



**NTT**

*R&D Laboratories*

AT THE



**OIF** OPTICAL  
INTERNETWORKING  
FORUM

WORLDWIDE INTEROPERABILITY DEMONSTRATION

**SUPERCOMM 2005**

# The NTT Group

- ◆ The NTT Group has led the development of telecommunications in Japan for more than a century.
- ◆ The NTT Group continue to accommodate the emerging needs of the ubiquitous broadband society in the 21st century.
- ◆ NTT Group employs over 205,000 people and operating revenues is over JPY 11 trillion (\$100B).
- ◆ NTT is the holding company which leads planning management strategies for the NTT Group and fundamental R&D efforts.
- ◆ Operating companies of the NTT Group are NTT EAST, NTT WEST, NTT Communications, NTT DATA, and NTT DoCoMO.



# Toward Early Realization of the ubiquitous broadband society Environment

- ◆ Provide ubiquitous broadband services
  - a flat-rate structure which is not based on call distances
  - give customers service options that meet their requirements
    - Quality, speed (data volume), reliability and security levels
- ◆ Build a next-generation network
  - High-quality, flexible and secure
    - Optical fiber access to flexibly and economically maintain quality and security levels
    - Shift 30 million customers to optical fiber access and next-generation network services by 2010
  - Intelligent Optical Transport Network is required.



# NTT Laboratories OIF Global Interoperability Demo Sites



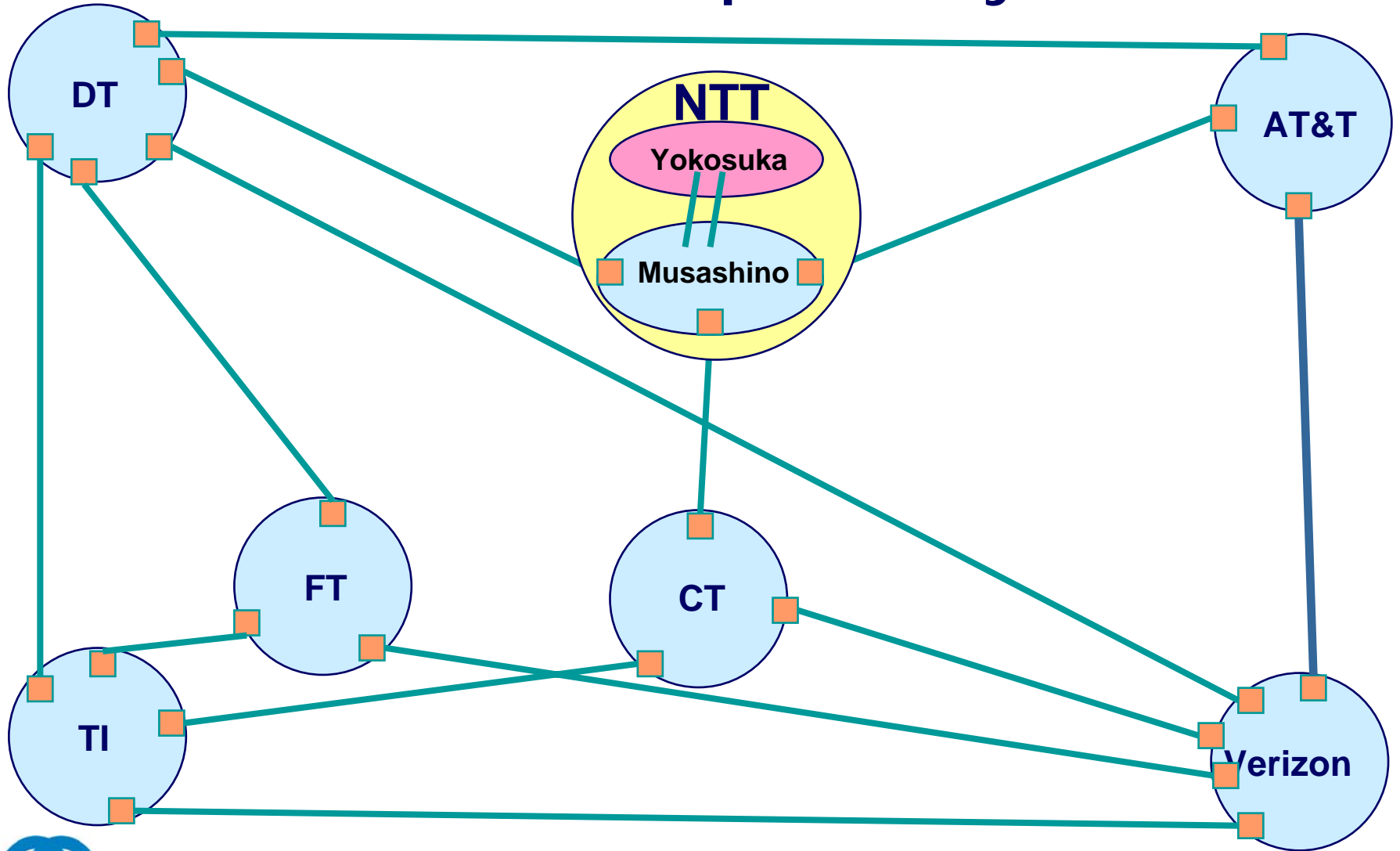
NTT Musashino R&D center

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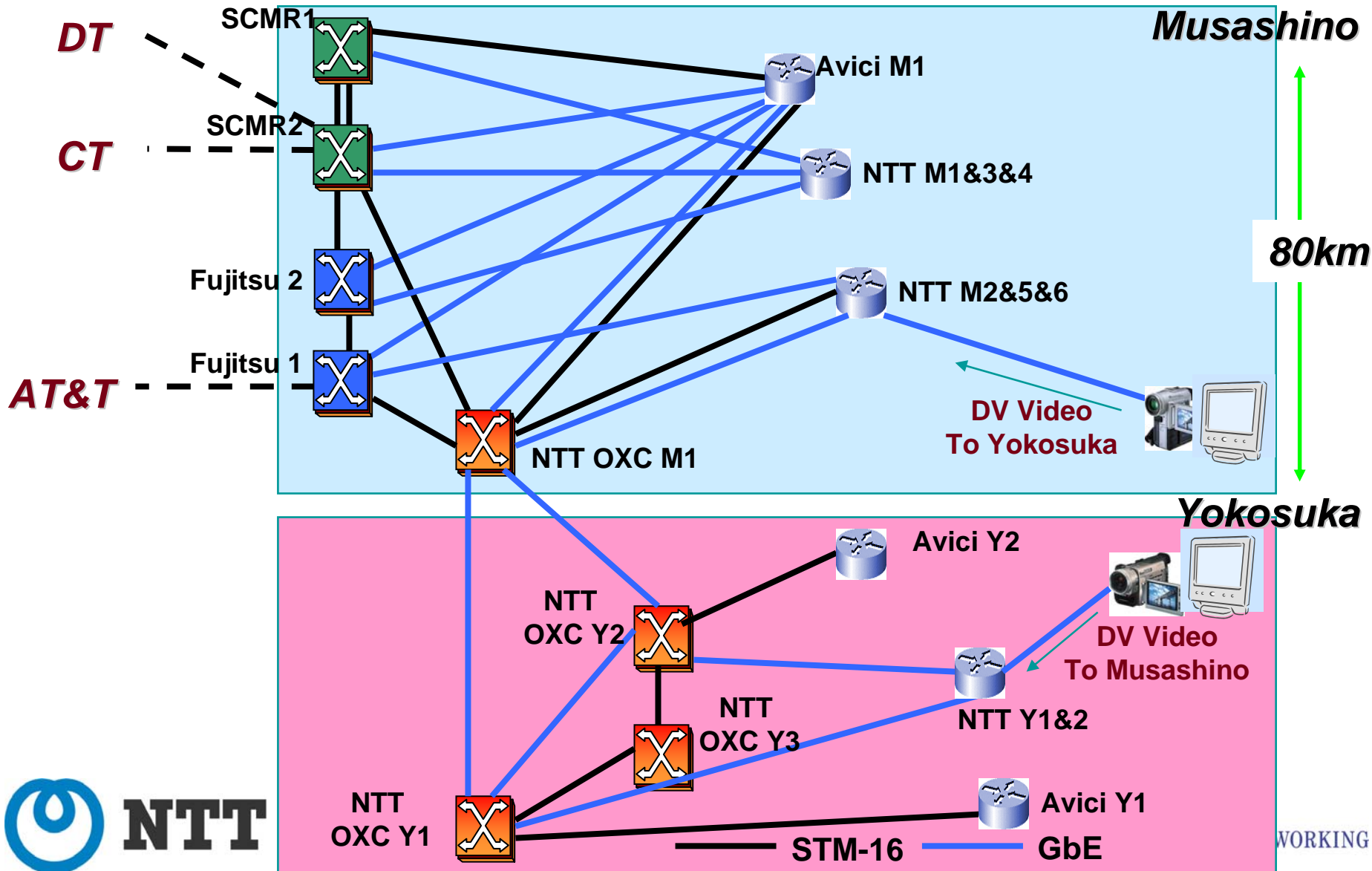


NTT Yokosuka R&D center

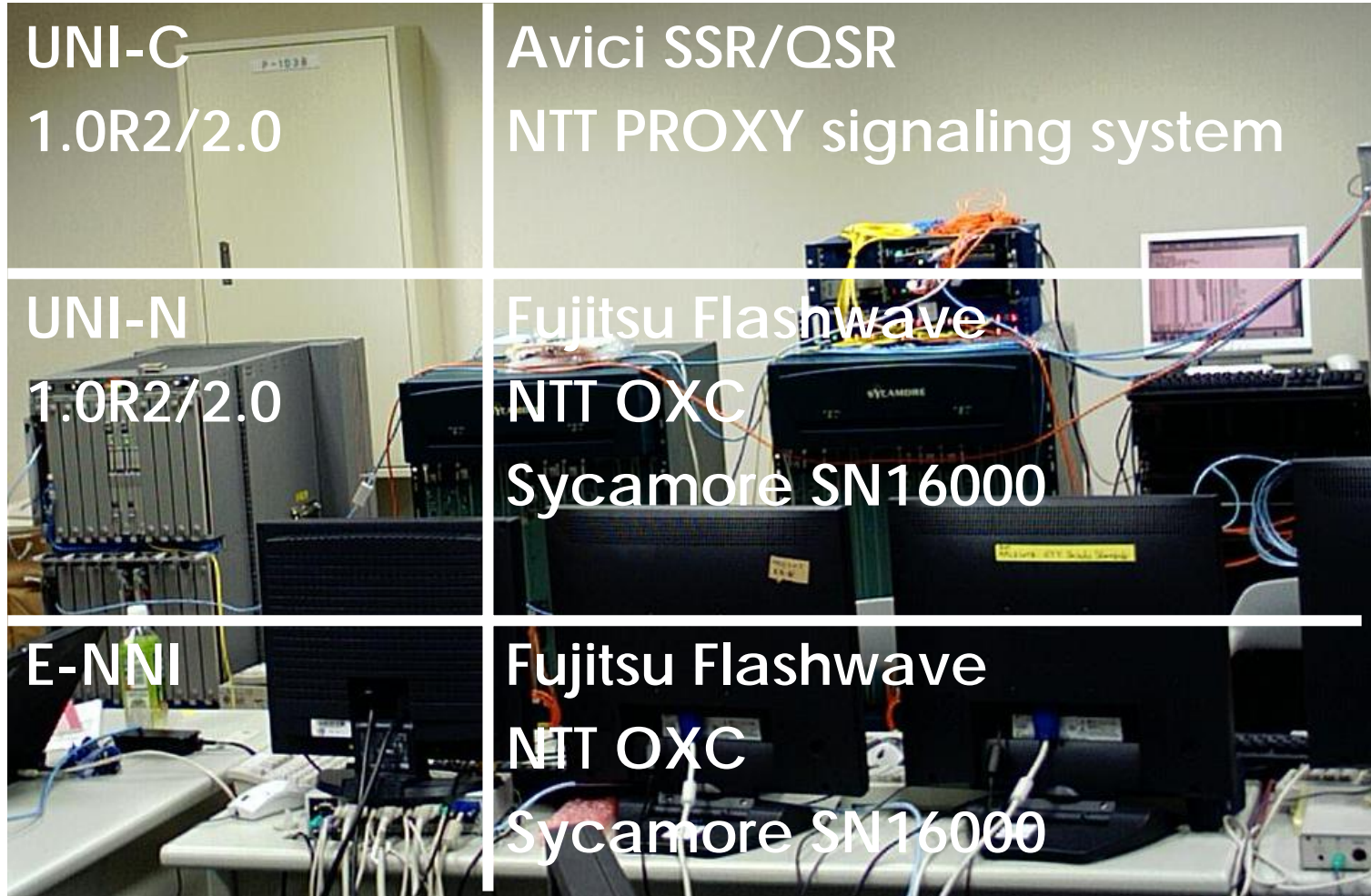
# OIF World Interoperability Tests 2005



# NTT Site Configuration Overview



# Equipment at NTT Laboratories



# Why we requires Intelligent Optical Network?

- ◆ **Distributed intelligence (control plane)**
  - Scalability
  - Reduced carrier-specific management system development
  - Technology reuse
- ◆ **Dynamic network reconfigurability**
  - Reduced inventory and dependence on forecasts
  - Improved customer service
  - Reduced provisioning times
- ◆ **New service enabler**
  - Bandwidth on Demand
  - Optical VPN and Layer 1 VPN
  - Scheduled connections

# Optical User to Network Interface (OUNI)

- ◆ **OUNI: allows clients to dynamically request bandwidth from the intelligent optical network**
  - Signaling for connection establishment, modification, deletion and query
  - No topology information exchanged between client network and carrier optical network
- ◆ **Potential OUNI applications:**
  - Reduced operations overheads – simplified provisioning of new IP router connectivity
  - New services: bandwidth on demand, optical VPN, layer 1 VPN
  - Integrated IP and optical failure recovery mechanisms

# Intra-carrier Network-to-Network Interface (Intra-carrier E-NNI)

- ◆ Intra-carrier E-NNI: interworking between “control domains” to provide:
  - Summarized topology and reachability information across domains
  - Signaling for connection establishment, removal and restoration
- ◆ Immediate Intra-carrier E-NNI applications:
  - Interworking between proprietary control planes
  - Interworking between subsidiary operating companies networks
  - Interworking different transport network technologies
    - E.g., all-optical and opto-electronic, OTN and SDH/SONET

# Interoperability Observations

- ◆ Successful establishment of stable control plane supported by VeriLan and NTT Labs.
  - **NTT – AT&T**
  - **NTT – CT**
  - **NTT – DT**
  - **NTT Musashino – NTT Yokosuka**
- ◆ Successful establishment of stable end-to-end Ethernet call over multiple domains
  - **NTT intra-lab**
  - **NTT – AT&T**
  - **NTT – CT**
  - **NTT – DT**

# Summary

- ◆ OIF World Interoperability Demo provides a truly worldwide test bed for carriers and vendors around the globe to interoperate with each other via the optical control plane.
- ◆ The successful interoperability testing provides a critical step in realizing intelligent automatically switched optical network which provides end-to-end dynamic bandwidth services.