

Nationwide Joint-use Facility

Information Technology Center, The University of Tokyo

東京大学情報基盤センター



2008 - 2009

Greetings

The Information Technology Center (ITC) of The University of Tokyo has been providing its service on the nation-wide basis as well as the university-wide basis. The service is roughly divided into 4 categories: (1) ultra-high performance computing, (2) campus networking, (3) educational computing, (4) digital library service. Some details of each service category can be found in the web pages of the corresponding divisions. What we would like to emphasize in each web page is that our first priority is to provide better service to a wider range of users, compared with the previous years.

The ultra-high performance division had been designing a new supercomputing system of massively parallel type, in cooperation with the ITCs of Kyoto University and Tsukuba University. The design called "T2K Open Supercomputer" was completed more than a year ago and the designed machine became operational in June this year. We expect that this machine will keep the highest performance rank in the nation for the next few years. Our intention of introducing this type of machine is not only to highly accelerate the development of computational science and engineering, but also to enlarge a new class of supercomputer users in number and depth.

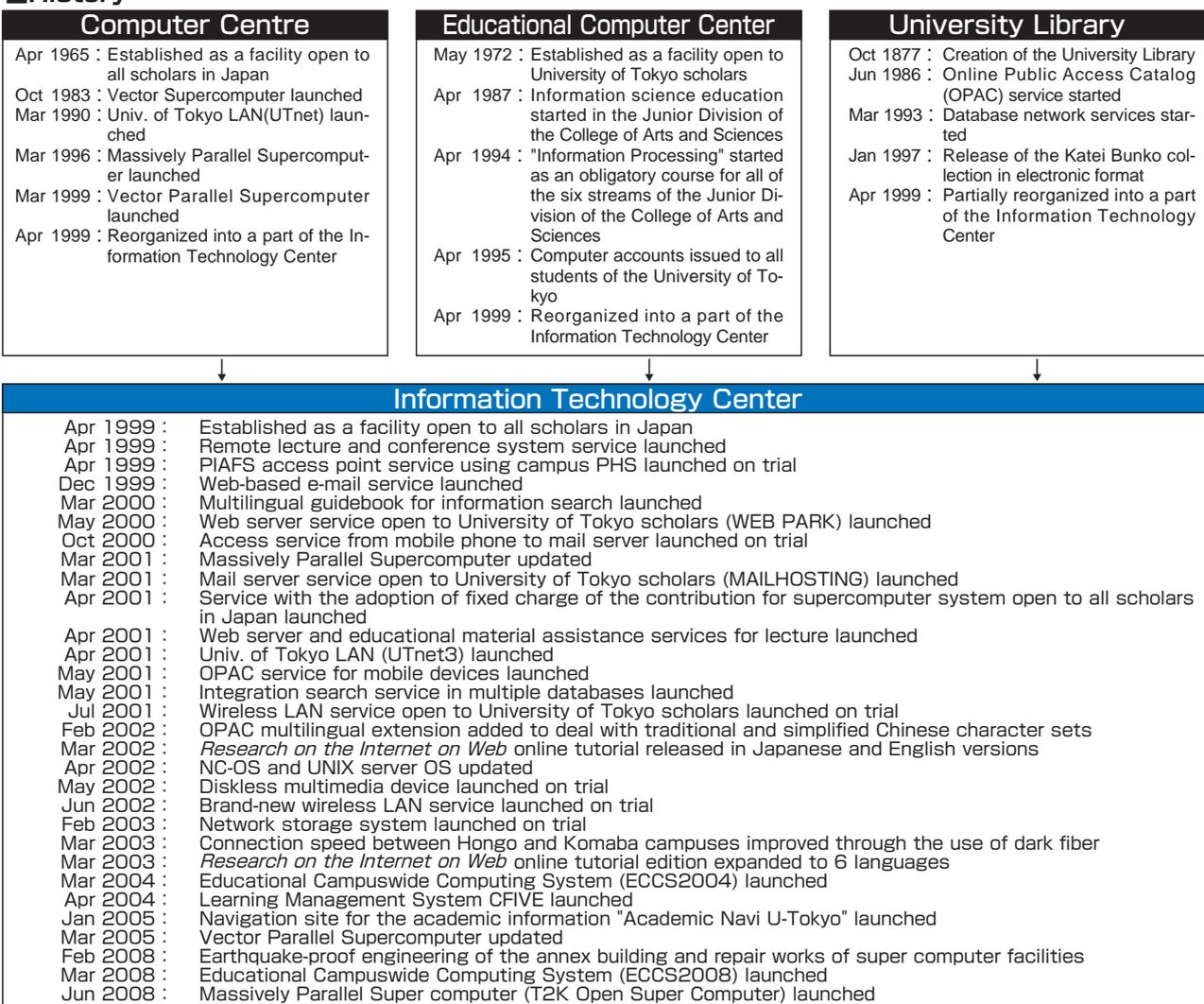
Our ITC has about 30 researchers and faculties in the four divisions and they are all working for research, development and education as well as social contributions. These activities are also reported in the web pages and the ITC's annual report.

October, 2008

Akinori Yonezawa

Director, Information Technology Center

History



Roles and Activities

Campuswide Computing and Communications Division

The Campuswide Computing and Communications Division is in charge of operating, administering, and maintaining the Educational Campuswide Computing System (ECCS). It is committed to the support of academic activities by promoting on-campus information literacy, and by providing a suitable information technology environment. To ensure the smooth proceeding of educational and research activities, the division also offers comprehensive services using the latest advances in information technology. These services include running the many servers (mail servers, web servers, and more) that form the university's IT infrastructure; promoting e-learning initiatives such as the computerization of teaching materials and the use of learning management systems; and providing support to departments and organizations in order to make their information and data available online. The Campuswide Computing Research Division's role is to support the whole system and to guide its evolution through research, planning, and development activities. Its operations range from evaluating the current system's efficiency and stability to designing the new structures that will support future e-learning and information technology services.

Digital Library Division

In addition to supporting academic activities by digitizing and updating indispensable scientific information, and making it available through the internet, the Digital Library Division provides services to make the constantly expanding mass of academic data available online, and conducts related research and development activities. The division also develops and provides access to a large variety of databases including the libraries' Online Public Access Catalog (OPAC), the ISI Web of Knowledge integrated research platform and citation index, and over 7,000 electronic journals. Moreover, emphasis has been placed on the education of users through regular training courses and the publication of materials for self-study such as the *Research on the Internet on Web* online tutorial.

The Research Division is in charge of using the latest technology to develop new services, such as the Web 2.0-enhanced library navigation system, the University of Tokyo's new portal system for academic contents, and the "GENSEN Web" automatic domain terminology extraction system. The division performs research on a number of fields deemed to be essential to the future development of a digital library, including information extraction, knowledge mining and intelligent navigation technologies. Research division members are also involved in education and research activities at the University of Tokyo's Graduate School of Information Science and Technology.

Campus Networking Division

The University of Tokyo is made up of six campuses and over 50 satellite research facilities around Tokyo. A secure and stable network environment is vital to ensure a smooth flow of the university's research and educational data. The Campus Networking Division is in charge of the construction, operation, and maintenance of the University of Tokyo Local Area Network (UTnet), which serves as the university's infrastructure for research and education. This division's vital research and development work is focused primarily on developing advanced network environments.

Supercomputing Division

Number of users of the supercomputers of the division is approximately 1,000 every year. They are faculty members and graduate/undergraduate students of universities and researchers of various types of research institutions. The supercomputers are used by these users for various types of purposes, such as academic research, education, industrial innovation and public welfare. Regular upgrades of the systems ensure the constantly enhanced processing power as well as high-grade services for advanced, large-scale computation. The introduction of a fixed-amount payment system in April 2004 provides flexible usage of the resources by users. Appointed as cooperative chair to the university's Department of Electrical Engineering and Information Systems in the Graduate School of Engineering, the Supercomputing Research Division plays an important role in graduate studies. While monitoring and assessing trends in computer technology and pursuing research for the future of supercomputing, the division also conducts joint research with researchers at the University of Tokyo and elsewhere, focusing on libraries and system software for high performance parallel supercomputers.

Campuswide Computing and Communications Division

<http://media.itc.u-tokyo.ac.jp/>

OVER 30,000 USERS

The purpose of the Educational Campuswide Computing System (ECCS), which is operated by the Information Technology Center, is to support the University of Tokyo's academic activities through information media. With over 30,000 users, it is the university's largest on-campus system. Accounts are available for all affiliates, and are issued to every undergraduate and graduate student. By providing all its users with email, web browsing, and Internet access for mobile computers, the ECCS is the University of Tokyo's base of information technology services.

MORE THAN 1,300 TERMINALS PROVIDING THE LATEST SERVICES

The ECCS was designed to be accessible from a variety of locations. Centered on the Information Technology Center (Hongo Campus) and the Information Education Building (Komaba Campus), over 1,300 terminals have been set up in more than a dozen locations covering all three campuses. In addition, dozens of cable and wireless LAN access points provide ubiquitous Internet access for mobile computers.

A PROFUSION OF APPLICATIONS

In order to provide a rich educational environment using different computers, the ECCS supports two types of terminals: (1) Mac OS based computers with Windows which runs on virtual machine and (2) Windows based computers for CAD users. Each terminal has been equipped to meet academic requirements by supporting a whole range of application software, covering:

- programming languages (GCC, Java, Eclipse)
- statistical data analysis (SAS, JMP, Stata)
- formula manipulation (Mathematica)
- numerical computing (MATLAB)
- CAD (Autodesk Inventor, 3ds max)
- office applications (Microsoft Office)
- image editing (Photoshop Elements)
- UNIX software

MULTIPLE EDUCATIONAL ENVIRONMENTS

Different types of servers contribute to offer a wide range of educational environments:

- lecture material server
- user data hosting servers
- streaming servers
- UNIX servers



NEC's NV7400 file server



Computer room of the Information Education Building, Komaba Campus



Multiple operating systems on a same terminal



Mail system to support teaching and research activities

A HIGHLY SECURE AND RELIABLE SYSTEM

To avoid problems such as the corruption of hard disk contents, computer terminals are configured to boot directly from the server without relying on a hard disk. Moreover, the network does not allow data transmission from/to unauthorized devices, thus contributing to the system's security. The system's external connections are also protected by allowing only encrypted traffic. Mail system are shielded from viruses and spam mail by specialized servers.

AN INFRASTRUCTURE TO SUPPORT ACADEMIC ACTIVITIES

To support the university's academic activities, the Campuswide Computing and Communications Division has developed a learning management system called CFIVE. Another convenient improvement has been the conversion of English-language teaching materials into MP3 format, in order to make them available at any time through a streaming server. Two special rooms dedicated to digital video editing have been set up, one for the production of teaching materials and the other as an environment to learn editing techniques.

DISTANCE LEARNING AND TELECONFERENCE SYSTEM

Teleconference rooms allowing two-way audio and video transmission over the Internet are available at the Information Technology Center on the Hongo Campus, and at the Information Education Building on the Komaba Campus. Apart from broadcasting live lectures, this system makes it possible to hold joint discussions between the University of Tokyo and other

overseas institutions. In addition, the contents of a conference or lecture can be easily recorded and transmitted online through a streaming server, using Video On Demand (VOD) technology.

AN INFRASTRUCTURE TO SUPPORT ACADEMIC ACTIVITIES

The Information Technology Center supports teaching and research activities by providing fundamental infrastructures to the university's institutions, including web, mail, and name servers. The web hosting system serves more than 500 domains. Over 40,000 mail accounts are served on the mail system, which consists of two load balancers and 15 specialized servers to provide virtual domains, web-based email services, and to filter against viruses and spam.

SYSTEM PLANNING AND DEVELOPMENT

The Campuswide Computing and Communications Division Research Section is in charge of planning, developing, and solving structural problems of large-scale and dispersed systems such as the ECCS. The section also provides technical support to plan, develop and maintain smaller systems dedicated to educational and research purposes. Services that have been initiated after an experimental period include secure cable and wireless LAN access points for mobile computers, printing system and attendance management based on smart card, and CFIVE which is released under an open source license. Other experimental services are currently being developed, including authentication information sharing and databases dedicated to academic courses.



Editing room for teaching materials



Video teleconference



CFIVE : Learnig Management System



Databases for academic courses

Digital Library Division

http://www.dl.itc.u-tokyo.ac.jp/

Ubiquitous Access to Contents

The Digital Library Division strives to offer comprehensive network access to academic and scientific information for everyone, anywhere, and at any time. With monthly access figures reaching over 500,000 queries to OPAC and electronic journals, the division continues its effort to satisfy future user needs.

Enhanced User-Friendliness

The division is constantly taking steps to guarantee quick and easy access to information. The division does not only provide the databases, but also is constantly developing and improving the division's systems to ensure maximum integration and compatibility between available services, and to provide more useful services and easy access to the digital contents. The division's services are provided by using the latest advances in research related to statistical natural language processing, information retrieval, interactive help features, as well as text and web mining.

Major Databases

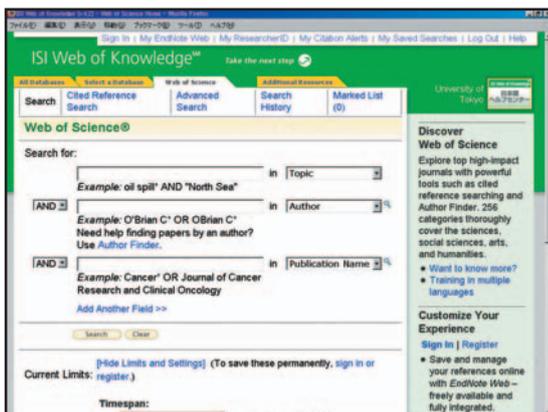
OPAC (Online Public Access Catalog)	Catalog of the University of Tokyo's library holdings, covering some 4,200,000 books and 110,000 journals.
UT Repository (Institutional Repository of the University of Tokyo)	Dissemination site for collecting, preserving, and disseminating the intellectual output of the University of Tokyo.
Web of Knowledge	Integrated search platform covering materials from 1970 to the present.
e-journal portal	Portal site for electronic journals, covering free online journals and online journals subscribed to by the University of Tokyo.
Electronic Journals	Electronic-format access to the full text and summaries of articles published in over 8,500 academic journals. (as of May 2008)



OPAC



e-journal portal



Web of Knowledge



Collection of links for the databases of electronic journals

Making the University's Academic and Scientific Information Available Online

The Digital Library Division actively supports projects aiming to publish academic and scientific information in electronic format. Together with the creation of new databases such as the University of Tokyo Doctorial Dissertation Database, and the UT Repository, the division also focuses on developing methods for database design and construction, while conducting research on new means to convert existing information into electronic format. In conjunction with other divisions, the division also supports the digitizing projects aiming to publish precious books in the University of Tokyo, such as the OGAI collection, and the *Katei Bunko*, in electronic format.



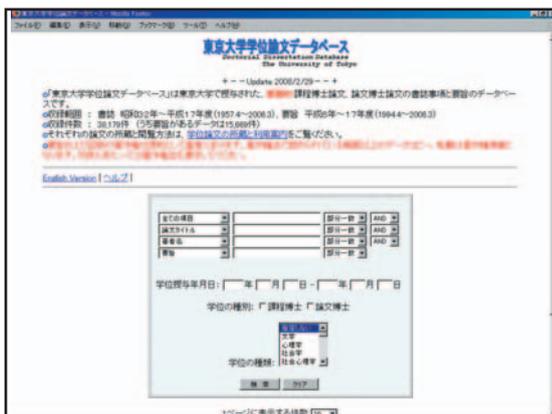
UT-Repository

Promoting Information Literacy

In parallel with its efforts to facilitate access to digital sources of information such as online databases and electronic journals, the Digital Library Division is also committed to the implementation of a complete user support program. Database training sessions, which can be adapted to fit particular needs, provide students with first-hand experience in techniques and methods to search for and locate reference materials. Information literacy is further promoted through publications such as the *Research on the Internet* booklet, available in several languages.



Database user training session



Doctorial dissertation database



Research on the Internet

Campus Networking Division

<http://www.nc.u-tokyo.ac.jp/>

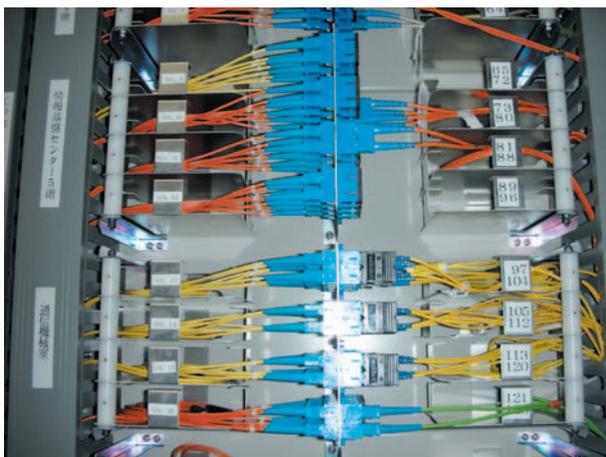
The Structure of UTnet

The University of Tokyo is composed of 10 faculties, 15 graduate schools, 11 research institutes, 18 university-wide centers. Their activities are spread over 6 campuses, including Hongo and Komaba, and over 50 satellite research facilities.

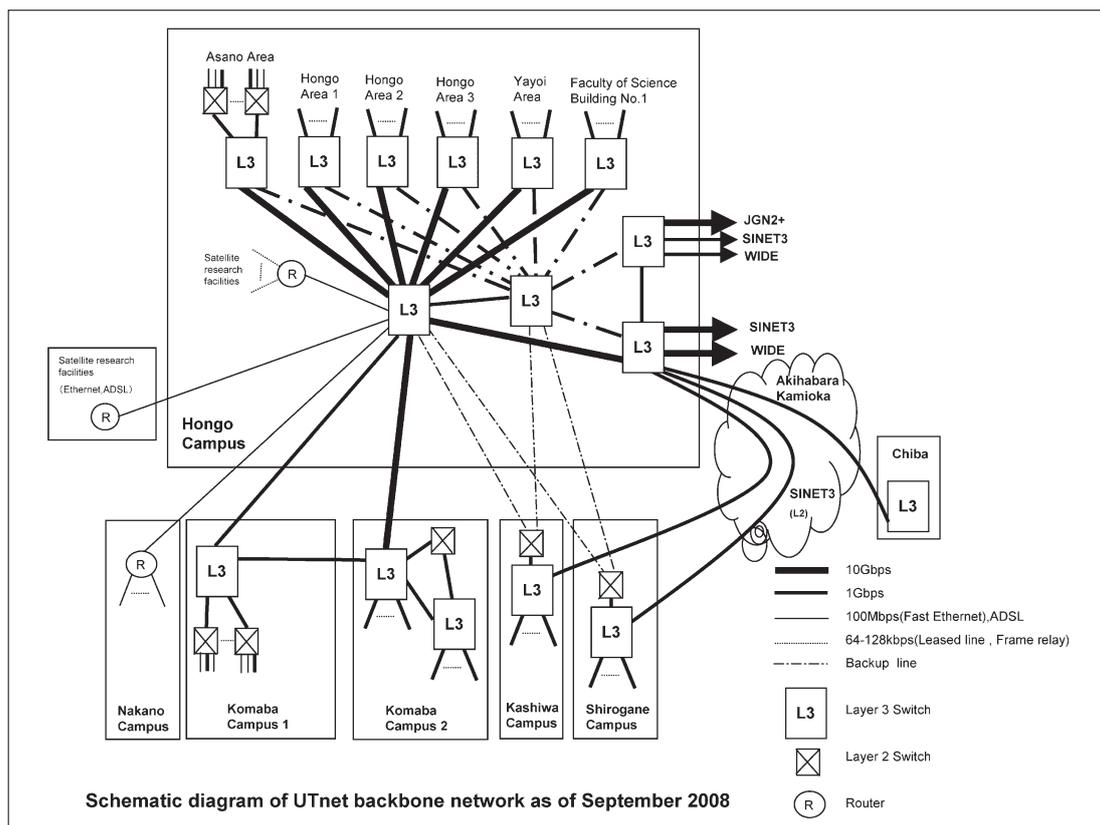
The University of Tokyo Information Network System, or UTnet, is in charge of uniting the university's large number of institutions. It enables a smooth flow of information and provides high-standard services to its users, whether they are academics, researchers or students.

The core portion of UTnet as it appears today was built in 2000, launched in 2001 and renewed from 2005 through 2008. Each campus houses a cable convergence facility, called a hub site, and from this central position optical fiber cables are laid in a star configuration to nearly every building on the campus.

On the Hongo Campus, which is too large to allow all the optical fiber cables to be concentrated in a single location, the cables are collected at five hub sites which are linked with each other. This optical fiber network serves both as a backbone and office network. It also answers the specific need for dedicated networks, while supporting the specific needs of research projects of dedicated network needs for specific research projects.

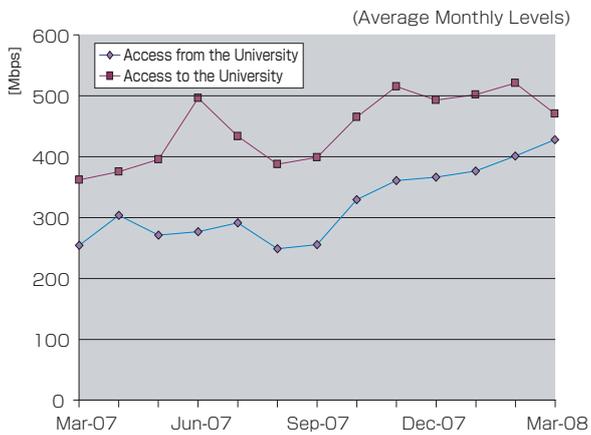


Inside the splicing box where the cables converge



UTnet3

The main network, UTnet3, was launched in 2001. The bandwidth for the backbone network is 10 Gbps, and each building has a connection of either 100Mbps or 1/10 Gbps. Virtual LAN (VLAN) services are also provided to academic departments in order to support projects involving multiple sites.



Network traffic from/to campus

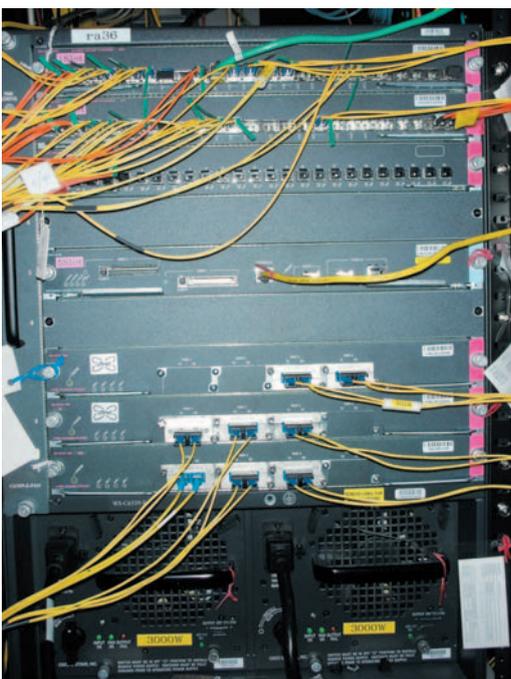
End User Services

The Campus Networking Division ensures that some software licenses are made available to all institutions within the university.

The division installed and operates wireless access networks in some conference rooms that are considered rather public.

Security Services

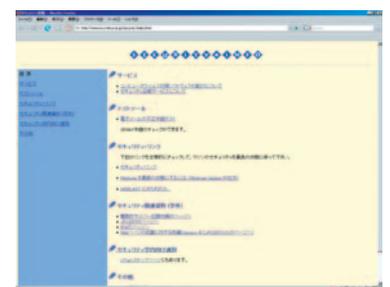
To confront frequent security problems, such as external attacks on the network or the presence of viruses on campus computers, the Campus Networking Division is in charge of monitoring unauthorized access attempts, filtering unnecessary packets, and eliminating infected email attachments. The division also provides technical support by conducting security checks on user terminals and servers, and by distributing antivirus software license throughout the campus.



Hub site equipment for UTnet3



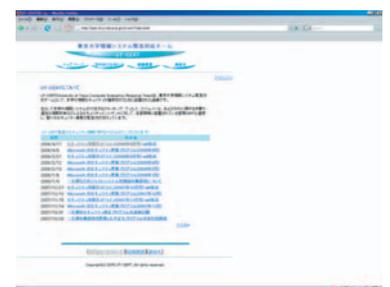
Security information news announced on the top web page on UTnet



Web page for security information



Web page for security software distribution



Web page for e-mail relay test

Security support information by Campus Networking Division

Supercomputing Division

<http://www.cc.u-tokyo.ac.jp/>

Supercomputer systems, open to researchers throughout Japan

The division provides high performance computers for research and innovative activity in universities, research organizations and other institutions throughout Japan, and also makes its systems available for the education of new generations of users. Two types of supercomputers, vector parallel and massively parallel computers, have been provided. Both of them are operated on UNIX-type OS (AIX and Linux). Services for users are very flexible and those covers both of personal users and users who belong to research groups.

Vector Parallel Supercomputer

The HITACHI SR11000 vector parallel supercomputer was installed in March 2005, and upgraded in March 2007. It consists of 128 nodes and brings its total peak processing power to 18.8 TFLOPS with 16 TB of memory. The bisection bandwidth is 24 GB/sec.

Massively Parallel Supercomputer (T2K Open Super Computer (Todai Combined Cluster))

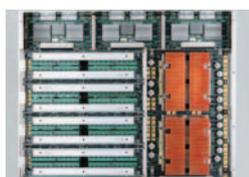
In June 2008, "T2K Open Super Computer (Todai Combined Cluster)" (T2K/Tokyo), which is a massively parallel supercomputer with 952 nodes of HITACHI HA8000-tc/RS425, started to operate. "T2K/Tokyo" consists of 3 clusters (each of which includes 512 nodes, 256 nodes, and 128 nodes, respectively) and 4 nodes for log-in. Total peak performance is 140TFLOPS, and total memory size is 32TB. Communication bandwidth between nodes is 10GB/s. for two directions. Services for large-scale computations using up to 512 nodes (8,192 cores, 75.4TFLOPS, 16TB) will be provided every month. The "T2K/Tokyo" system is based on specification design by the "T2K Open Supercomputer Alliance" by University of Tokyo, University of Tsukuba, and Kyoto University.



Vector parallel supercomputer HITACHI SR11000 model J2



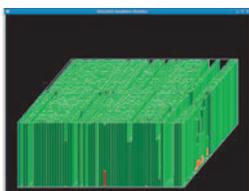
Massively Parallel Supercomputer
HITACHI HA8000 Cluster System



HITACHI SR11000 processor module



HA8000-tc/RS425 node (outside)



Screen shot indicating the performance of the HITACHI SR11000



HA8000-tc/RS425 node (inside)

System Upgrades

●Mainframes

1966~1973	HITAC 5020 (16KW)/5020E (65KW) + HITAC 5020 (32KW)
1973~1980	HITAC 8800×3 + HITAC 8700×1(8MB)
1980~1982	HITAC M-200H×8(64MB)
1982~1986	HITAC M-280H×6(192MB)
1986~1990	HITAC M-680H(128MB) + HITAC M-682H×2(384MB)
1991~1996	HITAC M-880/310 (MS:1GB, ES:4GB) + HITAC M-682H (256MB)
1996~2001	HITACHI MP5800/320 (MS + ES:10GB)

●Vector Supercomputers

1983~1987	HITAC S-810/20 (MS:256MB, ES:512MB) 730MFlops
1988~1993	HITAC S-820/80 (MS:512MB, ES:6GB) 2GFlops
1993~1999	HITAC S-3800/480 (MS:2GB, ES:16GB) 32GFlops

●Massively Parallel Supercomputers

1996~2001	HITACHI SR2201 (1024PE's, 256MB/node) 307.2GFlops, 256GB
2001~2007	HITACHI SR8000/MPP (144PE's, 8CPU/PE, 16GB/node) 2,073.6GFlops, 2,304GB
2008~	HITACHI HA 8000 Cluster System(952nodes, 16cores/node, 32or128GB/node), 140.1TFLOPS, 32TB

●Vector Parallel Supercomputers

1999~2005	HITACHI SR8000 (128nodes, 8CPU/node, 8GB/node) 1,024GFlops, 1,024GB
2005~2007	HITACHI SR11000 model J1 (44nodes, 16cores/node, 128GB/node) 5.3504TFlops, 5.632TB
2007~	HITACHI SR11000 model J2(128nodes, 16cores/node, 128GB/node)18.8TFlops, 16.384TB

Services Provided

The division provides both of the supercomputer resources and supporting services for programming by users. Recently, the division started new services for the industrial users, in which part of the computer resources and advanced scientific simulation codes developed by the university are provided. This activity is a part of "Advanced Large-scale Computational Simulation Services" in "Open Advanced Facilities Initiative for Innovation (Strategic Use by Industry)" of Ministry of Education, Culture, Sports, Science and Technology (MEXT) which supports innovative activities by industry communities. Available services and software on the supercomputers are as follows:

●Environment for High-Performance and Large-Scale Computing

FORTRAN/C/C++ compilers by HITACHI, various numerical libraries, such as MSL2 MATRIX/MPP, BLAS, LAPACK, and ScaLAPACK, and message passing library (MPI) are available on the supercomputers. All of these compilers and libraries are highly optimized for both of the supercomputers and can attain excellent performance in parallel codes for large-scale computations. Moreover, general commercial compilers developed by Intel and PGI are also available. Users of PC clusters can easily develop parallel codes on the supercomputers easily. The widely-used package of Gaussian03 for quantum chemistry is also available.

●Information Disclosure Service

For essential data that is to be released (from source programs, documents, the value of π in four billion digits, or the latest status of calculating π), access via FTP and HTTP is supported for publication to all users.

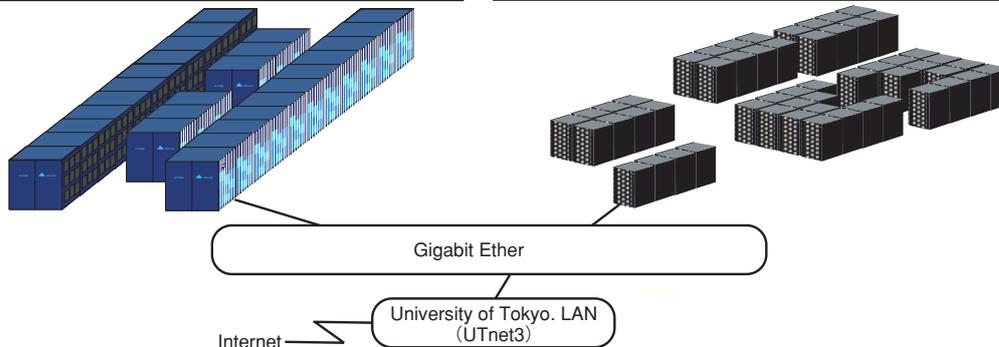
Supercomputer Systems

Vector Parallel Supercomputer

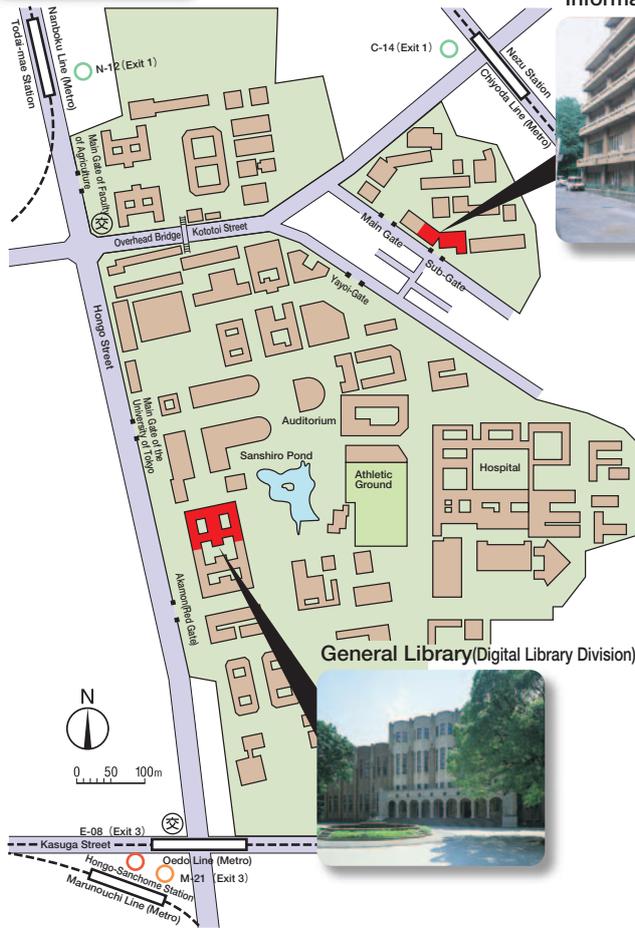
HITACHI SR11000 model J2	
Total peak performance	: 18.8 TFLOPS
Total number of nodes	: 128 (16 cores/node)
Peak performance per node	: 147.2 GFLOPS
Main memory per node	: 128 GB
Total memory	: 16.384 TB
Disk capacity	: 94.2 TB
Communication bandwidth between nodes	: 12.0GB/sec×2

Massively Parallel Supercomputer

HITACHI HA8000 Cluster System	
Total peak performance	: 140.1TFLOPS
Total number of nodes	: 952 (16 cores/node)
Peak performance per node	: 147.2 GFLOPS
Main memory per node	: 32 or 128 GB
Total memory	: 32.000 TB
Disk capacity	: 1.0 PB
Communication bandwidth between nodes	: 5.0GB/sec×2 (Type-A), 2.5GB/sec×2 (Type-B)



Hongo Campus



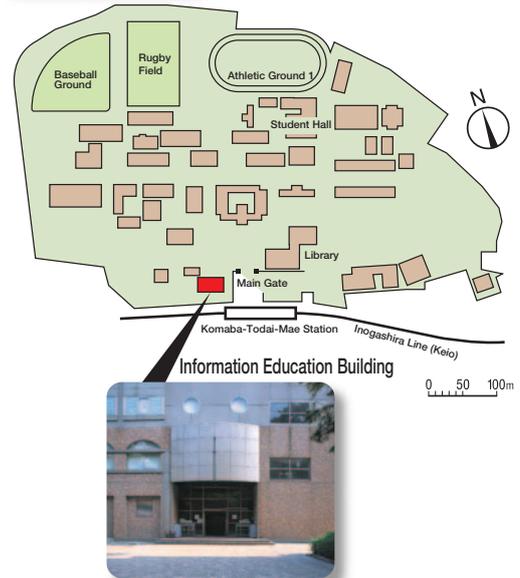
Information Technology Center



(Campuswide Computing and Communications Division
Campus Networking Division
Supercomputing Division)

Maps

Komaba Campus



Number of Personnel (Apr. 2008)

Director	1
Professors	4
Associate Professors	3
Lectures (Full-time)	2
Research Associates	9
Project Professor	1
Project Associate Professors	2
Project Research Associates	4
Project Researchers	2
Technical staff	26
Administrative staff	22

Revenue and Expenditure (2007 Fiscal Year)

(million yen)

Revenue	Regular Public Income	3,643
	Research Funds	191
	Service Charge	219
	Total	4,053
Expenditure	Personnel	564
	Maintenance	3,250
	Research	239
	Total	4,053

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