

# IPv6-Based Services and Operational Experiences in Japan

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NTT Communications

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## Agenda

- About NTT
- IPv6/IPv4 Dual Stack Backbone and Operations
- How IPv4 Depletion Make Impacts on Access Provider and Enterprise Business
- IPv6 Products and Services Offered by NTT
- Summary

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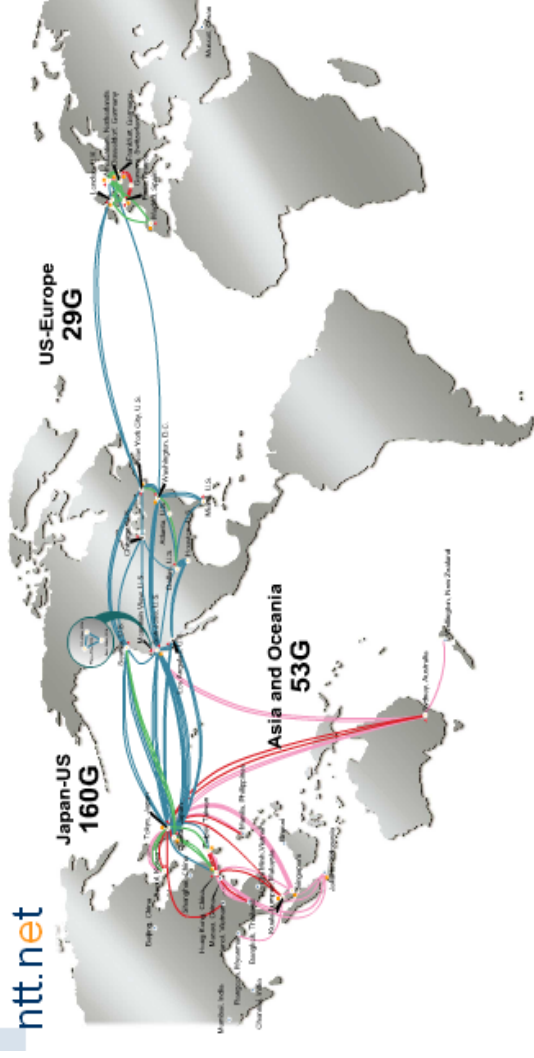


## About NTT

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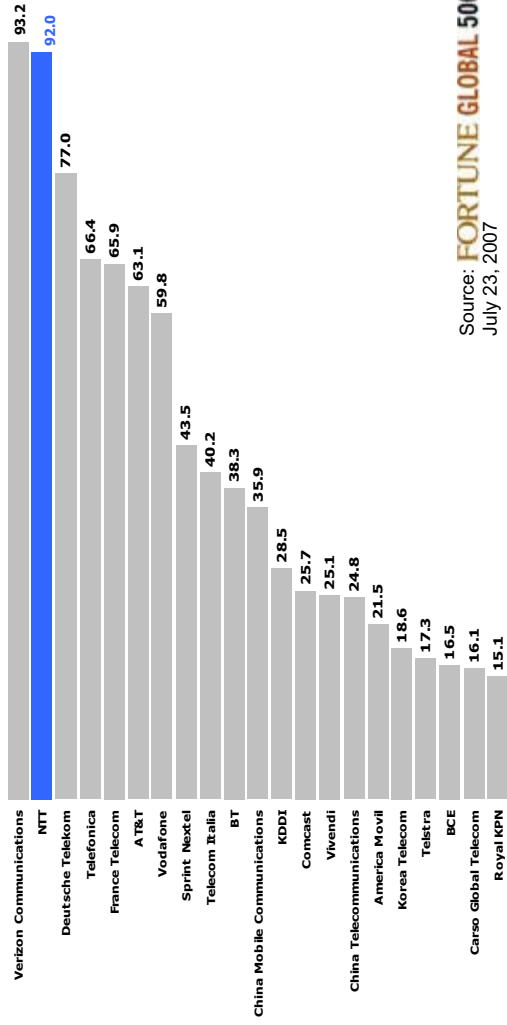
## Who is NTT?

### NTT Communications Global IP Network (AS2914)



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World's Top 21 Telecom Companies by Revenue (\$US Billion)



Source: **FORTUNE GLOBAL 500**  
July 23, 2007

## NTT Communications IPv6 Service History

<b>1996:</b> NTT Labs started one of the world's largest global IPv6 research networks	<b>1998:</b> Verio begins participation in PAIX native IPv6 IX	<b>1999:</b> NTT Com begins IPv6 tunneling trial for Japanese customers	<b>2000:</b> Verio obtains IPv6 sTTLA from ARIN	<b>2001:</b> NTT Com pioneers world's first IPv6 connectivity services on a commercial basis	<b>2002:</b> World Communications Awards (WCA) awards NTT Communications with "Best Technology Foresight" for its IPv6 Global products	<b>2003:</b> NTT/VERIO launches IPv6 Native, Tunneling, and Dual Stack commercial service in North America
<b>2003:</b> Communications Solutions magazine names NTT/VERIO IPv6 Gateway Services "Product of the Year"	<b>2004:</b> NTT IPv6 Native and Dual Stack services available around the globe	<b>2004:</b> NTT Com wins the World Communications Awards "Best New Service" award for IPv6/IPv4 Global Dual Service	<b>2004:</b> NTT Com wins the Virtual Private Server released. First ISP to offer an IPv6 managed firewall service	<b>2005:</b> Dual stack Virtual Private Server released. First ISP to offer an IPv6 managed firewall service	<b>10/2006 -</b> Launched the NTT Communications IPv6 Transition Consultancy	<b>2/2007 -</b> Awarded GSA Schedule 70 contract for IPv6 IP transit




# IPv6 - What and Why?



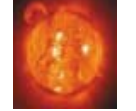
Source: "Internet Routing Guide" from Shoel Publishing

- IPv4 Addresses: 4,294,967,296
- World's Population: about 6,300,000,000
- IPv6 Addresses: 340,282,366,920,938,463,374,607,431,768,211,456


**Address Abundance: Comparative Examples**




IPv4) A Bucketful of Sand



IPv6) Sand Volume Equivalent to Our Sun



IPv4) 1mm in Length



IPv6) 84,000 Times Wider than the Diameter of Our Galaxy

IPv6 realizes a wide variety of applications and services in a simple and scalable manner with no concerns of IP address limitations or depletion

7

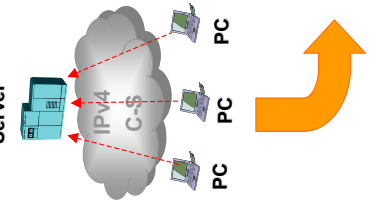
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# Big Picture of Our Goal



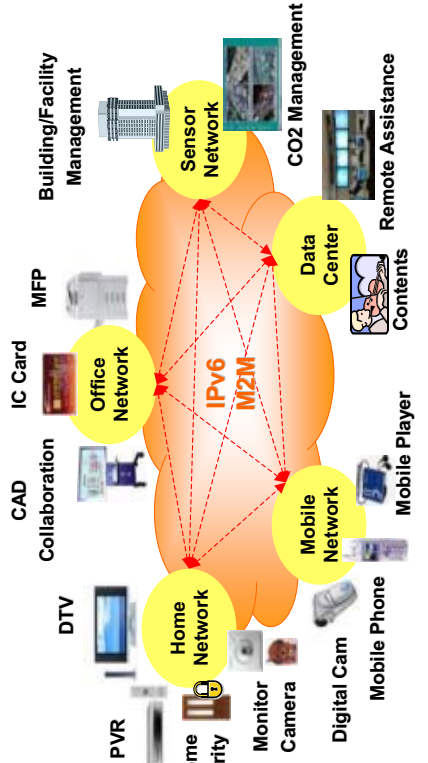
## Now: Client-Server Model

- ✓ PC-oriented, One-way or Archive style Communication
- ✓ Evil of Anonymity, D.I.Y Connection



## Future: Machine-to-Machine(M2M) Model

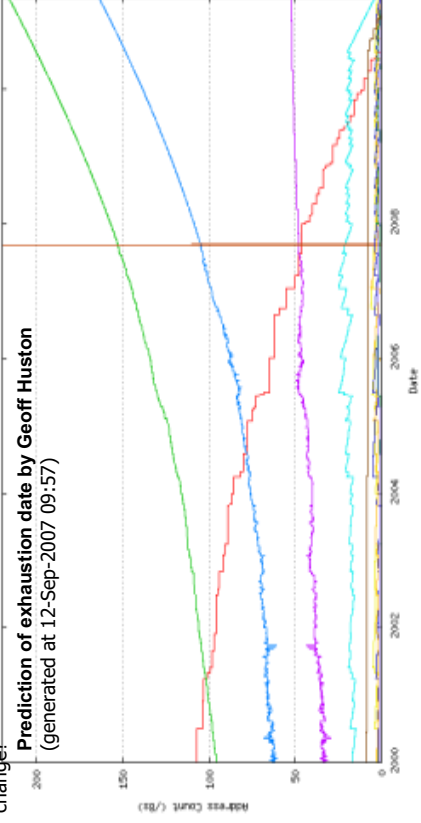
- ✓ All IP, bidirectional and real-time communication
- ✓ Assignable ID per Machine, Managed Connection



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8

- On 19 June 2007, JPNIC issued a press release regarding the IPv4 address consumption.
- The IPv4 address pool is expected to run out around 2010, according to the most reliable predictions.
  - After 2010, ISP cannot have new customer and enterprise system cannot be expanded on the current system.
  - ISP and engineering have to consider from now "What's happen?", "What is the problem?", "What should we change?"



The red line indicates the number of /8 address blocks remaining in the IANA free pool. The light blue line indicates the number of /8 address blocks available in RIR free address pools. The vertical line indicates today.

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JPNIC has started to work on and evaluate concrete measures with organized efforts internally and externally.

- Address Management Policy Evaluation WG has been organized under experts' and executive guidance, and submitted its distribution policy proposal to APNIC.

"Distribute a single /8 to each RIR at the point when new IANA free pool hits 5\*/8"

- Countermeasures for IPv4 Address Inventory Depletion WG has also been organized. It evaluates countermeasures against IPv4 exhaustion on technical standpoint, and expected impact to IPv4 business.
  - How to migrate IPv4 to IPv6 ?
    - IPv4/IPv6 translation ?
  - How to continue IPv4 business with limited number of Address ?
    - private IPv4 address with NAT ?

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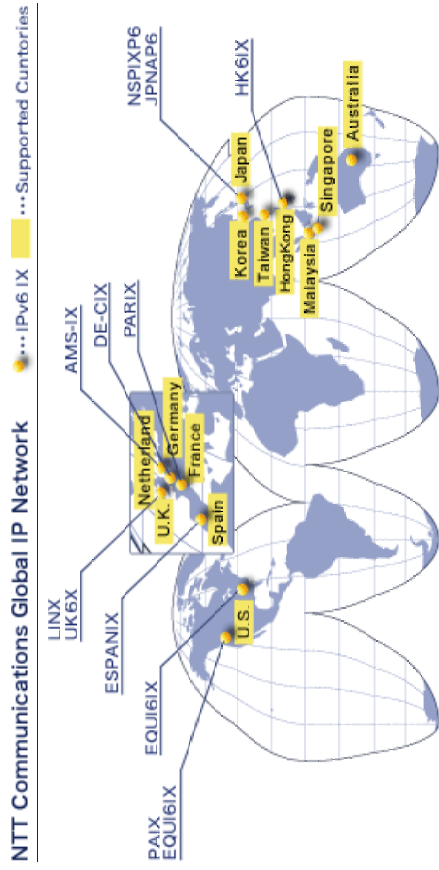
# IPv6/IPv4 Dual Stack Backbone and Operations

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## IPv6/IPv4 Dual Stack Backbone

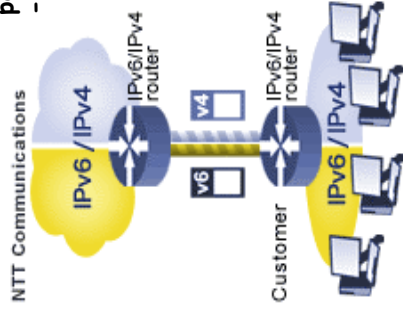
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Global Backbone: Completed in 2003  
Domestic Backbone: Completed in 2005



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## IPv6/IPv4 Dual Service



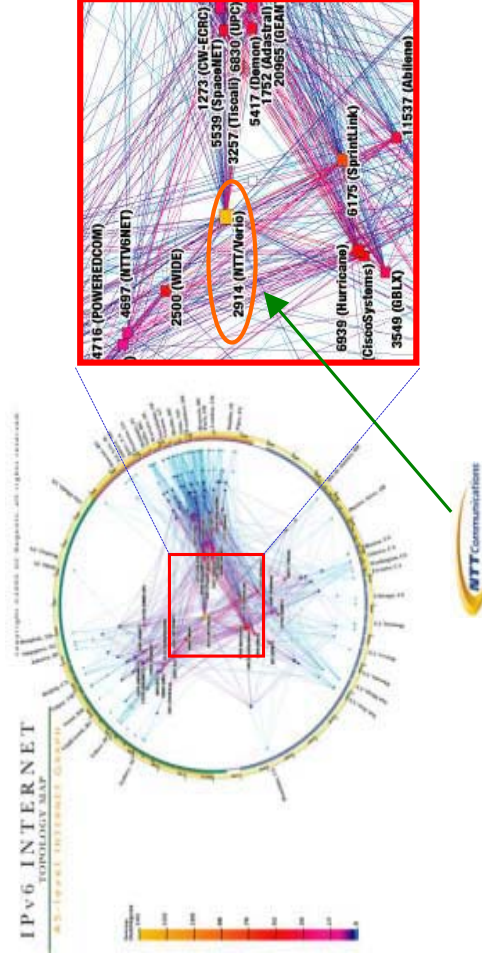
IPv6/IPv4 Dual Stack Backbone has shown a good performance without any critical problems so far.

- core routers / routing protocols generally look good enough to handle current IPv6 traffic.

But still, we have some operational difficulties:

- stats tools are not available on IPv6 environment
- IPv6 MIB support, SNMP over IPv6 support ...
- IPv6-enabled irrd/whois have been released, but poor performance yet...
- There are only few collectors which are capable of netflow v9

For future IPv6 traffic engineering, we need RSVP-TE for IPv6 and LDP for IPv6



Situated in the Heart of Global IPv6

Source: CAIDA

[http://www.caida.org/analysis/topology/as\\_core\\_network/ipv6.xml](http://www.caida.org/analysis/topology/as_core_network/ipv6.xml)

# How IPv4 Depletion Make Impacts on Access Provider and Enterprise Business

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## IPv6 Connectivity Services in Japan

Provider	for Consumers	for Enterprise Customers
NTT Communications	IPv6 Internet Connectivity (FTTH, ADSL, Wi-Fi, PHS, Dial-up)	IPv6 Internet Connectivity
NTT-East	IPv6 Non-Internet Connectivity (Video Streaming, VOIP, TV Phone, File Sharing)	IPv6 VPN
NTT-West	IPv6 Non-Internet Connectivity (Video Streaming, VOIP, TV Phone, File Sharing)	IPv6 VPN
KDDI		IPv6 Internet Connectivity
IJJ		IPv6 Internet Connectivity
Nifty	IPv6 Internet Connectivity (ADSL)	
Free Bit	IPv6 Internet Connectivity (Tunnel Service)	
IJJ mio	IPv6 Internet Connectivity (Tunnel Service)	
NTT-ME (Xephion)		IPv6 Internet Connectivity

\* [http://www.soumu.go.jp/is-news/2007/07/0330\\_12.html](http://www.soumu.go.jp/is-news/2007/07/0330_12.html)

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# IPv6 Products sold in Japan

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**Windows Vista**  
Microsoft Corporation



**Antivirus Software**  
Trend Micro Incorporated



**Networked Audition Machine**  
Yokogawa Electric



**IPv6 phone**  
FreeBit Co. Ltd.



**Field Server & Sensor**  
Yokogawa Electric  
- "Fis" Environment Analysis System



**Printers**  
-Panasonic Communications  
-Ricoh Company Ltd.



**TV Conference**  
Tandberg



**TV with IPv6 STB**  
Toshiba Co.



**IP Video Camera**  
Panasonic Communications



**Total Building System**  
Matsushita Electric Works  
- EMIT System



**IP Video Phone**  
NTT Regional.



**Translator**  
SEIKO Precision Inc.:  
-Network Time Server  
-IPv4 / IPv6 Translator  
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**Router**  
ALAXALA Network Corporation:  
- High-end gigabit router



**Home Router**  
coreaga K.K.



**Remote Camera Server:**  
Chuo Electronics co.,Ltd (CEC):



**Broadband Router:**  
YAMAHA Corporation:  
- Broadband VoIP Router  
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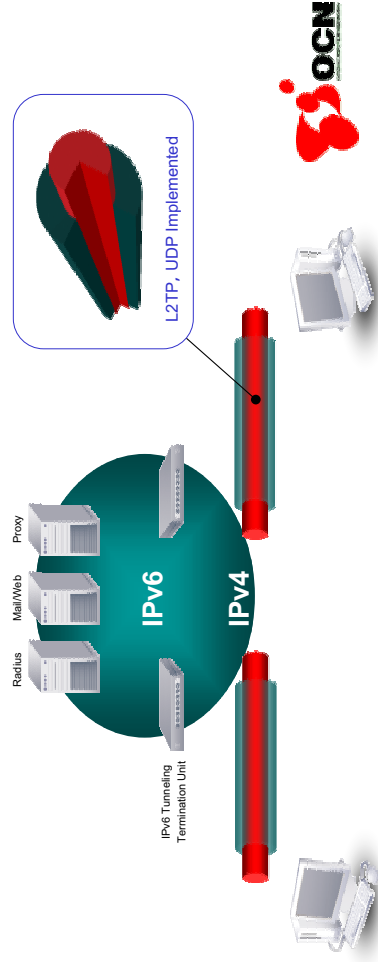
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# IPv6 Products and Services Offered by NTT

## OCN IPv6: IPv6 Emulation for Consumer Customers

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- ✓ Launched in December 2005
- ✓ IPv6 Tunneling Service over IPv4 based on L2TP
- ✓ Fixed IP address and non-fixed IP address to be given (Prefix for subnet: /64)
- ✓ Original tunneling software provided for subscribers



19

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## OCN IPv6 Brings New Life Style...

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With IPv6, you can ...

*Various home appliances will be controlled as you wish...*

How's your pet when you...

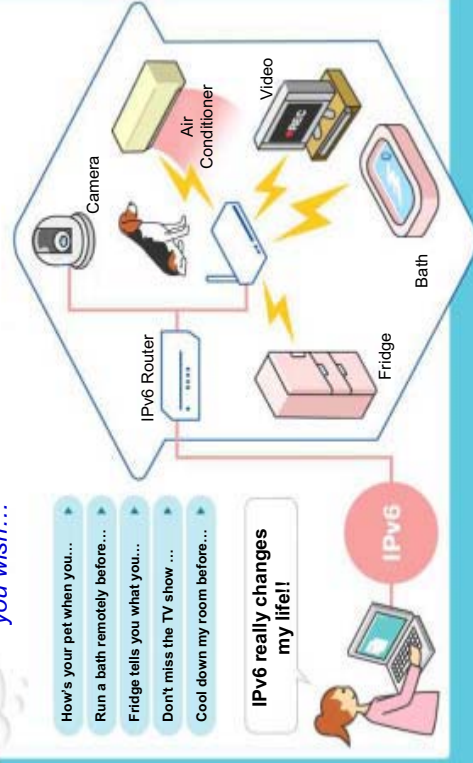
Run a bath remotely before...

Fridge tells you what you...

Don't miss the TV show ...

Cool down my room before...

**IPv6 really changes my life!!**



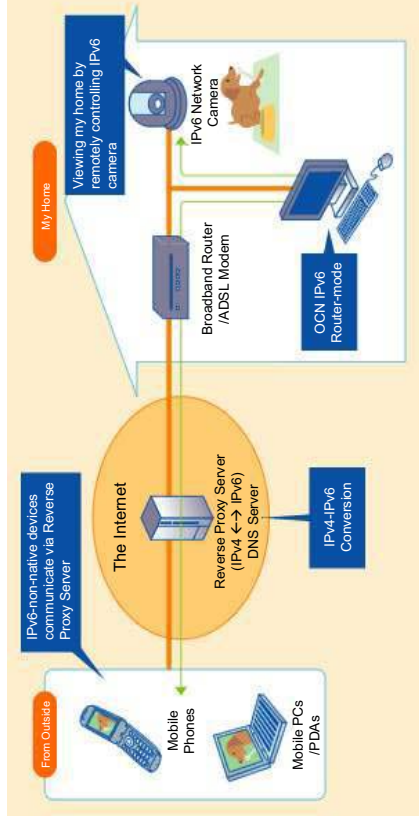
20

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## OCN IPv6 Mobile: Interoperability with Mobile Units



OCN IPv6 has an option to control IPv6 devices using non-native consoles such as mobile phones or PDAs

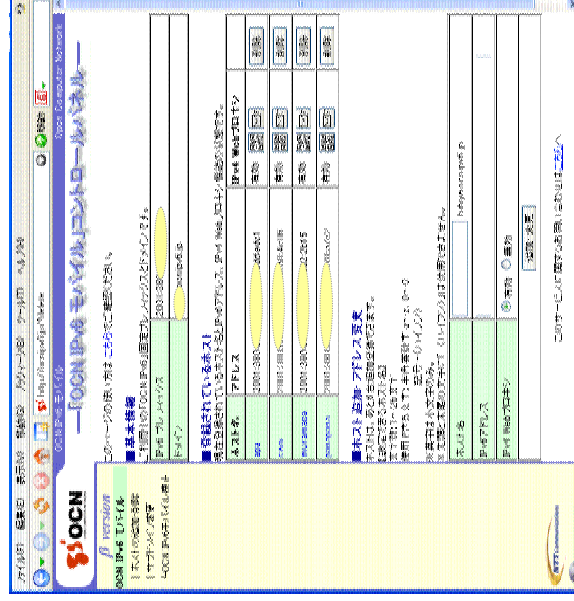


## OCN IPv6 Mobile: Control Panel



Managed by Web Interface

- Rev-Proxy
  - IPv4/IPv6 Translator
- DNS
  - IPv6 zone



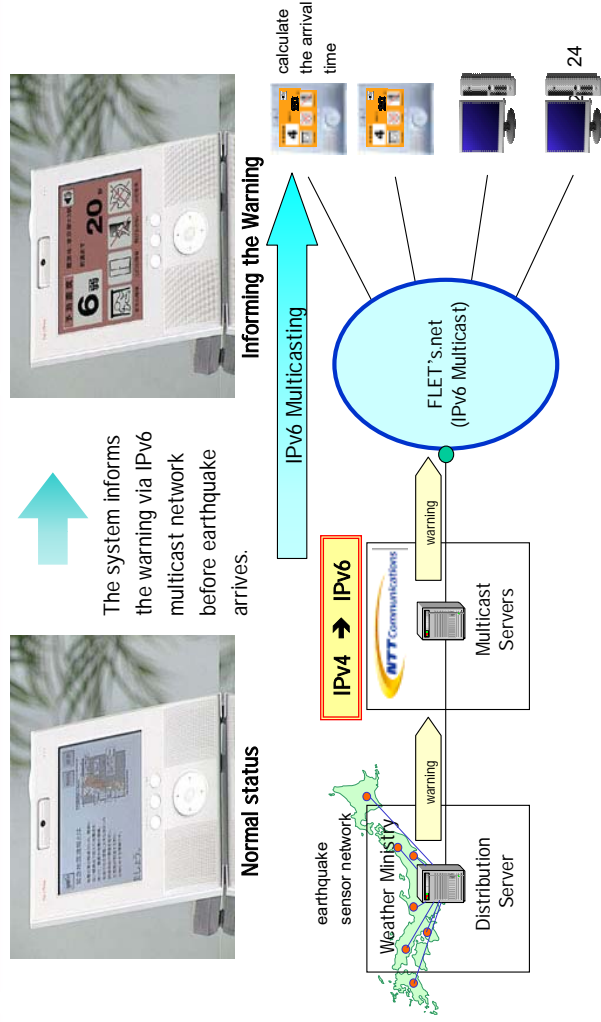
# CASE: IPv6 High Definition Video Conference Testntt.net with TANDBERG

Test Date:  
Feb 13, 2006



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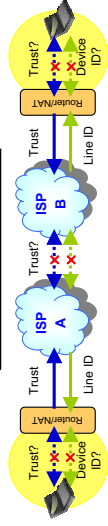
## Case: Earthquake warning system



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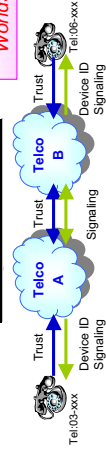
# m2m-x Essentials : Building an Ultimate Network

## The Internet Model



- Security
  - Easiness
  - Low Cost
- Interconnection at Conduit Level  
 Incapable of Blocking Malicious Users  
 Unable to Manage Communication Based on Device IDs not Fully Given and Coordinated  
 Provision of Conduit + D.I.Y. Work

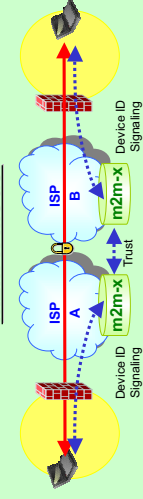
## Telephone Model



- Security
  - Easiness
  - Low Cost
- Interconnection at Signaling Level  
 Capable of Blocking Malicious Users  
 Able to Manage Communications by Device ID (Telephone Number) and Signaling  
 Signaling and Data Channel Exchange Based on Costly Circuit-switch

Sampling from Both Worlds

## m2m-x Model

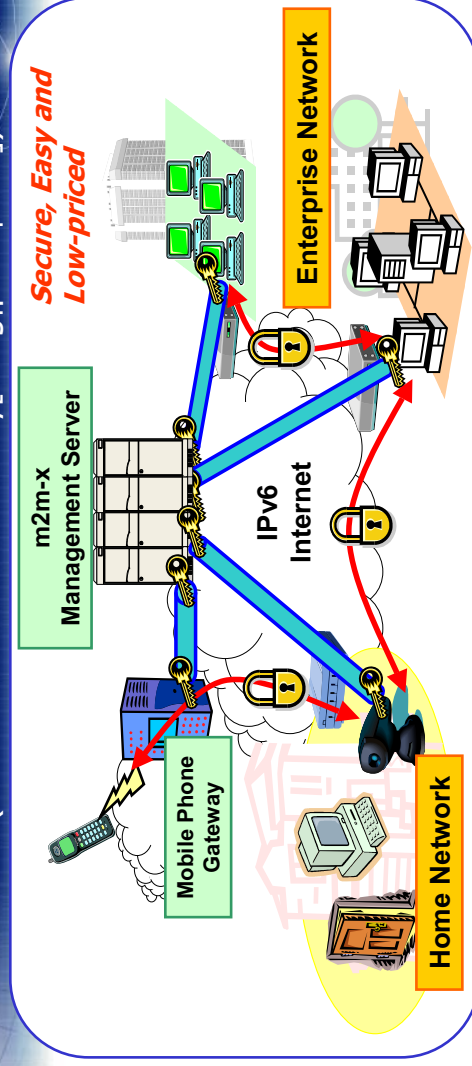


- Security
  - Easiness
  - Low Cost
- Interconnection at Signaling Level  
 Capable of Blocking Malicious User  
 Able to Manage Communications by Device ID and Signaling  
 Lower Cost Achieved Having Data Channel Bypassing the Server

•Secured, easy and low-cost new IP network by "signaling authentication"  
 •FMC and NGN will also adopt the same architectural philosophy

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# m2m-x (Machine to Machine for any[thing]place[time])



Secure, Easy and Low-priced

## m2m-x Management Server functions:

- Authentication
- Access control
- Issuance/distribution of encryption keys
- Visible only for authorized peers
- Firewall control

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## m2m-x Trials (2004.1Q-)

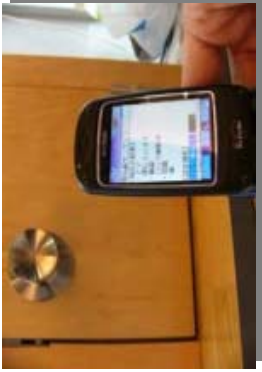
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PlayStation 2 with USB camera



Takara : IP Thread Telephone



Toshiba : Home appliance network



Pioneer : Cyber Conference System

27

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## m2m-x Trials (2004.1Q-) Continued

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Sanyo Electric : IPV6 Multimedia Player



Matsushita Electric Works : Home System



Ricoh : Ubiquitous Printing System



Nextech : Mah-jongg Game on Line

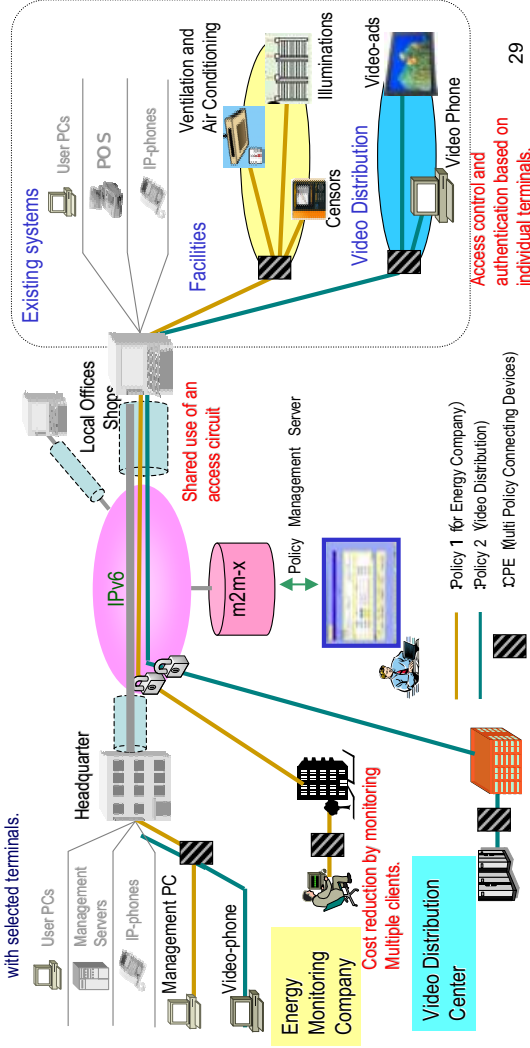
28

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# Multi-Policy VPN

Cost reduction by integrating different systems with different destinations to a single access circuit

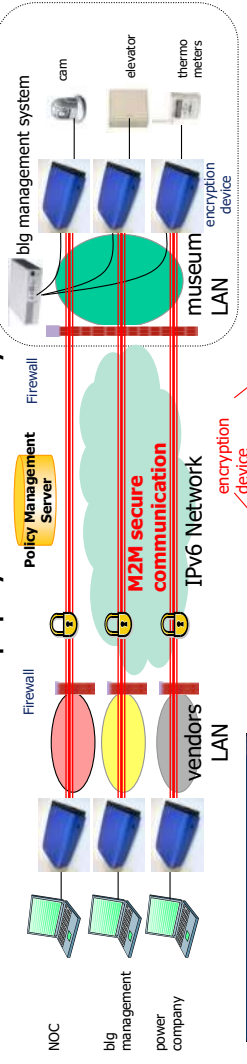
- > Enables constructing multiple secured network over a single access circuit
- > Enables centralized and simultaneous configuration changes by a central policy management server
- > Enables flexible control, for example, managing a system from multiple locations and establishing connections only with selected terminals.



# IPv6 Field Trial at Tokyo Metropolitan Art Museum ntt.net

## Multi-Policy VPN

- multi vendor system (thermometer, facility management system, elevator monitoring system ...)
- each vendor can reach its equipment remotely for responsive support
- **remote access can be restricted properly with IPv6 Multi-Policy VPN**



## Portable CPE (under development)

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- developing Portable CPE for m2m-x
- Portable CPE automatically configures appropriate VPN group (PnP)



31

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## other IPv6 Solutions

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- Convenience Store
  - Multicast network provides data simultaneously.
  - 7,000+ stores in nation-wide in Japan.
- Intelligent Building "Saitama-wave"
  - Facility network is worked on IPv6 network
  - NTT Facilities provide IPv6 Building Automation System and sensors.
  - Large number of sensors are connected and distinguished with plenty of IPv6 address.
- MIC project : "RFID-Tag system"
  - Quality of beef is guaranteed with networked RFID-Tag System.
  - RFID readers are secure-connected with IPv6 IPsec technology.
  - RFID-Tag system traces from processing plant to home.



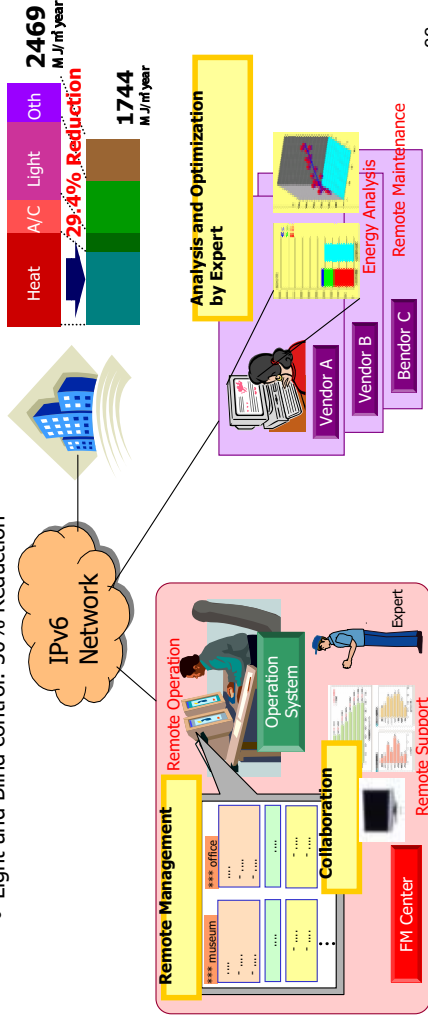
32

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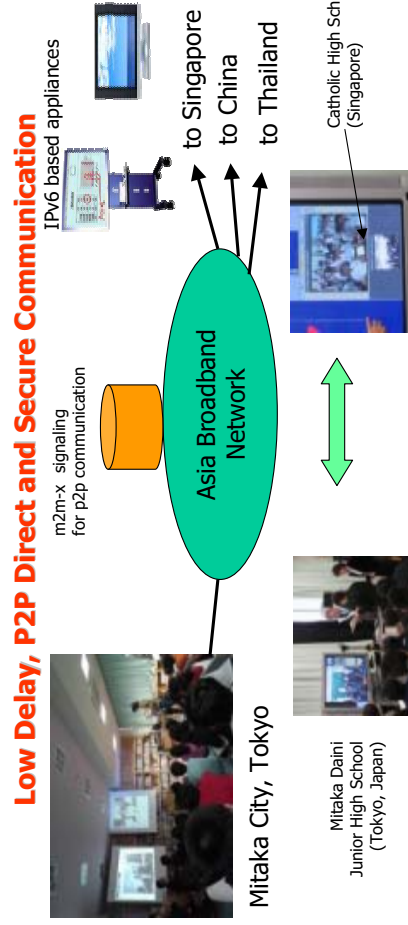
• **Remote Management: Building Facility System**

- Intensive management reduces work cost.
  - Remote support: 15 % Reduction
- Expert analyzes and optimizes the energy of building.
  - Light and Blind control: 30% Reduction

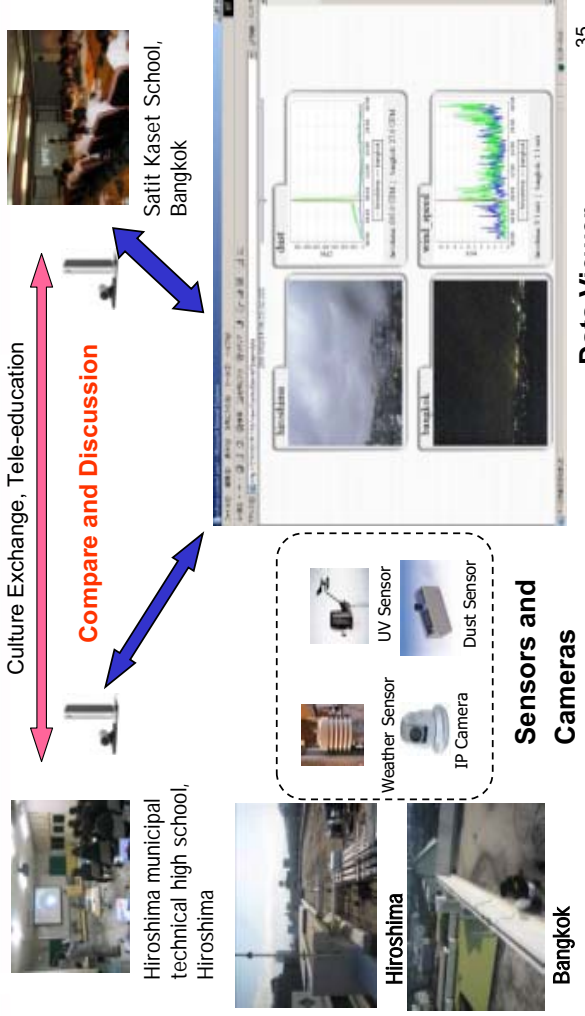


• **International Joint IT Experiment in Asia**

- Theme: e-trade, multi-language, IPv6 communication, collaboration and International IX
- Field: long distance education, medical treatment, etc.
- IPv6 supports P2P communication and collaboration



**2007: medical treatment and education collaboration between Japan and Thailand**



## Why IPv6?

People are interested in for non-internet use (Intranet, IPVPN)

### Positively

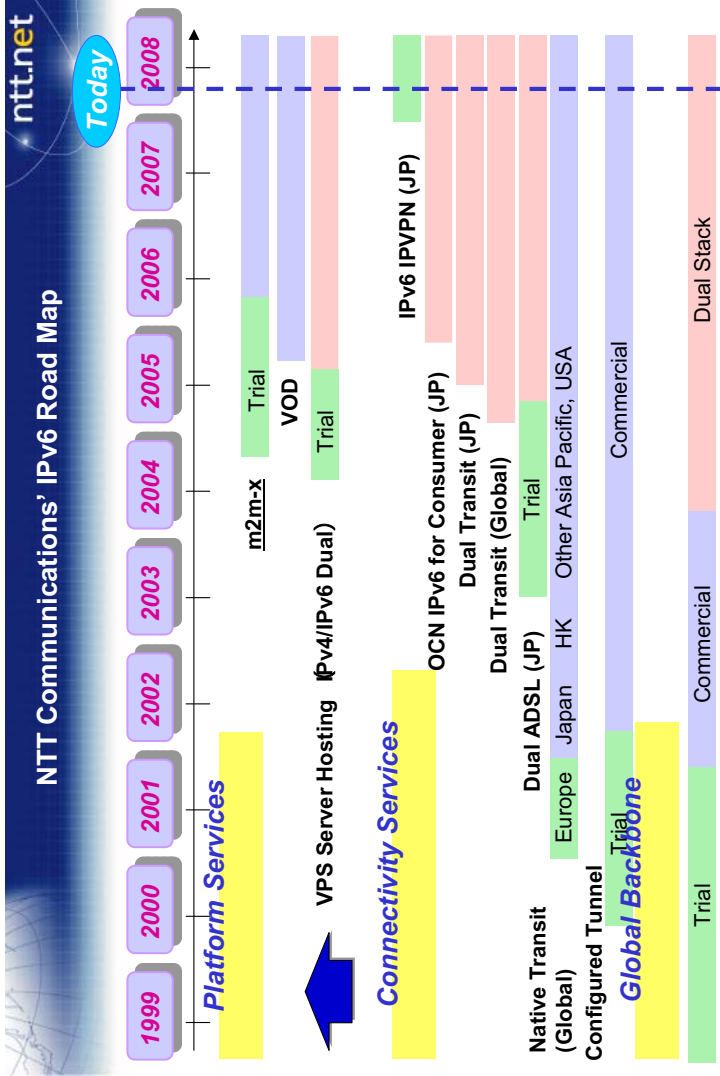
- **Value Adding**
  - IPv6 supports brand-new IP equipments and enables IP systems
  - Higher reliability / maintenanceability / scalability
- **Low Cost**
  - IPv6 provides Network Integration and simple / smart IP Network



### Negatively ...

- **IPv4 Address exhaustion**
- **Government Policy**

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*Thank you for your attention*

**<http://www.v6.ntt.net>**

**<http://www.ipv6style.jp>**

**[koji@ntt.net](mailto:koji@ntt.net)**

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