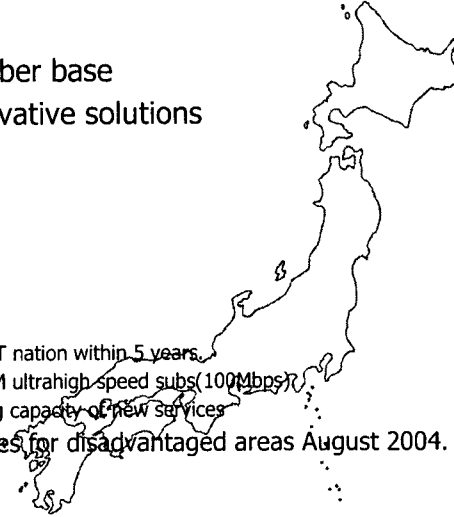
June.2 2005  
3M Company  
Communication Markets Division  
Masahiro Yamaguchi

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 257th 2005

**3M Innovation**

### JAPAN Fiber to the home Drivers

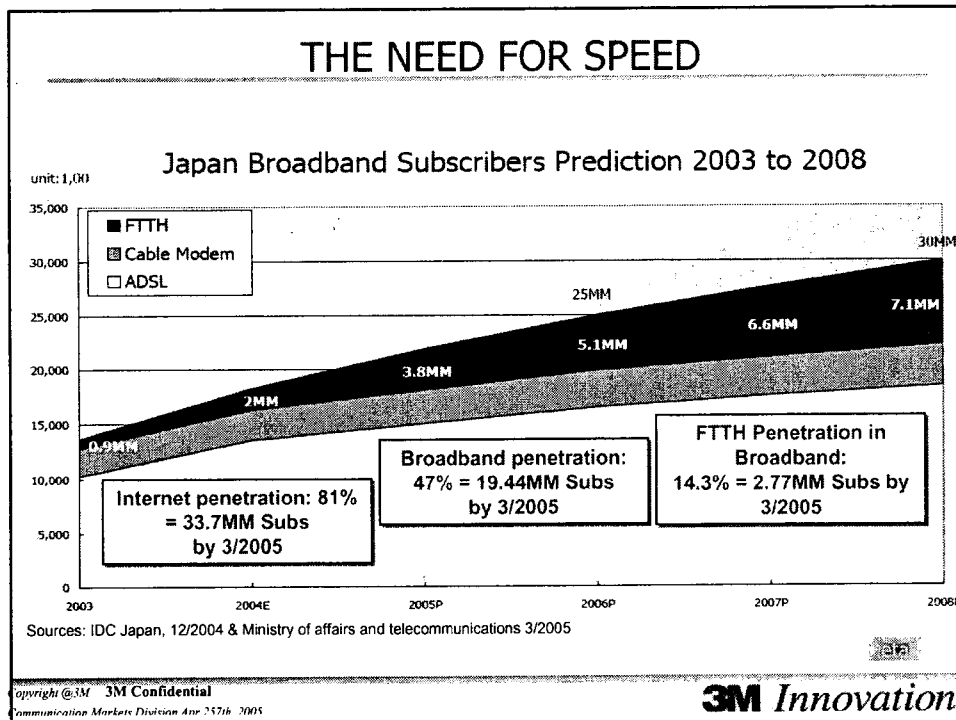
- ◆ THE NEED FOR SPEED
- ◆ Fierce competition for subscriber base
- ◆ Cost of deployment with innovative solutions
- ◆ Focus on contents
  - ◆ VOD
  - ◆ IP Broadcast
- ◆ Government Initiatives
  - ◆ e-Japan strategy I&II
    - ◆ Japan will be the most advanced IT nation within 5 years.
    - ◆ 30M high speed subs(10Mbps), 10M ultrahigh speed subs(100Mbps)
    - ◆ Focuses on content and harnessing capacity of new services
  - ◆ Government announces subsidies for disadvantaged areas August 2004.
  - ◆ u-Japan strategy.

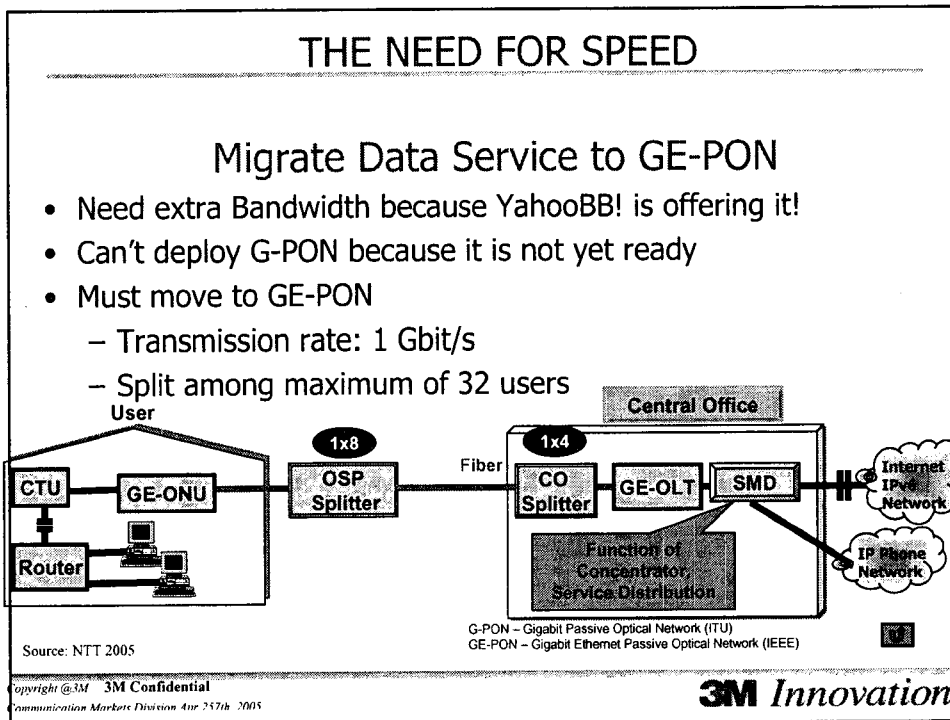
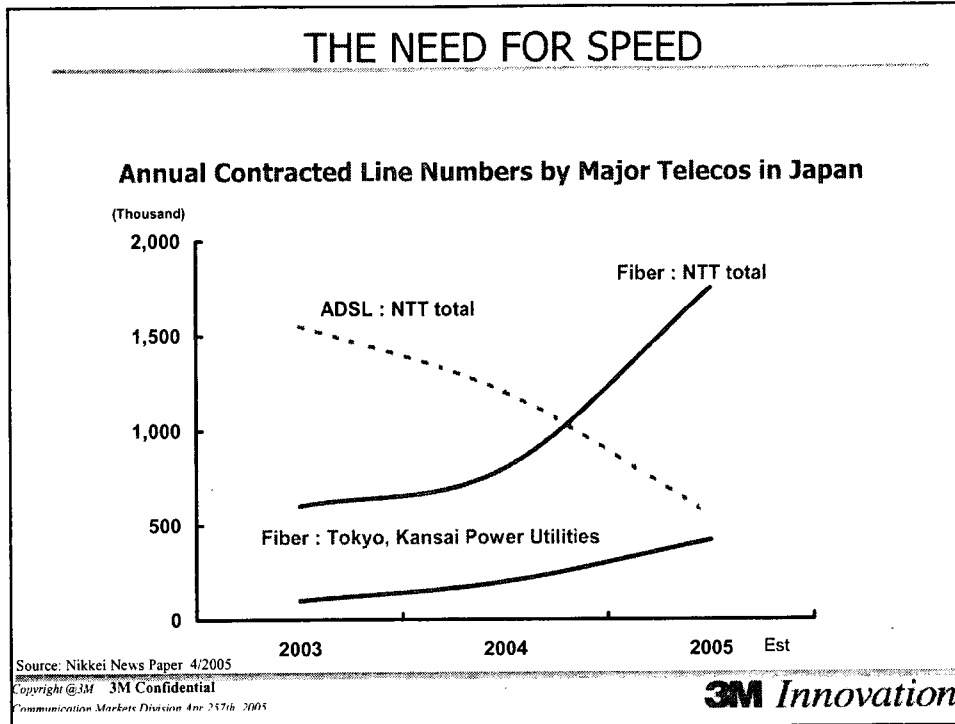


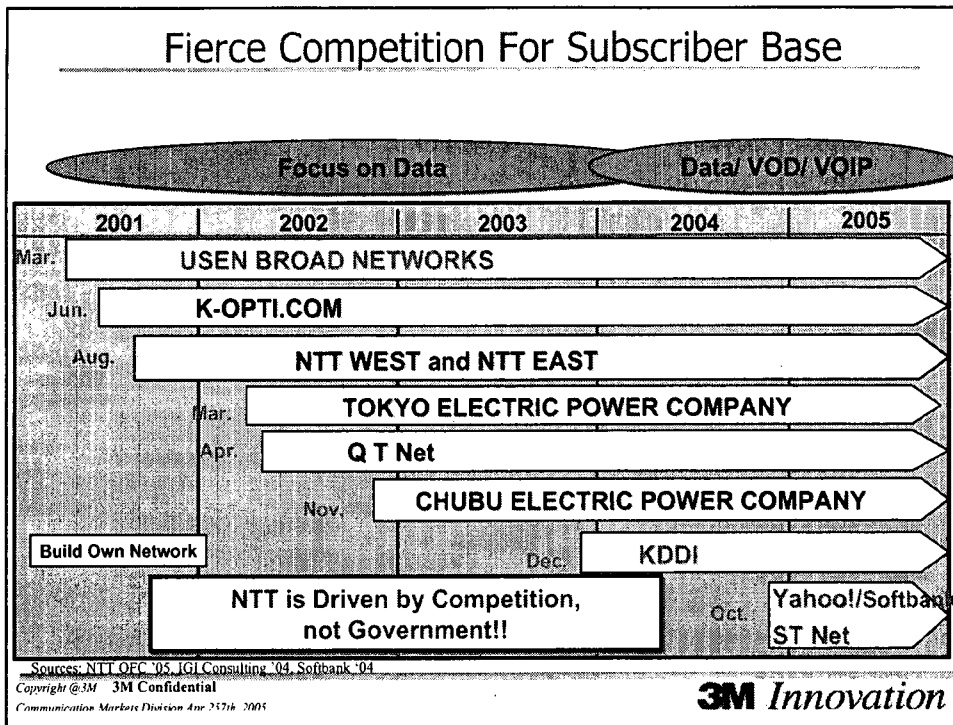
Reference: FTTH Council Presentation1/2005

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/26 2005

**3M Innovation**







### Fierce Competition For Subscriber Base

#### - Massive FTTH Deployment -


◆ Japan

- ◆ NTT plans massive FTTH Deployment
  - ◆ 30MM Homes and Business by 2010
  - ◆ Spend 5 Trillion Yen(\$49 Billion)
  - ◆ 280 Billion Yen(\$2.7 Billion) spent in last fiscal year (end March 05)
  - ◆ Target 5MM subscribers by March 2006.
- ◆ Electric Power Companies plans two times subs of 2004.
  - ◆ TEPCO: 130k → 220k, Kansai EPC 220k → 430k in 2005.
  - ◆ Spend 100 Billion Yen( \$0.94 Billion) by both of companies totally.

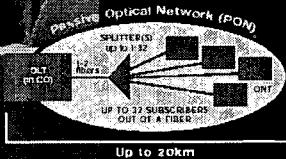
Copyright © 3M 3M Confidential  
Communication Markets Division Apr 257th 2005

3M Innovation

## Fiber To The Home Deployment

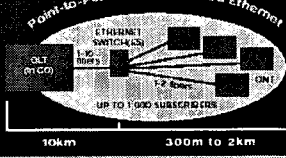


- Requires passive optical couplers/splitters
- Supports BPON (ITU-T G.983), EPON, FSAN (Full Service Access Network) and GPON (ITU-T G.984)
- Eliminates powering and maintenance issues associated with electronics in the outside plant



Up to 20km

- Switching accomplished at remote Ethernet switch site
- Does not require passive optical couplers/splitters
- Supports IEEE 802.3ah EFM (Ethernet in the First Mile)



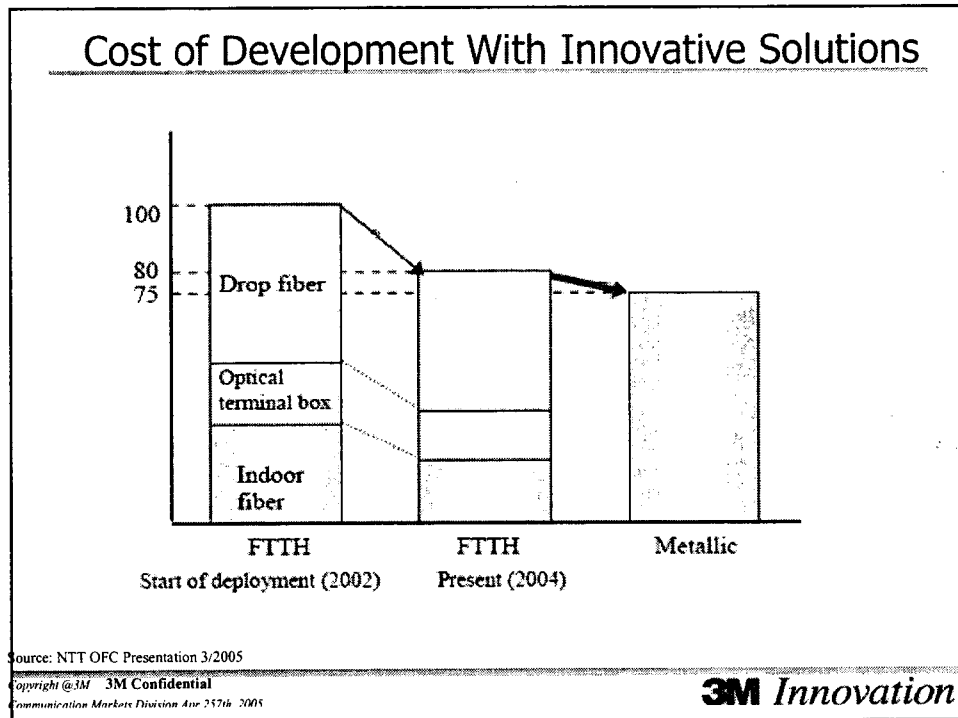
10km      300m to 2km

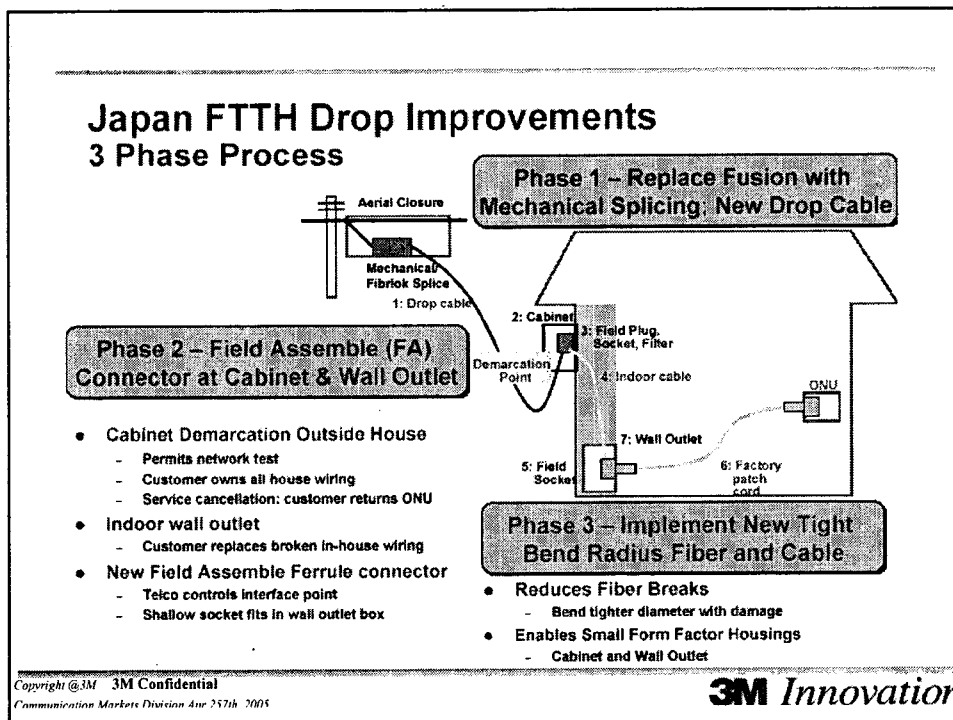
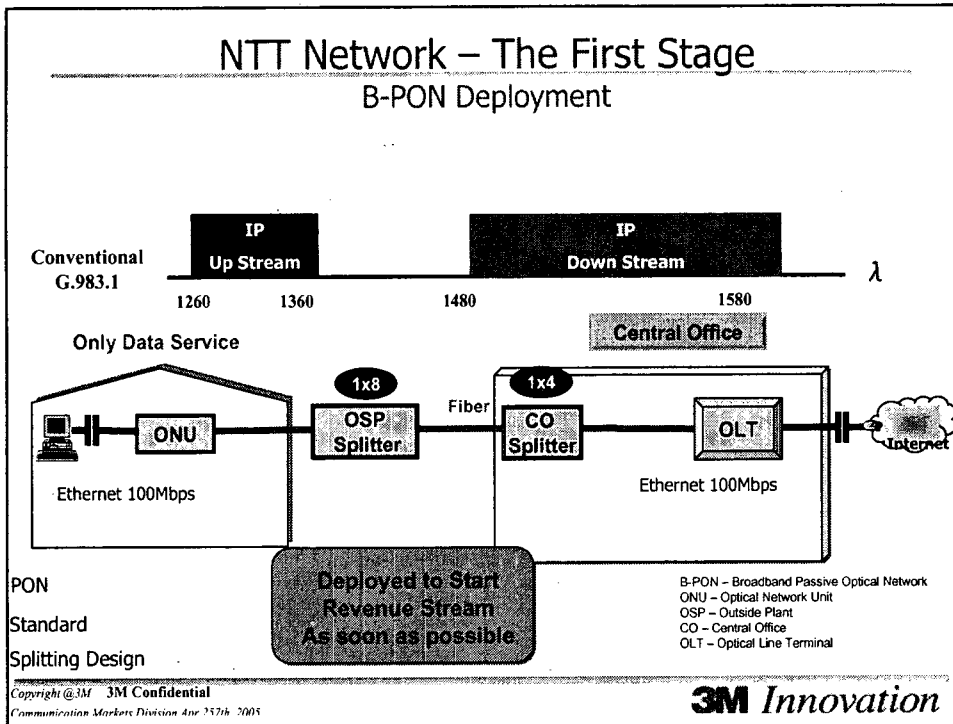
Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/04 2005

**3M Innovation**

Example Apartment

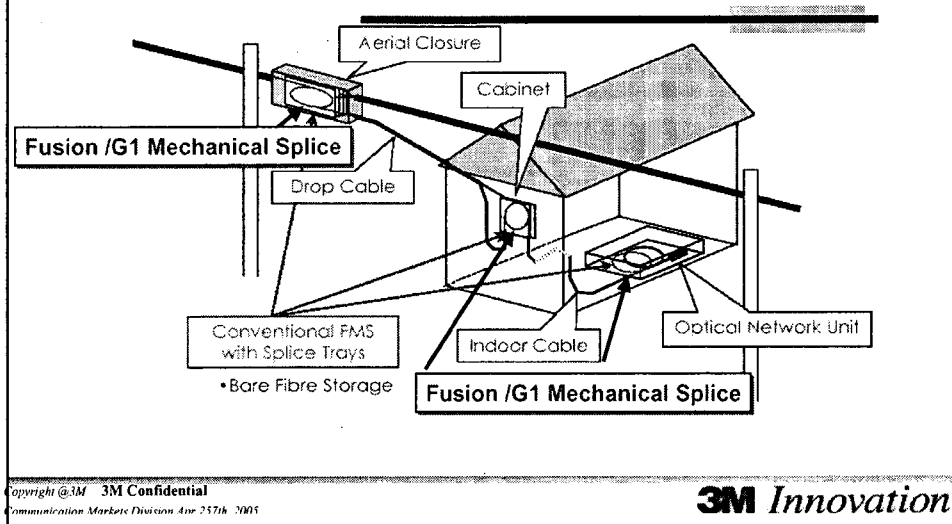
Example Independent House



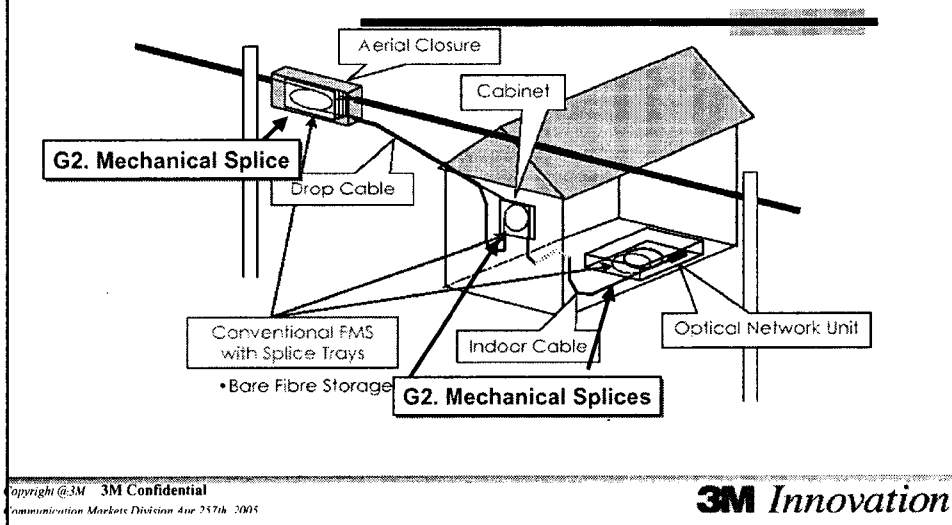




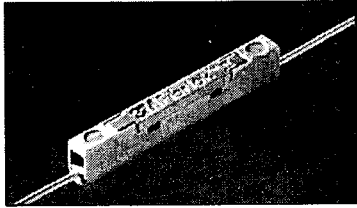
### FTTH Drop Architecture – 2001/2002



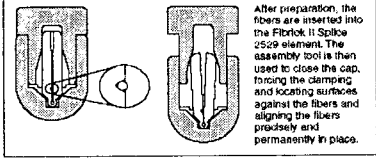
### FTTH Drop Architecture – 2003/2004



### 3 FibrLok™ Splice

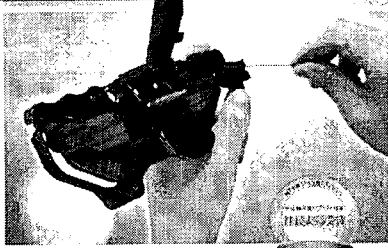


**Cross-sectional view of open and actuated Fibrlok II Splice 2529**



After preparation, the fibers are inserted into the Fibrlok II Splice 2529 element. The assembly tool is then used to close the cap, forcing the clamping and locating surfaces against the fibers and aligning the fibers precisely and permanently in place.

**Over 1 Million Deployed In Japan FTTH Market**



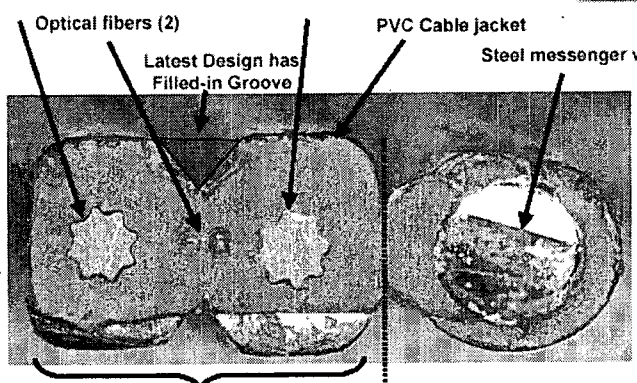
Features	Benefits
<0.1dB insertion loss	High performance
30 second installation time	Increased productivity
Minimum tooling requirements	Low capital cost
No epoxy or electricity required	Easy on-site installation
Simple, easy to use	Minimal training, lower installed cost

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/7th 2005

3M Innovation


### Japan Style Drop Cable - Cross-section

FRP(fiber reinforced plastic) Tension member



Remove messenger wire  
Remaining cable becomes "Indoor Cable"

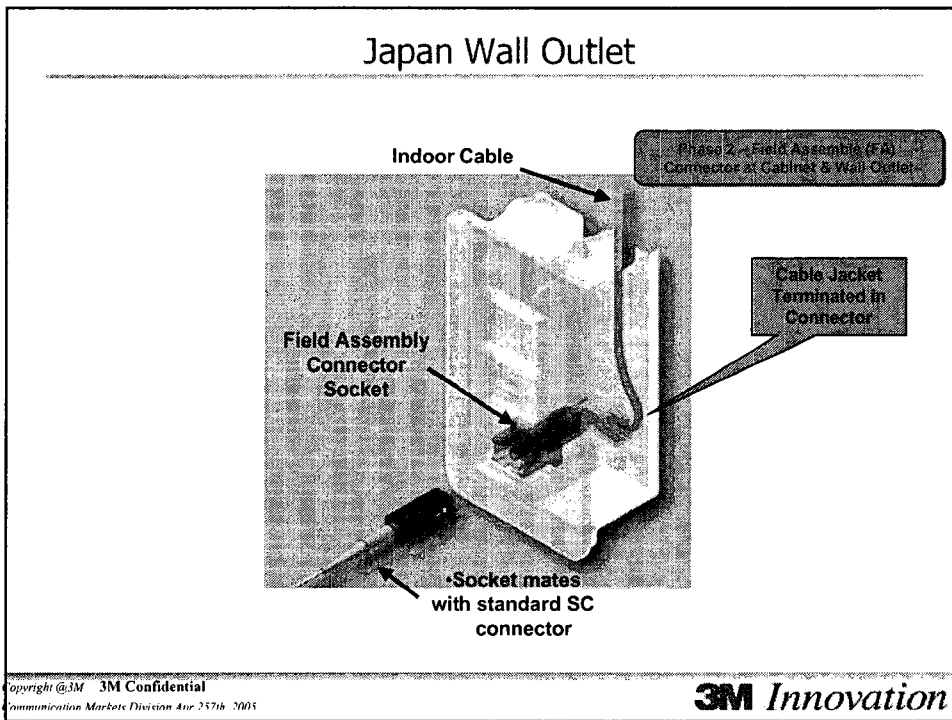
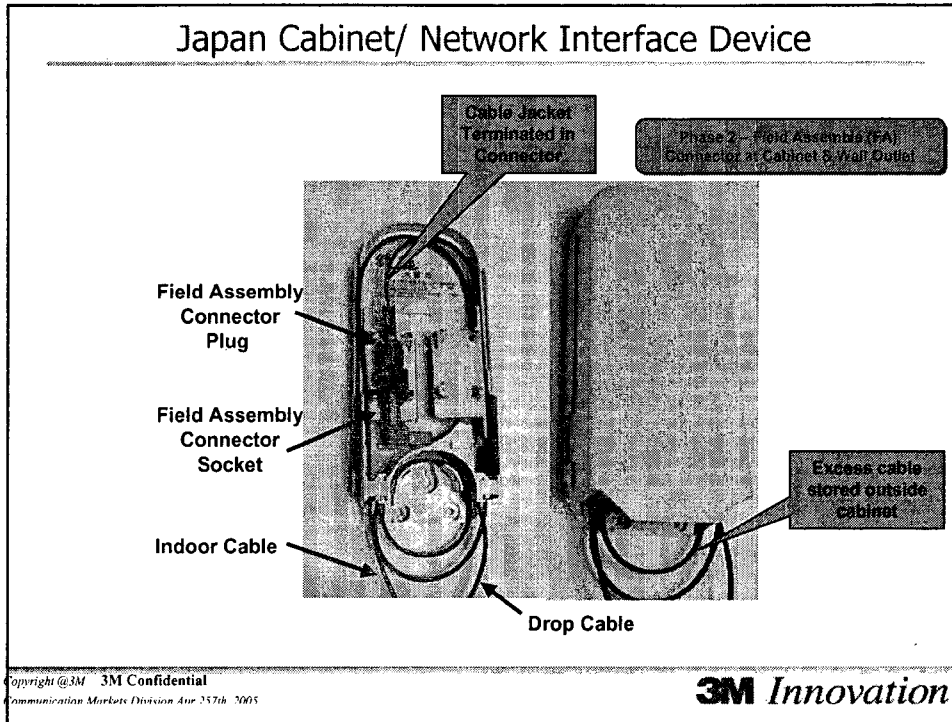
Phase 1 - Replace Fusion with Mechanical Splicing; New Drop Cable




Zip joint  
To remove steel messenger wire

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/7th 2005


3M Innovation



### 3M Field Assemble Connector Plug and Socket



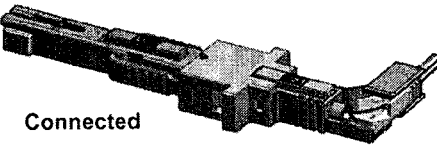
Plug



Socket

Phase 2 - Field Assemble (FA)  
Connector at Cabinet & Wall Outlet

- Factory Polished Fiber/Ferrule Assembly
- Field Assembled with Mechanical Splice



Connected


#### Features

- Simple tools, no adhesives or polishing
- L-Shaped Socket Design for Small Form Factor Wall Outlets or NIDs
- Socket mates with standard SC connector

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/1th 2005

3M Innovation



### 3M Field Assemble Connector Plug and Socket

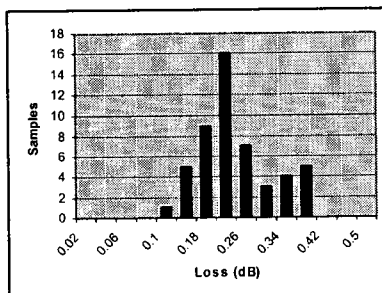


FA Connector Plug & Socket Set  
1310nm Test Results of 50 samples

#### Termination process

Simple assembly tool is used to activate splice inside connector and socket. Fiber can be prepared and cleaved using standard tools.

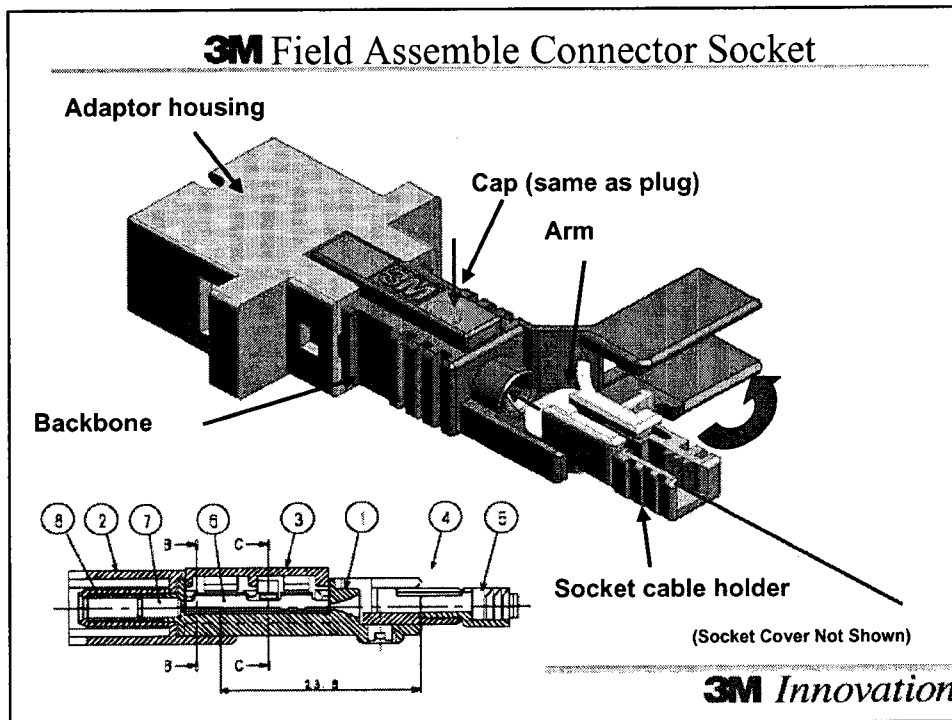
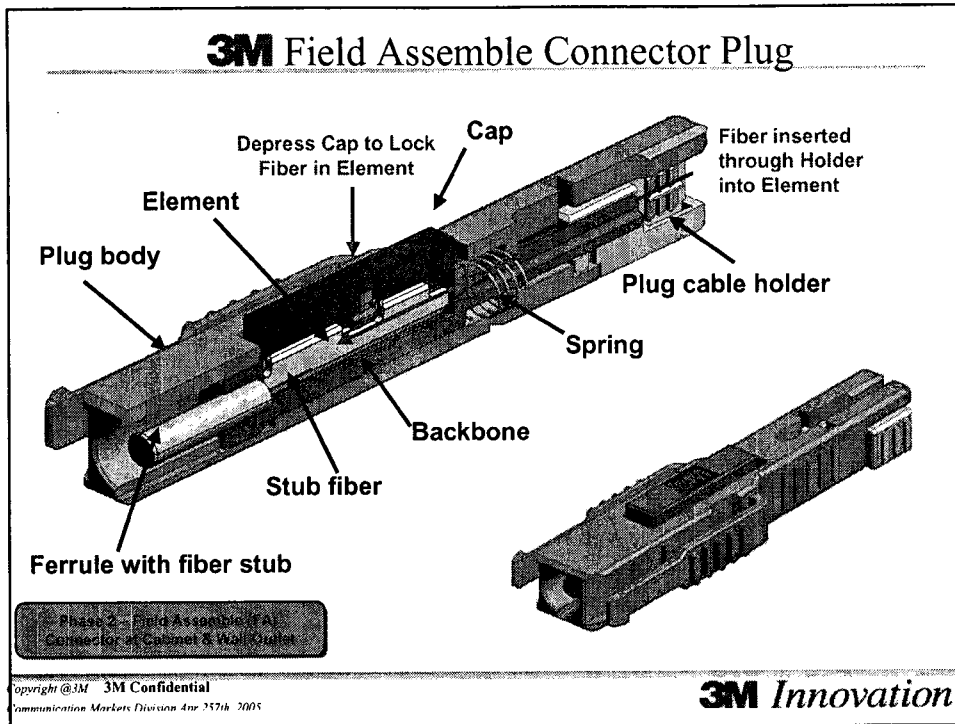


Loss (dB)	Samples
0.02	0
0.06	0
0.1	1
0.18	5
0.26	16
0.34	3
0.42	5
0.5	0

Specifications	
Dimensions	22 x 9.4 x 85 mm
Fiber Diameter	125um
Coating Diameter	250um
Operating temperature	-40° C to 70° C (-40° F to 158° F)
Insertion loss	< 0.7dB at 1310nm, < 0.9dB at 1550nm
Return loss	< -40dB at room temperature

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/1th 2005

3M Innovation



## Bendable Indoor Fiber

R=30mm (existing)  
R=15mm

R=10mm (existing)  
R=15mm

**Phase 3 - Implement New Tight Bend Radius Fiber and Cable**

Mechanical splicing connection

Connector loss (dB)	Return Loss (dB) - Wavelength 1310nm	Return Loss (dB) - Wavelength 1550nm
0.00	0	0
0.05	10	10
0.10	20	20
0.15	35	35
0.20	50	50
0.25	65	65
0.30	75	75
0.35	85	85
0.40	90	90
0.45	95	95
0.50	98	98

**15mm Bend Radius Fiber**

- Ruggedness similar to copper cable
- Easier Cable Routing
- Higher Reliability

30mm Bend R

15mm Bend R

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/2005

3M Innovation

## NTT Results in OFC 2005 Paper

FTTH Start of deployment (2002) vs FTTH Present (2004)

**Major Modifications**

- Cabinet combined metallic and fiber
- FRP Drop Optical Fiber
- Mechanical Splicing

**Major Modifications**

- Outer Clasp Connector
- Bendable Optical Fiber Cable
- Dual-Sided adhesive staple for indoor fiber

[ Comparison conditions ]  
Costs for ONU installation and testing line are excluded.

**Expect Cost Parity with Copper Drop Deployment With the completion of Phases 2 & 3**

- FA Connector
- Bendable Fiber

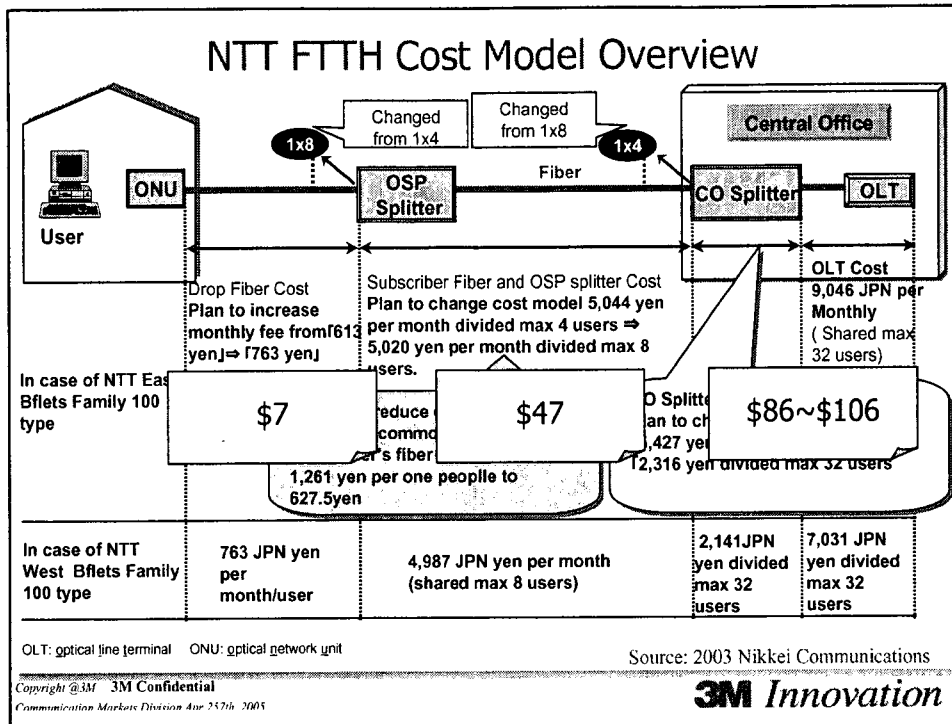
**Obtained 20% Cost Reduction for Phase 1**

- Mechanical Splicing
- Japan Type Drop Cable/ Cabinet

Source: NTT OFC Presentation 3/2005

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/2005

3M Innovation



## Key direction for further development

to drive cost reduction

Reduce costs by simplifying optical fiber installations like even copper wire installation crew can be used.

Skill less! **Tool less!** Care less!

## OPEX Comparison of Broadband Networks Significant Savings with FTTH possible

- ◆ Three major contributors to OPEX for advanced residential broadband networks are...
  - ◆ Staffing expenses
  - ◆ Network repair and maintenance expenses, and
  - ◆ Network powering expenses
- ◆ Significant OPEX savings potential with FTTH networks:
  - ◆ Less staffing requirements for comparable serving area vs. VDSL and Cable networks
  - ◆ Considerably less network maintenance and powering expenses.

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/16 2005

**3M Innovation**

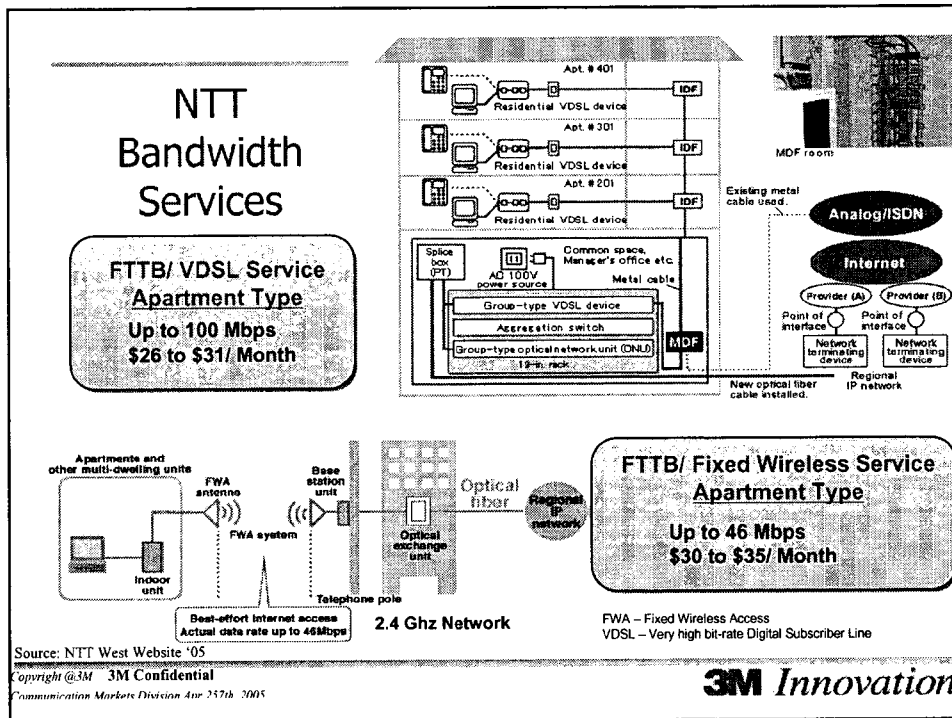
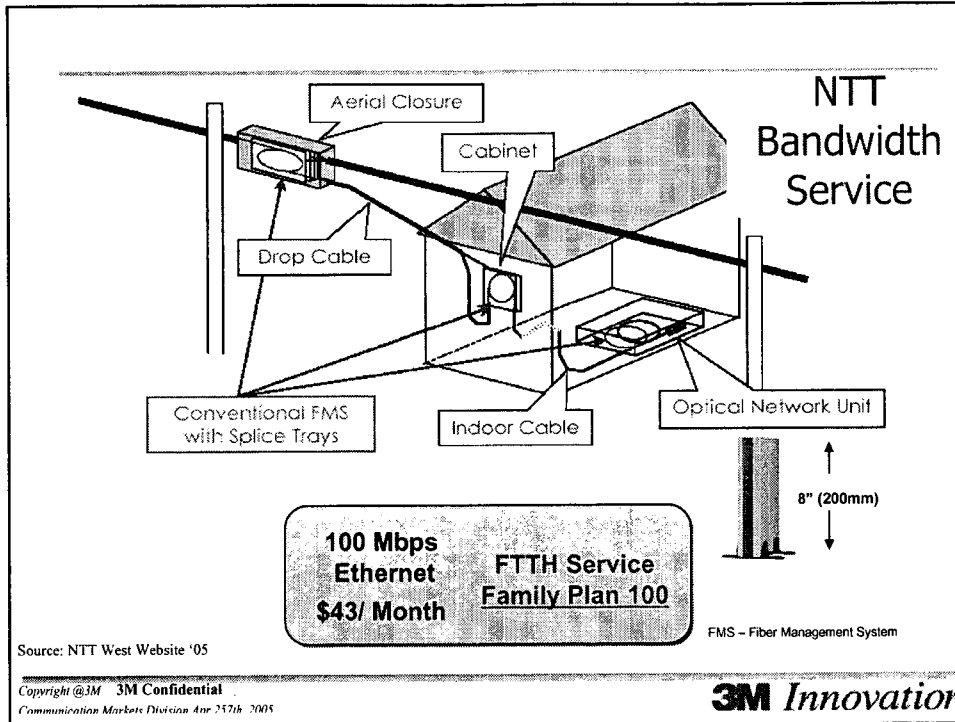
## Focus On Contents

new source of revenue  
**FTTH Services**

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/16 2005

**3M Innovation**





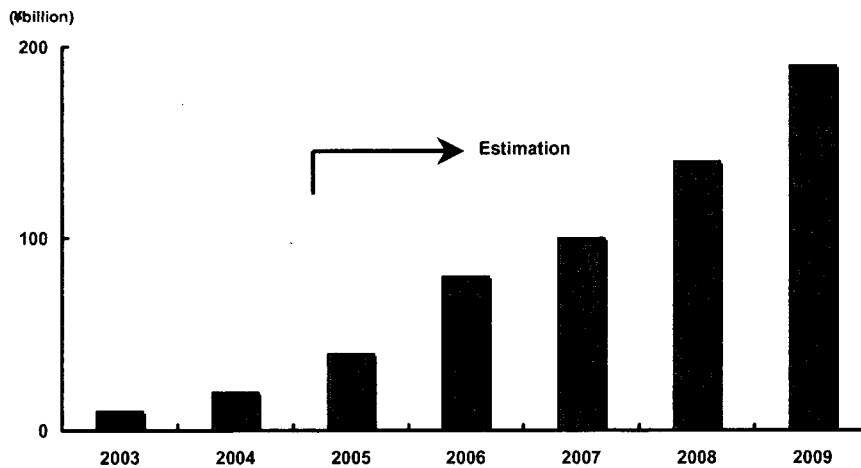
### NTT Services FTTx menu summary

Service Name	Description	Bandwidth	PPP session	Monthly Fee
Business Type	Fit to enterprise application. NTT provide 100Mbps pier to pier service and 24hs maintenance.	100Mbps(PtoP)	4 session	40,000 Yen
Basic Type	Fit to SOHO and heavy user application. NTT provide 100Mbps pier to pier service.	100Mbps(PtoP)	2 session	9,000 Yen
New Family type	Fit to consumer use. NTT provide shared 100Mbps per max 32 users.	100Mbps(PON)	2 session	4,500 Yen
Mansion type	Fit to consumer who lives in multi residential. NTT provide shared 100Mbps per each case conditions. NTT has LAN,VDSL,Wireless solutions to end user so far.	100Mbps(PtoP+@)	2 session	Plan1(>8 users): 3,500 Yen Plan2(>16 users): 2,850 Yen

Copyright ©3M 3M Confidential  
Communication Markets Division Apr 257th 2005

**3M Innovation**

### Video Service Market Prediction



Source: Nomura Research Institute 4/2005

Copyright ©3M 3M Confidential

Communication Markets Division Apr 257th 2005

**3M Innovation**

## Video Service in Japan

### • Traditional Video Providers

- Terrestrial "Ground Wave" Broadcast (NHK and Privates)
  - Analog and Digital Transmission
- CATV over Fiber/ Coax Network
  - Analog Transmission

Source: NHK Website '05

### • FTTH Video Service Providers

- IP over FTTH
  - Set Top Box + IPTV (NTT Communications/ Plala, KDDI)
  - PC + MS Windows Media Player (USEN)
- Analog over FTTH (NTT Comm/ Opticast, USEN)

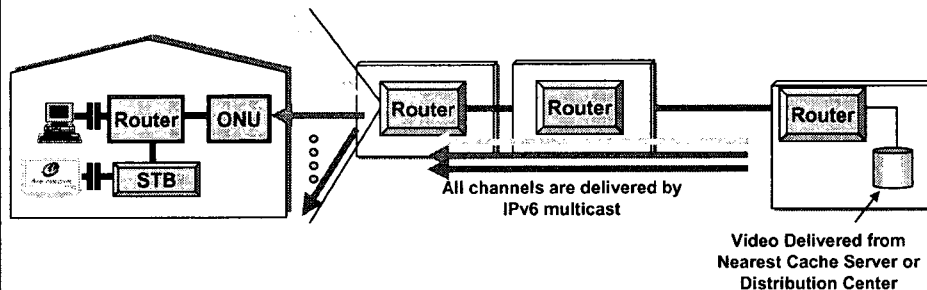
Copyright ©3M 3M Confidential  
Communication Markets Division Apr 257th 2005

**3M Innovation**

## Internet Protocol TV over FTTH

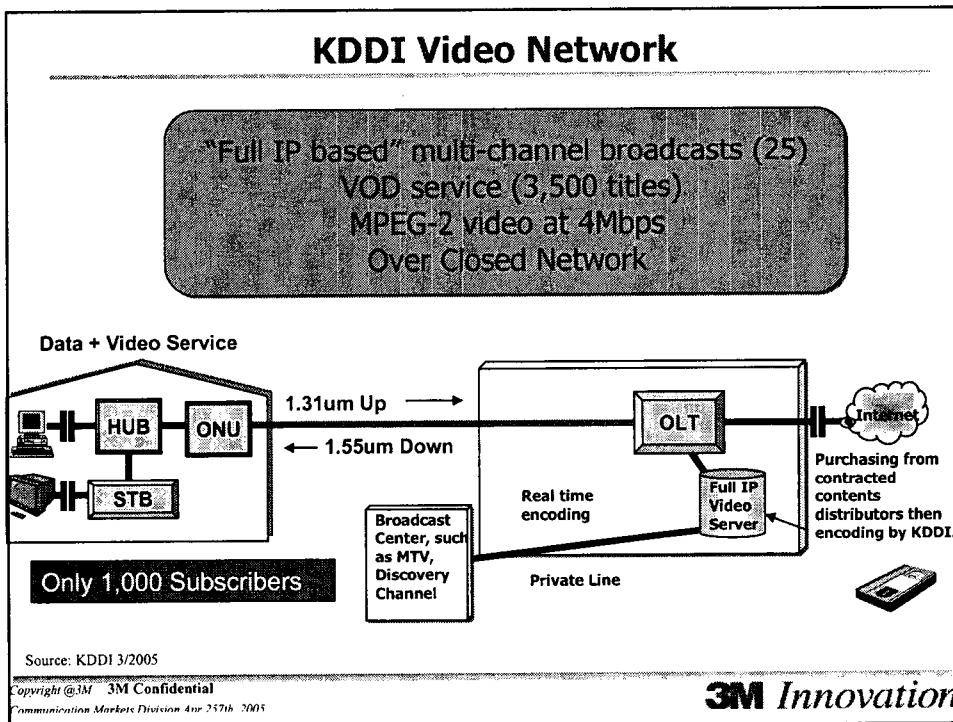
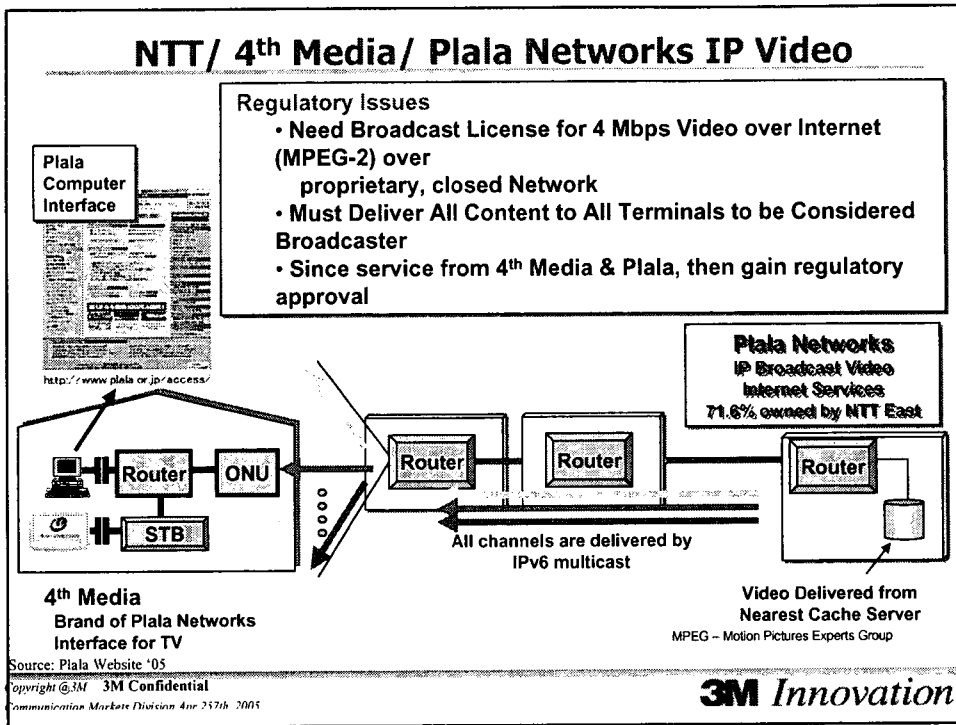
### Set Top Box (STB) + IPTV

- NTT Communications, KDDI, Yahoo BB!
- Private Network (All using NTT)
- Provide Streaming Video on Demand (VOD)



Copyright ©3M 3M Confidential  
Communication Markets Division Apr 257th 2005

**3M Innovation**



## Set Top Box(STB) + IPTV Summary

### Adoption Rate has been Slow

- Provides VOD movies & IP Broadcast Channels, i.e. Disney, MTV
- No Terrestrial Broadcast TV channels available
  - NHK has their own services
    - Digital Satellite Broadcast
    - Digital Terrestrial Broadcast
- Copyright laws have prevented Digital Video Recorders



Copyright ©3M 3M Confidential  
Communication Markets Division Apr 25/26 2005

**3M Innovation**

## IP Video over FTTH



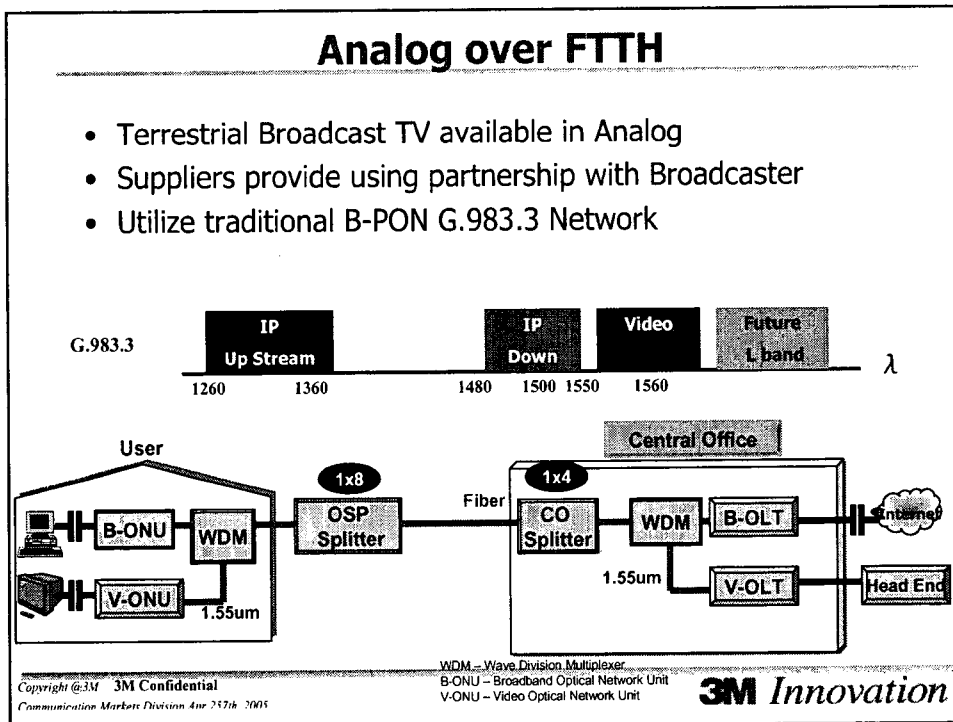
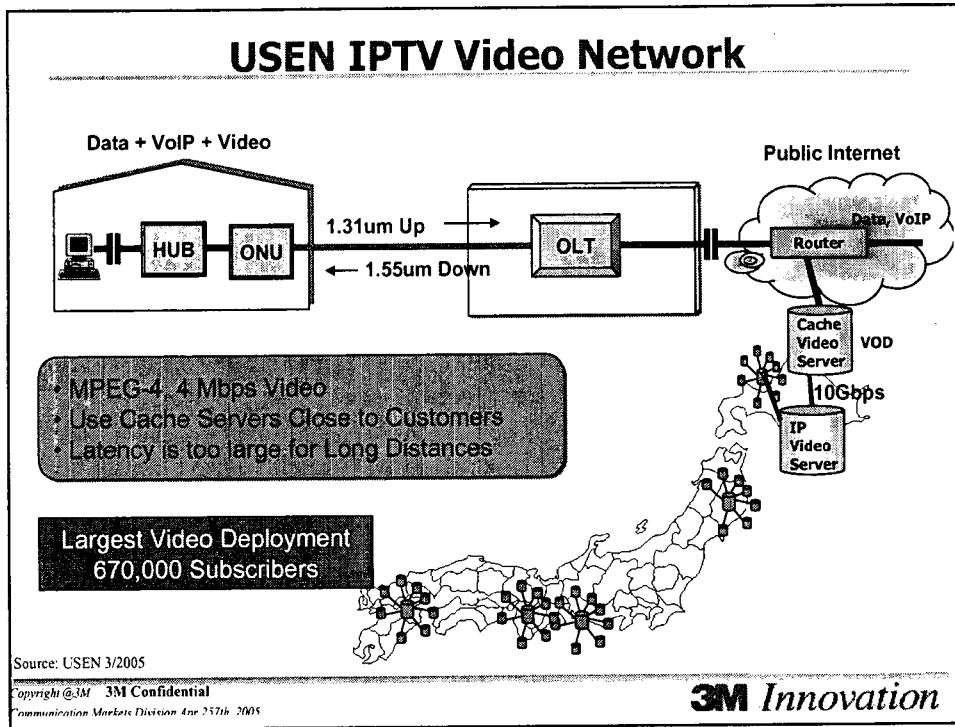
### PC + Microsoft Windows Media Player

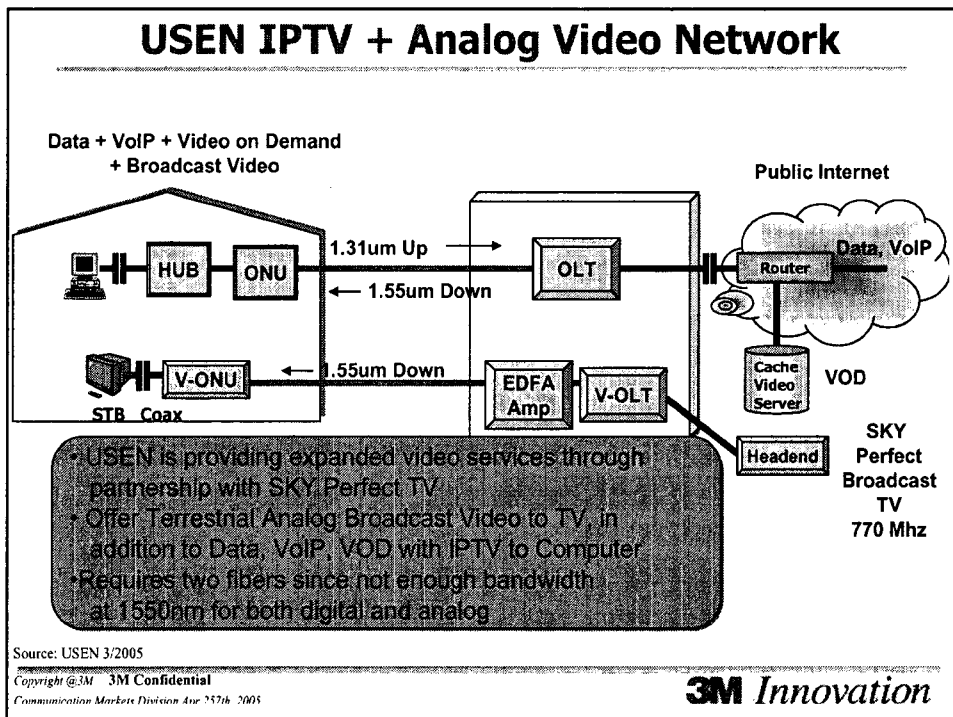
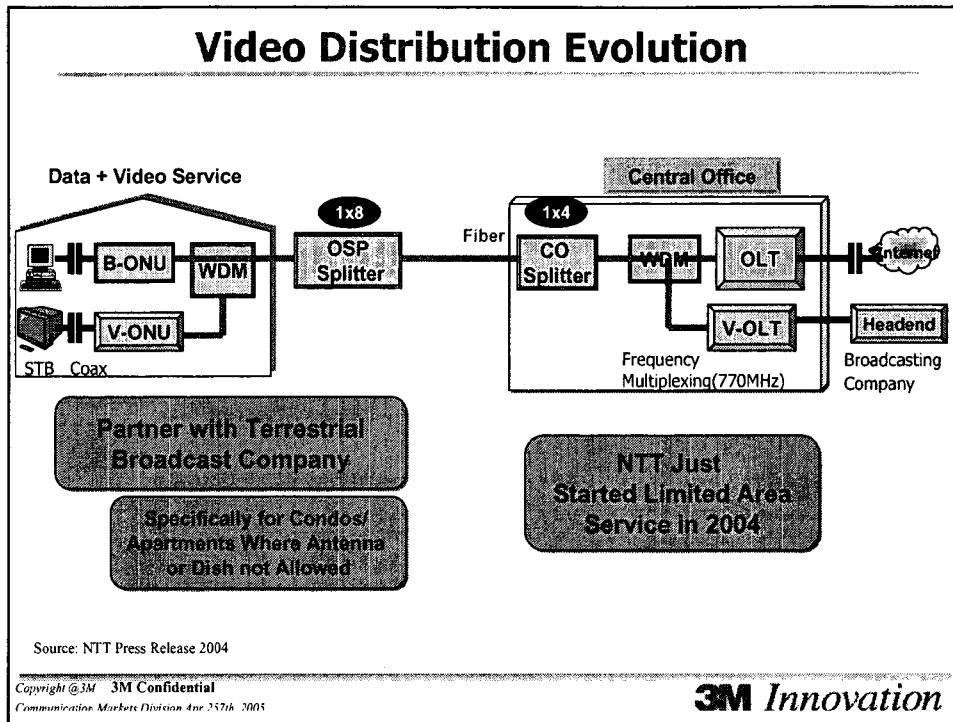
- Use Public Internet to transmit movies and other video on demand content
- Watch Movie on Computer using Media Player
- No need for set top box
- Media Player has billing feature for pay for view content
- Most Popular Method of VOD in Japan

**In Japan, Computer & TV have merged in many households**

Copyright ©3M 3M Confidential  
Communication Markets Division Apr 25/26 2005

**3M Innovation**





## Analog over FTTH Network

- Service Providers starting to Offer Analog TV through partnerships since only method for Broadcast TV
- NTT still faces Regulatory issues
  - Can not be full solution provider
  - Must provide service to all in the community equally
- NTT network designed for digital, but can transmit analog signals
  - **PC (standard polish) SC connectors and standard mechanical splices**
  - Add Erbium Doped Fiber Amplifier for analog transmission links that are long
  - If providing Digital and Analog service at 1550nm, may need two separate fibers



Copyright ©3M 3M Confidential  
Communication Markets Division Apr 257th 2005

**3M Innovation**

## Japan FTTH Services Overview

- Data
  - Rates up 100 Mbps
  - Bandwidth is a status symbol
- Voice
  - 4MM Voice over IP users with Yahoo!BB DSL
  - Voice over IP for FTTH is rolling out now at NTT
- Video
  - Video on Demand has started, but copyright issues with Digital Video Recorders
  - Analog Video offered by USEN, but just starting by NTT through partnership with Opticast
    - Only for locations where antenna prohibited
    - Issue for NTT anywhere else

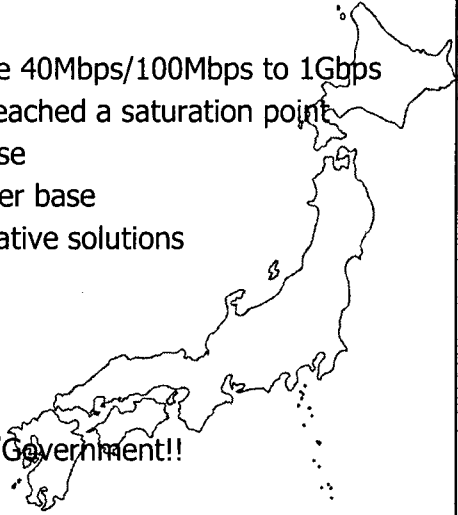
Copyright ©3M 3M Confidential  
Communication Markets Division Apr 257th 2005

**3M Innovation**



## Japan Lesson Learned

- ◆ THE NEED FOR SPEED, migrate 40Mbps/100Mbps to 1Gbps
- ◆ ADSL is still main stream but reached a saturation point
- ◆ FTTH is no longer embolic phase
- ◆ Fierce competition for subscriber base
- ◆ Cost of deployment with innovative solutions
- ◆ Focus on contents
  - ◆ VOD
  - ◆ IP Broadcast
- ◆ Government Initiatives
  - ◆ Driven by Competition, not Government!!



Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/26 2005

**3M Innovation**

3M PHYSICAL-MEDIA  
LAYER CAPABILITIES.

**Thank you for your attention**

Copyright © 3M 3M Confidential  
Communication Markets Division Apr 25/26 2005

**3M Innovation**