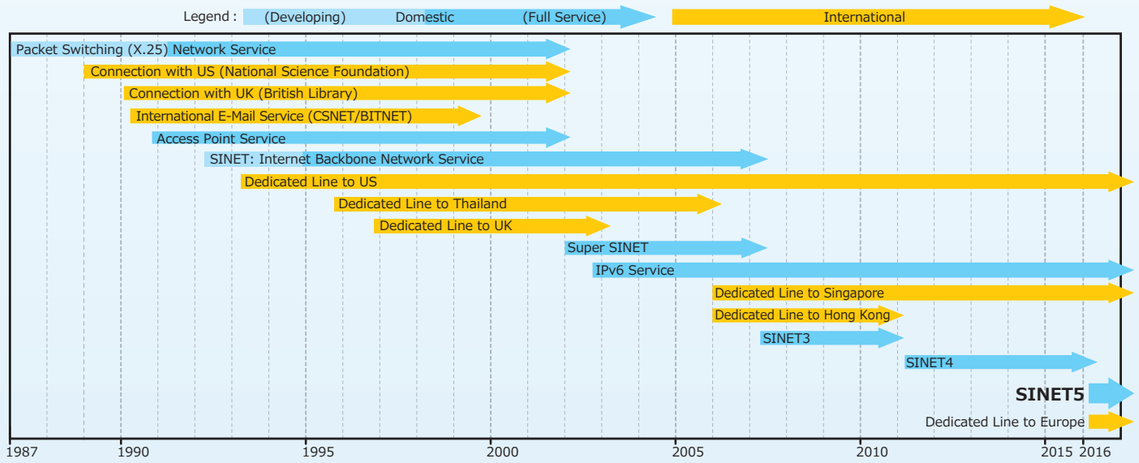
History



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.

【Please direct queries to】
SINET Promotion Office
Academic Infrastructure Division
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, use cases of SINET promotion, creation of documentation, and publication of information on the Web

A New Development in Academic Information Infrastructure

To collaborate with and promote academic research and educational activities at universities and other academic and research institutions, SINET5 offers enhanced cloud and security features and academic content, on an ultra-high-speed network.

Collaboration with and promotion of academic research & educational activities at universities, etc.

Open access and sharing of academic information
- Promoting open access to and distribution of academic information
- Promoting enhancement and improvement of institutional repositories at universities

CiNii, JAIRO Cloud — Academic content infrastructure

Support for collaboration between universities
- Encouraging collaboration and mutual use of various resources between universities via systems with unified specifications

Academic Access Management Federation in Japan (GakuNin)
HPCI (High Performance Computing Infrastructure) authentication
eduroam — Wireless LAN roaming

Cloud utilization support
- Significantly reducing IT expenses and creating more sophisticated research and education environments by encouraging the effective use of cloud technologies

Cloud support services
SINET direct-linked cloud

Enhanced security
- Protecting information and facilitating safe authentication through the use of encryption technologies
- Implementing cyber-attack countermeasures through linkage with network functionality

UPKI — Electronic certificates
VPN

Construction and operation of the Science Information Network
- Japanese domestic connection lines upgraded to 100Gbps nationwide
- High speed connection with overseas countries (U.S., Europe and Asia)
- Introduced the latest network technologies such as SDN, etc., to cater to diversifying needs

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 http://www.nii.ac.jp/

Contact Info for Inquiries
SINET Promotion Office, Academic Infrastructure Division
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TEL +81-3-4212-2269 FAX +81-3-4212-2270
https://www.sinet.ad.jp/en/

2016.11

SINET5

Science Information NETwork 5

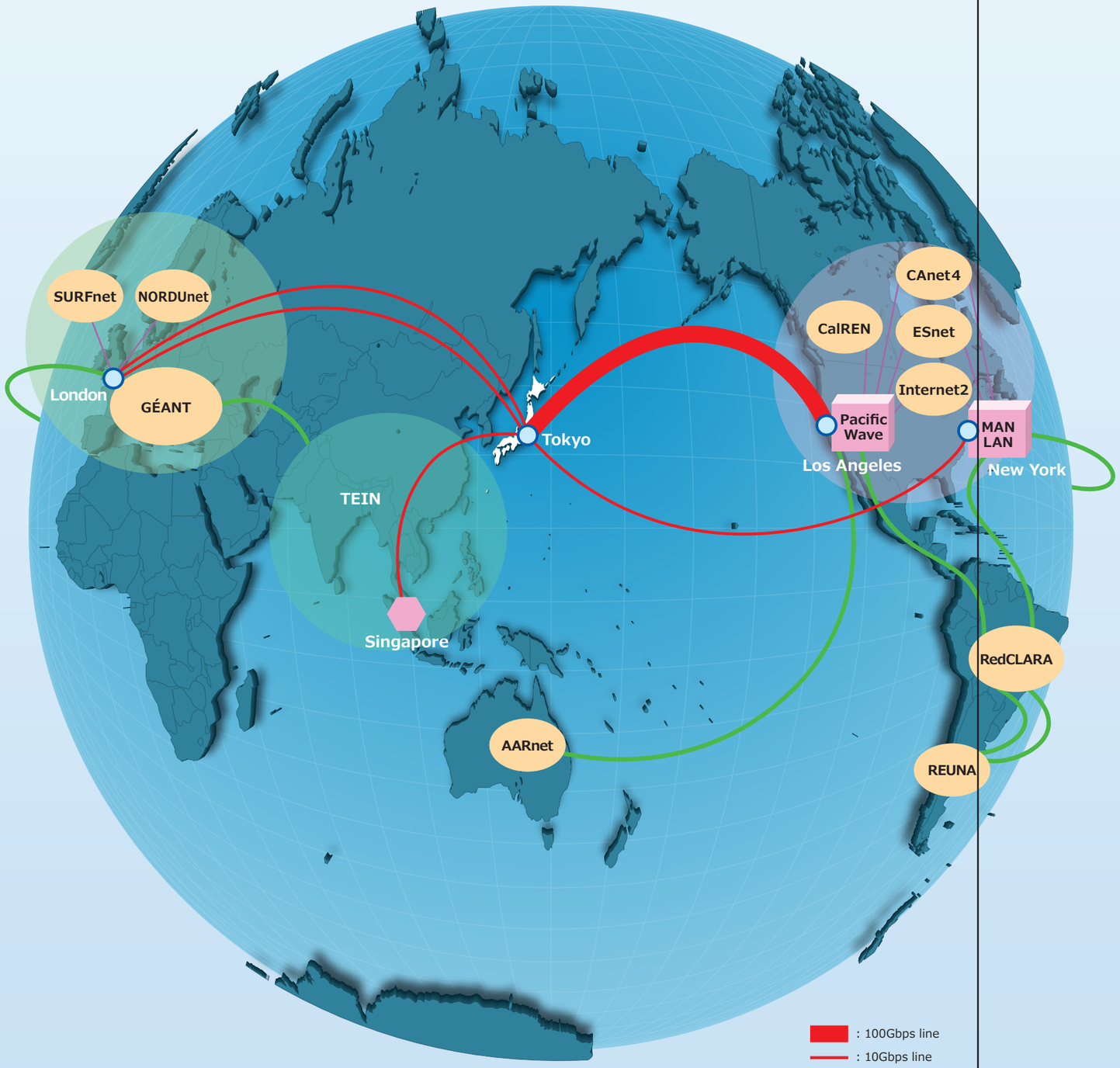
The Science Information Network (SINET) is an information and communication network connecting universities and research institutions throughout Japan via nationwide connection points (nodes). It is designed to promote research and education as well as the circulation of scientific information among universities, research institutions, and similar entities. SINET is also connected to research networks such as Internet2 in the U.S. and GÉANT in Europe to facilitate dissemination of research information and collaborations over networks.
SINET5 began operations in April 2016, and it brings new possibilities with its 100G full-mesh network connecting more than 800 organizations, clouds, and academic contents.

2016

Pamphlet

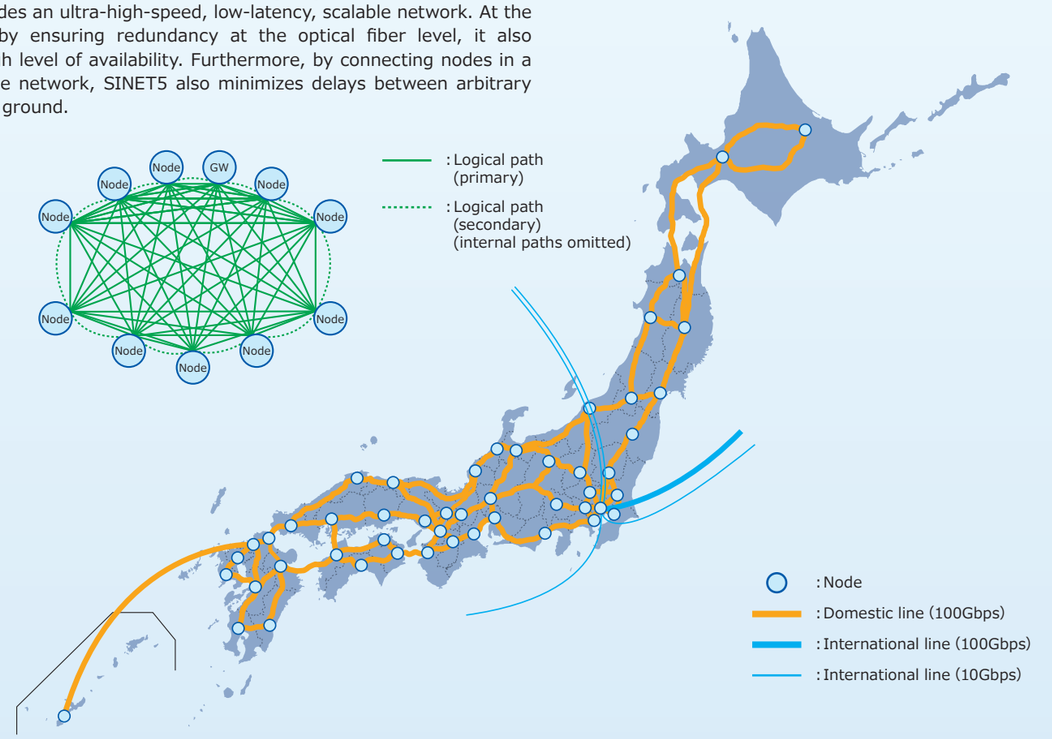
Network Topology of SINET5

SINET5 commenced full-scale operation as of April 2016. SINET is now being used by over 3 million researchers and students etc., at over 800 universities and research institutions throughout Japan. At the time of commencing initial operation, SINET5 is equipped with one 100Gbps and one 10Gbps line to the United States, two direct 10Gbps lines to Europe, and a single 10Gbps line to Asia. Through collaboration with overseas partners, SINET5 offers more sophisticated data transfer environment for joint international research, and enables use of experimental facilities in other countries, provision of domestic experimental facilities, and high-capability linkage between facilities both overseas and in Japan.



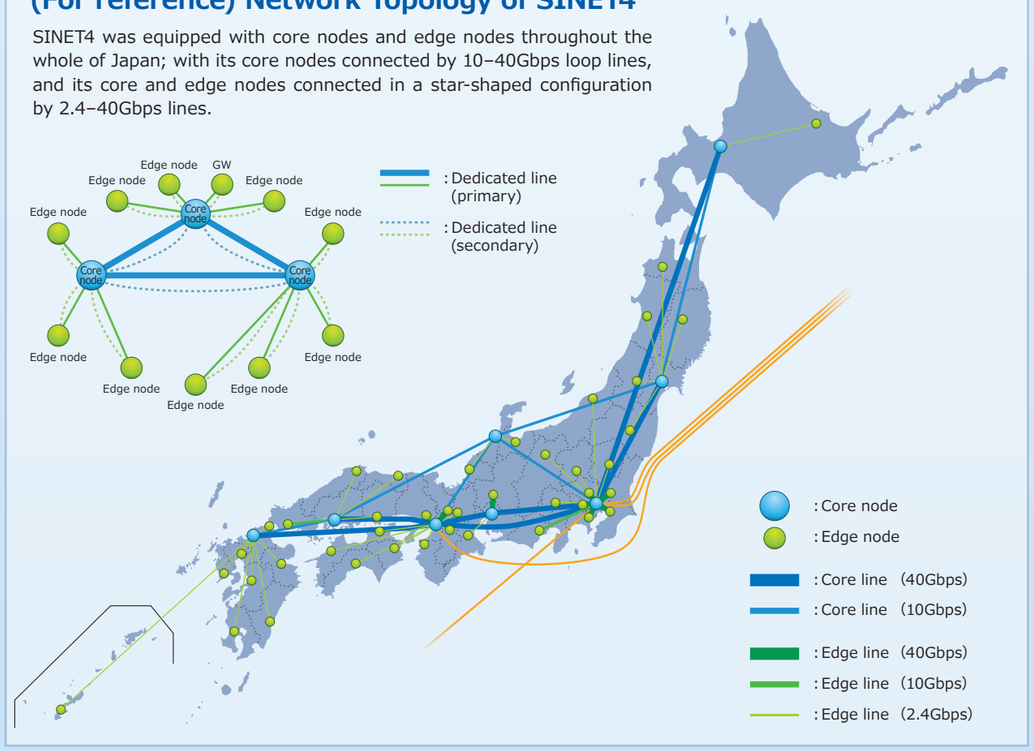
Domestic Network Topology

SINET5 achieves the realization of a nationwide 100Gbps network. By securing optical fiber lines to form the shortest possible connections between nodes and using the latest cutting-edge transmission devices, SINET5 provides an ultra-high-speed, low-latency, scalable network. At the same time, by ensuring redundancy at the optical fiber level, it also ensures a high level of availability. Furthermore, by connecting nodes in a full mesh-type network, SINET5 also minimizes delays between arbitrary points on the ground.



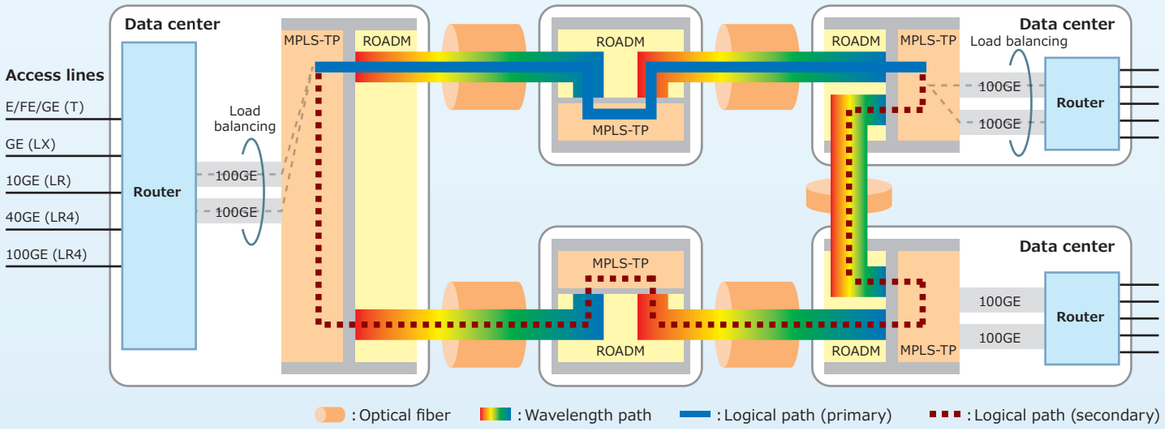
(For reference) Network Topology of SINET4

SINET4 was equipped with core nodes and edge nodes throughout the whole of Japan; with its core nodes connected by 10–40Gbps loop lines, and its core and edge nodes connected in a star-shaped configuration by 2.4–40Gbps lines.

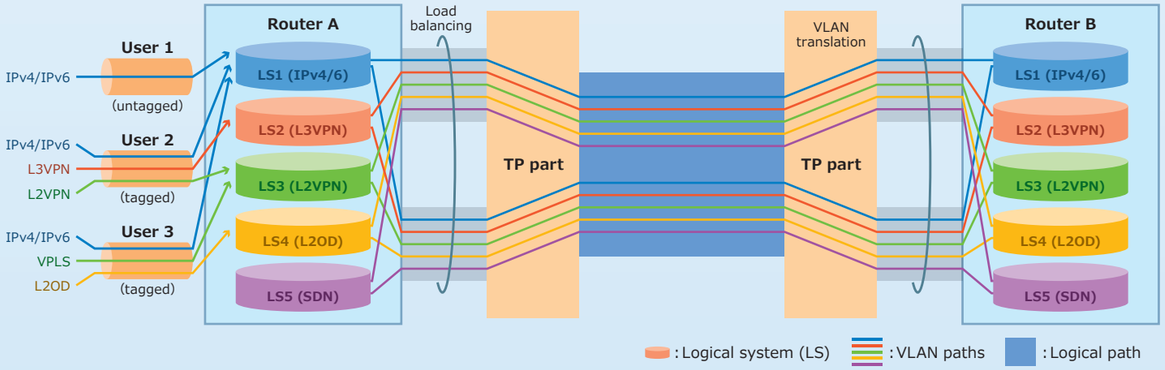


SINET5 Architecture

The MPLS-TP of transmission devices is connected to routers with two or more 100Gbps links and carries out load balancing. Sections between each MPLS-TP are connected via ROADMs (Reconfigurable Optical Add/Drop Multiplexers) by both wavelength and logical paths, with dual logical paths (primary and secondary) being used to ensure high availability.



Routers set logical systems (LS) for each group of services. Individual LSs are connected by VLAN connections.

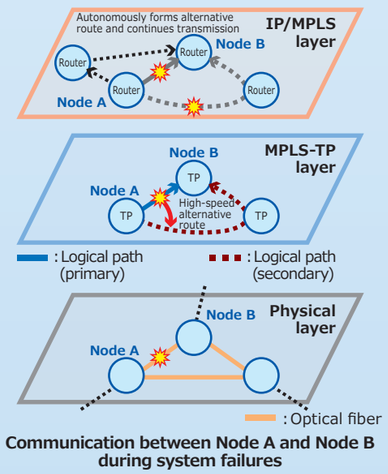


High Availability of SINET5

3) Even in the event that both of the logical paths (i.e. primary and secondary) between two nodes are interrupted, routers autonomously form an alternative route within a few seconds, limiting the impact on user transmissions as much as possible.

2) Where two nodes are connected by two logical paths (primary and secondary) and the active path is severed, transmission rapidly switches over to the alternative route via the secondary logical path, and communication continues with no packet loss. Dual logical paths are arranged in an alternative redundancy route configuration, ensuring that the two paths do not affect one another.

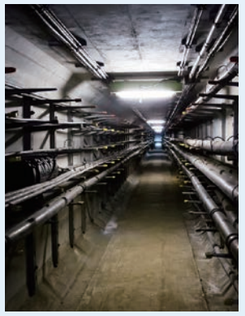
1) Each node is connected to another by at least two or more alternative optical fiber routes, increasing the SINET5's resistance to network failures in the event of optical fibers being severed.



Communication between Node A and Node B during system failures

(Reference) Cable Tunnels

In order to protect them from earthquakes and other disasters, major optical fibers are installed inside underground tunnels called cable tunnels (or "*todo*" in Japanese).



SINET5 Network Services

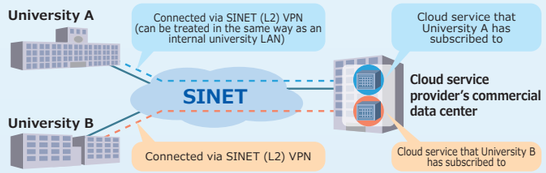
In order to expand and enhance network service functionality and build secure, advanced research environments for universities and research institutions, SINET5 offers an expanded range of user-oriented services, including virtual university LAN and L2 on-demand services.

Network service		SINET5	SINET4
Layer-3 (L3) services	Internet connection (IPv4 & IPv6) [Option] QoS [Option] Full route provision [Option] Multi-homing [Option] IPv6 tunneling connection	✓ ✓ ✓ ✓ Limited	✓ ✓ ✓ ✓ ✓
	IP multicast (IPv4 & IPv6) [Option] QoS	✓ ✓	✓ ✓
	L3VPN [Option] QoS [Option] VXLAN access New	✓ ✓ Planned	✓ ✓ –
Layer-2 (L2) services	L2VPN/VPLS [Option] QoS [Option] VXLAN access New	✓ ✓ Planned	✓ ✓ –
	L2 on-demand	✓	Trial
	Virtual University LAN New	✓	–
Layer-1 (L1) services	L1 on-demand	– *	✓
	Dedicated wavelength/bandwidth line New	✓	–

*Integrated with L2 on-demand due to an upgrade to 100Gbps

Framework for Secure Use of Cloud Services

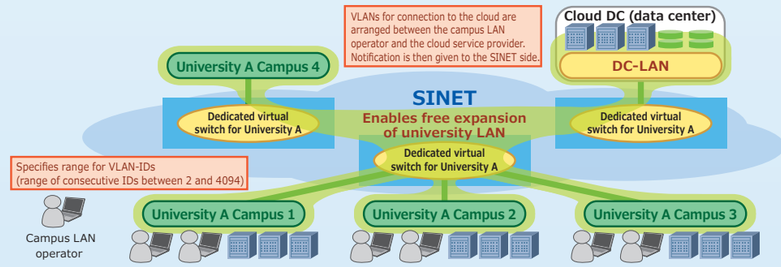
In order to enable secure use of upper-layer services (e.g. e-mail and storage), SINET5 adopts a framework whereby the lines that connect cloud service providers to SINET are prepared by the cloud service providers themselves.



Virtual University LAN Services

SINET enables free expansion of university LANs to connect to multiple campuses and clouds.

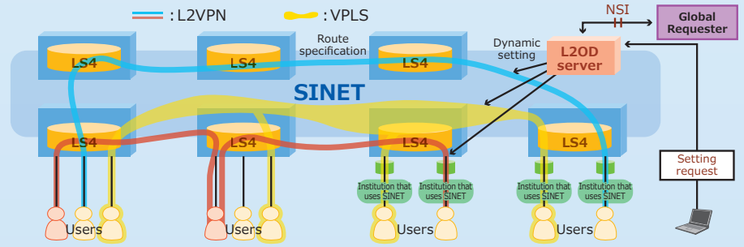
- User side: Specifies range of VLAN-IDs. VLAN-IDs for connection to Internet/L2 & L3 VPN are specified separately. Use procedures for addition of each new VLAN-ID are unnecessary, enabling flexible operation by participating institutions.
- SINET side: Automatically recognizes VLAN-IDs at SINET nodes and automatically connects between multiple points.



Layer 2 (L2) On-demand Services

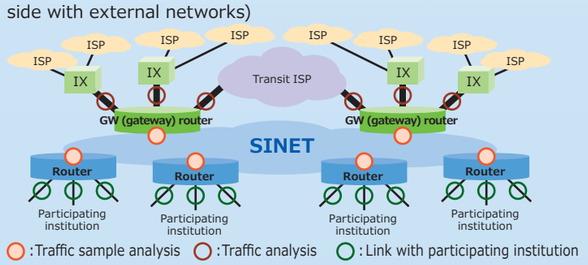
Users can connect to L2VPN/VPLS on-demand, based on the connection points and start and end times (from short-term to long-term) they specify. Below is an image of how this service works when in use.

- L2VPN (P-to-P connection): allows optional specification of bandwidth and route
- VPLS (MP-to-MP connection): allows optional addition and removal of connection points



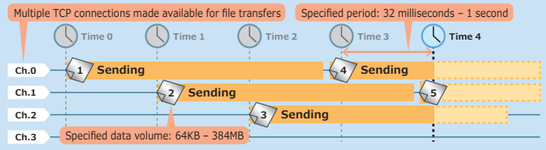
Increased Stability of Backbone Operation

There are plans to enhance the traffic analysis functionality of the SINET backbone (i.e. the portion connecting the transfer side with external networks)



High-speed File Transfer Software

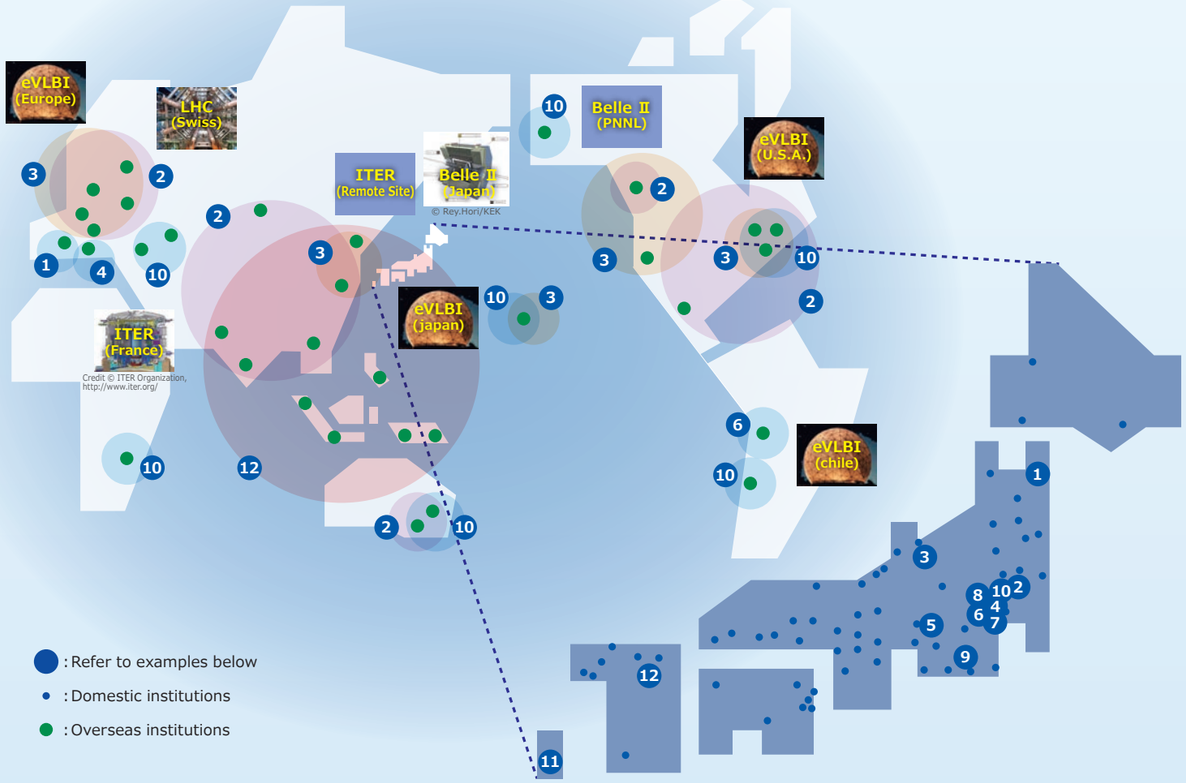
Even where the network is congested, or in high-latency environments such as with overseas-oriented transfers, SINET enables users to specify a transfer speed (= specified volume of data / specified period) and send files at high speed. When sending files, SINET avoids connections that are already being used to send data, and utilizes open connections.



SINET Use Cases

SINET has been utilized as academic information infrastructure essential for scientific research and education in a broad array of areas in Japan. For details of SINET use cases, please visit the SINET website.

https://www.sinet.ad.jp/en/



L1 : L1VPN　L2 : L2VPN/VPLS　L3 : L3VPN　od : On-demand　D : IP Dual　I : International connection

High Energy Physics and Nuclear Fusion Science

1	I		SINET Speeds Up Japan-Europe Collaboration in International Research on Nuclear Fusion	Institutions : National Institute for Fusion Science, Japan Atomic Energy Agency
2	L3 I		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.
3	L2 L3		Neutrino Research	Institutions : Kamioka Observatory (ICRR, The University of Tokyo), J-PARC, domestic and overseas researchers
4	I		Distributed analysis of enormous amounts of data produced by the LHC accelerator	Institutions : The University of Tokyo,High Energy Accelerator Research Organization (KEK), University of Tsukuba, Waseda University, Tokyo Institute of Technology, Tokyo Metropolitan University, Nagoya University, Kyoto University, Kyoto University of Education, Shinshu University, Okayama University, Hiroshima Institute of University, Nagasaki Institute of Applied Science, CERN, Etc.vv
5	L2 L3		Nuclear Fusion Research for a Clean Future Energy	Institutions : National Institute for Fusion Science (NIFS), University of Tsukuba, Kyushu University

Space Science and Astronomy

6	L3		The ALMA Project and SINET	Institutions : National Astronomical Observatory of Japan
7	od		Optically Connected VLBI Observation Using SINET L1 On-demand Service	Institutions : National Astronomical Observatory of Japan (NAOJ), Hokkaido University, Yamaguchi University, National Institute for Fusion Science (NIFS), High Energy Accelerator Research Organization (KEK)
8	L1		Studying the Sun with the Solar Observation Satellite Hinode	Institutions : Institute of Space and Astronautical Science (ISAS), NAOJ, and solar physics researchers worldwide

Environmental Science, Meteorology, Earth Science

9	D I		A Computer Network Enabling an Increasing Volume of Data	Institutions : National Institute of Genetics
10	I		International Sharing of Extra-Large Volumes of Data from VLBI Observations	Institutions : Geospatial Information Authority of Japan and observatories worldwide

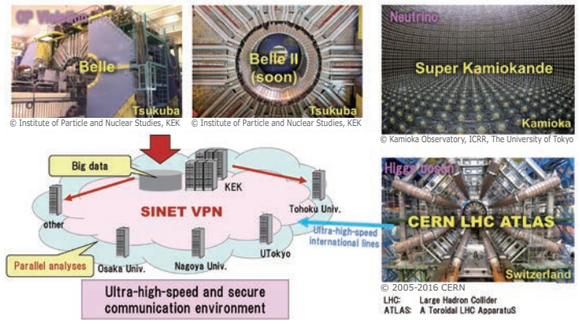
Remote Learning and Communications

11	I		International Remote Lectures Using SINET	Institutions : University of the Ryukyus, Keio University, the Academic Arm of the United Nations, University of Hawai'i, University of the South Pacific, Asian Institute of Technology, National University of Samoa

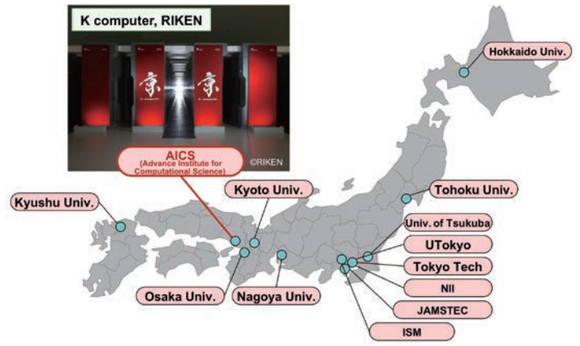
Telemedicine

12	D od		Promoting International Telemedicine Using Academic Networks	Institutions : Kyushu University, universities in Asia

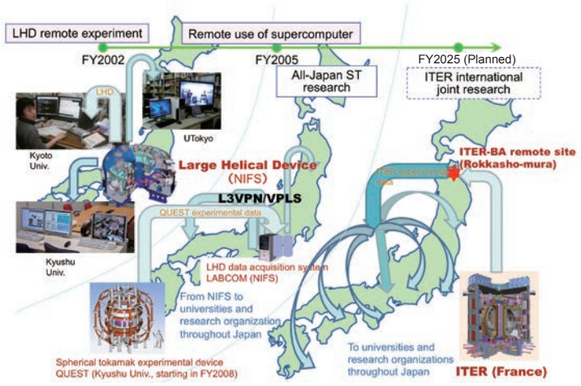
High energy research



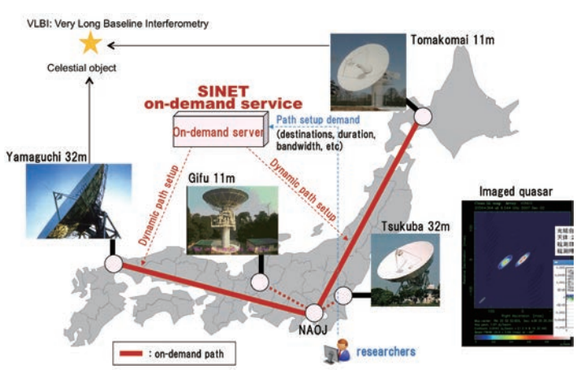
HPCI (High Performance Computing Infrastructure)



Nuclear fusion science research

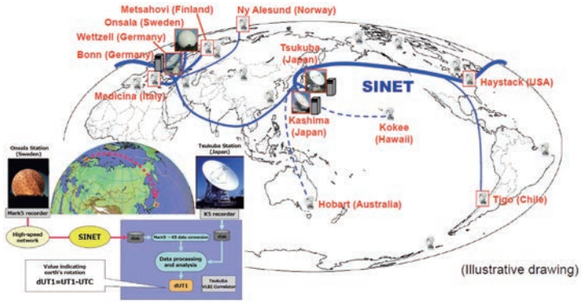


Astronomy research

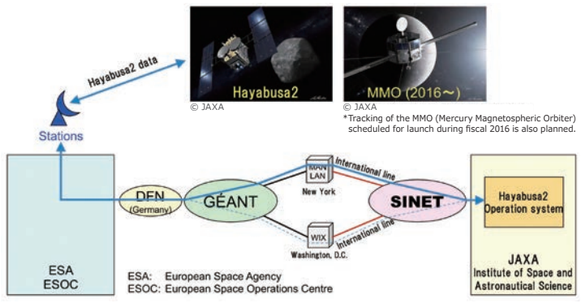


As of 2010

Geodetic research



Hayabusa2 (Asteroid explorer)



As of fiscal 2015