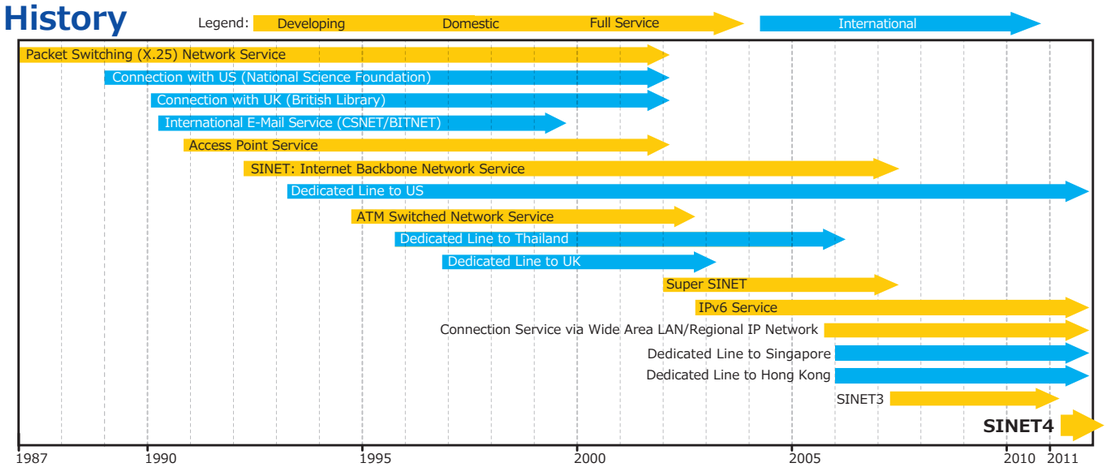
## History




## SINET Promotion Office

The SINET Promotion Office was established in October 2007 in order to promote the use of SINET. It provides consulting on the advanced use of the network, user support, and training and promotion regarding network services, and also carries out an educational campaign. If you experience any trouble or find something you do not understand, please contact us for assistance.

【Main activities in fiscal 2010】
- Held presentations on SINET services in Fukuoka, Nagoya,Sapporo, Kyoto, and Tokyo
- Provided advice on usage(E-mail/Phone responses; Visitors receivedand Visits made)
- Consulting on shift and connection to SINET4

【Please direct queries to】
SINET Promotion Office
Research and Development Center for Academic Networks
Tel: +81-3-4212-2269 Fax: +81-3-4212-2270
E-mail: support@sinet.ad.jp

## Services

**User consultation/response**

Consulting on the use of network services

**Interviews/surveys on user requests**

Solicitation of comments and requests for SINET

**Troubleshooting of performance-related problems**

Support for network service usage problems and performance improvements

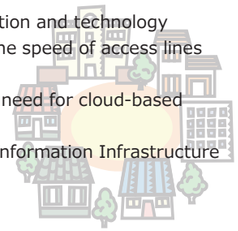
**Technology promotion and educational campaign (lectures and technological exchanges)**

Presentations on using SINET, educational campaign, case examples of SINET promotion, creation of documentation, and publication of information on the Web

## Academic Information Infrastructure Open Forum

The Open Forum was launched in June 2009 as a framework for enhancing collaboration and information exchange among universities and research institutions in order to strengthen the Cyber Science Infrastructure (CSI), which supports the growth and development of academic research and education.

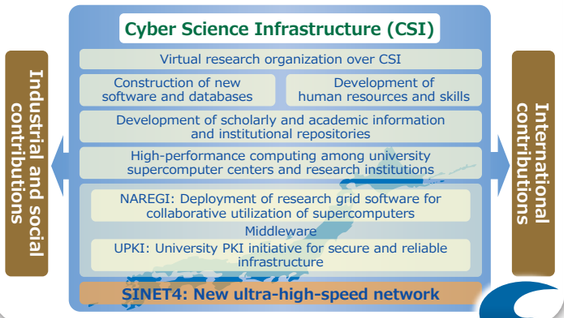
【Main activities in fiscal 2010】
- Exchanges of CSI-related information and technology
- Taking steps to further increase the speed of access lines for SINET4
- Studies to address the increasing need for cloud-based services for scientists
- Held presentations on Academic Information Infrastructure Open Forum 2010



【Please direct queries to】
Academic Network Division
Cyber Science Infrastructure Development Department
Tel: +81-3-4212-2262 Fax: +81-3-4212-2270
E-mail: openforum@nii.ac.jp

## Cyber Science Infrastructure (CSI)

The National Institute of Informatics (NII) is promoting the development of the Cyber Science Infrastructure (CSI) through cooperation with universities and other organizations. CSI supports Japan's academic research and educational activities and strengthen international competitiveness.
SINET plays an important role as the core component of CSI.





Inter-University Research Institute Corporation
Research Organization of Information and Systems
National Institute of Informatics
NII
2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo 101-8430 URL http://www.nii.ac.jp/

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URL http://www.sinet.ad.jp/



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# SINET4

Science Information NETwork 4

2011-2012

Pamphlet

# SINET4 commenced operation in April 2011.

The Science Information Network (SINET) is an information and communication network connecting universities and research institutions throughout Japan via nationwide connection points (nodes). It is designed to promote research and education as well as the circulation of scientific information among universities, research institutions, and similar entities. SINET is also connected to research networks such as Internet2 in the U.S. and GÉANT2 in Europe to facilitate dissemination of research information and collaborations over networks.
SINET4 began operations in April 2011, and it replaces the previous SINET3. SINET4 plays an important role as the core component of the Cyber Science Infrastructure(CSI).

: **Core node** (data center)

: **Core line** (40Gbps or 10Gbps)

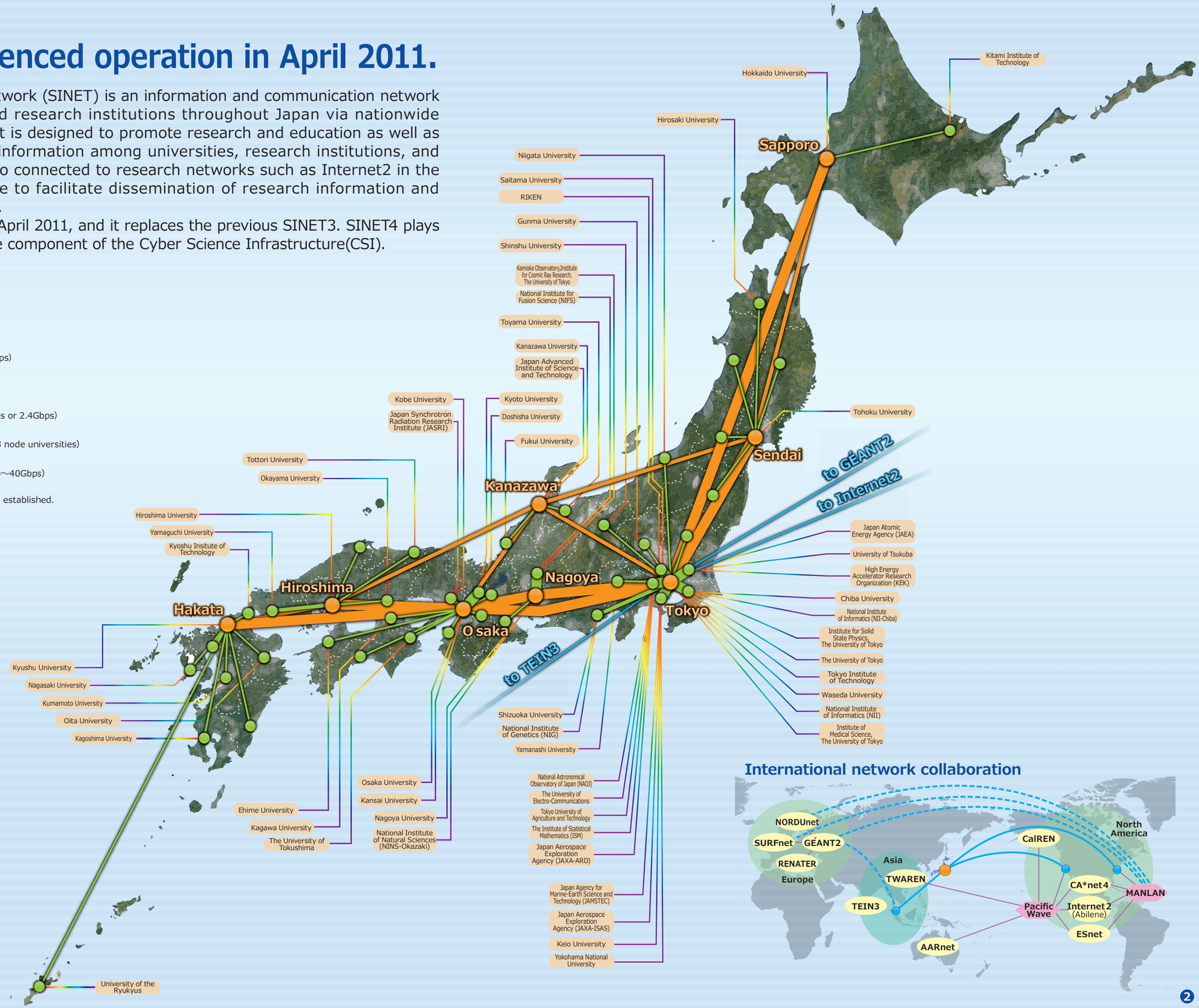
: **Edge node** (data center)

: **Edge Line** (40Gbps, 10Gbps or 2.4Gbps)

: **Institution on site** (SINET3 node universities)

: **Access line (DF+DWM)** (10～40Gbps)

*Some of the connections are to be established.

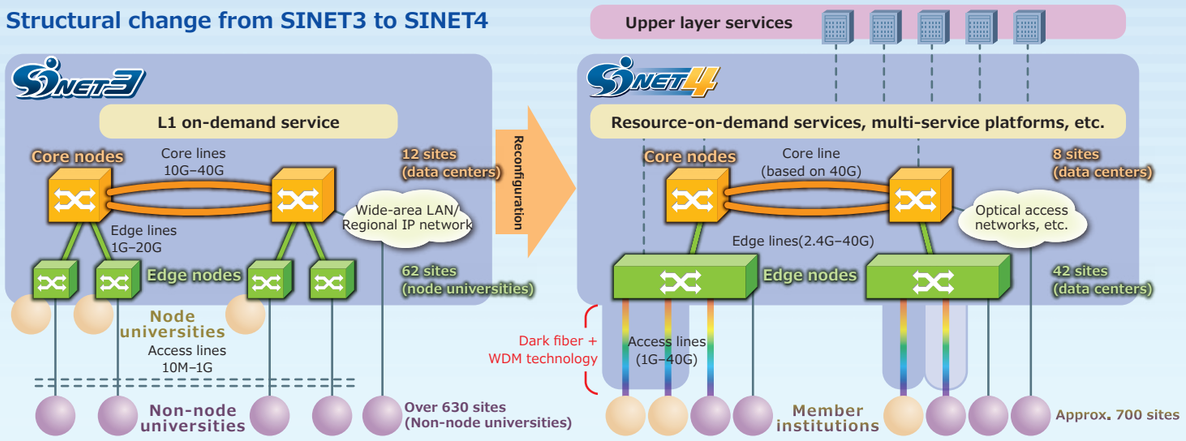



## International network collaboration

# SINET4 Development Goals and Architecture

With structural changes from SINET3, SINET4 has achieved higher network speed, the provision of diverse services, and more stable edge nodes.

### Structural change from SINET3 to SINET4

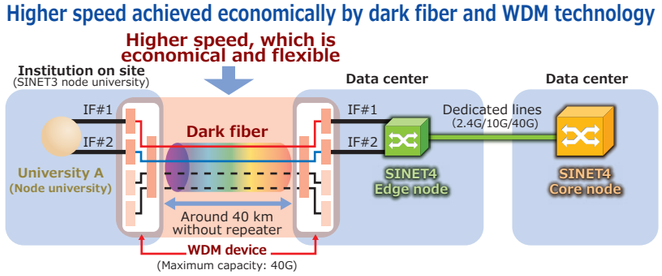



## Higher network speed

The effecitive network bandwidth has been increased and the rerouting function has been improved by reconfiguring the network and adopting solutions including dark fiber and WDM technology. This has made the network even more cost effective.

Core line (between core nodes)
Made redundant based on 40Gbps
Edge line (between edge nodes and core nodes)
2.4Gbps—40Gbps
Access line (between institutions onsite and edge nodes)
10Gbps—40Gbps
Access line (between member institutions and edge nodes)
1Gbps—40Gbps
(*In the case of a participation in the access line joint procurement)

### Higher speed achieved economically by dark fiber and WDM technology



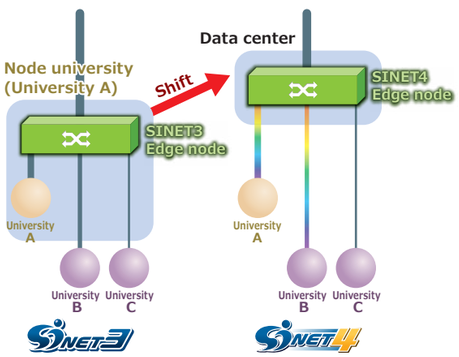

## Higher edge node stability

SINET4 positions both edge nodes and core nodes in data centers, improving the reliability of the network including its availability, maintainability, and security.

**[Criteria for data center selection]** (Abstract)
- There is no interruption to power supply due to planned outages.
- In the case of an outage, power can be supplied from emergency power supply system for at least ten hours in a row.
- It is capable of enduring an earthquake equivalent in intensity to the Great Hanshin Awaji Earthquake.
- Access securely controlled 24 hours a day, 365 days a year.

### Shift of edge nodes

(From node universities to data centers)

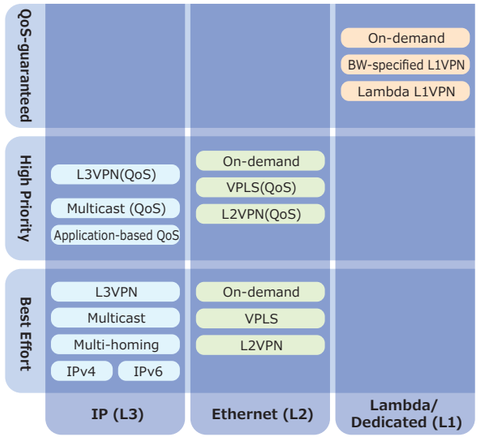





## Provision of diverse services

SINET4 inherits all of SINET3's services, with services such as resource-on-demand strengthened and expanded.

### SINET4 Services (Classification bynetwork layer and QoS)



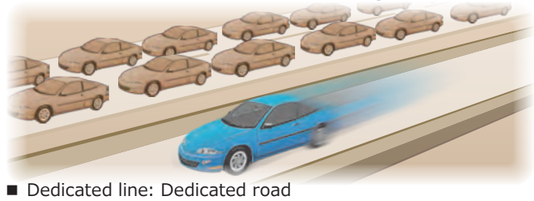

### SINET4 Service Menu

| Service Menu | | SINET4 | Notes |
|---|---|---|---|
| Provided interface | E/FE/GE (T) | ○ | |
| | GE (LX) | ○ | |
| | 10GE (LR) | ○ | |
| L3 service | IPv4 | ○ | |
| | IPv6 | ○ | native/dual stack/tunnel |
| | Multi-homing | ○ | |
| | Full routes | ○ | |
| | IP multicast | ○ | |
| | L3VPN | ○ | |
| | Application-based QoS | ○ | |
| | IP multicast (QoS) | ○ | |
| | L3VPN (QoS) | ○ | |
| | L3VPN (multicast) | Planned | |
| L2 service | L2VPN/VPLS | ○ | |
| | L2VPN/VPLS (QoS) | ○ | |
| | L2 on-demand | Planned | |
| L1 service | L1 on-demand | ○ | |
| Network information/ user support services | Performance measurements/improvements | ○ | Provision of throughput/RTT information, provision of performance improvement software (Planned) |
| | Traffic information | ○ | Please contact the SINET Promotion Office for details. |

*Other services are also being considered.

**[What are resource-on-demand services?]**
Resource-on-demand is a service for providing network resources in response to user demand. Network resources that are usually shared, such as communication lines, are allocated exclusively to particular users as needed, responding flexibly to constantly diversifying research needs.
SINET3 enabled the development and operation of L1 on-demand services for the first time in the world. SINET4 will strengthen and expand these services to make them usable with all edge nodes, while also providing L2 on-demand services.

### If communication lines are compared to roads…



- Dedicated line: Dedicated road
- Broadband dedicated line: Dedicated highway
- On-demand:
  - Site setup: At the desired section
  - Period setup: At the desired time
  - Bandwidth setup: In accordance with the desired load (number of lanes)

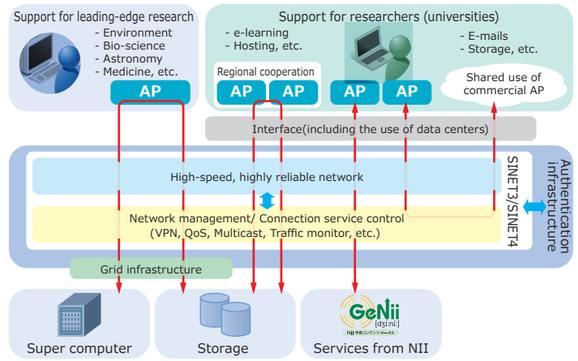
## Establishment of an environment for high-speed access lines

By undertaking shared procurement of access lines, a faster access system has been created for member institutions other than those on site (SINET3 node universities).In addition, installment of nodes is scheduled to be completed within FY2011 in all prefectures in Japan.

## Upper layer deployment

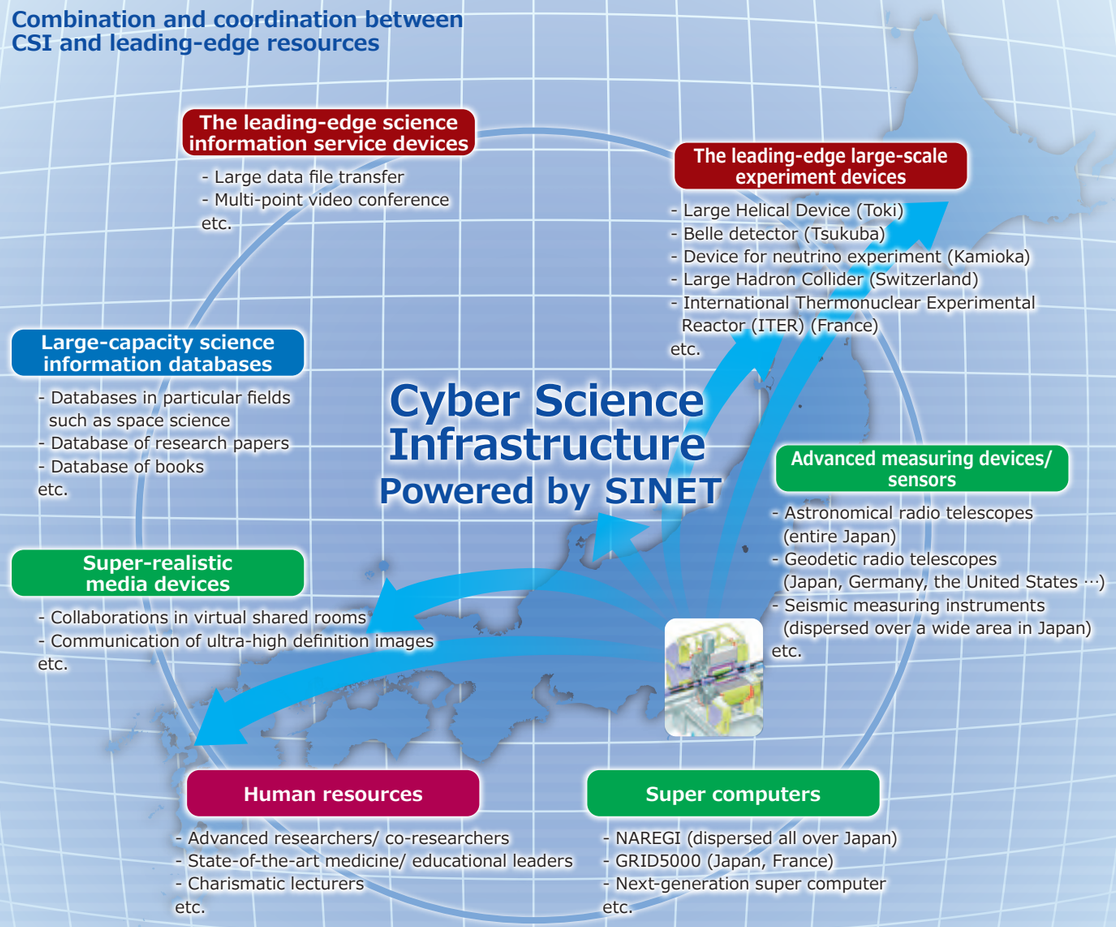
Installation of interfaces and service-providing platforms to support the upper layer is being considered.

### Conceptual rendering of upper-layer service provisions



# Case examples using SINET as core Cyber Science Infrastructure (CSI)

CSI effectively combines resources for leading-edge research and education with human resources, coordinating them to improve the productivity and quality of research and education, increasing overall national strength, and helping to create new future value and intellectual breakthroughs. CSI consist of an ultra high-speed network (SINET) as its core and functions to promote cooperation (including academic authentication and grid infrastructure).
SINET has been utilized as scientific information infrastructure essential for scientific research and education in a broad array of areas in Japan.For details of case studies using SINET, please visit the SINET website.
**http://www.sinet.ad.jp/case-examples/**




## High Energy Physics and Nuclear Fusion Science


The "Belle Experiment": A Major Contribution to Confirmation of the Theory of Kobayashi and Maskawa, Nobel Laureates in Physics
Institutions: High Energy Accelerator Research Organization (KEK), Tohoku University, Tokyo Institute of Technology, The University of Tokyo, Nagoya University, Osaka University, Etc. Services: L3 VPN, International connection


Neutrino Research
Institutions: Kamioka Observatory (ICRR, The University of Tokyo) Services: L2 VPN, L3 VPN


Distributed analysis of enormous amounts of data produced by the LHC accelerator
Institutions: The University of Tokyo, CERN, Etc. Services: International connection


Lattice QCD Simulation in Research on Hadron Physics and the Standard Model of Elementary Particles
Institutions: University of Tsukuba, KEK, Kyoto University, Osaka University, Hiroshima University, Kanazawa University Services: L3 VPN


Nuclear Fusion Research for a Clean Future Energy
Institutions: National Institute for Fusion Science (NIFS), University of Tsukuba, Kyushu University, (NIFS Rokkasho Research Center) Services: L2 VPN, L3 VPN


LEPS experiments to study the properties of hadrons using a laser-electron-photon beamline
Institutions: Osaka University, Japan Synchrotron Radiation Research Institute Services: L3 VPN

Nuclear Fusion Research for a Clean Future Energy

## Space Science and Astronomy


Optically Connected VLBI Observation Using SINET L1 On-demand Service
Institutions: National Astronomical Observatory of Japan (NAOJ), Hokkaido University, Yamaguchi University, NIFS, KEK Services: L1 on-demand


Studying the Sun with the Solar Observation Satellite Hinode
Institutions: Institute of Space and Astronautical Science (ISAS), NAOJ, and solar physics researchers worldwide Services: L1 VPN


The VERA Project: Mapping our galaxy in 3D-kinematics
Institutions: Kagoshima University,National Astronomical Observatory of Japan Services: L2 VPN

## Environmental Science, Meteorology, Earth Science


Receipt, Processing, Archiving, and Dissemination of Satellite Data
Institutions: Chiba University (Center for Environmental Remote Sensing) Services: IP Dual


Building and Operation of the Japan Data Exchange Network (JDXnet) for Earthquake Observation Data
Institutions: 10 institutions, including the Earthquake Research Institute, the University of Tokyo Services: L2 VPN


International Sharing of Extra-Large Volumes of Data from VLBI Observations
Institutions: Geospatial Information Authority of Japan and observatories worldwide Services: International Connection

## Remote Learning and Communications


Use of HD Interactive Remote Lectures and IPv6 for Training in the Healthcare Information Field
Institutions: Yokohama National University, Yokohama City University Services: IP Dual


Remote Lecture System Linking 18 UGAS Universities across Japan
Institutions: Tokyo University of Agriculture and Technology, Etc. Services: IP Dual


Interactive Remote Learning System Linking the National Universities of Three Hokuriku Prefectures
Institutions: Kanazawa University, Toyama University, Fukui University, Japan Advanced Institute of Science and Technology Services: IP Dual


Interactive Remote Learning in Special Support Education
Institutions: Ehime University, Tottori University Services: L2 VPN


Studying the t-Room room-sharing communication system
Institutions: Doshisha University Services: L1 On-demand

## Remote Use of Computing Resources, Experimental Facilities, Etc.


Connecting the Earth Simulator supercomputer to SINET
Institutions: Japan Agency for Marine-Earth Science and Technology Services: L2 VPN、IP Dual


Using SINET to provide computing resources and to facilitate a smooth campus relocation
Institutions: The Institute of Statistical Mathematics Services: L2 VPN, IP Dual


Remote Control System with Haptic Feedback
Institutions: Toyohashi University of Technology, Hakodate National College of Technology Services: QoS


The Renkei Project: A study of resource coordination techniques for the formation of research communities
Institutions: Tokyo Institute of Technology Services: L3 VPN

## Telemedicine


Promoting International Telemedicine Using Academic Networks
Institutions: Kyushu University Services: IP Dual L1 On-demand

## Development of Advanced Campus Network


Construction and operation of a web authentication system for a campus network (HINET2007)
Institutions: Hiroshima University Services: IP Dual

## Network Research


Use of SINET L1 On-demand Service to Evaluate iSCSI-APT Performance
Institutions: Osaka University, Hokkaido University, Kyushu University Services: L1 on-demand


Global Load Balancing Experiments Using the SINET Full Route Provision Service
Institutions: Kyushu University, Kyushu Sangyo University Services: Full Route

## Regional Revitalization and Career Training


Developing the Human Resources to Build a Better Shikoku Based on the Collective Results of the “Knowledge of Shikoku” Project
Institutions: Kagawa University, The University of Tokushima, Naruto University of Education, Ehime University, Kochi University,Shikoku University, Tokushima Bunri University, Kochi University of Technology Services: IP Dual