

WIDE Testbed and Services

Akira Kato



The Univ. of Tokyo/WIDE Project
kato@wide.ad.jp

Testbed

WIDE Testbed

☆ **Before WIDE Project established in 1988**

- No internet in Japan
- The first task was to create an Internet
- 64kbps link between
 - Univ. of Tokyo and Tokyo Inst. of Tech.
 - Univ. of Tokyo and Keio Univ.
 - Keio Univ. and Univ. of Hawaii (1989)
- Now WIDE became part of the global Internet

☆ **After commercial ISPs launched in 1992**

- It became "our" network
- Operated as a live testbed
 - Still users transmit regular traffic

WIDE Testbed

☆ **Stable operation is not the first priority**

- Stability is still important, however
- We don't hesitate IOS T train for Cisco

☆ **Routers/switches from various vendors**

- Cisco, Foundry, Juniper, Alaxala/Hitachi, PC
- Old box, previous generation, latest generation
 - e.g. C7500, GSR, Cat6500/SUP720

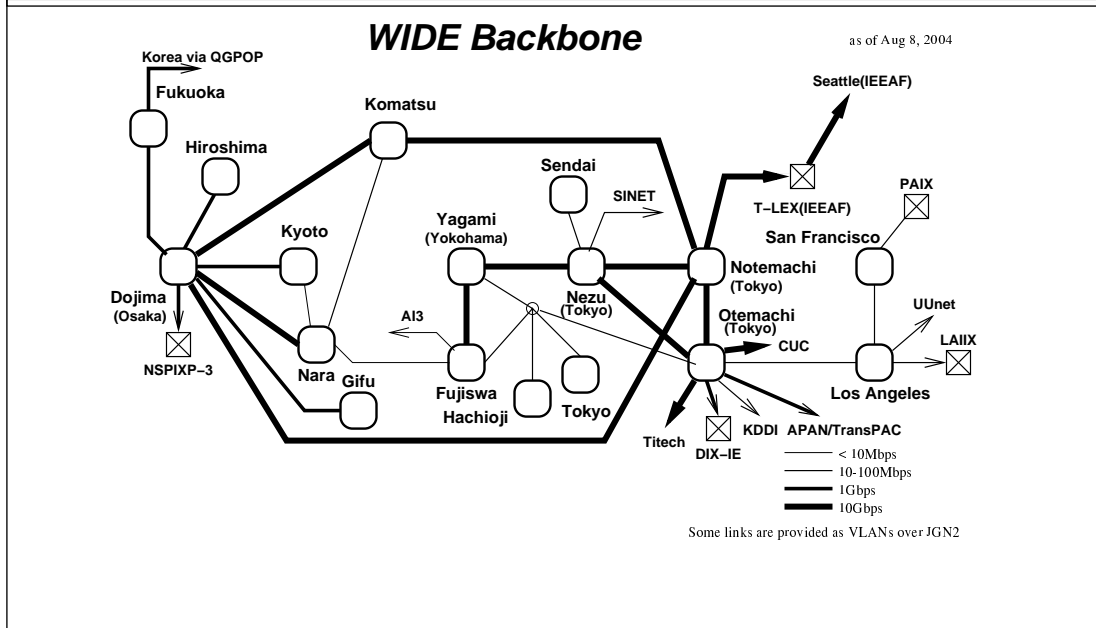
☆ **Playground for new technologies**

- IPv6 has been operated since 1995
- New technologies such as IPv6

☆ **Study Internet traffic through measurement**

- It's possible because it is a live testbed

Current configuration



Configuration

☆ Domestic backbone are 10Gbps ready

- Dark Fiber (w/ EDFA when necessary)

— Otemachi--Nezu(U-Tokyo)--Yagami(Keio)--Fujisawa(Keio)

— Dojima(Osaka)--Nara(NAIST)

- Triangle 10GE LAN (internal is STM-64)
- Otemachi--Komatsu--Dojima--Otemachi

☆ OC-3 international link

- Otemachi--Los Angeles--San Francisco
- LA: access to LAIIX
- SFO: access to PAIX/Palo Alto

☆ Some GbE links are running over JGN2

- e.g. Dojima--Fukuoka, Hiroshima, Kyoto

Operation

- ☆ **Most of the backbone links**
 - Layer-2, IPv4, and IPv6 ready
- ☆ **IPv4 topology is not the same as IPv6**
 - Some routers are IPv4 only (e.g. BI4000/IronCore)
 - Some IPv6 routers are still PC based
- ☆ **Replacing old gear makes unified topology**
 - Toward dual-stack operation
 - Makes jumbo frame available
 - Higher port density, 10GE ports

Operation and Service

JP DNS Server

- ☆ **WIDE has operated JP DNS since 1989**
- ☆ **2001 IPv6 transport operational**
 - Query in IPv6
 - IPv6 "contents" has been available since 1997
- ☆ **2002 Moved to Osaka**
 - Dedicated HW resource assigned
- ☆ **2003 Dedicated IPv4 prefix**
 - Not part of WIDE BB address
 - Service available if WIDE BB goes down
- ☆ **2005 Anycast server installed**
 - Paris and San Francisco
 - IPv6 test address from APNIC 2001:de0::/32
 - Not operational yet

M-Root Server

- ☆ **1997 Aug: M started operation in Tokyo**
 - At NSPIX-2
 - Redundant servers
 - Two PentiumPro PCs
 - Server replaced in every two years
- ☆ **1999 Access to JPIX**
 - JPIX has offered its port and a router
- ☆ **2000 Access to JPNAP**
 - JPNAP offered FE link and its port

M-Root Anycasting

☆ 2001 Anycast in a rack

- Query from JPIX to server-1/-2
- Query from DIX-IE/JPNAP to server-3/-4

☆ 2002 Backup server in Osaka

- Along with AS112 server

☆ 2004 Anycast in a cage

- 3 clusters, each for DIX-IE, JPIX, and JPNAP
 - 3000-5000qps

M-Root Anycasting

☆ 2004 Anycast servers outside of Japan

- Seoul : KINX contributed
 - 200-1000qps
- Paris : Renater/FT/TISCALI contributed
 - 4000-6000qps

☆ 2005 Additional Anycast server

- San Francisco : operational soon
 - at PAIX/Palo Alto

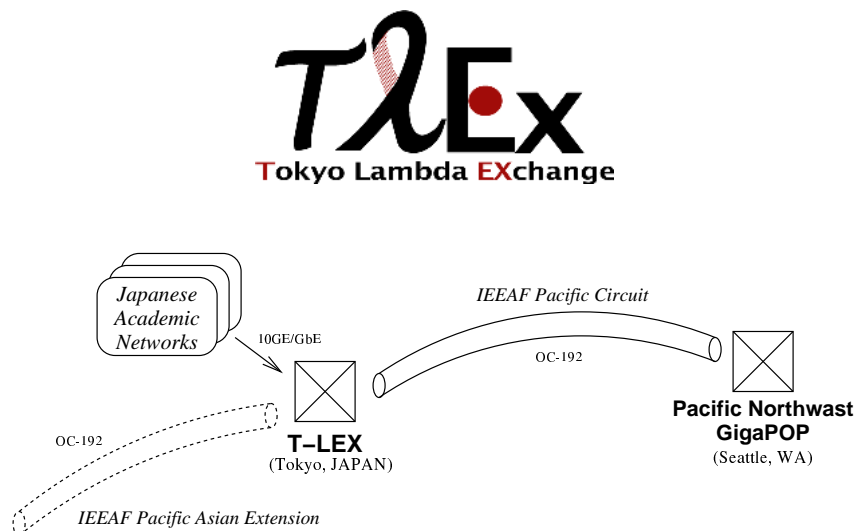
☆ More Anycast servers

- China?
- Singapore ? (if TEIN2 allows transit)

T-LEX

- ☆ **IEEAF Pacific link available in 2003**
 - Between Portland and Tokyo, donated by Tyco
 - OC-192 unprotected and OC-12 protected
 - Failed to obtain gear in both side
 - Backhaul in Tokyo was donated by NTT-C
- ☆ **Gear acquired in 2004**
 - Seattle : Univ. of Washington/PNWGpop
 - Tokyo : T-LEX by WIDE

T-LEX



T-LEX

☆ **T-LEX established to terminate the links**

- ONS-15454 and BI15000
 - Some blades were donated
- OC-192 is now "clear channel"
 - Just through Tyco's DWDM
- OC-12 is now operational

T-LEX

☆ **NI40G introduced in 2004**

- A loan from JGN2
- WANPHY capable
- Used for Data Reservoir data transfer
 - CERN---Tokyo
- DR Project won LSR record

☆ **WANPHY test has been done**

- NI40G --- Cat6500
- NI40G --- GS4000
- Cat6500 --- GS4000
- NI40G --- Starlight Force10
- GS4000 --- Starlight Force10

T-LEX

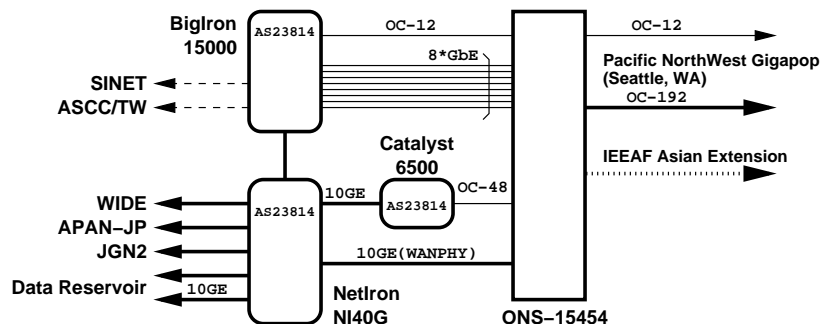
☆ Layer-1

- ONS-15454
- Four OC-192 blade for IEEAF Asian Extension
- MEMS ?

☆ Layer-2

- Cat6500 (OC-48) + NI40G + BI15000 (GbE, OC-12)
- APAN-JP, JGN2, WIDE : 10Gbps
- SINET, ASCC/TW, KEK over JGN2 : GbE
- KOREN may get access via G-H and JGN2

T-LEX Configuration



Summary

☆ **Testbed is an important playground for us**

- Necessary for practical works
- Test new technologies

☆ **Testbed and other service (DNS, etc)**

- Gives us various "real" data
- Analysis of data can improve service
 - Expect future trends
 - Necessary resource enhancement