

# IPv6 Strategy and Status in Japan



Hiroshi Esaki

[hiroshi@wide.ad.jp](mailto:hiroshi@wide.ad.jp)

University of Tokyo / WIDE Project

# Policy speech

- Prime Minister, Yoshiro Mori
- Sep. 21, 2000
  - 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>



# *Internet into the 4<sup>th</sup>-Wave*

1<sup>st</sup> Wave : Closed Open Network → Global Open Network

→ not only for closed system

- TCP/IP as the common language

2nd Wave : IP for Everyone/Billions

→ not only for researchers

- Scalability, Reliability & Robustness

3rd Wave : IP for E-Business

→ not only for hobby/research

4th Wave : Broadband/Ubiquitous (always connected)

→ not only for computers

- Small Nodes

- Heterogeneous (Quality and Quantity)

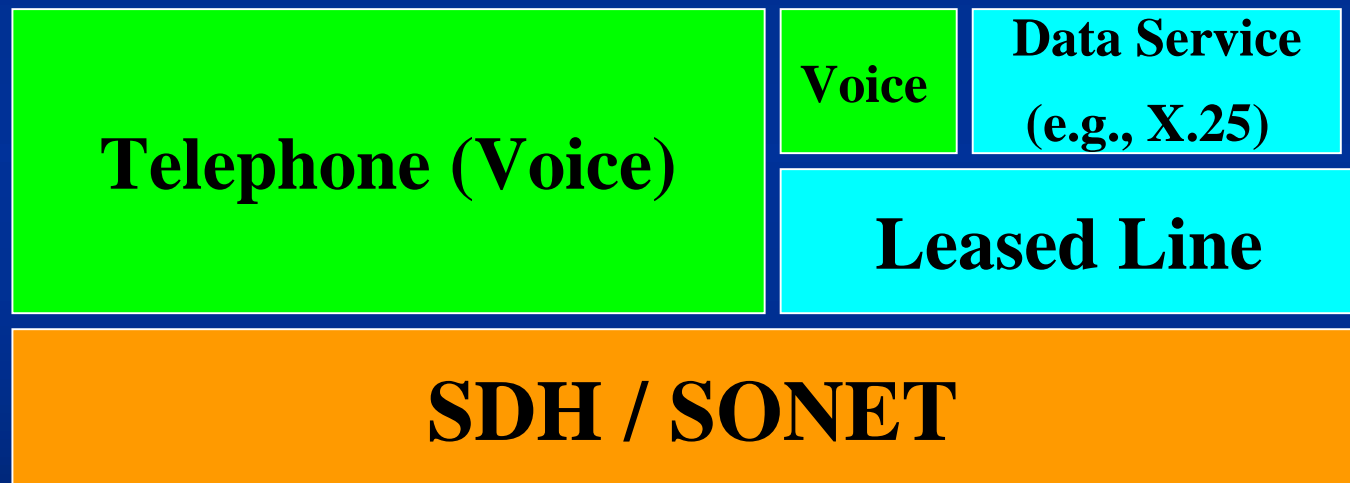
Toward  
“the Native Internet”  
from  
Internet over Telephone Infrastructure



☆ No more Dialup,  
☆ Hello, Always Connected

# Where we are going ?

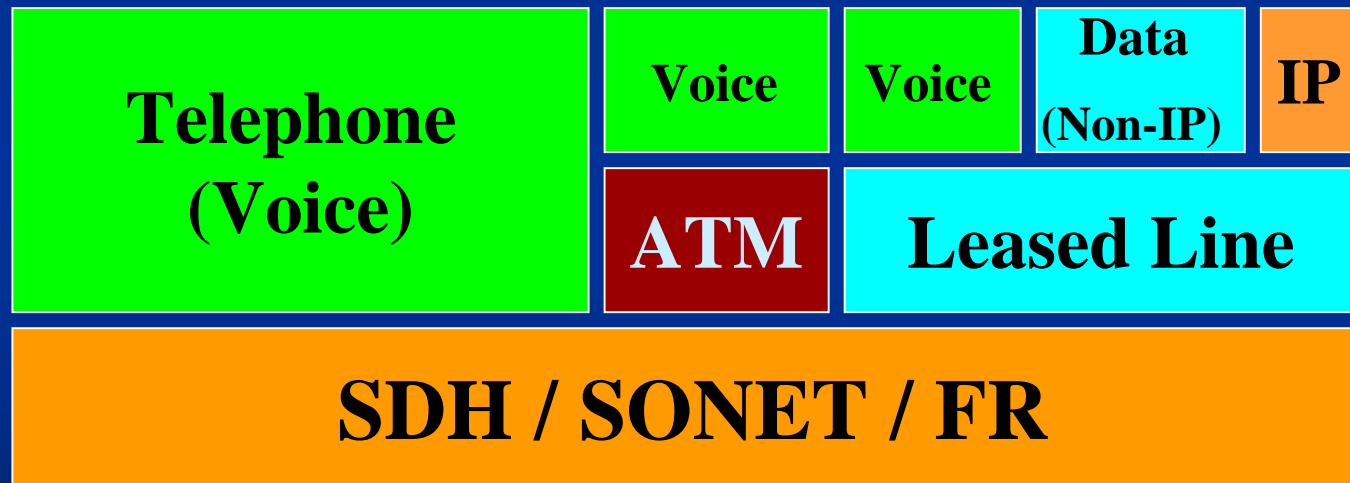
No IP, No Internet



{ Before Internet }

# Where we are going ?

IP uses Shared p2p Link

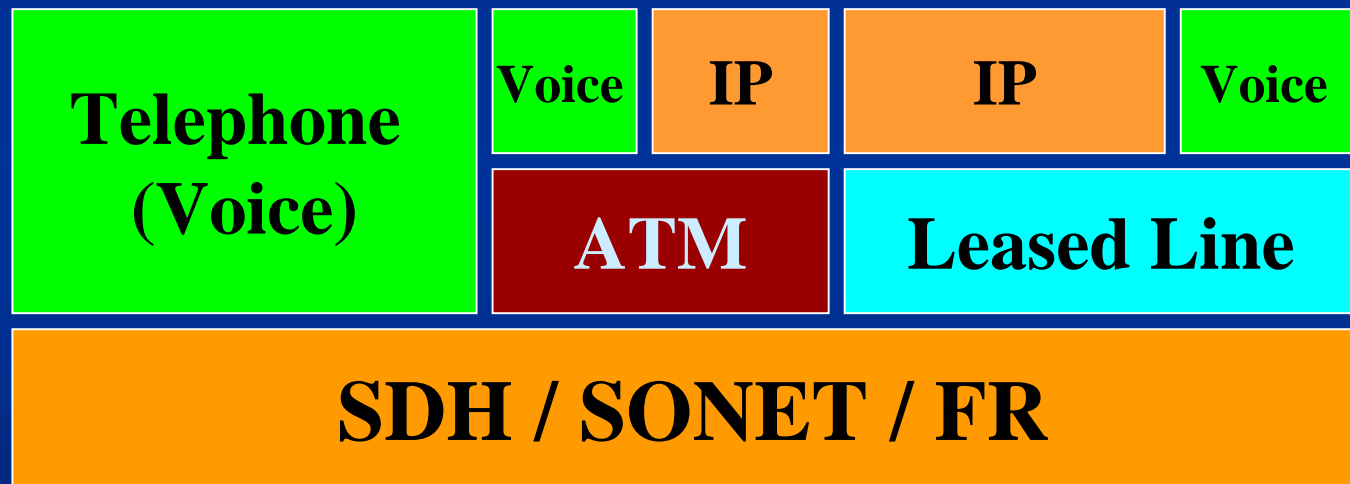


{ Internet use SONET & FR }

{ ATM is for voice and BISDN }

# Where we are going ?

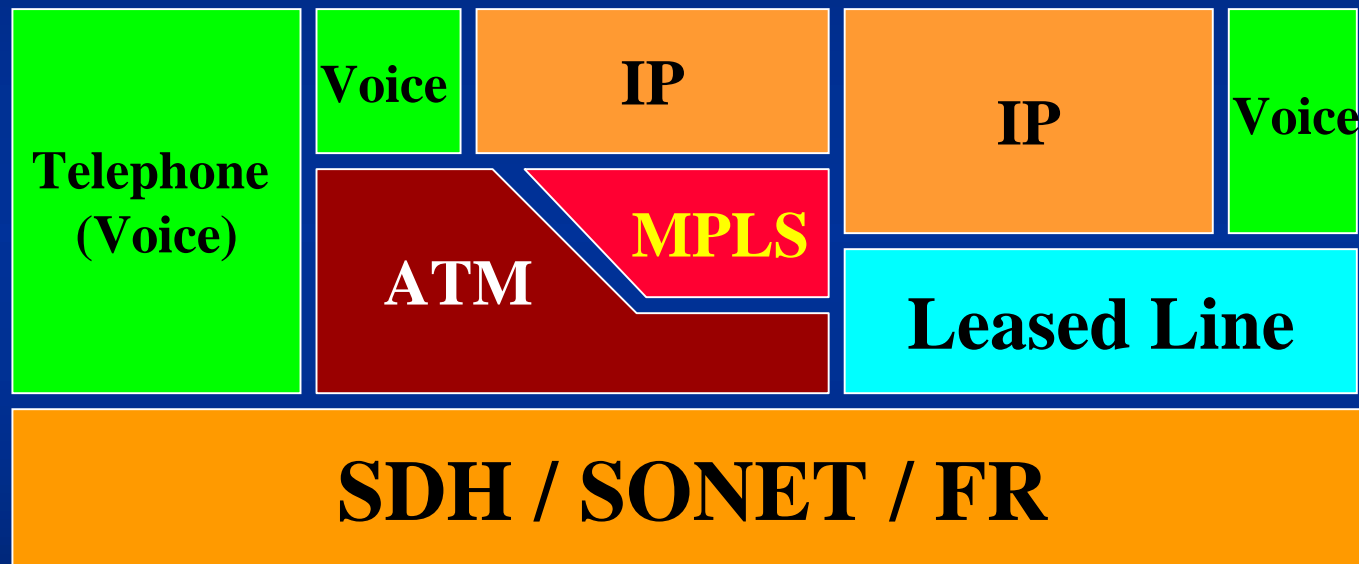
IP uses Virtual Connection



{ IP over ATM/FR/SONET }

# Where we are going ?

IP uses ATM Switch Engine



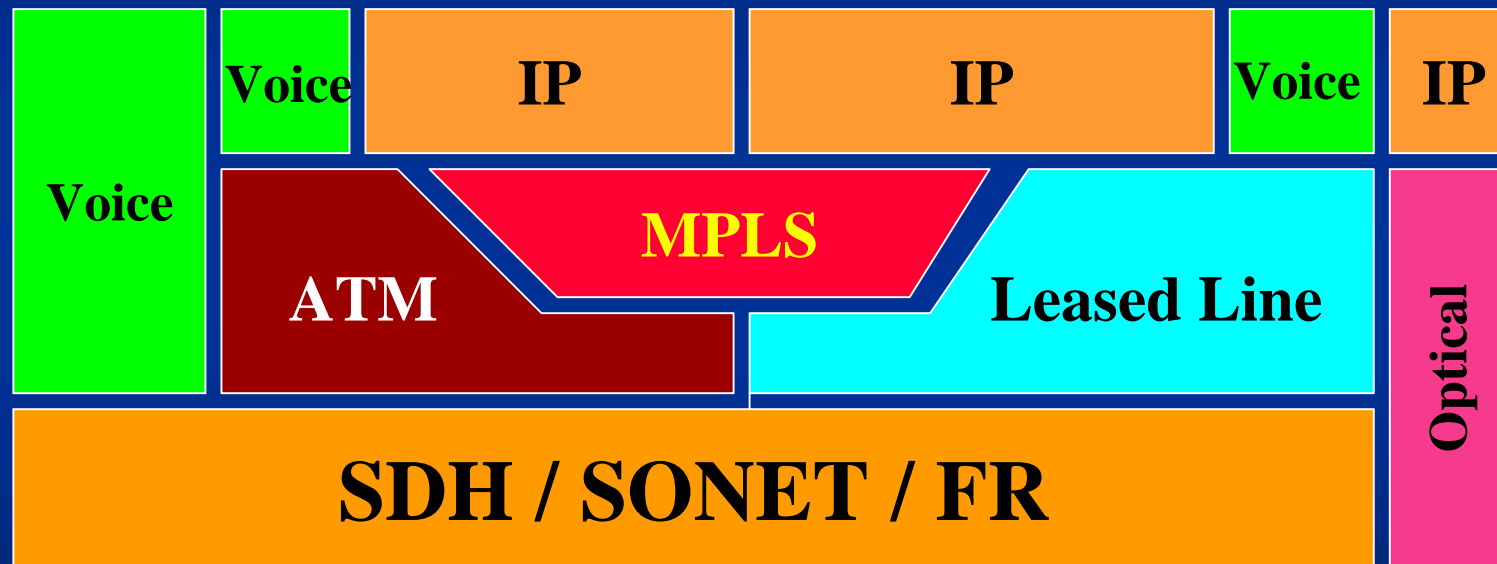
**{ IP over MPLS over ATM }**



# Where we are going ?

IP uses MPLS over Any-link

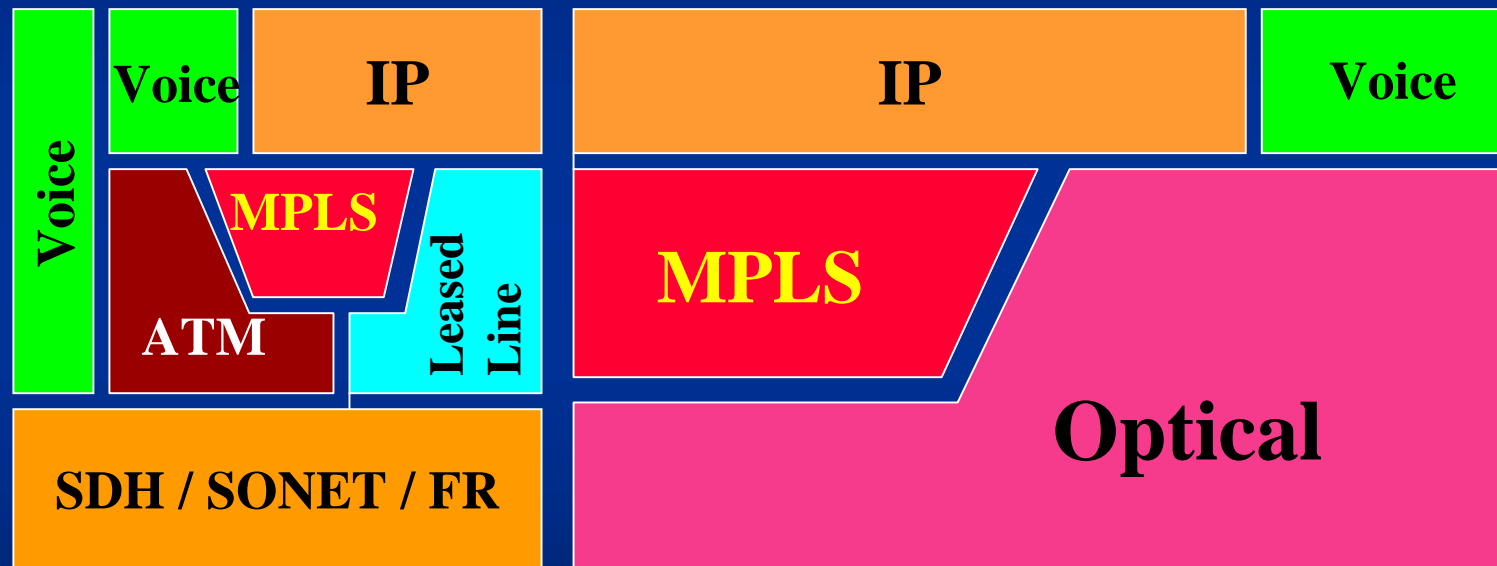
IP directly uses Optical



{ IP over MPLS over Anylink }

# Where we are going ?

IP uses MPLS over Optical MP ~~λ~~ S



{ IP over MPLS over Optical }

# IP version 6 Activities in Japan

## – Federal Government–

- Prime Minister Mr.Mori said;
  - Targeting on Internet R&D and deployment
  - Deploy the IP version 6
- Policies by Japanese Government
  - \$90 Billion for IT
  - \$30 Billion for Internet
  - Everything with IPv6
  - Research : \$6 Billion
  - Deployment : \$24 Billion

# IP version 6 Activities in Japan

## – Federal Government–

- Ministry of Public Management, Home Affairs, Post and Telecommunications
  - \$ 90 Million for IPv6 in 2000FY
  - JGN (Japan Gigabit Network) IPv6 Deployment
  - v6 forum
  - IPv6 test-bed operation
- Ministry of Economy, Trade and Industry
  - wireless internet node and system with IPv6
  - security related work around IPv6
- ITS (Intelligent Traffic System) with IPv6
  - few hundreds of billion dollars
- Satellite internet with IPv6
- Governmental service with Internet using IPv6

# IP version 6 Activities in Japan

## – Federal Government–

- Commercial ISPs with IPv6
  - Supporting deployment of IPv6
- De-regulation to deploy the high-speed always connected
  - FTTH
  - Full IP mobile internet system
    - development funds
    - radio frequency

# IP version 6 Activities in Japan

## – IPv6 test-bed –

- Carriers/ISP : NTT, Yusen, IP revolution, Tokyo-Metalic, eAccess, Metro\_Access, Tokyo-Cable, Odakyu-Cable, NTT-SC/JCSAT,etc., China Telecom, CERNET
- Data Center : NTT-C, AboveNet, MIND, etc,
- Contents : NHK, ABC, etc.,
- Wireless : NOKIA, Ericsson, SONY-CSL, Toshiba, etc.,
- Cable Modem : Panasonic, etc.,
- Hosts : MicroSoft, SONY, Panasonic
- Sensor node : Yokogawa
- Satellite : JCSAT/NTTSC

# IP version 6 Activities in Japan

## – Commercial Providers–

- NTT Communications
- IIJ (Internet Initiative Japan)
- NSPIXP2 with IPv6
- BigGlobe by NEC
- Yusen Broadband Networks

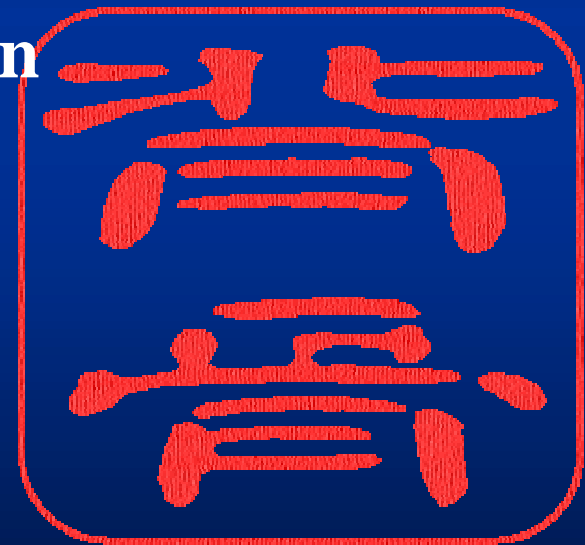
# IP version 6 Activities in Japan -Researches-

WIDE Project and JB Project



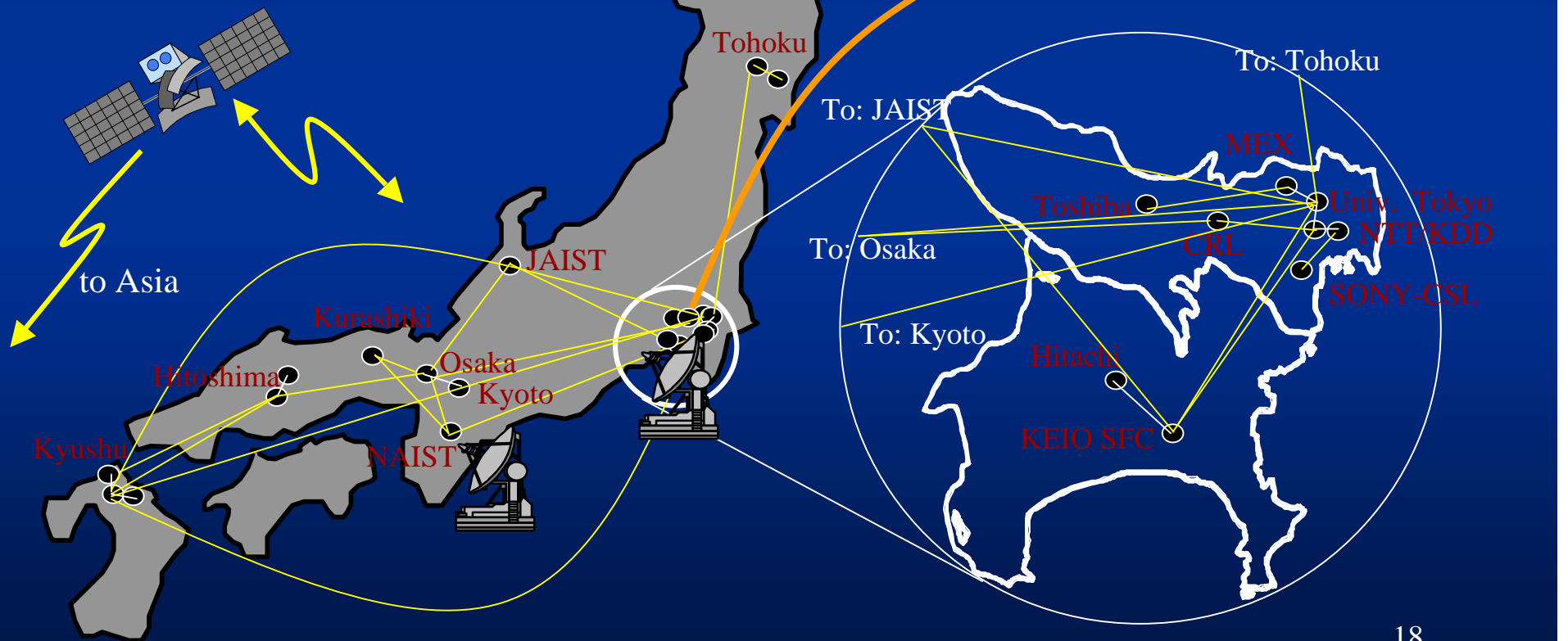
# Project JB : Overview (1)

- Research Collaboration for Internet Technologies among academia and industries (project leader; Prof.Jun Murai)
  - (1) R&D of Next Generation Internet Technologies
  - (2) Operation of Research and Educational Network
- Kind of SIG without any Bylaw nor Contract
- Domestic Collaborations in Japan
  - CKP(Cyber Kansai Project)
  - ITRC Project
  - WIDE Project
  - etc.,



# JB: Network Topology and organization map

(\*) Mixture of SDH, ATM, Sattelite with 64Kbps to 1Gbps



# IP version 6 at WIDE Project

- Everything with IPv6
  - All research and development is based on IPv6
  - KAME/TAHI/USAGI
  - WIDE testbed with IPv6
  - Operate NSPIXP6 for IPv6 research
  - NSPIXP is IPv6 ready for IPv6 commercial operation
  - M-root DNS server with IPv6
    - ➔ Working with USC-ISI Bill Manning
- International IPv6 activities
  - IPv6 in the APAN (Asian Pacific Advanced Network)
  - China Telecom and CERNET
  - AIII (Internet for Asia via Satellite) with IPv6

# AI<sup>3</sup> Testbed Network



WIDE  
PROJECT

JCSAT-3  
C-band

Keio



NAIST

HKUST

IOIT

ASTI

AIT

USM

CMB

TP

ITB

JCSAT-1B  
Ku-band



1.5 Mbit/s : JP to others  
512 kbit/s : others to JP



# What WIDE Achieved

- **KAME IPv6 Implementation**

- **Participants**

- Keio Univ., Univ. of Tokyo, Fujitsu,  
Foretune, Hitachi, IJ, NEC, Toshiba, Yokogawa

- **\*BSD\*** (BSDI, OpenBSD, FreeBSD, NetBSD)

- <http://www.kame.net>

- **TAHI IPv6 Test & Evaluation Software**

- <http://www.tahi.org>

- **JB Testbed**

- Multicast with DV

- QoS-aware technologies (e.g., Diff-Serv, BB/COPS)

- Routing Protocols (BGP4+, OSPFv3, RIPng)

- SOI(School on the Internet)

- DNS and Address/Routing Registry

- Integration with label switch technology

- IPv4/IPv6 Translation (SOCKS and NAT)





# IP version 6 Activities in Japan -Researches-

## Into the Next Stage

# IP sensor Prototype (Thermo Sensor Node)

Inside view



Outside view

# Network Appliances(on sale)



© NTT DoCoMo

Cellular  
Phone  
with Internet  
Connectivity



© Cannon

Digital  
Camera  
with Network  
Connectivity



© Sony

Digital  
Video  
Camera  
With A/V  
Network  
Connection



© Sharp

Microwave  
with Network  
Connectivity



# User application (Java applet)

## Temperature and Door status



Door0 : Closed  
Temp0: -16.7C

Compressor  
Temp:70.0C

# International Research Network Operation

- EU
  - DANTE (TEN-155)
  - NODUNET
  - SURFNET (Netherland)
  - JANET (BK)
  - DFNET (Germany)
- North Anmerica
  - Internet2 / Abeline
  - vBNS+
  - Ca\*Net3/4

# Current Status of IPv6 Developments



[1] Standardization



: almost done

**Basic technology and operation development has been almost ready.**

**Now, we are going to the Next Stage**

**→ Full Digital Information Environment**



(iv) Interoperability

[3] Deployment



(i) Address allocation



(ii) DNS update



(iii) IPv6 network operation

# Summary

- **Production Quality IPv6 Network Operation**
  - Research Network Testbed (e.g., JB, JGN)
  - Commercial Network Testbed (by MPHPT)
- **Technology Development and Deployment**
  - Many Government Supporting IPv6 Projects
  - IPv6 Native Applications
    - Information Appliances, InternetCar, Nomadic Computing
  - Digital Information Control and Management