

NTT Communications' Global IPv6 Strategy

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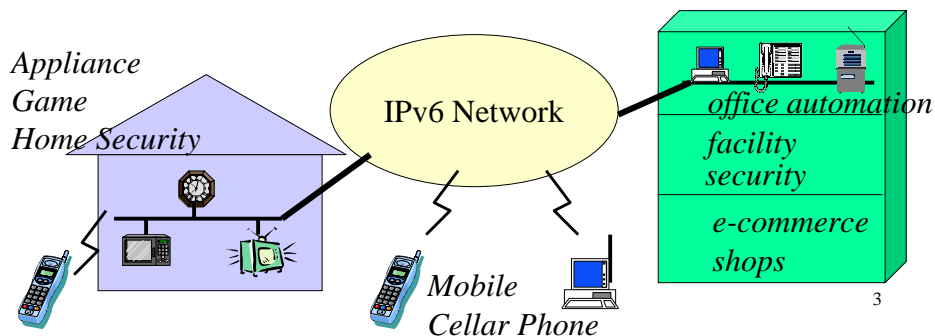
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What is an IPv6 market?

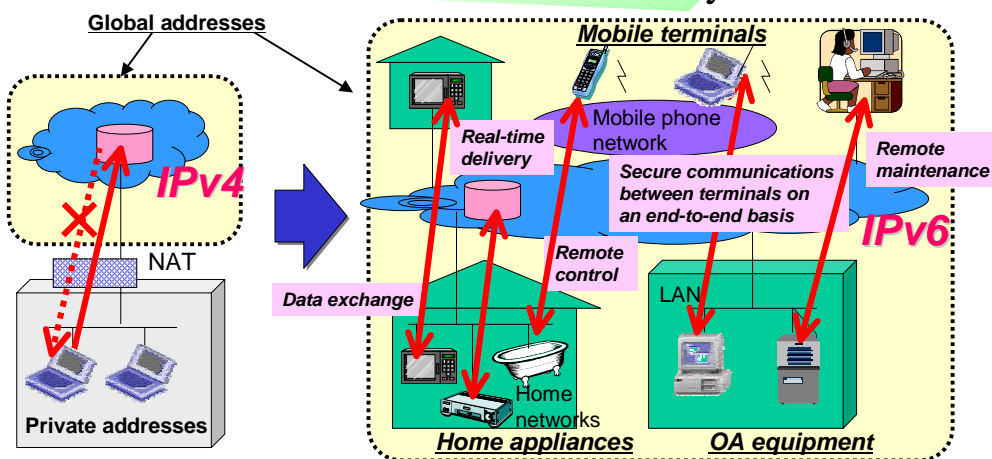
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What is IPv6?

- The Internet has expanded exponentially. => Address will be exhausted.
- IPv6 has been developed as the next generation Internet.
 - inexhaustible **addressees** (cellar phone, appliance, facility in the building)
 - standardized **security & QoS** functions (e-commerce, image distribution)
 - **auto-configuration**, plug & play function (appliance)
 - another functions: **multicast etc.**



New Internet Business Created by IPv6



IPv4: One-way access

- Transform private addresses to global addresses using NAT
- One-way access from terminals to the Internet
- Client & server type business model

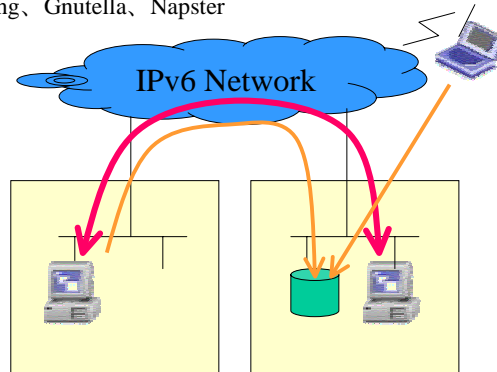
IPv6: Two-way access

- All terminals provided with respective global address
- All terminals capable of peer-to-peer access
- Home appliances and mobile terminals connected to IPv6
- Possibilities for new type of Internet business

IPv6 creates new business markets (example)

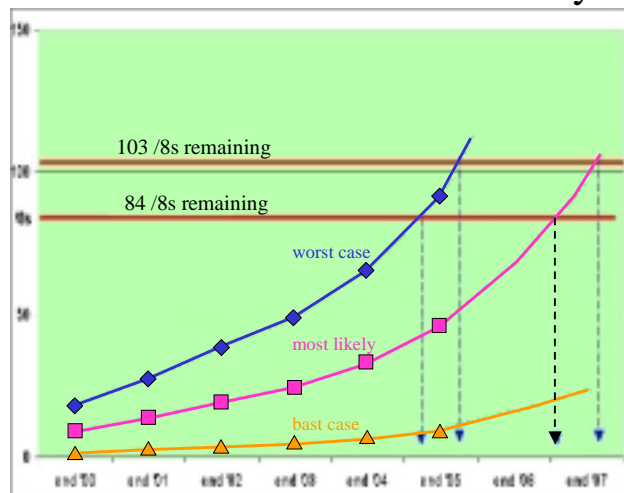
Business market of IPv4 + New business market of IPv6

- Bi-direction communication
 - Create new kind of application
 - P2P Application
 - (Ex.) Net Meeting, Gnutella, Napster
- End-to-End secure communication
 - Setup cheap & detail VPNs
 - Intranet & Extranet



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IPv4 addresses will be exhausted by 2007



Global demand for Cellular and ADSL/Cable modem - exhaustion dates (ICANN Adhoc)

= We have to spread IPv6 by 2005 - 2007.

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Japan's situation

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Opening speech to the 150th session of the Diet (Parliament) on September 21, the Prime Minister of Japan mentioned IPv6

...

I shall boldly address the diverse range of issues we face, including the early realization of e-government, the computerization of school education and the development of systems compatible with the integration of communications and broadcasting, on the basis of discussion in the IT Strategy Council. We shall also aim to provide a telling international contribution to the development of the Internet through research and development of state-of-the-art Internet technologies and active participation in resolving global Internet issues in such areas as IP version 6 (IPv6).

...

(<http://www.kantei.go.jp/foreign/souri/mori/2000/0921policy.html>)

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IPv6 situation

Technology:

- Standardization has almost completed **without dial-up protocol etc.**
- 3GPP will use IPv6 for multimedia mobile network after 2003.

Business:

- The formal address has assigned from September 1999.
- Nokia: demonstrated IPv6 based mobile multimedia network in Madrid.
- The IPv6 Forum
- National project:
 - e-Japan project
 - IPv6 deployment: 13.7 Billion Yen
 - IPv6 appliance: 8.05 Billion Yen

Service:

- Network Service
 - US: MCI announced IPv6 service. But...
 - Japan: IJ, NTT Com, Fujitsu, NEC, KDDI, JENS, OMP, ,,,
- OS
 - SUN Solaris 8、FreeBSD 4.x、Linux
 - MAC OS X
 - **Windows XP**
- Router:
 - **Telebit, NEC, Hitachi, Fujitsu, CISCO etc.**
 - SOHO: Yamaha, Allied, Fujitsu, CISCO, NEC, Panasonic
 - IPv6-IPv4 translator: YDC
- Application
 - transplant IPv6 applications
 - DV over IPv6
 - IPv6 Appliance (trial product)

Japan is hot for IPv6

- National strategy “e-Japan strategy”
 - Promote the shift to the Internet networks equipped with IPv6
 - IPv6 appliance Internet : 8.05 Billion Yen
- IPv6 projects
 - WIDE Project (Prof. Jun Murai)
 - KAME Project (FreeBSD), USAGI Project (Linux), TAHI Project (Interoperability)
 - IPv6 Summit in Japan
 - IPv6 Deployment Committee (IAJapan)
 - IPv6 Operation Study Group
 - The IPv6 Journal(RIIS)
- Deployment
 - Router: Hitachi, NEC, Fujitsu, YAMAHA, Allied Telesis, etc.
 - ISP: NTT Com, IJ, KDDI, JENS, Biglobe, Infoweb, OMP, IMNet, etc.
 - Appliance: Networkworld + Interop 2001 IPv6 Showcase
 - Others: PlayStation 2

N+I2001 IPv6 Showcase



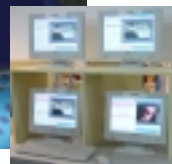
Ready for IPv6 - NTT Com Demos at N+I Tokyo, June 2001 -



Hong Kong view
via IPv6 remote control camera

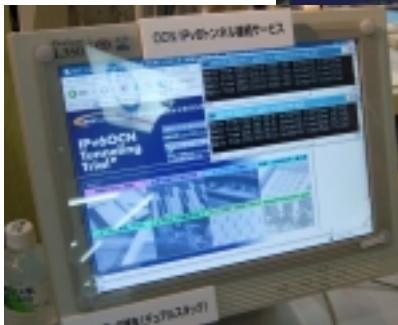


P2P DVPN *



* NTT Information
Sharing Platform
Labs. provided
prototypes.

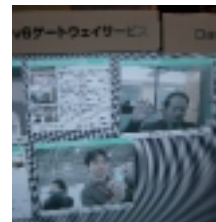
Secure multicast *



Windows-XP working with OCN



SOHO routers working with
OCN



Video conference
over IPv6

NTT Com's Activities

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Progress of *NTTv6net* implementation

- 1996 Aug : join 6bone as a **Leaf Site**
- 1997 Dec : join 6bone as an **NLA1**
build Japan NOC
start IPv6 provider experiment in Japan
- 1998 Jul : join 6bone as a **pTLA**
start peering with pTLAs in the world
- 1998 Aug : extend to CA using IPv6 native Pacific link
build **US-west NOC**
- 1998 Dec : build **EU NOC** in Germany
- 1999 Jan : start pTLA provider experiment
- 1999 Jul : extend to STARTAP in Chicago
build **US-east NOC**
- 1999 Oct: extend IPv6 native link to EU NOC

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Background

- **Since 1996, NTT has studied researches of IPv6 network operation on a global scale.**
 - NTT Com Obtained sTLA registry from APNIC (Sep. 1999)

- **Some customers longed to connect to IPv6 network.**
 - First of all ISPs should support IPv6, we thought.
 - NTT Com has started IPv6 trials on a global scale. (Dec. 1999)

- **Companies started considering businesses with IPv6.**
 - Our trials have supported developers of IPv6 business.
 - Now we're preparing for commercializing IPv6 services.

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NTT Communications' IPv6 Trials

- **Network Operation Trials** (<http://www.v6.ntt.net>)
 - IPv6 OCN Tunneling Trial (NTT Communications)
 - No charge for accessing IPv6 network during the trials.
 - The trials will end on March 31, 2001.
 - IPv6 Operation Trials in Europe (NTT Europe)
 - IPv6 Commercial IX in San Jose, U.S.A. (NTT MCL)

- **IPv6 Application Trial**
 - Application Trial
 - Tests & developments for system integration and migration
 - Individual Trial
 - Joint trials with several companies.

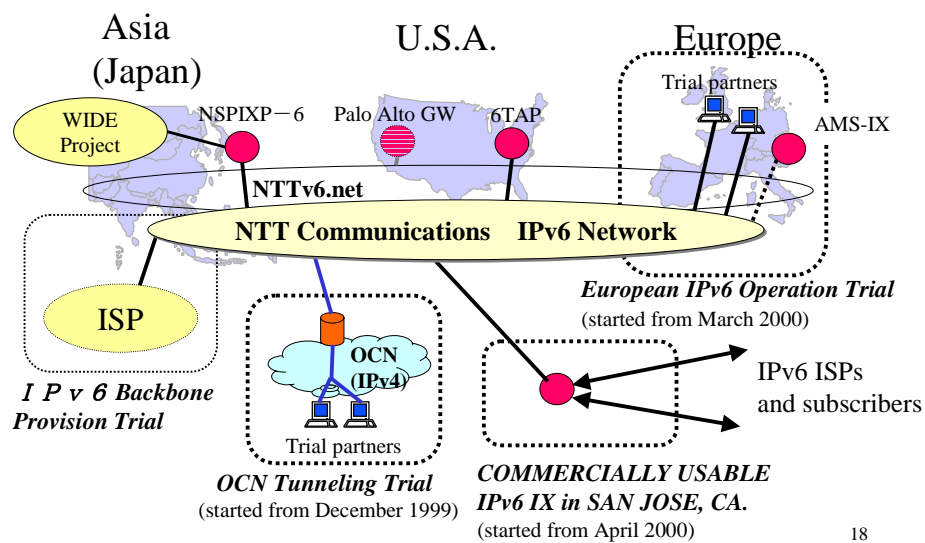
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Network Operation Trials

- **IPv6 OCN Tunneling Trial** (NTT Communications)
 - IPv6 over IPv4 tunneling technology
 - For customers of OCN leased-line connection service
 - For customers of OCN dial-up access service (planning)
- **IPv6 Operation Trials in Europe** (NTT Europe)
 - Native connection, Tunneling connection
 - Connecting to the many IPv6 networks that exist in Europe
- **IPv6 Commercial IX in San Jose, U.S.A.** (NTT MCL)
 - Operating a commercially usable IPv6 IX service
 - NTT America's San Jose data center

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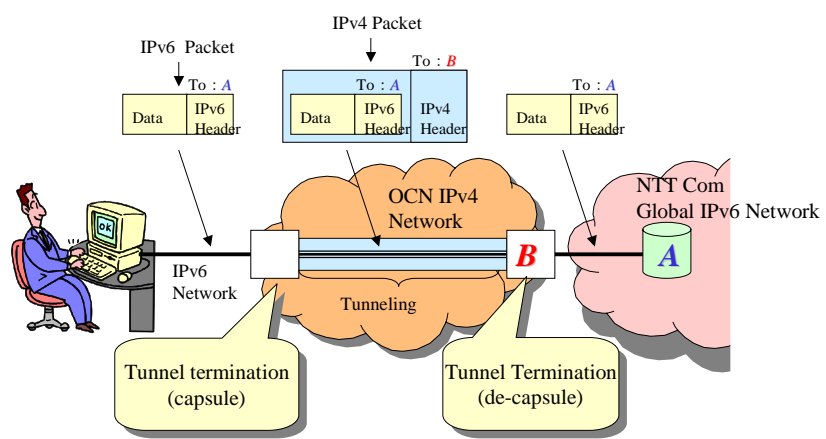
NTT Com Global IPv6 Network



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IPv6 OCN Tunneling Trial

IPv6 over IPv4 tunneling

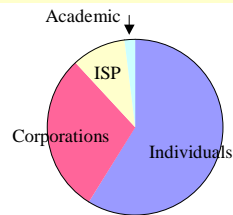


Status of OCN IPv6 Trial

Number of trial partners: about 185 (As of end-Mar.2001)

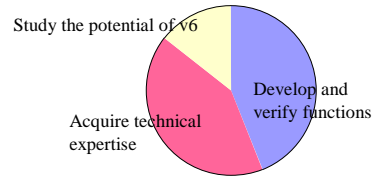
Breakdown of Participants

Shifting from research phase to business phase



Purpose of Participation

53% of participants are preparing to commercialize the service



Participants with IPv6 experience 28 %
 IPv6 researchers and developers 20 %

What do you expect for IPv6?

- 1) Addresses
- 2) Security

Application Trials

Web site for testing IPv6 application.

These sites are opened to every IPv6 users of the world.

- **NTT Business Information Service, Inc.**

- constructs a music distribution site
- application: mpeg123 (Linux and FreeBSD)

- **NTT Software Corporation**

- develops TWIN-VQ IPv6 for Windows2000 + MSDN
(joint research with NTT Cyber Space Laboratories)
- provides music songs for audition

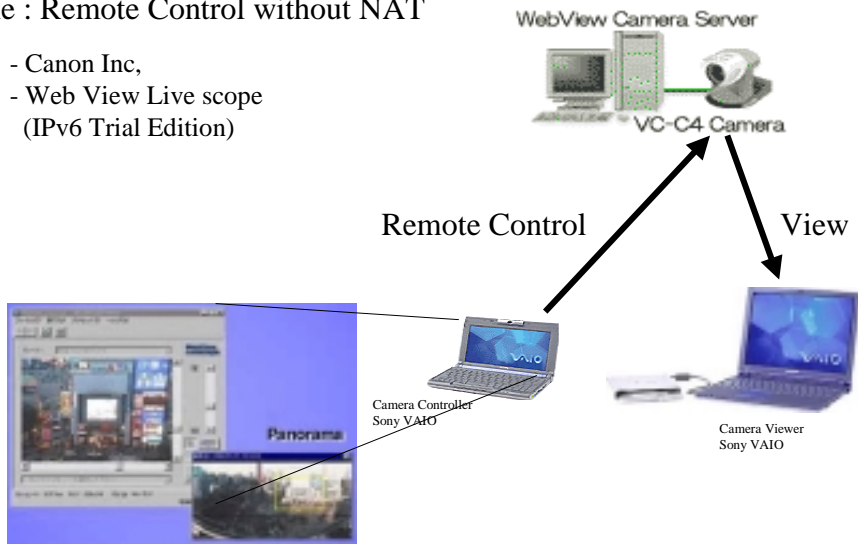
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Demonstration in
Computer Expo(HK) and N+I2001(JPN)

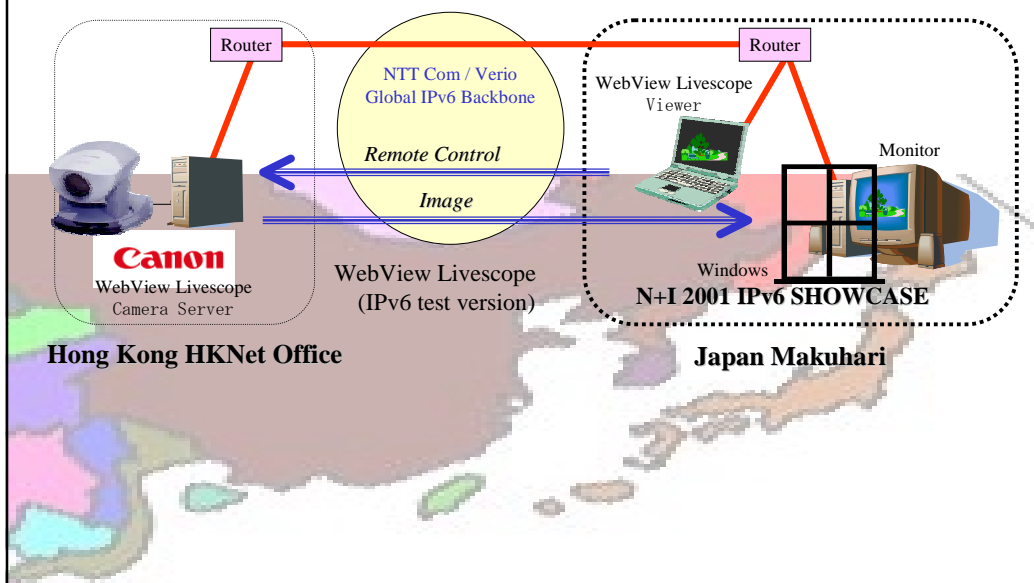
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Title : Remote Control without NAT

- Canon Inc,
- Web View Live scope (IPv6 Trial Edition)



N+I 2001 Demonstration



IPv6 Webview Livescope



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Demonstrations

- Hong Kong Computer Expo Exhibition
- Hong Kong HKNNet Office
- Tokyo NTT Com Office
- N+I2001 NTT Com Booth

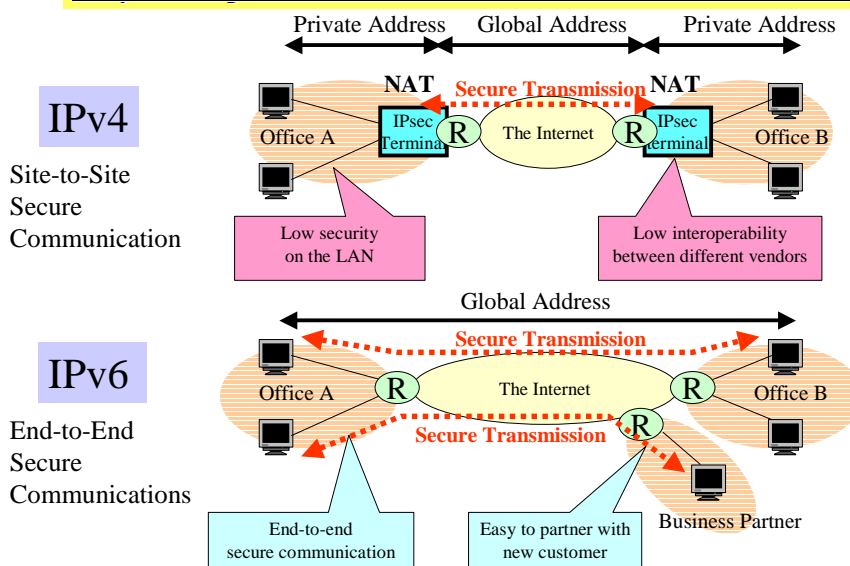


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Individual Trials

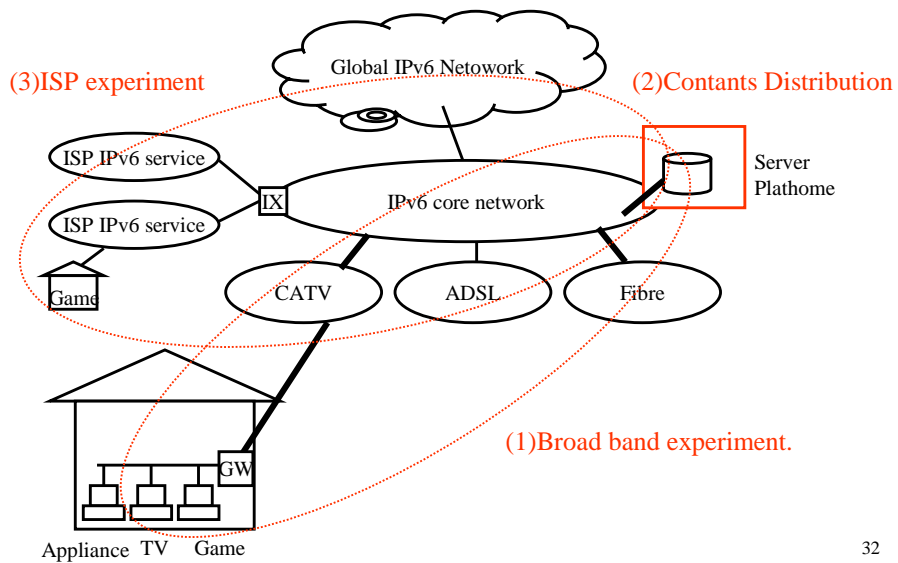
End-to-End Secure Communication

Easy to setup IP-VPN between end-to-end terminals with IPv6

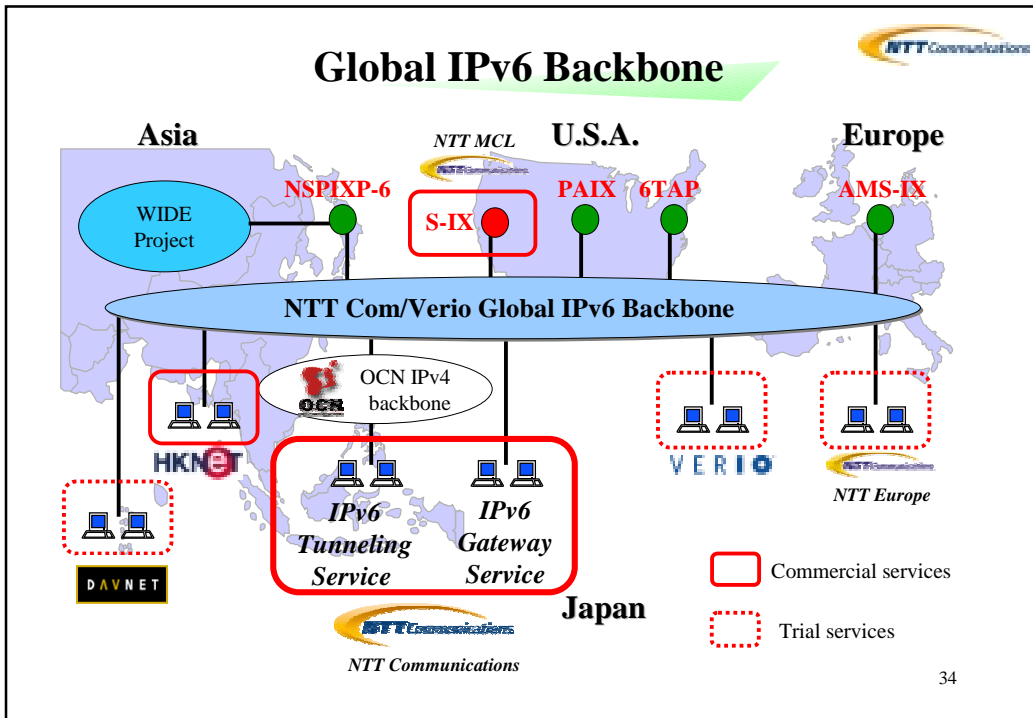


National Project

Home Appliance Trial



International Strategy



International Strategy

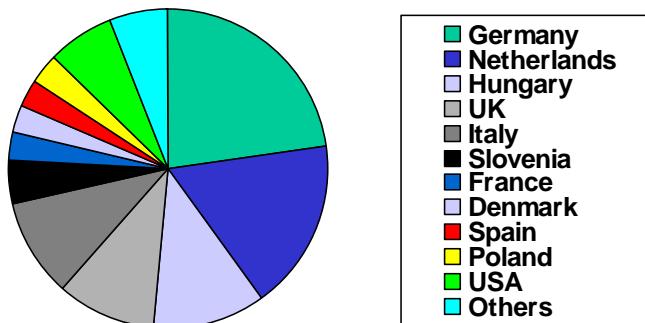
- Global One Network
 - NTT Com + Verio
- Support Foreign ISPs
 - HKNet, Davnet, NTT-E, NTTMCL etc...
- Standardization
 - IPv6 Forum, IETF
- Corroboration
 - 6NET, other trials

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Status of IPv6 Trial in Europe

- Number of trial partner: 70 (as of June 2001)

Countries of Trial Participants



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Difficulty operating and supporting IPv6 networks



- No IPv6 support in operational Tools
 - Router configuration tools, (built in house)
 - Network monitoring tools, (Openview, NetExpert)
 - No IPv6 SNMP support or defined MIBs
 - No NMS support for ICMPv6 polling, (built in house)
- NOC/Operational personnel unfamiliar with IPv6 protocol
 - Training
 - Experience

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Requirements moving forward



- Address Management
- Handling BGP customers/Multihoming issue
- IPv6 Support, and features missing
 - BGP MD5 authentication
 - BGP Confederations
 - IPv6 ISIS support
 - OSPFv3 support
 - SNMP support, and MIBs
 - Hardware forwarding
- Manufactures supporting IPv6 at all
- Manufactures continuing to design equipment that cannot support IPv6

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