National Institute of
Information and Communications Technology

On Network Testbed Projects conducted/supported by NICT of Japan

INFORMATION

TTC/NICT

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Brief introduction of NICT of Japan

- In April 2004, the Communications Research Laboratory, an incorporated administrative agency, and the Telecommunications Advancement Organization of Japan, a chartered corporation, were merged and relaunched as the National Institute of Information and Communications Technology (NICT), an incorporated administrative agency.

- NICT was established to carry out research and development in the field of information and communications technology, in an integrated manner from basic science to application, with the aim of supporting the high information and communication society of the 21st century as well as to provide comprehensive assistance to public and private organizations working in this field. Building on the strengths of CRL, which carried out both basic and applied research in the field of information and communications, and of TAO, which conducted practical research and development cooperatively with industry and academia for the practical application of information and communications technologies, provided various forms of assistance to researchers in the private and academic sectors, and gave various subsidies to enterprises in the communications and broadcasting field, we aim through integrated management to contribute to the further development of this field in Japan.

http://www.nict.go.jp/overview/index.html

About the National Institute of Information and Communications Technology (NICT)

[Communications Research Laboratory]

National Research Laboratory

1952
Radio Research Laboratory

1988
Communications Research Laboratory

2001
(Incorporated) Communications Research Laboratory

Incorporated Administrative Agency

Research and development
Routine operations

[Telecommunications Advancement Organization of Japan]

1979
Communications and Broadcast Satellite Organization

1992
Telecommunications Advancement Organization of Japan

Authorized Corporation

Research and development, R&D support
Telecommunications and broadcasting business support

2004

NiCT 独立行政法人 情報通信研究機構
National Institute of Information and Communications Technology

Outline of NICT Operations

Main operations: (Incorporated Administrative Agency, the National Institute of Information and Communications Technology Law)

- Research and development of technologies relating to the Electromagnetic distribution of data and utilization of radio waves
- Provision of support to individuals undertaking research and development in the field of advanced communications and broadcasting
- Promotion of businesses in the communications and broadcasting sector

Established: April 1, 2004

Mid-term Plan: April 2001/March 2006

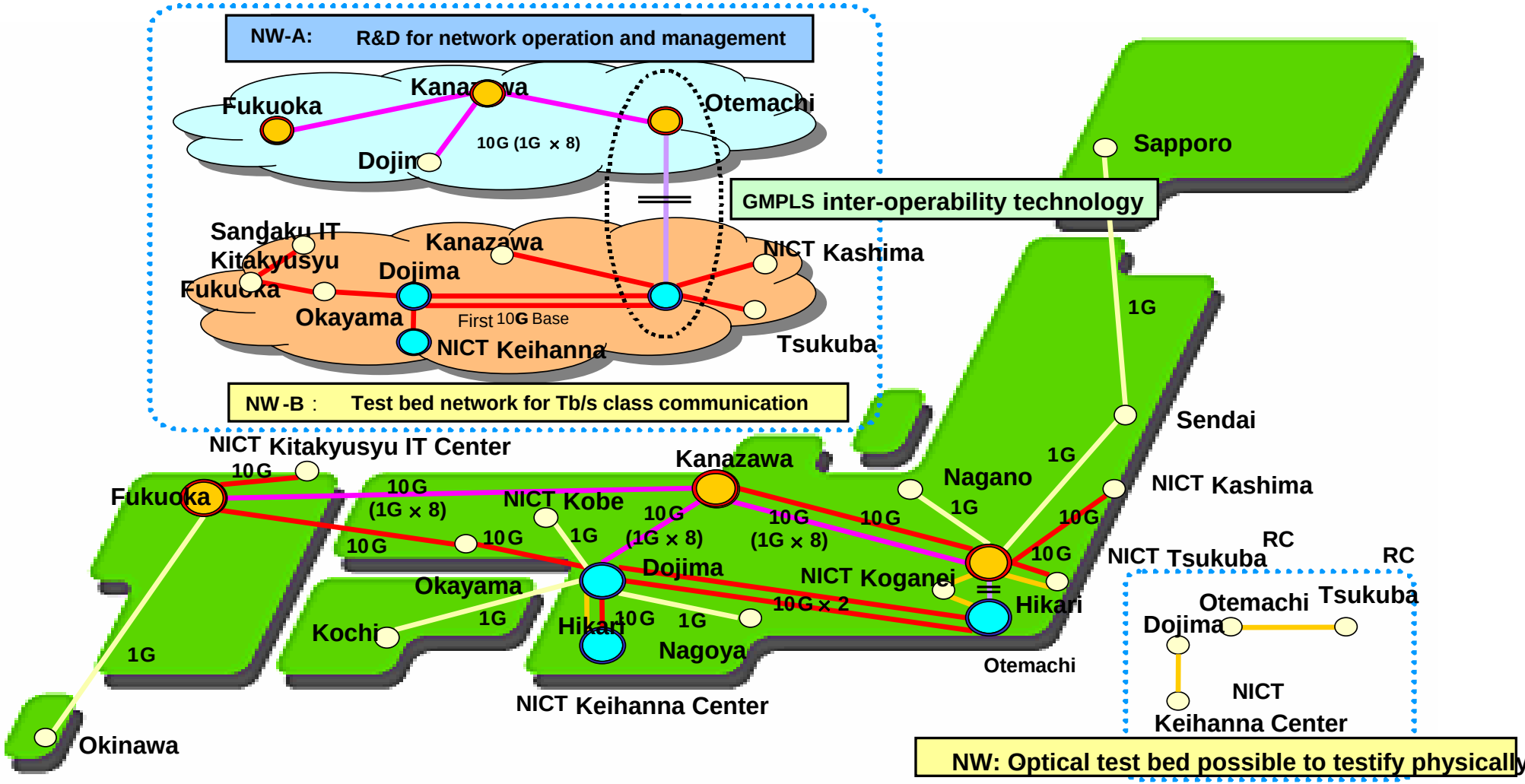
Budget: Approx. 60 billion yen (fiscal 2004)

Employees: Approx. 480 full-time staff members

JGN2 - Nationwide Advanced Network Testbed for R&D use

Architecture of R&D network: JGN2

- 20/10 Gbit/s backbone of OXC/wavelength multiplexing network
- 63 access points nationwide
- Connection with overseas
- We have built 2 optical test beds for inspection research



Services Provided by JGN2

Ethernet connection (L2) services

(1) Service connecting 2 points

This service connects 2 points by an L2 connection based on a VLAN

(2) Multipoint connection services

This service connects multiple points by L2 connections based on the same VLAN

IP connection (L3) services

This service connects JGN2 users with each other,or with other research networks and other users,at the IP level(a service with an IPv4/IPv6 dual stack)

－Interface －

- 10/100/1000Base-TX(RJ45)
- Consultations necessary for all experiments to be conducted using optical fiber connections such as 1000BASE-SX/LX, etc.

Services Provided by JGN II (available in specific access points)

- **OXC connection services**
  (Tokyo (2 sites); Osaka; Keihanna; Fukuoka; Kanazawa)
  This service connects, at the optical fiber wavelength level ,places where OXC* is installed
  Two types of interface will be used: 1Gbps and 10Gbps

  *OXC:Optical Cross Connect

- **10G connection services**
  (Otemachi, Tokyo; Dojima, Osaka; Fukuoka; Tsukuba; Kanazawa; Keihannna; Okayama; Kita Kyushu; etc.)
  This service connects specific points by a 10Gbps-Ehternet
  It can also connect points that do not provide this service
  (There are some usage restrictions,including band restrictions)

- **Optical testbed services**
  (Otemachi, Tokyo/Tsukuba JGN2-RC, NICT Keihanna Center/Dojima)
  This service is for conducting experiments on optical transmission between specific points

JGN2 AUP

AUP:Acceptable Use Policy

JGN 2 will, in principle, conform with JGN AUP

The following activities are prohibited:

(1) Use of the JGN2 without concluding a joint research contract

(2) Use of the JGN2 that is unrelated to the research being conducted by the user

(3) Use of the JGN2 for direct commercial gain

(4) Use of the JGN2 by parties other than the designated user

(5) Obstruction of network operation

(6) Actions that contravene the law or that offend public order and morals

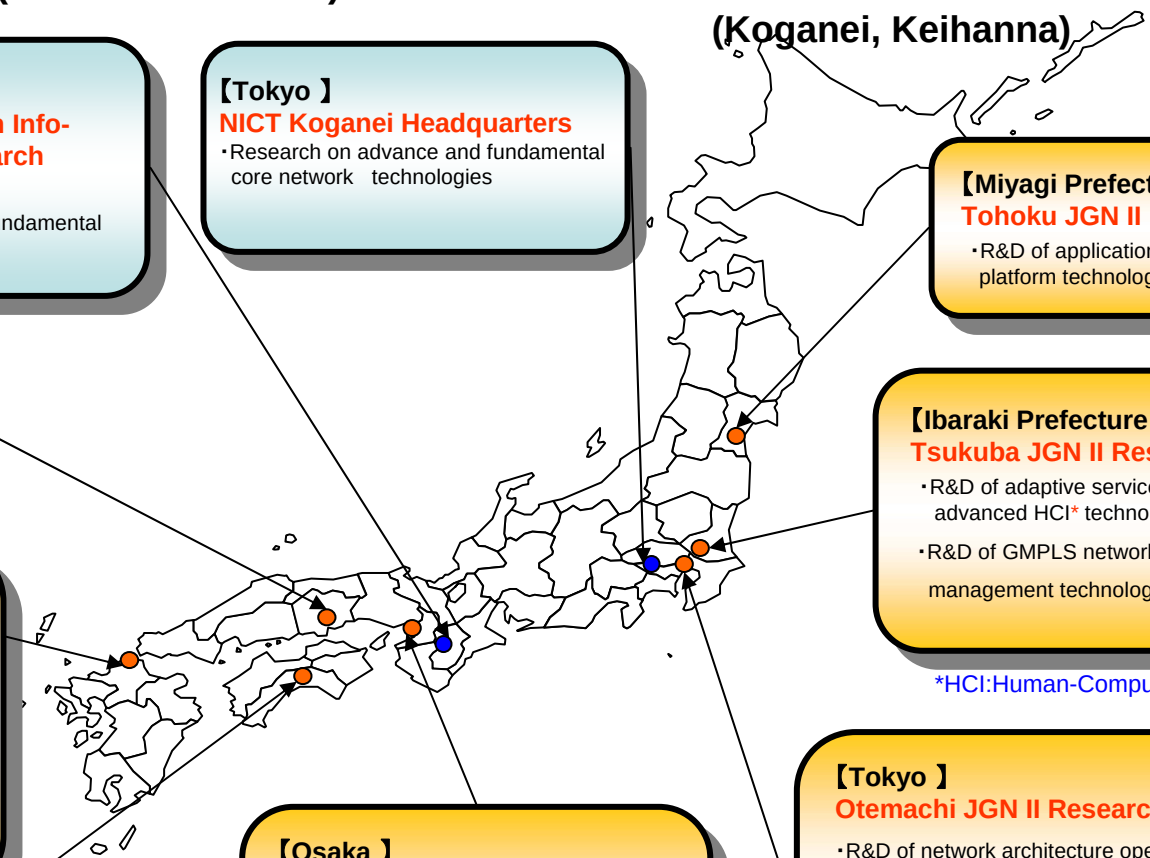
(7) Any other actions that NICT (JGN2 administrator) deems to be inappropriate

- **NICT does not guarantee the quality of the research and development network**
- **NICT reserves the right to collect any data necessary to the operation of the network**

JGN2 Research Centers, etc.

— Research and development being undertaken by NICT (JGN2 Research Centers, etc.) —

■JGN2 Research Centers (7 sites nationwide)　■NICT Information and Communications Department (Koganei, Keihanna)



【Kyoto】
NICT Keihannna Human Info-Communications Research Center
・Research on advance and fundamental core network technologies

【Tokyo】
NICT Koganei Headquarters
・Research on advance and fundamental core network technologies

【Miyagi Prefecture】
Tohoku JGN II Research Center
・R&D of application-oriented management platform technologies

【Okayama Prefecture】
Okayama JGN II Research Center
・R&D of interoperability verification for the next generation Internet

【Ibaraki Prefecture】
Tsukuba JGN II Research Center
・R&D of adaptive service control utilizing advanced HCI* technology
・R&D of GMPLS network operation and management technology

*HCI:Human-Computer Interraction

【Fukuoka Prefecture】
Kita Kyushu JGN II Research Center
・R&D of measurement-based adaptive routing technology
・R&D of QoS-aware and seamless resource allocation/utilization technology
・R&D of end-to-end communication control technology adaptive to diversity variability

【Tokyo】
Otemachi JGN II Research Center
・R&D of network architecture operation support tools
・R&D of wide-area, highly reliable network access provision technologies
・R&D of methods and tools of testing and analyzing IPv6 equipment

【Osaka】
Osaka JGN II Research Center
・R&D of secure resource sharing technologies for base linkups
・R&D of large-scale data processing linkup technologies on wide-area networks

【Kochi Prefecture】
Kochi JGN II Research Center
・R&D of surrounding computing technology

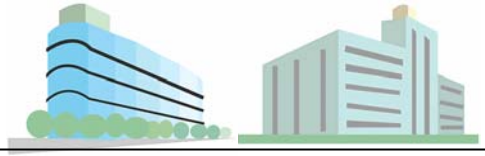
Collaborating R&D by industry, university and government on Interoperability of GMPLS

at NICT Keihanna Open Laboratory

Outline of NICT Keihanna Open Laboratory

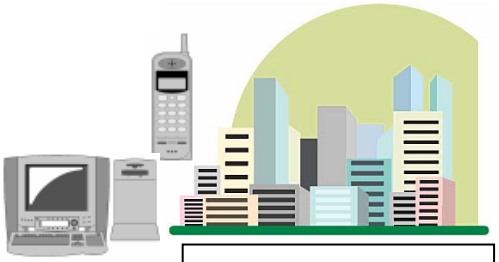
To promote IT R&D in fields where industry, government, and education are collaborating, we established an open laboratory R&D environment in the Info-Communication Research Center (Keihanna)　(Opened June 2003)

We established the Open Laboratory (R&D stronghold) in a research environment equipped with highly-functional network technology and opened it to universities, communication and broadcast services, manufacturers, research institutes, venture companies, local authorities, etc., and also contribute to training of staff, including specialists



Universities, communication and broadcast services, manufacturers, research institutes, venture companies, local authorities, etc.

Keihanna
Info-Communication
Open laboratory
Research promotion council



Genesis of new services and industries

Staff training

Enforcement of IT R&D by combined Industry, Government and Education

Researchers etc. attended laboratory

Basic research results of universities, etc.

Know-how of private commercialization

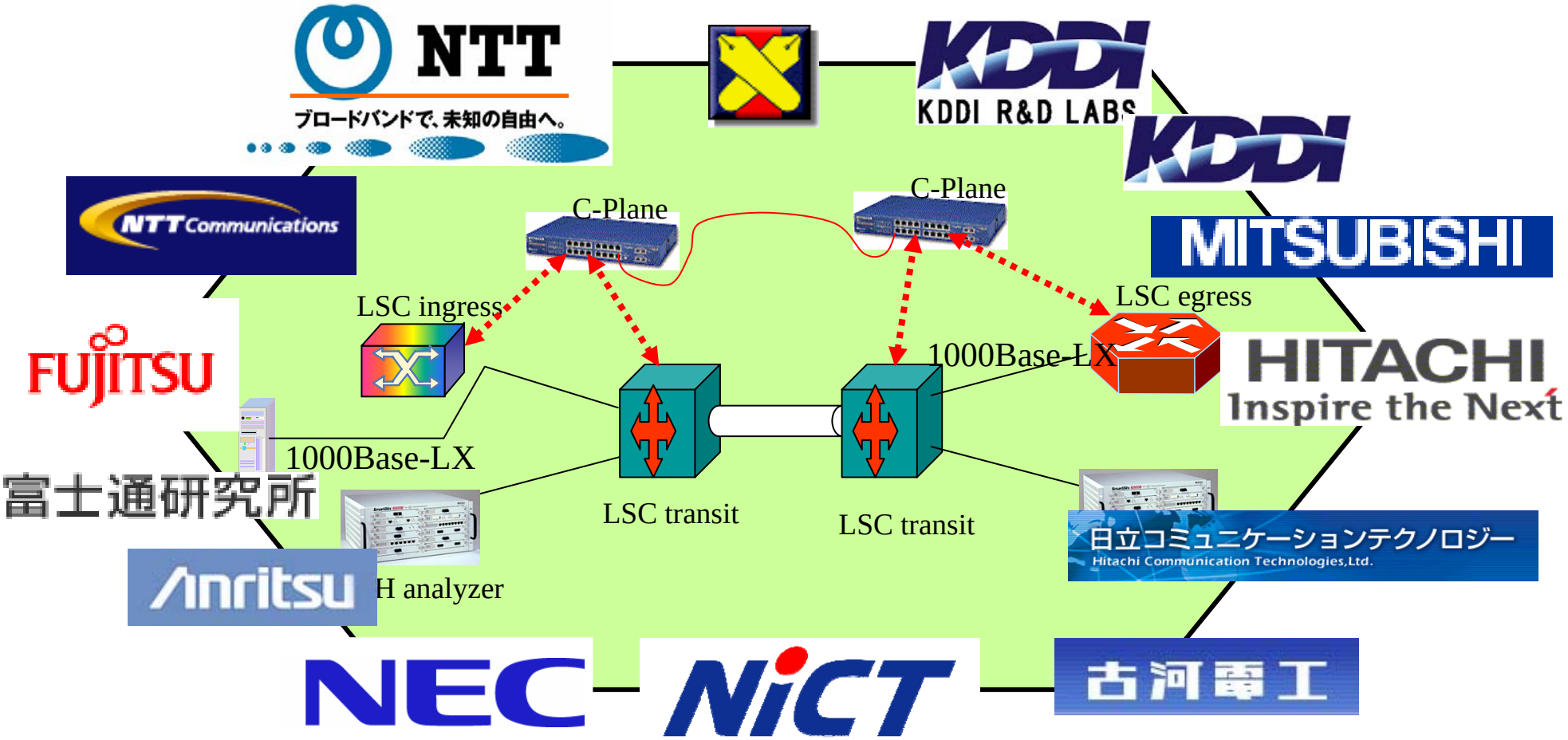
R&D results of NICT

36 projects, 89 institutes, 422 people used this laboratory

up to September 30, 2004

GMPLS Global Interoperability Verification Consortium working in Keihanna Open Laboratory

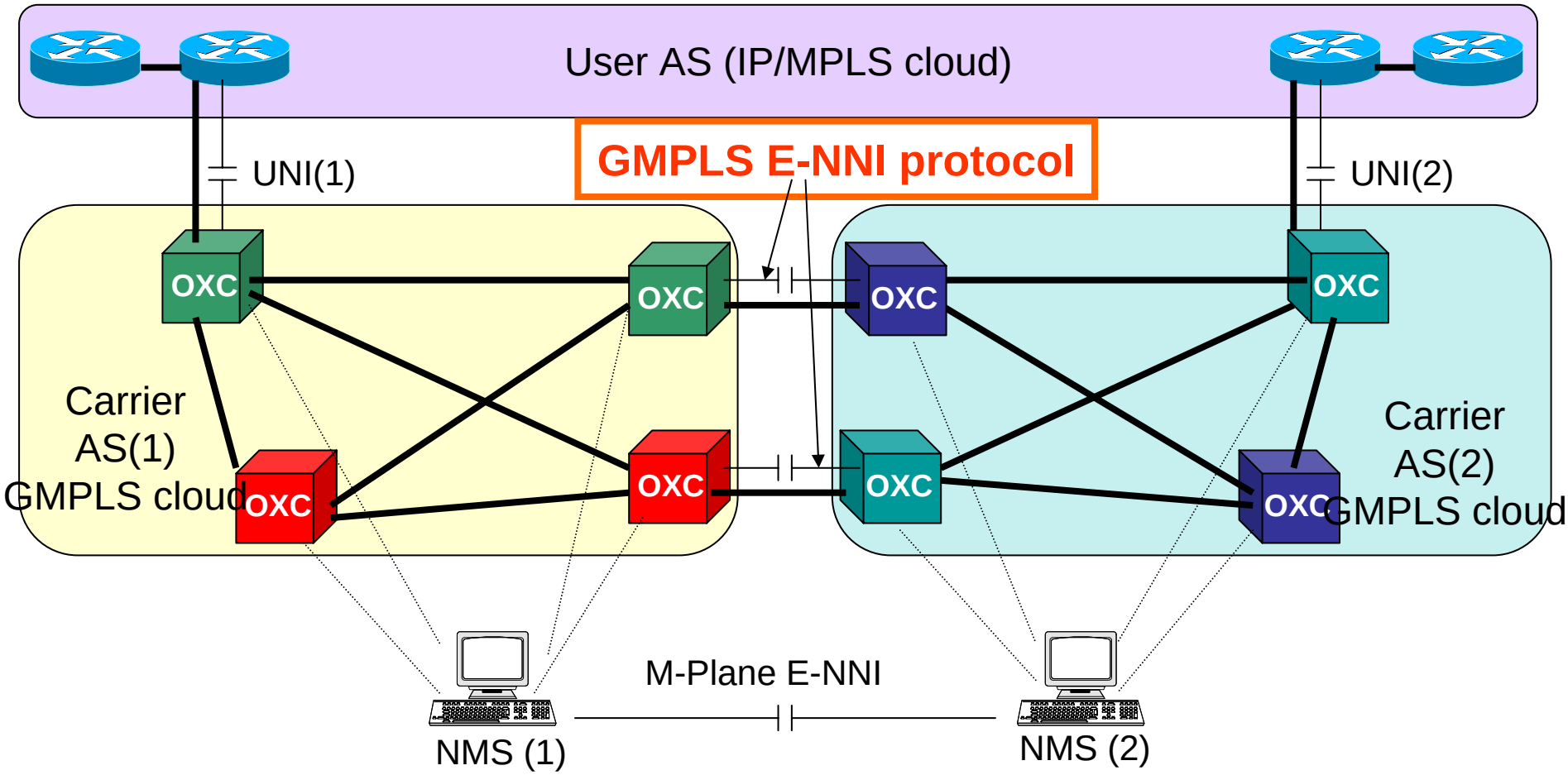
- 14 organizations from industry, university and government work together to promote the development and installation of E-NNI (between carrier/AS) interoperable protocols, etc.. We are striving to make an international standard proposed by Japan in the field of optical network control technology.
- We have built reference machines, and are deploying an open wide-area test bed for interoperable inspection on JGN2.



http://www.khn-openlab.jp/bunkakai-gw/kokino-net/sousetsu/

GMPLS inter-Carrier connection model

- **Aim to photonic network in multi-Carrier contribution**
  - **Constitution of GMPLS Inter-Carrier E-NNI protocol**
  - **ex. Interconnection between Overlay Model cloud and Peer Model cloud**

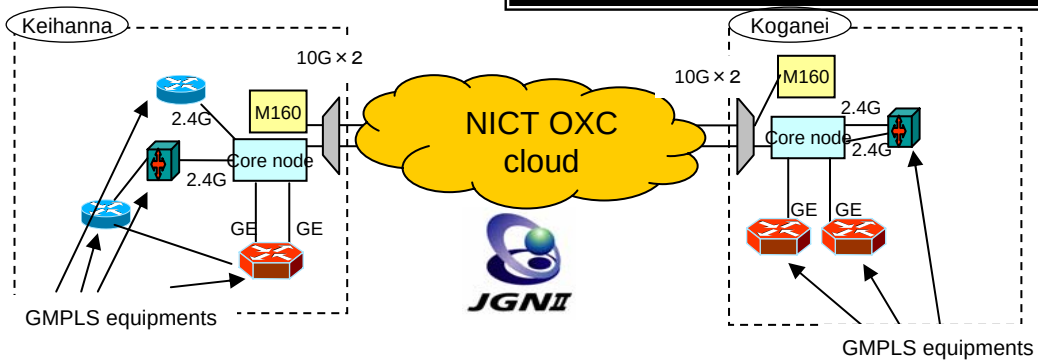


Interoperability research facility

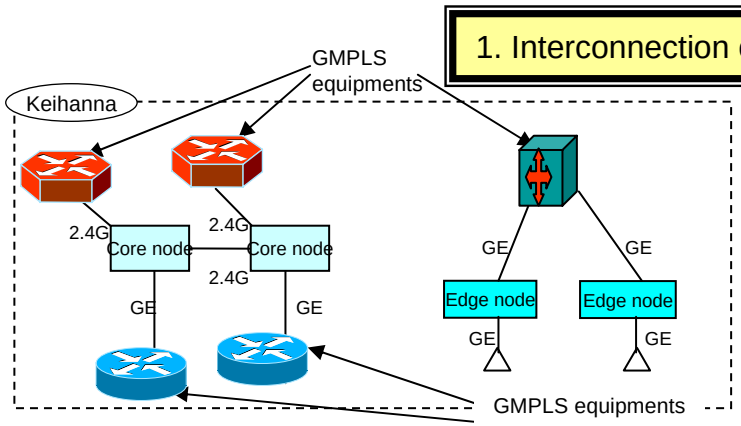
Specific activity term

1. GMPLS open site construct
2. Extended GMPLS experimental environment construct
3. Inter-Carrier Extended GMPLS experiment

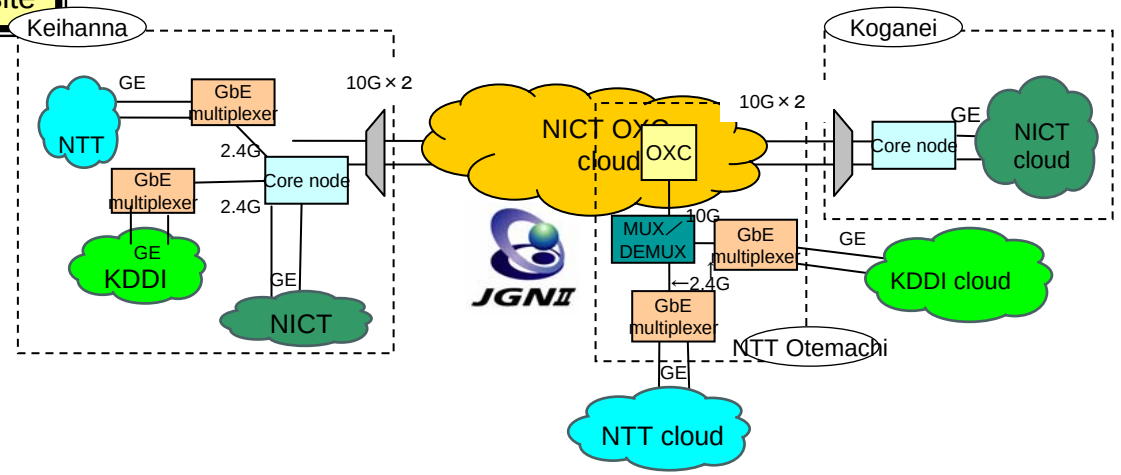
2.Experimental connection experiment



1. Interconnection open site



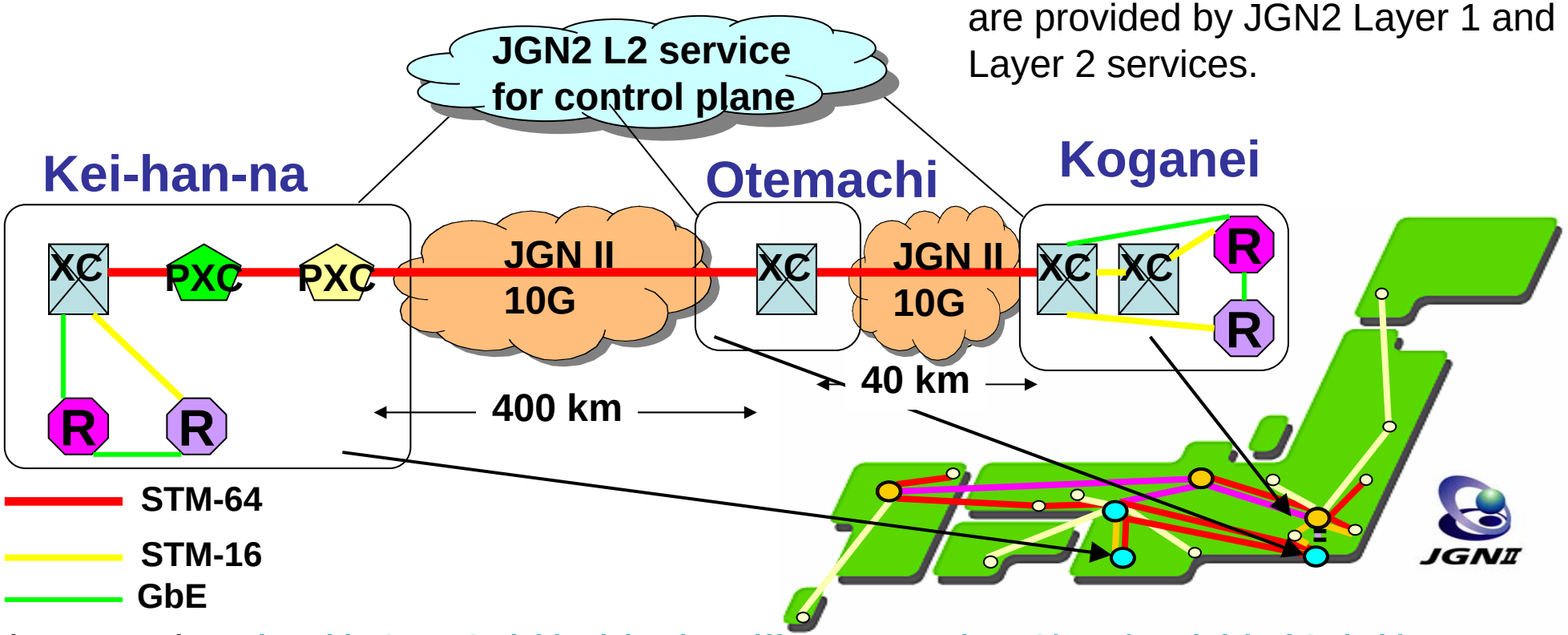
3. Inter-Carrier connection experiment



Nationwide GMPLS field trial

- 9 vendors' GMPLS equipments from 8 members.
- Multi-Layer: MPLS, TDM(SDH), Lambda, Routers are multi-vendor, PXCs are multi-vendor
- (G)MPLS RSVP-TE, (G)MPLS OSPF

Both Data plane and Control plane are provided by JGN2 Layer 1 and Layer 2 services.



Okamoto et al.: Nationwide GMPLS Field Trial Using Different Types (MPLS/TDM/Lambda) of Switching Capable Equipment from Multiple Vendors, OFC2005 PDP40 March 2005.

Japan - Korea APII Link on the APII IPv6 R&D Testbed Project

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International Alliance Division

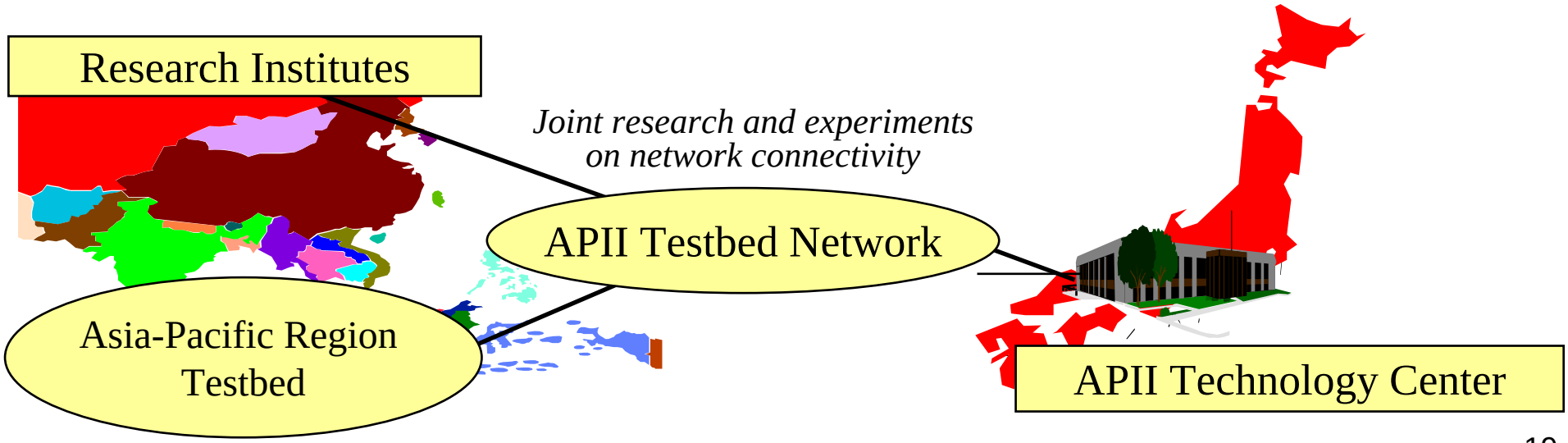
APII Testbed Project

1 Objective

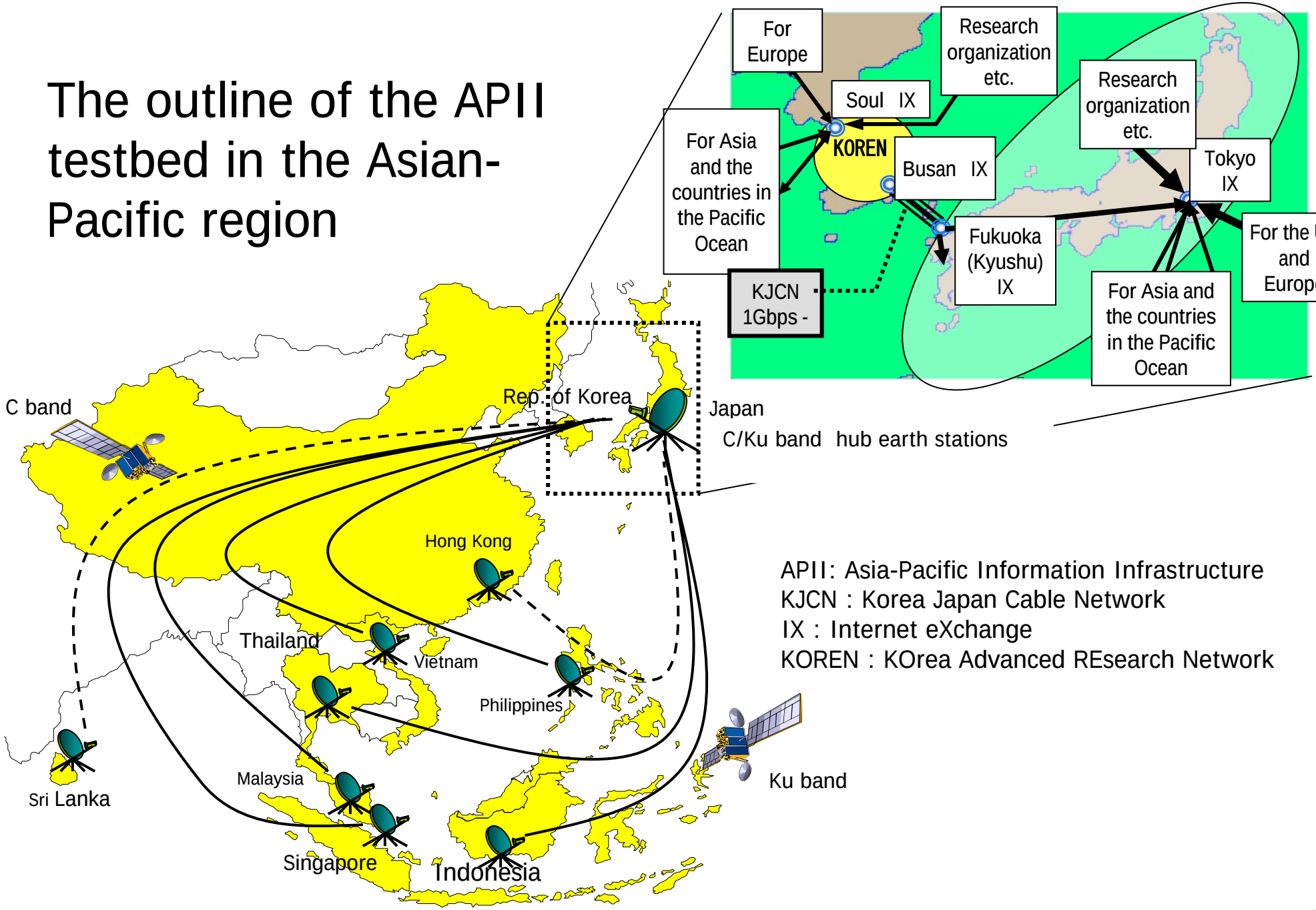
Contribution to economic development in Asia-Pacific Region
by development on information infrastructure

2 Outline

- APII Technology Center in Kobe as a base facility for international joint research for the Telecommunications foundation.
- 1 economy connected with submarin cable
- 8 economies connected with Satellite link



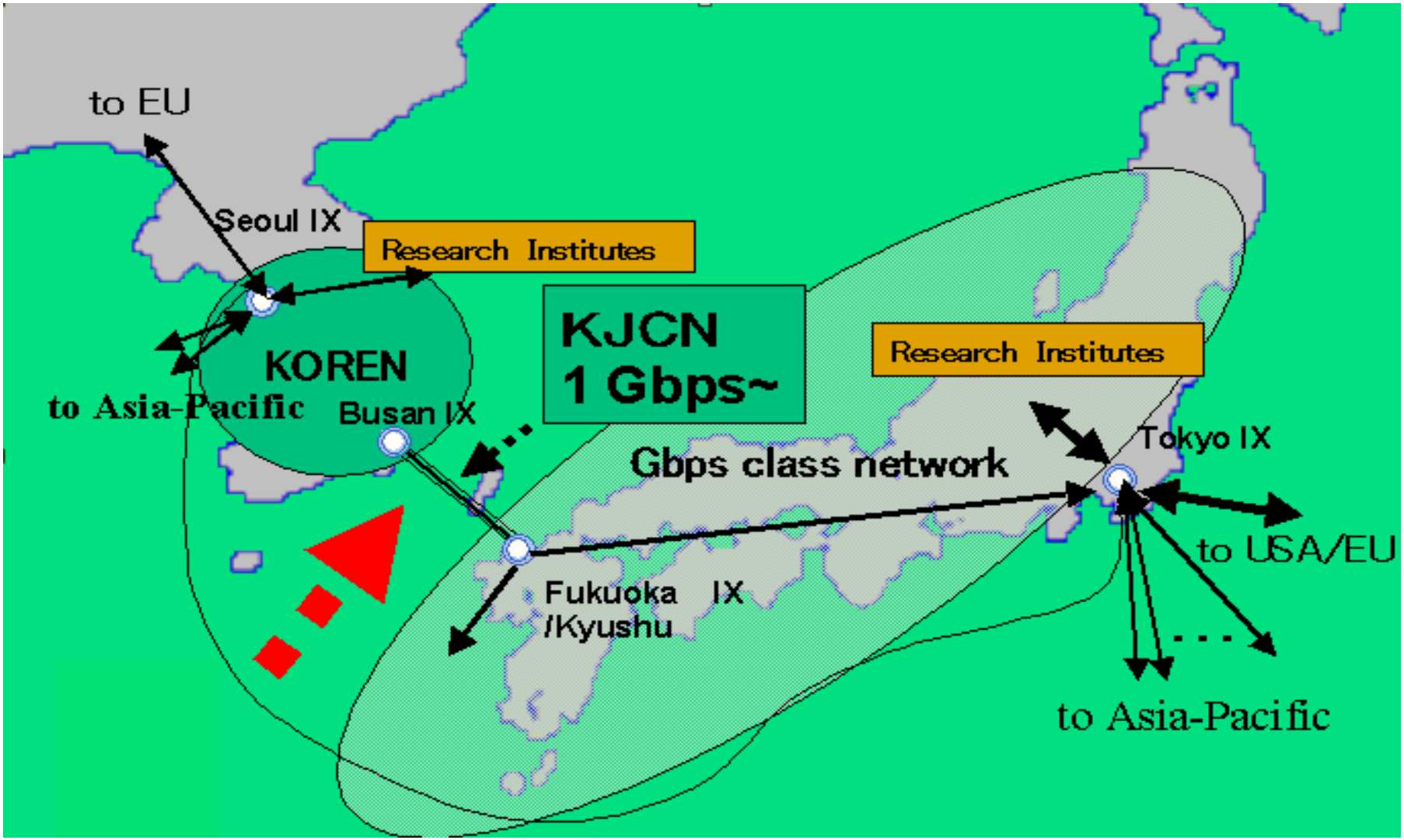
The outline of the APII testbed in the Asian-Pacific region



APII: Asia-Pacific Information Infrastructure
KJCN : Korea Japan Cable Network
IX : Internet eXchange
KOREN : KOrea Advanced REsearch Network

Notes: The dotted lines corresponding satellite channels are under preparation now.

APII Japan - Korea Link



Conclusion

- For providing information to the NGN testbed discussions, the following items are reported;

1. The Japanese advanced network for R&D: JGN2 is introduced. This R&D network may provide the nationwide connectivity among the NGN interoperability testing facilities before introduction of the NGN services.
2. Collaborating R&D activity on interoperability of GMPLS at NICT Keihanna Open Laboratory is introduced. This project is expected to contribute to the international standardization work on Optical Transport Network based Internet.
3. Japan - Korea APII link on the APII IPv6 R&D Testbed Project is also introduced. This international link may have a potential to carry on the connectivity between NGN testbeds of both country in trial basis under special agreement between both side.