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

SINET6 user consultations

(e-mail, phone, direct visit)

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

Public relations activities on the scientific information infrastructure

The NII Open Forum was established in June 2009, as a framework to strengthen collaboration and information exchange among universities and research institutions, for the purpose of enhancing cutting-edge scientific information infrastructure as a foundation for supporting the development and growth of academic research and education.

The Forum engages in activities for quickly sharing a detailed image of education and research environments at universities and research institutions that will be realized through SINET6, and developing them together with users.



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Main Activities • Briefings on NII services • NII Open Forum

2025.02

Science Information NETwork 6

2025-2026





Network Topology of SINET6

The Science Information NETwork (SINET) is an ultra-high-speed research and education network designed, developed, and operated by the National Institute of Informatics (NII) to serve universities and research institutions across Japan.

The latest version, SINET6, delivers an advanced communication environment to over 1,000 universities and research institutions by seamlessly integrating cloud infrastructure, security devices, and academic content via a nationwide 400 Gbps network.

To ensure the efficient exchange of research data required for international cutting-edge research projects, SINET6 is interconnected with numerous academic networks worldwide.

Regarding its international circuits, SINET6 features a 400 Gbps link between Japan and Amsterdam, along with 100 Gbps links between Japan and Singapore and Japan and Guam. Additionally, starting in April 2025, the bandwidth of the Japan–Los Angeles–New York route will be significantly upgraded to a 400 Gbps line. With these network advancements, SINET strives to further enhance its contributions to international research projects.



- research institutions nationwide(*1)
- overseas research networks(*3)
- and education through various services

research institutions with those at other universities and research institutions



SINET6 Services

Automatic DDoS Mitigation Service

Address ranges and detection conditions are registered in advance, and detection and packet drop are performed automatically when communication patterns match the specific conditions.

Notify and control attacks quickly

- Institution registers the address to be monitored and the control method at the time of detection (participating institution)
- Information collection and monitoring from routers (SINET) **BDDoS** attack occurs
- Obtects DDoS and executes registered actions (monitoring, policer and drop).



Data Center Connection Redundancy Service

The Data Center Connection Redundancy Service provides communication with alternate data center routers when connection failures occur, without the need to connect multiple connection lines to separate data centers.

Build multiple connections at low cost

- Two access lines connected to SINET DC1
- · Line 2 is accommodated in a separate data center router via SINET DC1 (As a general rule, connection speed for Line 2 is 10 Gbps or less)



SINET6 Architecture

Transmission devices (L2MUX) are connected to the router with two or more 400 Gbps links and carry out load balancing. Sections between each L2MUX are connected by both wavelength and logical paths. When a logical path comes into failure, the transmission is automatically diverted to another route.



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



High Availability of SINET6

Wavelength path redundancy

Each node is connected to another by at least two wavelength paths, ensuring continuity of transmission even in the event of an optical fiber being severed and enhancing reliability.

Nodes are connected by logical paths in a full mesh topology. If the primary (active) path fails, transmission is automatically diverted to another route.





Communication between Node A and Node B during system failures

SINET6 Network Services

In order to expand and enhance network service functionality and build secure, advanced research environments for universities and research institutions, SINET6 offers an expanded range of user-oriented services, including virtual university LAN and L2 on-demand services.

Service menu		
L3 services	Internet Connection (IPv4 & IPv6)	
	Full Route Provision	
	IP multicast (+QoS)	
	QoS for each application	
	L3VPN (+QoS)	
L2 services	L2VPN/VPLS (+QoS)	Rapidly increasing
	Virtual University LAN	Expanding into a multicampus service
	L2 on-demand (basic)	Used in high-capacity transmission experiments
	L2 on-demand (international collaboration: NSI)	Used in international experiments
	L2 on-demand (cloud system collaboration: REST)	
Mobile SINET	Secure mobile connections	In trial phase
Redundancy of access lines	Multihoming	
	Link aggregation (identical speed)	
	Link aggregation (different speeds)	
	Redundant trunk group service	
	Data Center Connection Redundancy Service	Started in July 2022
Stabilization of network operations	Automatic DDoS Mitigation Service	Started in January 2023
	BGP Looking Glass	Started in August 2022
Enhanced transfer performance	Performance measurement	
	High- speed file transfer	Achieved world's fastest at 416 Gbps between Japan and the U.S.

Virtual University LAN Services

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

· User side: Specifies range of VLAN-IDOs. VLAN-IDs for connection to the Internet/ L2 & L3 VPNs are specified separately. Negotiations with NII for addition of each new VLAN-ID are unnecessary, enabling flexible operation by participating institutions. · SINET side: Automatically recognizes





Laver 2 (L2) On-demand Services

Users can establish 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



Mobile SINET

(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).

To send and receive valuable research data generated in remote areas, at sea, and in other locations where a wired network is unavailable, the service offers a secure communication environment connected directly to SINET over public 5G mobile networks. A new trial was launched in April 2024 in preparation for full-scale deployment of the service. There is also a plan to support the private 5G networks operated by universities.



Please direct queries to: Mobile SINET representative wadci@sinet.ad.jp

* IoT app development support software (SINET Stream) is available on this service. It is distributed as open source software For details and inquiries, visit: https://www.sinetstream.net/

Remote area 🔏 👫

Framework for Secure Use of Cloud Services

In order to enable the secure use of upper-layer services (e.g. e-mail and storage), SINET6 adopts a framework whereby the lines that connect cloud service provider's commercial data centers are directly connected to SINET and their resources are logically and directly connected to universities by L2VPNs.

* In order to use the service, the participating institution must sign an individual contract with the cloud service provider.





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/



Relevant item: 1 4 5 Nuclear fusion science research

The data from Large Helical Device (LHD) and OUEST are shared among universities and NIFS through SINET VPNs, and the data volume has been steadily increasing. Rokkasho-mura, the remote site of ITER, has been open for collaboration with Europe



Relevant item: 1 2 3 6 High energy research



Relevant item: 10 Geodetic research



Network Research

13 High-Speed File Transfer Software – MMCFTP–

Relevant item: 12

HPCI (High Performance Computing Infrastructure)

Contributing to the joint use of supercomputers and storage owned by research institutions (RIKEN Center for Computational Science (R-CCS), etc.) and university information technology centers from around Japan at ultra-high speeds Source: RIKEN Center for Computational Science (R-CCS)



Relevant item: **7** Hayabusa 2 (Asteroid explorer)

 JAXA ISAS tracked Asteroid Explorer Hayabusa 2 by collaborating with ESA ESOC, and the observed data were transferred to Japan via other NRENs and SINET. •The data from Mercury Magnetospheric Orbiter (MMO) has been transferred to Japan under the same eration framev



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Relevant item: 13 High-Speed File Transfer Software



- NII has developed a high-speed file transfer software, called Massively Multi-Connection File Transfer Protocol (MMCFTP), and done demonstrations
- •At international conference SC19 in Nov. 2019, NII attained the world record of 416.3 Gbps between Tokyo and Denver by using five international
- •At Data Mover Challenge 2020 in Feb. 2020, NII received the Most Innovative & Novelty Award.

Experimental outline

- 96 TB of data was transferred from Tokyo to Denver 7 times. (memory to memory transfer)
- Duration of data transmission: about 30 minutes Server: DELL PowerEdge R7425

