GMPLS/OXC network testbed of JGN II

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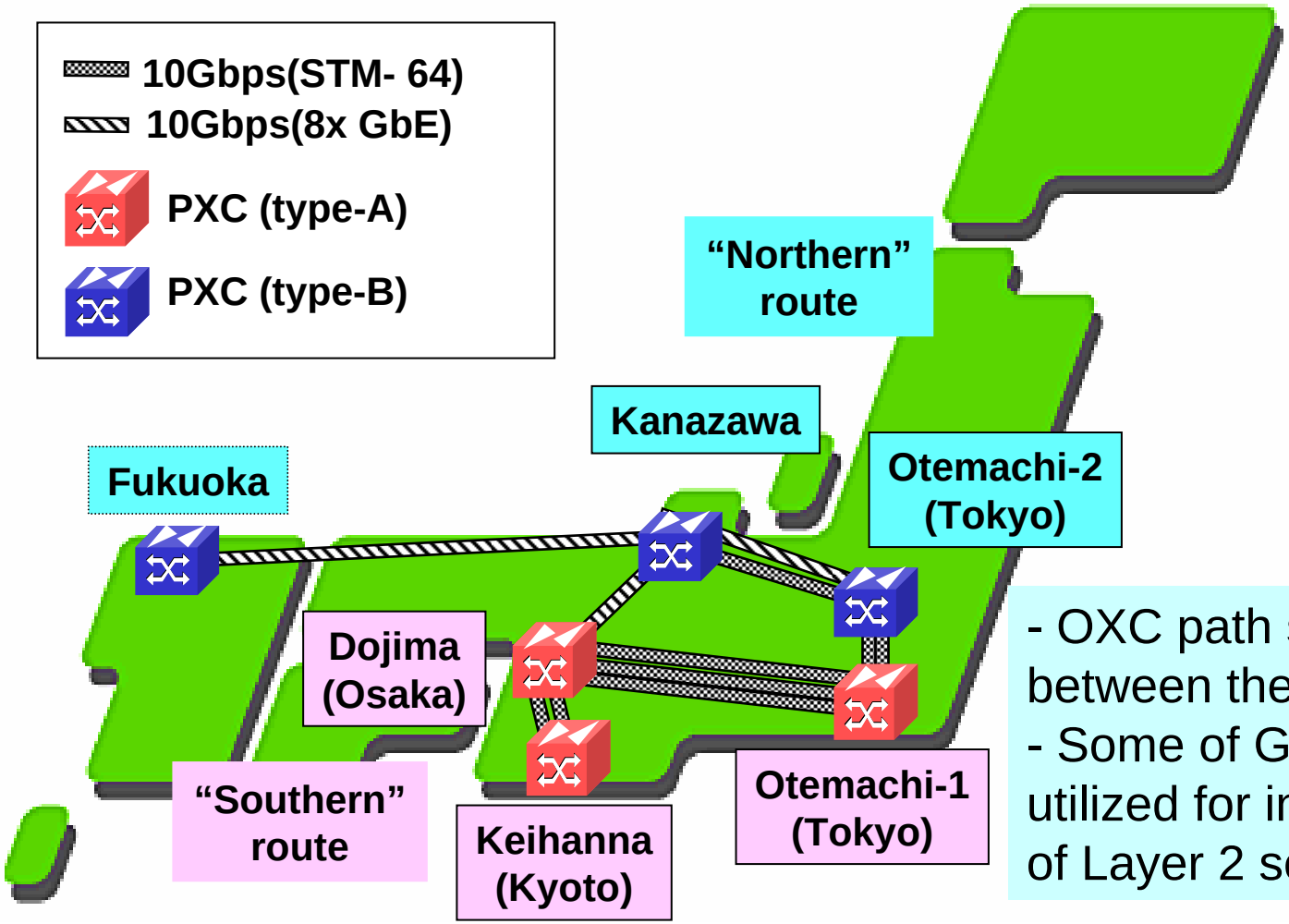
What's JGN II ?

- R&D network testbed for universities, research institutions, and companies
- Non-commercial use only
- 64 access-points on every prefecture
- JGN II has been operated by NICT, since April 2004.
- Some international lines (Japan-US, etc)
- An introduction of GMPLS and photonic cross connects (PXCs) technologies to a backbone network.
- JGNII provides optical path service by using GMPLS and PXC technologies as well as L2 or L3 service on top of the GMPLS network.

Overview of JGN II GMPLS network



- OXC path service is provided between these sites.
- Some of GMPLS LSPs are utilized for internal connectivity of Layer 2 services of JGN II.

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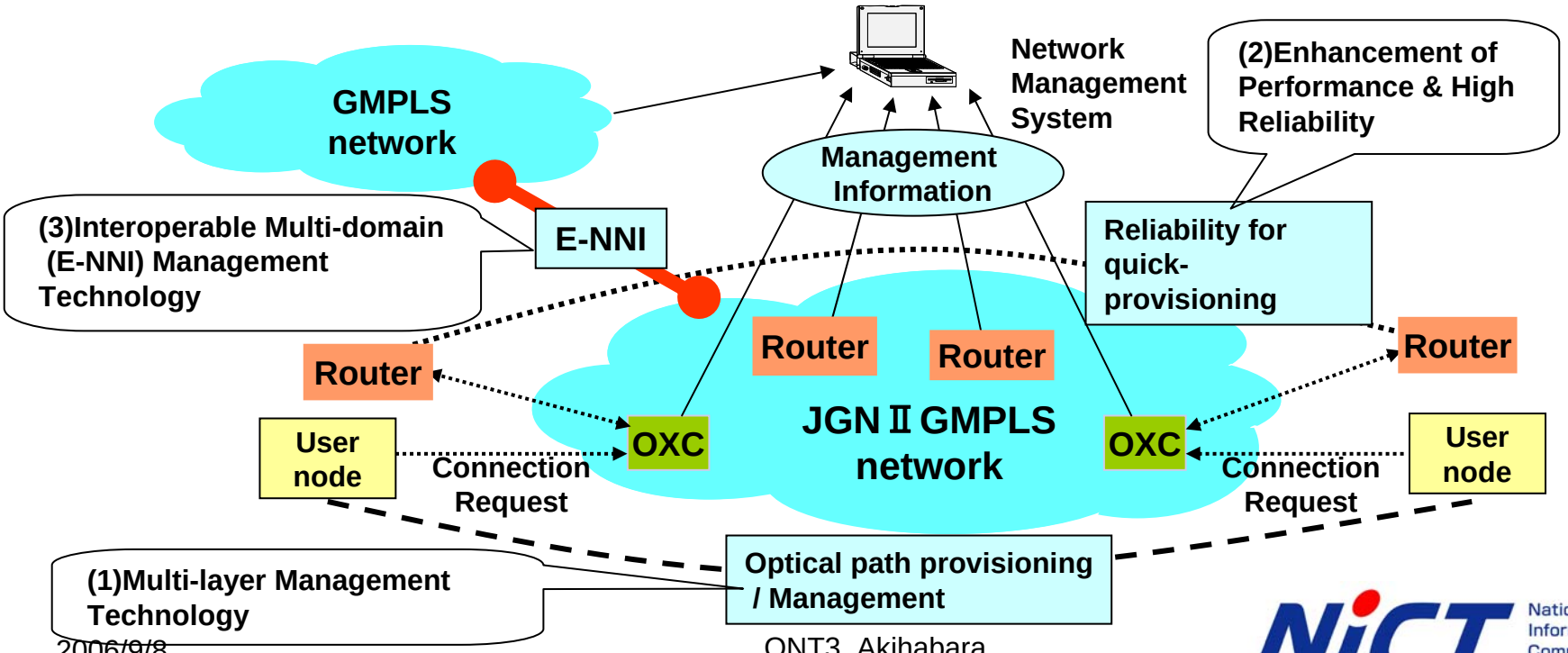
GMPLS related research activities

- Multi-layer management technology
  - Lambda-LSP provisioning network management and control mechanism
  - Application driven network control and management technology
- Enhancement of performance and reliability of GMPLS Network
  - Reliability of control plane as well as data-plane, including line monitoring
- Interoperable multi-domain (E-NNI) management technology
  - GMPLS Interworking between multiple domains



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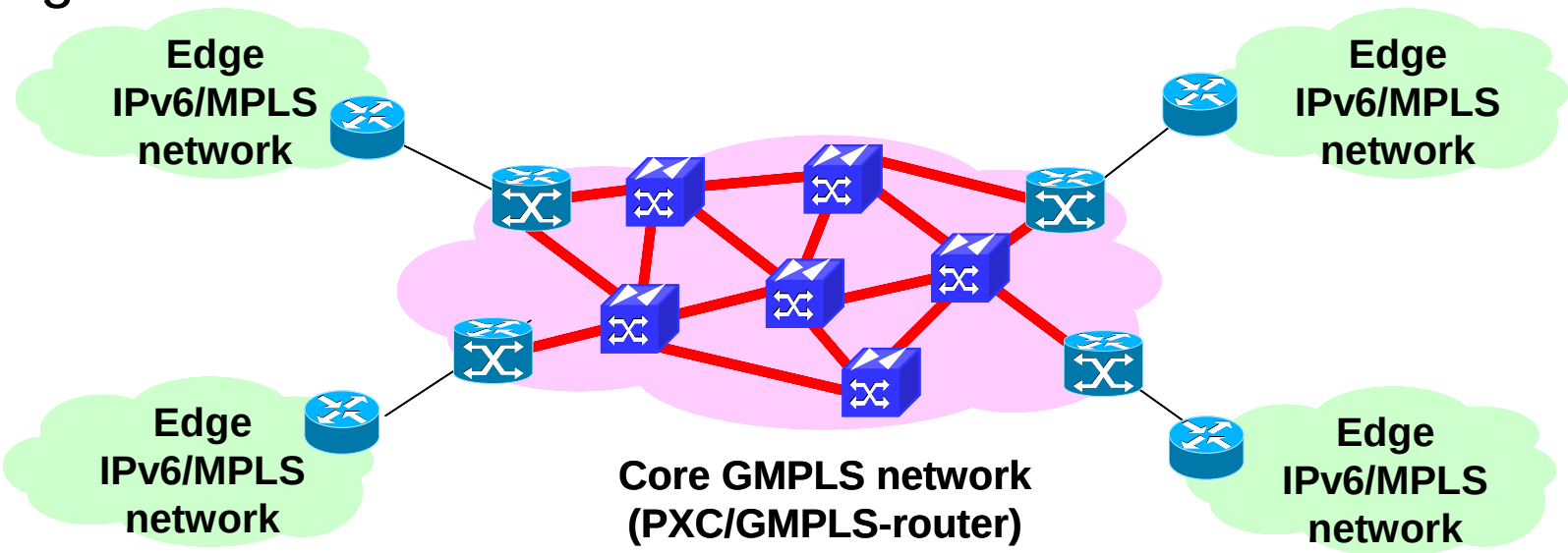
IP/Optical integration model of JGN II

- Currently investigating network integration model in JGN II
  - Core: GMPLS network
  - Edge: IPv6/MPLS network
  - Fully-peer GMPLS model as well as overlay GMPLS model
- How to manage and operate such GMPLS-based integrating IP/Optical network for MPLS and IPv4/v6 services is our target.



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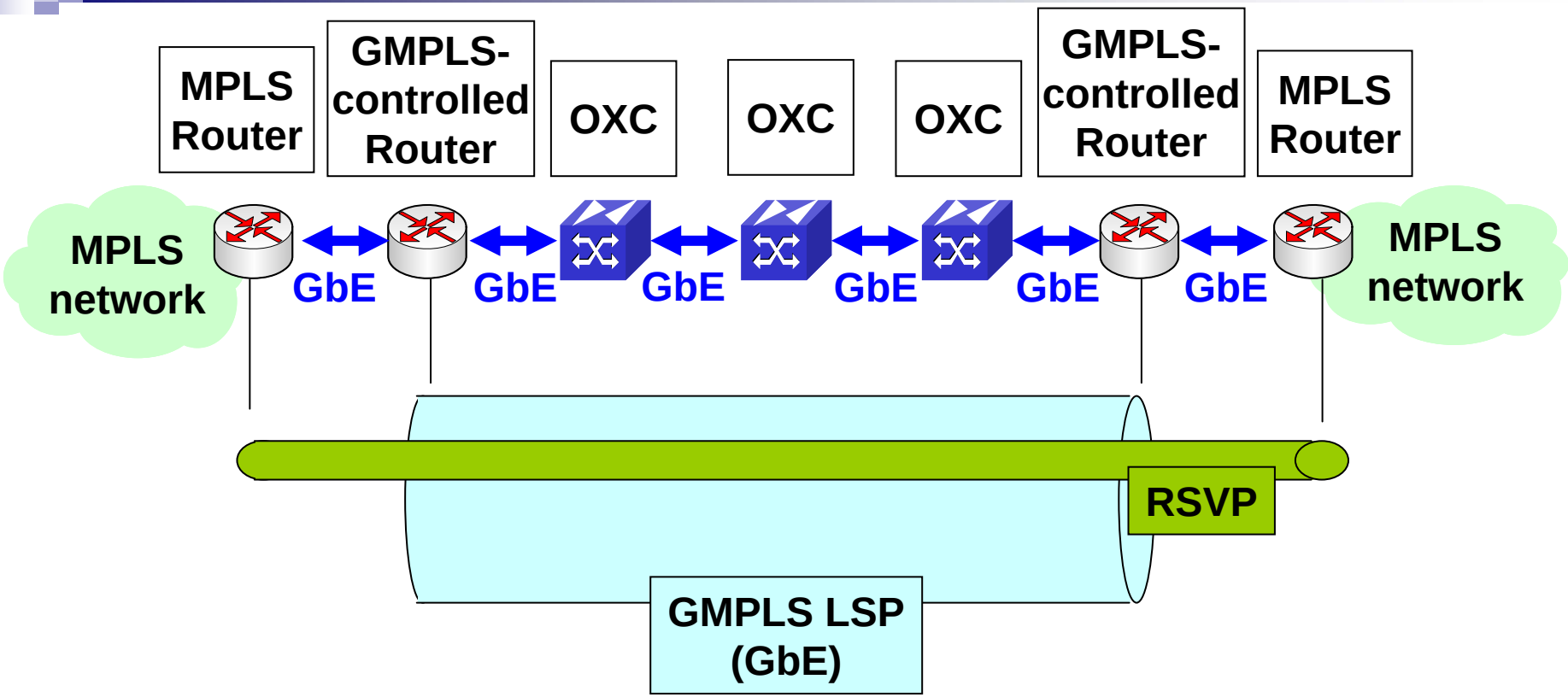
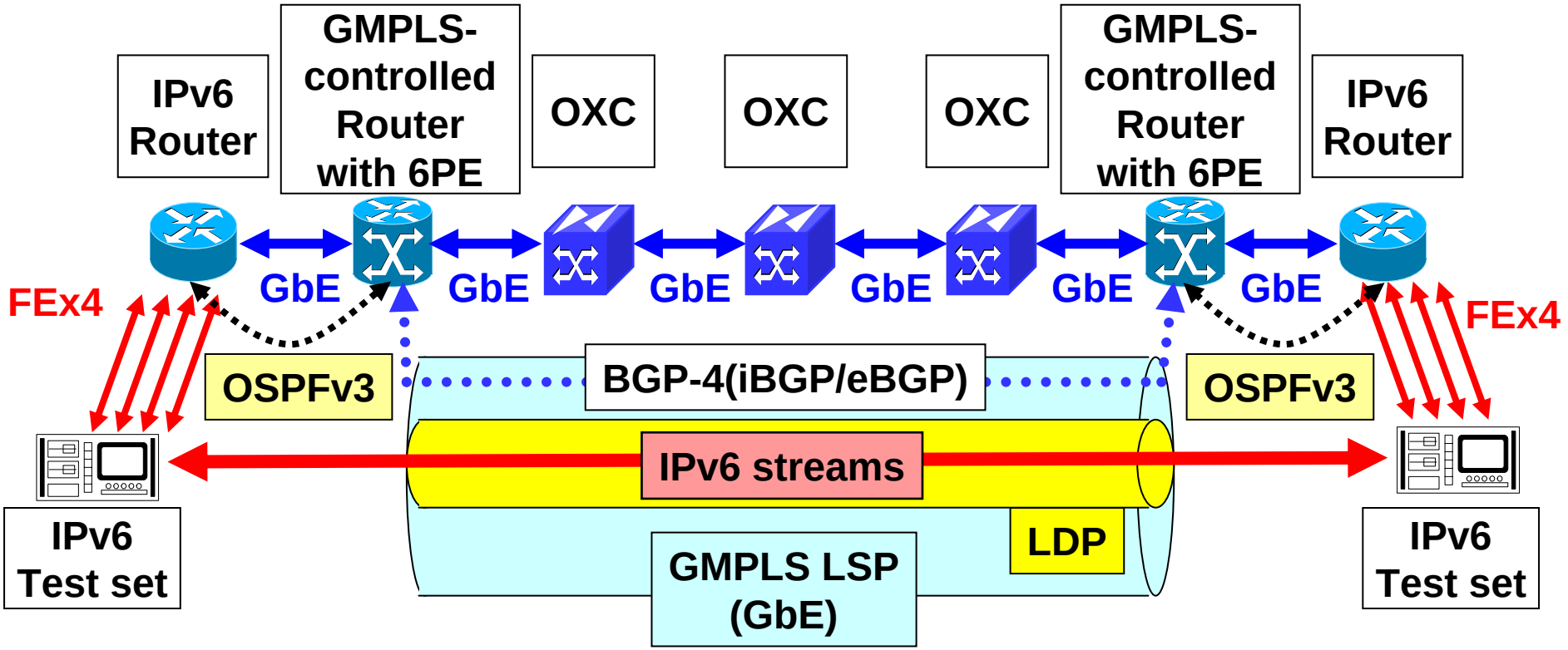
MPLS LSP over GMPLS LSP



- MPLS LSPs could be set up over a GMPLS LSP even with the same routers.
- The MPLS service has already been provided to the MPLS network testbed calld Distix.

IPv6 over GMPLS: Procedures and results



- IPv6 stream transport between IPv6 test sets each other

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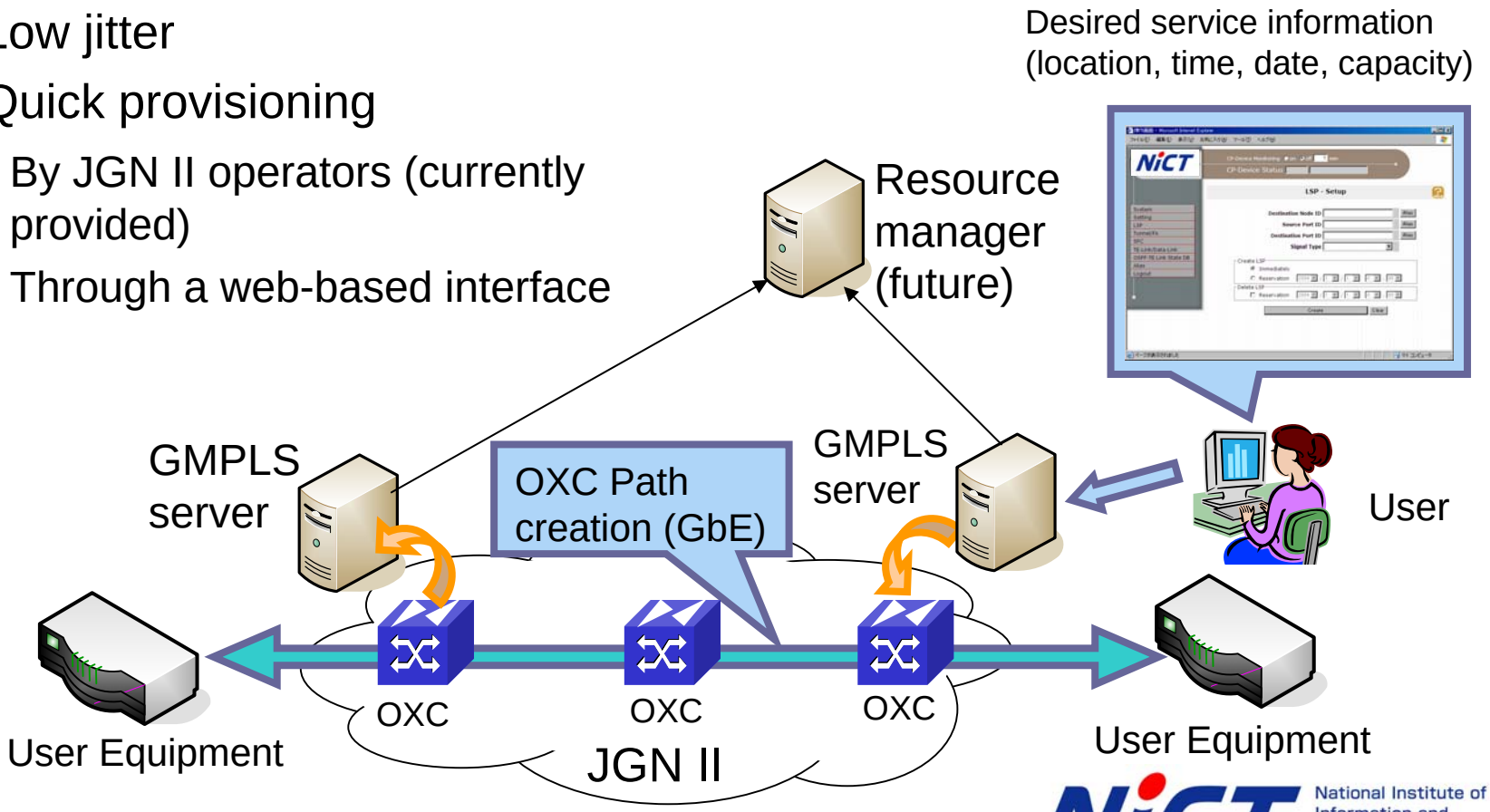
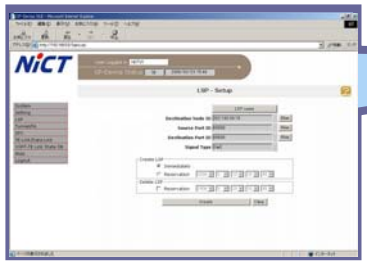
User-oriented OXC path service

- Demand-based or user-oriented JGN II OXC path service
  - Large bandwidth (GbE/10G)
  - Fixed delay
  - Low jitter
  - Quick provisioning
    - By JGN II operators (currently provided)
    - Through a web-based interface



Experimental configuration



Web-based GUI

BoD User

User-access network
(By JGN II L2 service)

Fukuoka

Kanazawa

Otemachi-2
(Tokyo)

Web

Web

Web

User-access Network

GUI

GUI

GUI

Control-Plane

GMPLS Emulator

OSPF-TE
RSVP-TE

GMPLS Emulator

OSPF-TE
RSVP-TE

GMPLS Emulator

PXC

PXC

PXC

Data-Plane

User Equipment

User Equipment

User Equipment

GbE

GbE

GbE

GbE

GbE

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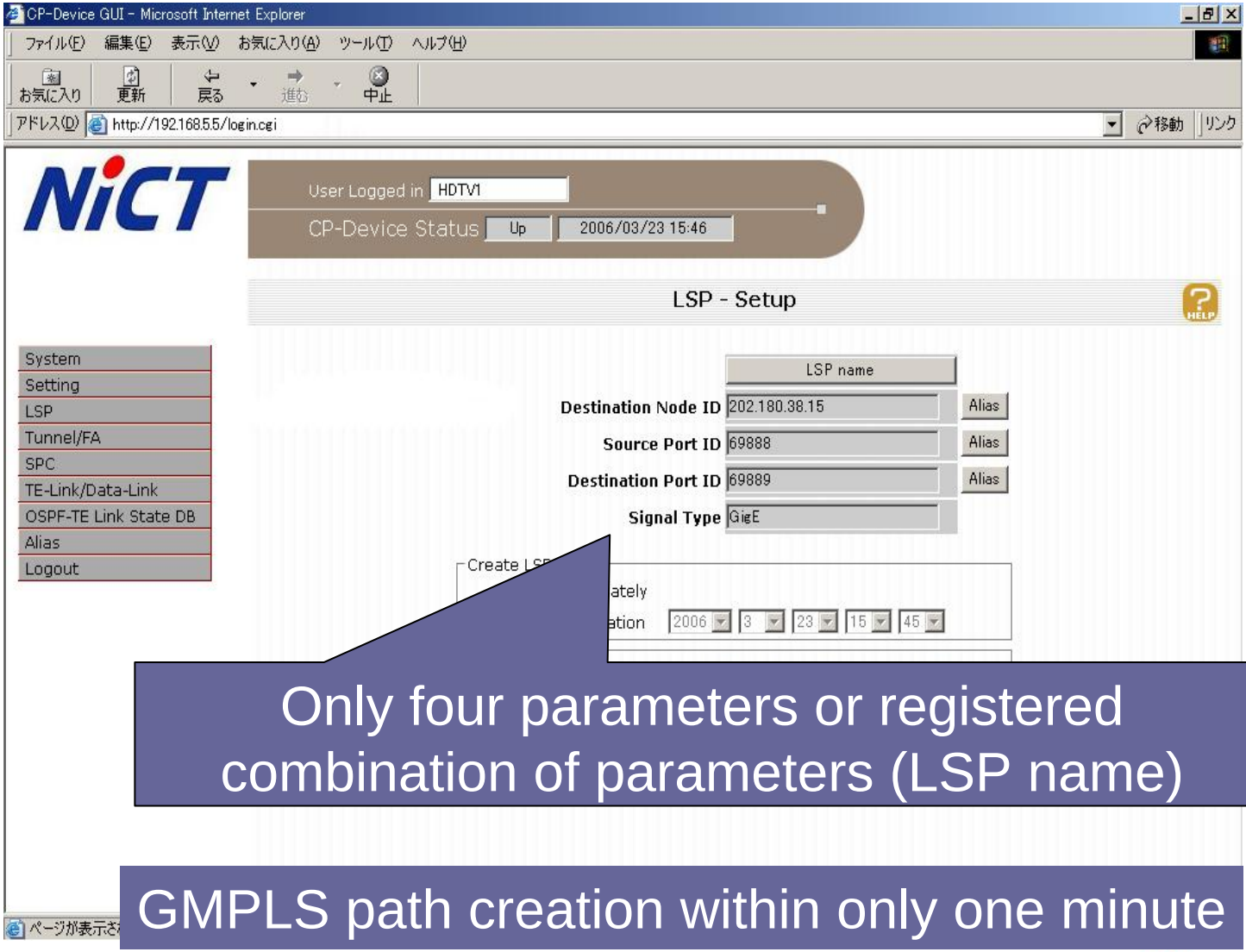
GUI of JGN II BoD service



Only four parameters or registered combination of parameters (LSP name)

GMPLS path creation within only one minute

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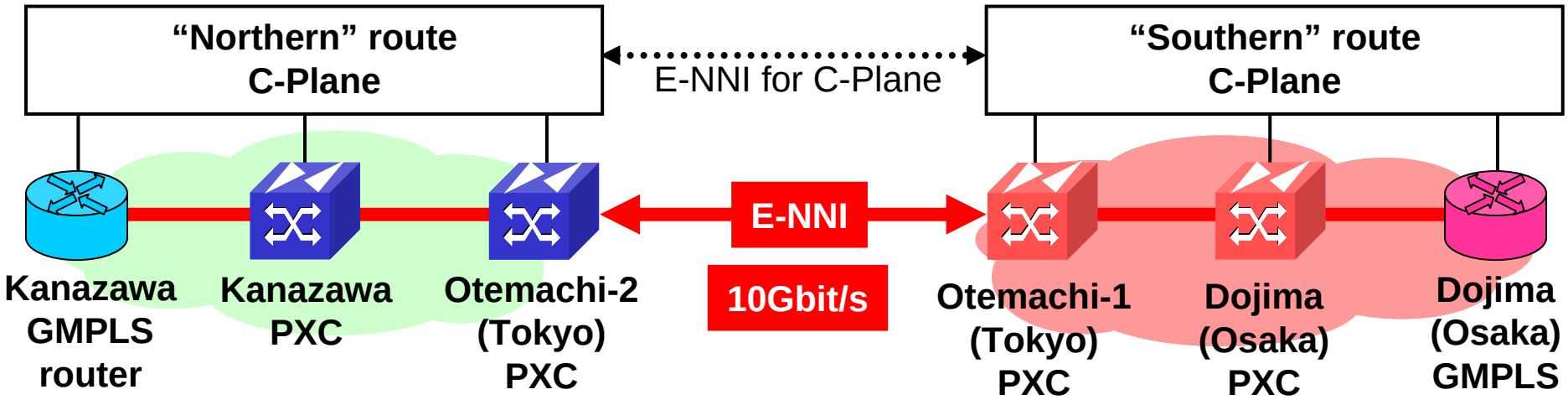
Evaluation of E-NNI

- GMPLS RSVP-TE signaling
  - LSP could be successfully created over multiple domain.
- GMPLS OSPF-TE routing
  - Static routes were configured on domain-border nodes.
  - Dynamic routing exchange is under investigation
    - IETF standardizing activities
    - BGP-4, PCE, etc.



Conclusions

- JGN II network testbed, especially focusing on GMPLS/OXC was introduced.
- Experiment of data transport over GMPLS networks
  - MPLS over GMPLS
  - IPv6 over GMPLS
- Future challenges were also introduced.
  - User-oriented GMPLS path services
  - E-NNI function
- JGNII GMPLS network is ready for providing OXC path service as well as IPv6/MPLS services to the users.

Thank you !!