

# JGN IPv6 Network

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# Content

## ◆ Outline of JGN IPv6

(It is referred to as *JGNv6*)

- Network composition and feature
- Operations situation of JGNv6

## ◆ Research and development using on the JGNv6

- Evaluation of Functional Interoperability among IPv6 routers
- Management technology for IPv6

## ◆ Performance Measurement on JGNv6

- The performance of each individual router.



# JGN (Japan Gigabit Network)

## ◆ JGN (Japan Gigabit Network)

- Constructed and Operated by TAO
  - ◆ TAO: Telecommunications Advancement Organization of Japan
  - ◆ TAO is an affiliated associations of Ministry of Public Management, Home Affairs, Posts and Telecommunications.
- Nation wide ATM base network (OC3, OC12)



# JGNv6 Network(1)

## ◆ JGNv6(Japan Gigabit Network for IPv6)

- IPv6 overlaying on the JGN's ATM network
- Various vendor Routers (five vendors now)
- Native IPv6 service, i.e., No-Tunneling
- The largest native IPv6 R&D network in the world
- Test Operation ; October 2001
- General Service ; April 2002



# JGNv6 Network(2)

## ◆ Core sites

- Tokyo(Univ. of Tokyo)    Osaka(NTT Dojima)
- Fukuoka(Kyusyu Univ.)
- Okayama(IPv6 Okayama Interoperability and Evaluation Laboratory)

## ◆ An access point are over nation wide.

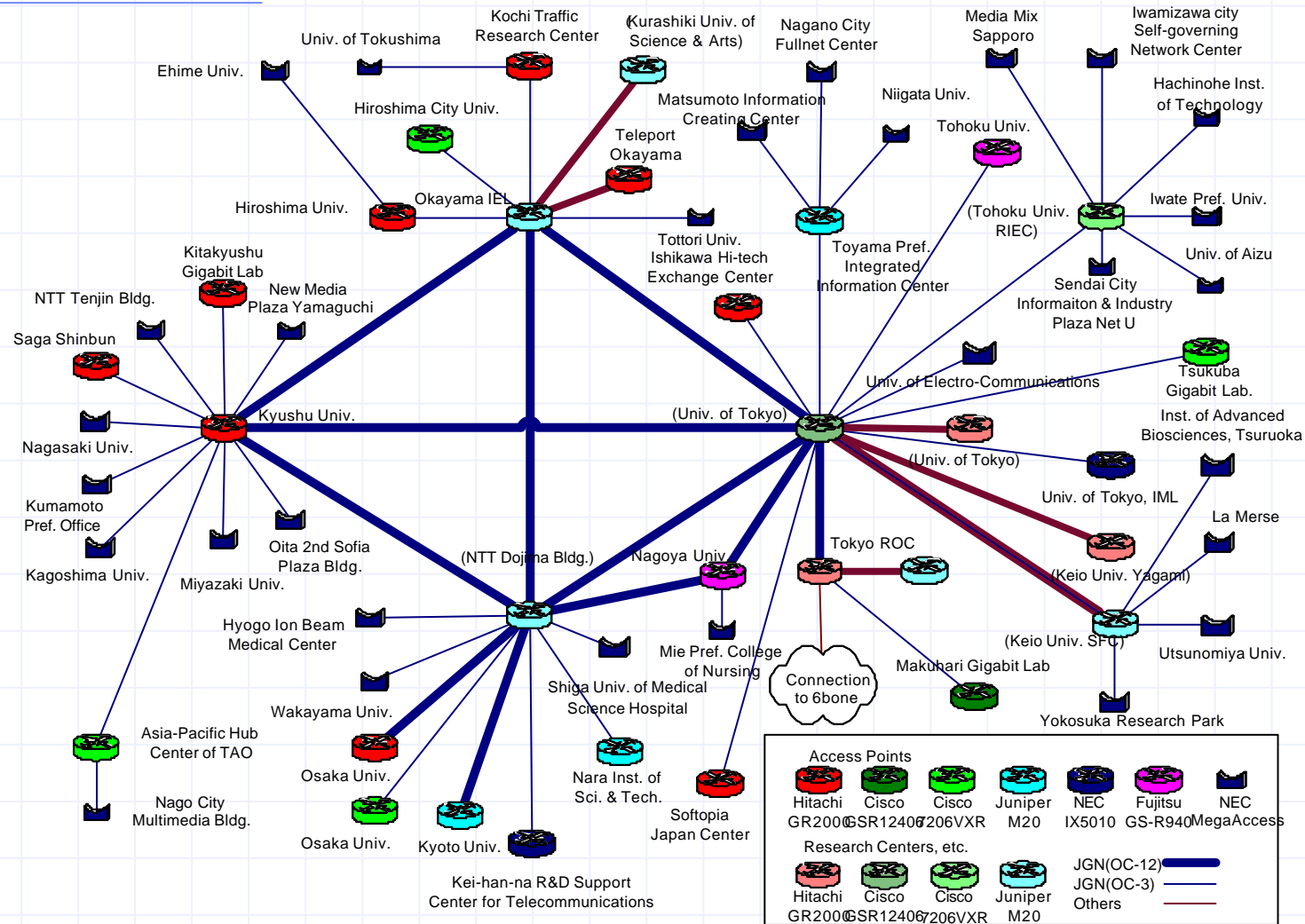
- 28 router sites.
- 29 bridge sites.

## ◆ External connectivity, e.g., Abeline, APAN, v6pc

## ◆ Evaluate the interoperability and applicability of new functions, e.g., multicast, IPsec.



# Network Topology



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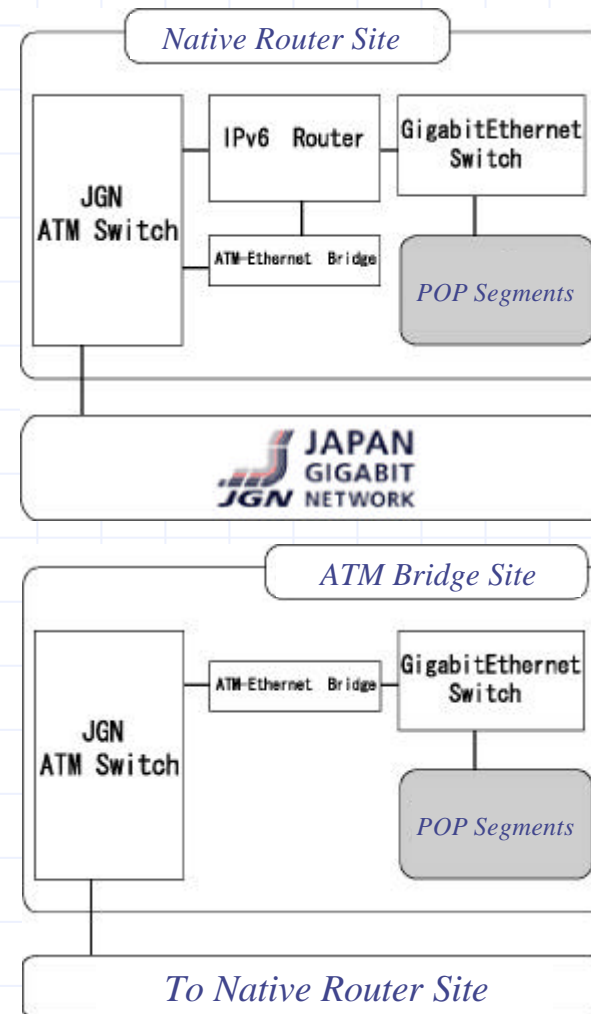
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# Router site & ATM Bridge site

- ◆ Dual Stack Network
  - IPv6 & IPv4
- ◆ Connection Service
  - Ethernet (100/1000BASE-T)
  - ATM (special)
  - Gigabit Ethernet (special)





# The Current Status of IPv6

## ◆ IPv6 commercial ISP operational status in Japan

- IX(internet eXchange) for IPv6
  - ◆ NSPIXP6... IPv6 only: since Sep/1999
  - ◆ NSPIXP2... IPv6/v4 Dual stack: since Apr/2001
- ISP IPv6 Commercial Service
  - ◆ IIJ (since Sep/1999)
  - ◆ NTT Communications OCN (since Dec/1999)
  - ◆ KDDI (since Oct/2000) etc...

## ◆ IPv6 router development status

- Basic routing protocol (IGP, EGP) is available.
- Some performance problem
- SNMP/MIB and some operational technology is advancing to standardization.

# IPv6 Products (Japanese Network Products)

## ◆ IPv6 Products

### ■ IIJ SEIL



- ◆ T1(1.5Mbps) Router
- ◆ <http://www.seil-t1.com/>

### ■ Fujitsu Geo Stream R940



- ◆ Backbone Router
- ◆ [http://www.fujitsu.co.jp/jp/cover/network3/products\\_1.html](http://www.fujitsu.co.jp/jp/cover/network3/products_1.html)

### ■ Fujitsu NetVehicle ( )

- ◆ ISDN Router

### ■ Hitachi GR2000

- ◆ Gigabit Router
- ◆ <http://www.hitachi.co.jp/network/>



### ■ MGCS SJ6

- ◆ Access Router

### ■ NEC IX5000 CX5210 IP8800/700

- ◆ Backbone Router
- ◆ <http://www.nec.co.jp/japanese/product/kiban/den/ix5k7k/>



### ■ Yamaha

- ◆ ISDN Router
- ◆ RT300i/RT105i/RTA52i/RT60w
- ◆ <http://www.rtpro.yamaha.co.jp/>



### ■ YDC TTB

- ◆ IPv6 IPv4 Translation Router
- ◆ <http://www.ydc.co.jp/IT/ip/TTB/index-j.html>

### ■ access ave-TCP 6.0

- ◆ Protocol Stack for industry devices
- ◆ <http://www.access.co.jp/press/001016.html>



# IPv6 Products (Japanese Home Electronics)

- ◆ Sony

- PlayStation2



- ◆ Toshiba

- Internet refrigerator



- ◆ Panasonic

- IPv6 HomeGateway
- IPv6 iFAX/VoIP Gateway
- Internet TV



- ◆ Hitachi

- Mobile Viewer Flola ie



- ◆ Softfront

- IPv6 Phone



- ◆ Yokogawa

- IPv6 remote controller



# JGNv6 operational offices

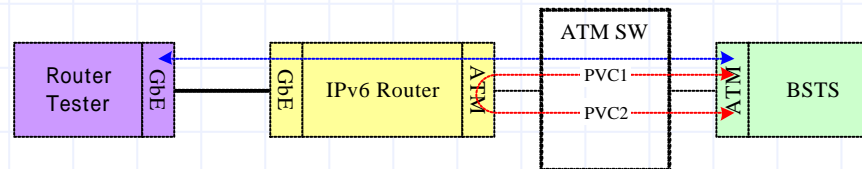
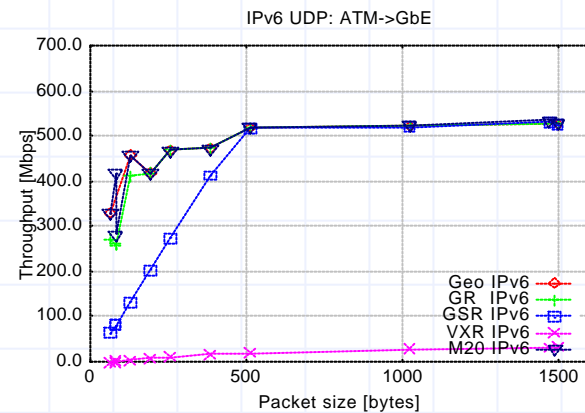
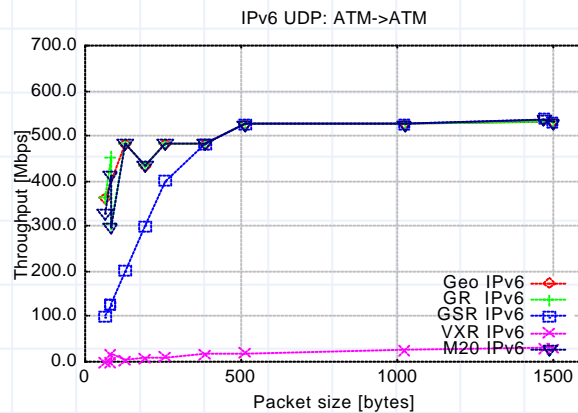
- ◆ Special research group for JGNv6
  - 8 researchers and “many” collaborators
- ◆ Important offices in TAO for IPv6
  - For interoperability testing
    - ◆ Okayama Interoperability & Evaluation Lab.(Okayama Japan)
    - ◆ Makuhari research office.(Chiba Japan)
  - For operational technology researches
    - ◆ Tokyo (Otemachi)Research & Operation Center.

# Okayama Interoperability & Evaluation Lab



# Example of Performance Evaluation

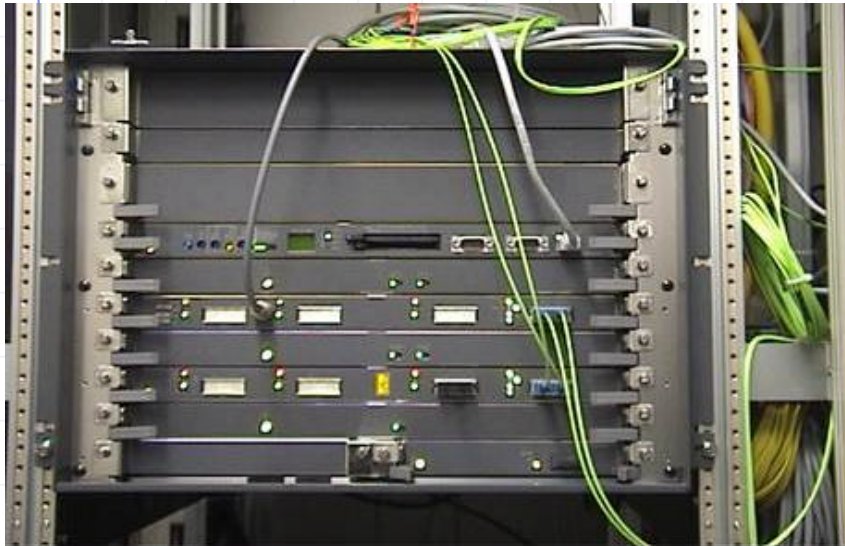
## ◆ Performance Evaluation for Routers



## ◆ Direct feedback with equipment vendors

- Quick bug fixing cycle

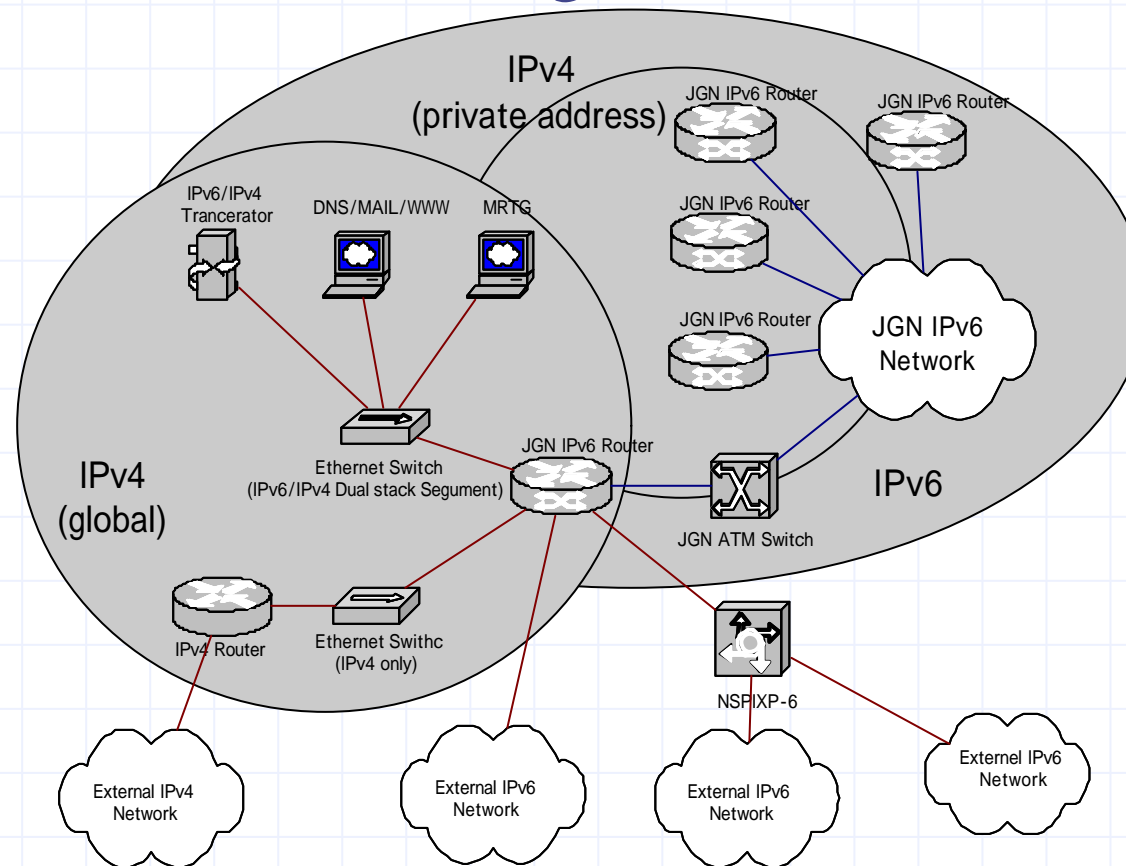
# Tokyo Research & Operation Center(Otemachi, Tokyo)



- ◆ Development of IPv6 traffic collection system
- ◆ SNMPv3 development
- ◆ Network operation and management tools

# Example of Tokyo R&O Activity

## ◆ Operation & Management





# Routing Protocol (1)

## ◆ Initial phase

- Static and RIPng
- BGP4+

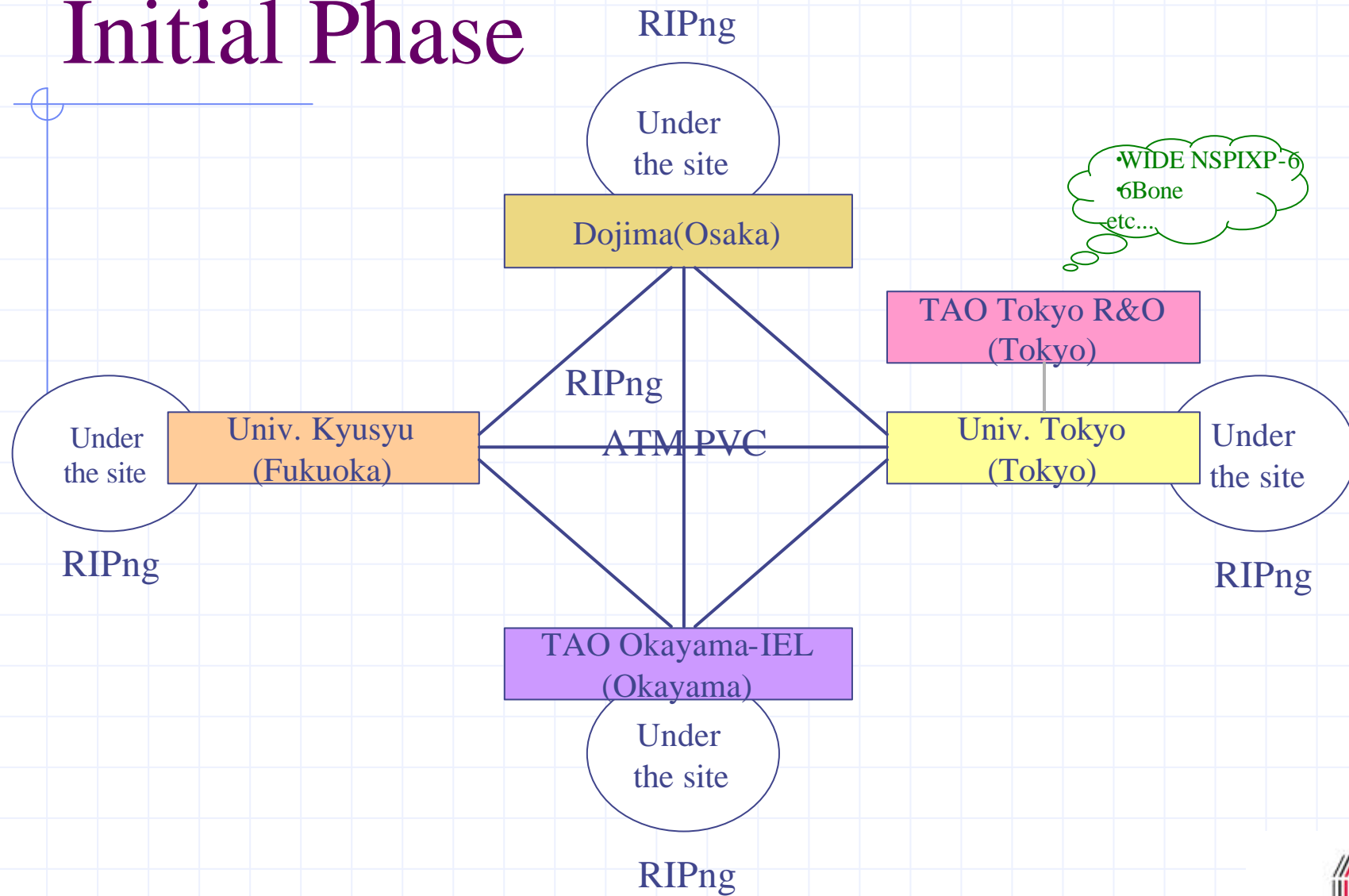
## ◆ Introducing configuration

- BGP4+(IBGP)
- OSPFv3
- PIM-SM

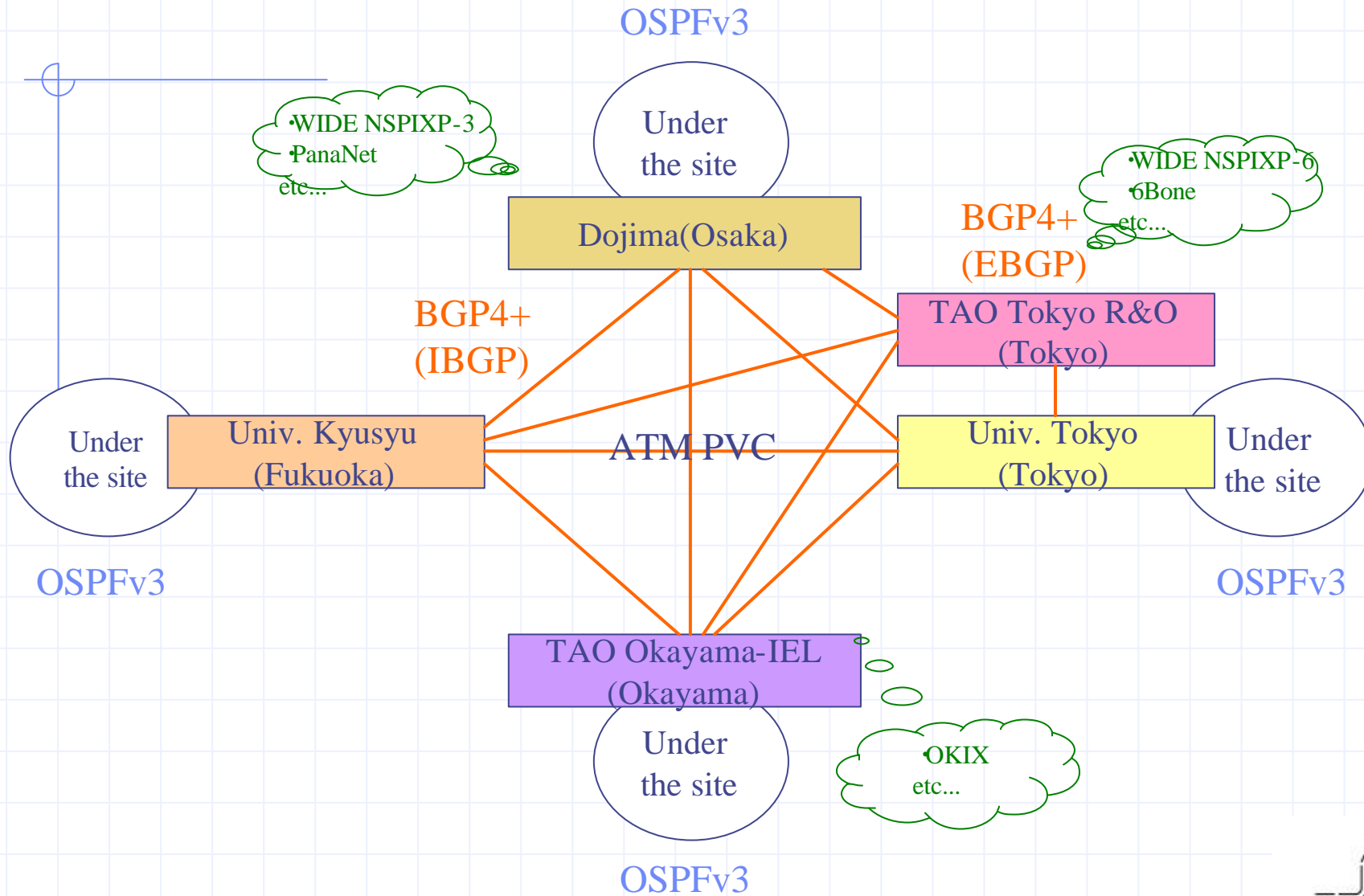
### ex. Configuration

```
ripng {  
  traceoptions {  
    file ripng.log files 20;  
    flag all;  
  }  
  group jgnv6 {  
    export adv-ripng-free;  
    neighbor at-0/0/0.1;  
    neighbor at-0/0/0.2;  
    neighbor at-0/0/0.10;  
  }  
}
```






# Initial Phase



# Introducing Configuration (IBGP)



# Routers installed in JGNv6

Vender name	Product name	Quantity
Cisco Systems 	GSR12406	3
	7200VXR	6
Juniper Networks 	M20	8
HITACHI 	GR2000-6H	13
FUJITSU 	GeoStream R940	3
NEC 	IX5010	3

# IPv6 Address space allocation

## ◆ JGNv6 IPv6 address

- 3ffe:516::/32(NLA in “WIDE Project” pTLA)
- Hierarchical allocation in JGNv6
  - ◆ 4 Core site ::/35
  - ◆ 28 Router site ::/40
  - ◆ 29 Bridge site ::/48

# External connectivity(IPv6)

## ◆ AS(Autonomous System) number

- AS 17394

## ◆ Peerings (as of October 18,2002)

WIDE Project (AS 2500)	KDDI (AS2516)
Netsurf (AS 4675)	FINE (AS4678)
MIND (AS 4680)	PoweredCom (AS4716)
APAN Tokyo-XP (AS 7660)	KDDI Laboratories (AS7667)
IPv6 Promotion Council Network (AS 17935)	
APII (AS 18083)	NTT DoCoMo (AS 18262)

# Network Management Technology

## ◆ IPv6 Network Management

- Required function
  - ◆ Collect traffic information of an interface with an IPv6 address
  - ◆ Perform collect address notation corresponding to 128 bits
- Operation and Researches at Otemachi R&O
  - ◆ Management and allocation of IPv6 addresses and network prefixes
  - ◆ Management of network topology and routing information
  - ◆ Management of IPv6 servers e.g. DNS and web.

# Conclusions(1)

## ◆ JGNv6

- Research and development network for IPv6  
footprinting nation-wide Japan

## ◆ Multi-vendor environment

- Five vendors
- Hitachi, Cisco, Juniper, NEC, Fujitsu

## ◆ Operational Timeline

- October 1, 2001 ; Test operation
- April 1, 2002 ; General service





# Conclusions(2)

- ◆ Evaluation of network equipments (Okayama)
- ◆ Researches and development on operation and management technology (Otemachi/Tokyo)
- ◆ Contribution to deployment of IPv6
  - Practical evaluation of commercial network equipment for professional operation
  - Technical feedback to commercial vendors
  - Advanced research and development through the practical and live network operation.

# ご静聴ありがとうございました & Some URLs

- ◆ TAO Home Page “Japan Gigabit Network”
  - <http://www.jgn.tao.go.jp/>
- ◆ WIDE Project Home Page
  - <http://www.wide.ad.jp/>
- ◆ KAME Project Home Page
  - <http://www.kame.net/>
- ◆ USAGI Project Home Page
  - <http://www.linux-ipv6.org/>
- ◆ TAHI Project Home Page
  - <http://www.tahi.org/>