

2016 Joint Usage/Research Center for Interdisciplinary Large-scale Information Infrastructures  
Call for Proposal of Joint Research Projects

The Joint Usage/Research Center for Interdisciplinary Large-scale Information Infrastructures (JHPCN) has been in operation since April 2010, with certification from the Minister of Education, Culture, Sports, Science and Technology, as a “Network-Type” Joint Usage/Joint Research Center comprising eight super-computer equipped centers affiliated with Hokkaido University, Tohoku University, The University of Tokyo, Tokyo Institute of Technology, Nagoya University, Kyoto University, Osaka University and Kyushu University. The Information Technology Center at the University of Tokyo functions as the core institution of the Center. Since 2013, the JHPCN’s centers are responsible for the operation of those joint research resources named the HPCI-JHPCN system as parts the HPCI system provided by the High Performance Computer Infrastructure (HPCI). Applications for research projects that use the HPCI-JHPCN System are now invited via the HPCI online application system and will be selected in line with our reviewing policy (see Section 6, “Research Project Reviews”).

The Network-Type Research Center aims to contribute to the advancement and permanent development of the academic and research infrastructure of Japan by implementing academic joint-usage/joint-research centers for the following fields: Earth environment, energy, materials, genomic information, web data, academic information, time-series data from the sensor networks, video data, program analysis, and other fields in information technology. Using information infrastructures such as very large-scale computers as well as very large capacity storage and networks, the Center also aims to address challenging problems that are thus far considered extremely difficult to resolve or clarify. This Network-Type Research Center has enrolled leading researchers in the above-mentioned fields and anticipates the development of an innovative research theme through the collaboration among these researchers. These joint research projects (for the fiscal year 2016) will be implemented from April 2016 to March 2017.

## 1. Joint Research Fields

This call for joint research projects will adopt interdisciplinary research projects that use very large-scale numerical computation, very large-scale data processing, very large capacity network technology, and very large-scale information systems. Approximately 60\* research projects will be adopted.

\* Total number of research centers used for a research project.

### (1) Very large-scale numerical computation

This includes scientific and technological simulations in scientific/engineering fields such as Earth environment, energy, and materials, as well as modeling, numerical analysis algorithms, visualization techniques, information infrastructure, etc., to support these simulations.

### (2) Very large-scale data processing

This includes processing genomic information, web data (including from *Wikipedia*, as well as news sites and blogs), academic information contents, time-series data from the sensor networks, high-level multimedia information processing needed for streaming data for video footage, etc., program analysis, access and search, information extraction, statistical and semantic analysis, data-mining, etc.

### (3) Very large capacity network technology

This includes providing control and security of network quality for very large-scale data sharing. Monitoring and management are required for constructing and operating the very large-capacity network, providing assessment and maintenance of the safety of such networks as well as the development of

various technologies for the support of research.

(4) Very large-scale information systems

This combines each of the above-mentioned fields, entailing architecture of the exa-scale computer the creation of high-performance computing infrastructure software, managing grids, virtualization technology, cloud computing, etc.

Please pay special attention to the following points when applying.

- ① We will only be accepting interdisciplinary joint research proposals that will involve cooperation among researchers from a wide range of disciplines. For example, we presume that “very large-scale numerical computation” will be a cooperative complimentary research format between computer science and computational science. Therefore, we invite joint research projects among researchers solving problems in fields that use computers and those conducting research related to information science, such as on algorithms, modeling, and parallel processing.
- ② As long as the conditions in ① are met, we accept joint research projects that do not use our research resources such as the HPCI-JHPCN System and the other equipment/resources of our centers.
- ③ Research projects that use computer resources at multiple locations by taking advantage of the features of the Network-Type Center, or projects that will be worked on in conjunction with several researchers belonging to different research centers will be viewed favorably. For example, project structures for consideration may include the following: joint research projects that share computing resources between several researchers involved in widely distributed large-scale information systems; remote visualization and multi-platform implementation of applications; or cooperation between researchers at different research centers in different fields of research such as simulation and visualization.

## 2. Categories of Joint Research Projects:

Under the premise of the interdisciplinary joint research project structure mentioned above, joint research projects to be invited are as follows:

- (1) **General Joint Research Projects (approximately 80% of the total number of accepted projects will be in this category)**
- (2) **International Joint Research Projects (approximately 10% of the total number of accepted projects will be in this category)**

International joint research projects are conducted in conjunction with foreign researchers to address challenging problems that may not be resolved or clarified with only the help of researchers within Japan.

For such research projects, there will be a certain amount of subsidies paid to cover travel expenses incurred for holding meetings with foreign joint researchers during the fiscal year of commencement.

For details, please contact our office once your research project has been accepted.

- (3) **Industrial Joint Research Project (approximately 10% of the total number of accepted projects will be in this category)**

Industrial joint research projects are interdisciplinary projects focused on industrial applications.

We invite applications in each of these three categories for “research projects that use the HPCI-JHPCN System” and “research projects that do not use the HPCI-JHPCN System.”

If you require the assistance and cooperation of researchers and research groups that are affiliated with each of the research centers in the computer science field, please complete the corresponding sections of the application form describing the specific research target and items required for sharing. We will, whenever possible, arrange for assistance and cooperation through the Network-Type Research Center.

During the application, please designate the university (research center) with which you seek collaboration. You may also name several research centers. If this is difficult for you to designate, it is possible for us to decide corresponding research centers on your behalf after considering the research content, etc. Please be sure to discuss this with our contact person (listed on page 8) in advance.

### 3. Application Requirements:

Applications must be made by a Project Representative. Furthermore, the Project Representative and the Deputy Representative, as well as any other joint researchers, must fulfill the following conditions.

- ① The Project Representative must be affiliated with an institution in Japan (University/Public Authority, Private Enterprise, etc), and must be in a position to be able to obtain the approval of his/her institution (or representative head).
- ② At least one Deputy Representative must be a researcher in a different field from that of the Project Representative. There may be more than one Deputy Representative. For example, HPCI face-to-face identity vetting can be provided by another Deputy Representative.
- ③ If a student is going to participate in the project as a joint researcher, he/she must have graduated. If a non-resident member, defined by the Foreign Exchange and Foreign Trade Act, is going to use computers, a researcher affiliated with your desired joint research center must participate as a joint researcher.

International joint research projects must, in addition to the above-mentioned ①–③, fulfill the following conditions (④ and ⑤):

- ④ More than one researcher affiliated with a research institution outside Japan must be named as a Deputy Representative. Furthermore, an application must be made using the English Application Form.
- ⑤ A researcher affiliated with your desired joint research center must participate as a joint researcher.

Industry joint research projects must, in addition to the above-mentioned ①–③, fulfill the following conditions (⑥ and ⑦):

- ⑥ The Project Representative must be affiliated with a private company, excluding universities and public authorities.
- ⑦ More than one researcher affiliated with your desired joint research center must be named as a

Deputy Project Representative.

**4. Joint Research Period:**

April 1, 2016 to March 31, 2017.

Depending on possible issues while preparing computer user accounts, the commencement of computer use may be delayed.

**5. Facility Use Fees:**

Research resources listed on the Attachment 1 can be utilized free of charge within the approved amount of resources.

**6. Research Project Reviews:**

Reviews will be conducted by the Joint Research Project Screening Committee, which comprises faculty members affiliated with each research center as well as external members, and the HPCI Screening Committee, which comprises industry, academic, and government experts. Research project proposals will be reviewed in both a general and technical sense for their scientific and technological validity, their facility/equipment requirements and the feasibility of these requirements, and their potential for development.

In addition, the validity of resources at the desired center of joint research, along with the cooperation/collaboration proposed, will be subject to review. In addition, for each type of joint research project, there will be considerations as to how suited the form of the proposed project is to the objective of each category.

Furthermore, for projects continuing from the previous fiscal year and projects determined to have substantial continuity, an assessment of the previous year's interim report and previous usage of computer resources may be considered during the screening process.

**7. Notification of Adoption:**

We expect to notify the review results by mid-March 2016.

**8. Application Process:**

1. Please note that the following application procedures differ for "Research projects that use the HPCI-JHPCN System" and "Research projects that do not use the HPCI-JHPCN System" (described in the Attachment 1).

2. In particular, for "Research projects that use the HPCI-JHPCN System," the Project Representative, the Deputy Representative, and all joint researchers that will use the computer must have obtained their HPCI-ID prior to the application.

3. For international joint research projects, an English application form must be completed.

(1) Application Procedure:

After completing the application form obtained from the JHPCN website (<http://jhpcn-kyoten.itc.u-tokyo.ac.jp/>) and completing the online submission of the electronic application,

please print and press your seal onto the Research Project Proposal Application Form. Mail the completed applications to the Information Technology Center, The University of Tokyo (address provided at the end of this document). For details on the application process, please consult the JHPCN website and the “HPCI Quick Start Guide.”

The summary of the application process is shown below.

I: For “Research Projects that use the HPCI-JHPCN System”

- ① Download the Research Project Proposal Application Form (MS Word format) from the JHPCN website and complete it. While completing the Research Project Proposal Application Form, the Project Representative, the Deputy Representative, and all other joint researchers who will use the HPCI-JHPCN System must obtain their HPCI-IDs. If IDs have been obtained in the past, please continue to use them. For online entries to be made as per the requirements of step ②, it is necessary to register the HPCI-ID of the Project Representative, the Deputy Representative, and all other joint researchers who will use the HPCI-JHPCN System. Joint researchers who are not registered at this stage will not be issued with a computer user account (HPCI account, local account) and will not be able to use the computers.
  - ② Access the “Research Projects that use the HPCI-JHPCN System” on the Project Application page on the above-mentioned JHPCN website. You will be transferred to the HPCI Application Assistance System where after filling out the necessary items, you may upload a PDF file of the Research Project Proposal Application Form (without seal) created in ①.  
 ※For “Research Projects that use the HPCI-JHPCN System,” the project application system on the JHPCN website will not be used.
  - ③ Print and press your seal onto the Research Project Proposal Application Form created in ①, and mail it to the address provided at the end of this application guideline.
- ◆ If your project is adopted, please follow the outline concerning post-adoption procedures stipulated by the HPCI (<https://www.hpci-office.jp/user/taimen.html>). In particular, face-to-face identity vetting must be provided by an individual who is able to assume the responsibility of the entire project (the Project Representative or the Deputy Representative). The face-to-face representative must bring copies of photographic identification of all joint researchers who will use the computer (contact representatives such as secretaries are ineligible for a face-to-face identity vetting).

II: For “Research Projects that do not use the HPCI-JHPCN System”

- ① Download the Research Project Proposal Application Form (MS Word format) from the JHPCN website and complete it.
- ② Access the “Research Projects that do not use the HPCI-JHPCN System” on the project application page on the above-mentioned JHPCN website. After filling out the necessary items, you may upload a PDF file of the Research Project Proposal Application Form (without seal) created in ①. An e-mail “Notification of Receipt” will be sent to the e-mail address that you registered on the Research Project Application page.  
 ※ Applications for “Research Projects that do not use the HPCI-JHPCN System” do not require

the HPCI Application Assistance System. Therefore, it is not necessary to obtain the HPCI-ID.

- ③ Print and press your seal onto the Research Project Proposal Application Form created in ①, and mail it to the address provided at the end of this application guideline.

## (2) Application Deadline

### Online Registration

(submission of PDF application form): January 8, 2016 (Fri.) 17:00  
[Mandatory]

Submission of printed application form: January 15, 2016 (Fri.) 17:00  
[Mandatory]

The above deadlines must be followed for submission of the Research Project Proposal Application Forms. However, if submission of printed documents created in (1) I ③ and (1) II ③ above is delayed, please contact the JHPCN office (details on Page 8) in advance.

## (3) Points to remember when creating the Research Project Proposal Application Form

- ① Applicants must comply rules and regulations of the research center whose computer resources will be used in the joint research project.
- ② Research resources must be only used for the purpose of the adopted research project.
- ③ The proposal must be for a project with peaceful purposes.
- ④ The proposal should consider human rights and profit protection.
- ⑤ The proposal must comply with the Ministry of Education's "Approach to Bioethics and Safety".
- ⑥ The proposal must comply with the Ministry of Economy, Trade and Industry's "Concerning Security Trade Management."
- ⑦ Applicants must complete a course in research ethics education.

Programs on research ethics, including lectures, e-learning, and training workshops, are conducted at each of the affiliated organizations (including CITI Japan e-learning). If your affiliated organization does not provide any research ethics education, please contact our office. Researchers that are eligible to apply for the Japanese Grant-in-Aid for Scientific Research offered by the Ministry of Education, Culture, Sports, Science and Technology and the Japan Society for the Promotion of Science will be considered as eligible if they note their "Kakenhi" Researcher Code in the application form.

## 9. Other Important Notices:

### (1) Submission of a written oath:

Research groups whose research projects have been adopted will be expected to submit a written oath pledging adherence to the contents of the above-mentioned "8. Application Process" and "(3) Points to remember when creating the Research Project Proposal Application Form." The specific process of submission will be provided post-adoption, but a sample of it is provided on the website should applicants wish to familiarize themselves with the requirements of the oath.

### (2) Regulations for use of facilities:

While using the facilities, you are expected to follow the regulations for use pertaining to research

resources as stipulated by the research center where you will work.

(3) Types of reports:

The submission of research introduction posters, interim reports, and final reports are expected. Each report must be submitted by the designated deadline. Research introduction posters as well as the final report, in particular, will be expected to be suitable for disclosure (see the website for details). For International Joint Research Projects, these reports should be submitted in English in principle.

Furthermore, you will be asked to report the progress of the research (through oral presentation or poster presentation) at the JHPCN symposium (where the results of research projects from the previous year will be presented) that is expected to be held during the summer

(4) Disclaimer:

Each of the research sites assumes no responsibility at all for any inconveniences that affect applicants as a consequence of this call for joint research projects.

(5) Handling of intellectual property rights:

In principle, any intellectual property that arises as a result of this research project will belong to each of the research groups involved. However, it is presumed that any certification of invention conducted by the practitioners of this joint research will be in accordance with the host university's policy concerning intellectual property rights. Please contact each of the research sites for details and handling of other exceptional matters.

(6) Research ethics education:

If a participant in an accepted project (excluding students) cannot be confirmed to have completed a program pertaining to research ethics education or equivalent (for example, eligibility for the Japanese Grant-in-Aid for Scientific Research that is offered by the Ministry of Education, Culture, Sports, Science and Technology, or the Japan Society for the Promotion of Science), this individual's use of computers may be suspended until the completion of such a program can be confirmed.

(7) Other:

- ① Personal information provided by this proposal shall only be used for screening research projects and providing system access.
- ② After the adoption of a research project, the project name and the name/affiliation of the Project Representative will be disclosed
- ③ After the adoption of the research project, changes cannot be made to the research site or the computer that will be used.
- ④ If you wish to discuss your application, please contact us on the e-mail address provided below (please note in advance that we are not able to respond to telephone-based inquiries).

◆ Contact information (for queries about applications, etc.):

Joint Usage/Research Center for Interdisciplinary Large-scale Information Infrastructures Office  
E-mail address: [jhpcn@itc.u-tokyo.ac.jp](mailto:jhpcn@itc.u-tokyo.ac.jp)

For details pertaining to eligibility and the management of intellectual property at each research site, you may directly contact each center. You can access the websites of each research site by selecting "Research Centers" on our website: (<http://jhpcn-kyoten.itc.u-tokyo.ac.jp/>).

- ◆ Mailing address for the Research Project Proposal Application Form:  
 2-11-6 Yayoi, Bunkyo-ku, Tokyo 113-8658  
 Information Technology Center, The University of Tokyo  
 Joint Usage/Research Center for Interdisciplinary Large-scale Information Infrastructures Office  
 (You may use the abbreviations, “Information Technology Center Office,” or the “JHPCN Office”)

## Attachment 1

List of research resources available at each Research Center for the Joint Research Project(s)

※(1) and (2) represent the HPCI-JHPCN System.

## (1) List of computational resources available for Joint Research Project(s)

Name of Research Center	Computational Resource, Format of Use	Estimated number of Projects adopted
Information Initiative Center, Hokkaido University	① HITACHI SR16000/M1 (Max. 4 node years per 1 project) (168 nodes, 5,376 physical cores, Total main memory capacity 21 TB, 164.72 TFLOPS) (Shared with general user, MPI parallel processing of up to a maximum of 128 node per 1 job is possible) 1) Calculation time: 27,000,000 seconds: file 2.5 TB 2) Calculation time: 2,700,000 seconds: file 0.5 TB (Assumed amount of resources: 500,000,000 s and 53 TB when combining 1) and 2)) ② Cloud-System Blade Symphony BS2000 (Max. 4 (node) years per 1 project) (2 nodes, 80 cores) Equal to 4 units of L Server (May also use S Server and M Server), 1 unit of XL Server ③ Data Science Cloud System HITACHI HA8000 (Max. 1 per 1 project, 7 (node) years for 1), 2 (node) years for 2)) 1) Virtual Server (10 cores, Hard-Disk 800 GB, with 1 TB storage for each a, b, c below) 7 units 2) Physical Server (20 cores, Memory 80 GB, Hard-Disk 2 TB) 2 units Cloud-integrated Storage System a. Additional Storage for Virtual Server: Max. 18 TB b. gfarm Storage for Local Server: Max. 68 TB c. Amazon S3 compatible object storage: Max. 18 TB d. WebDAV Storage: Max. 22 TB	①+②:10  ③ 1):7 2):2 (Max. 9)
Cyberscience Center, Tohoku University	① Supercomputer System SX-ACE (2,560 nodes) (Max. 48 node years per 1 project) Theoretical Peak Performance 707TFLOPS, Main Memory Capacity 160 TB, Max. 1,024 nodes, shared use with general users ② Computing Server System (68 nodes) (Max. 12 node years per 1 project) Theoretical Peak Performance 31.3TFLOPS, Main Memory Capacity 8.5 TB, Max. 24 nodes, shared use with general users ③ Storage 4PB (Max. 20 TB per 1 project)	10

Information Technology Center, The University of Tokyo	<p>① Fujitsu PRIMEHPC FX10 (Max. resource allocation per 1 project: 60 (node) years) For each adopted project, 12 nodes to 60 nodes × 1 year equivalent of tokens will be provided. While the number of priority nodes can vary depending on the number of projects adopted, the maximum is 480 nodes.</p>	10
Global Scientific Information and Computing Center, Tokyo Institute of Technology	<p>① Cloudy Green Supercomputer "TSUBAME 2.5" and Successor Model provides 180 units of TSUBAME2.5 (= equivalent to 540,000 (node) h in Thin node). Max. 420 nodes (CPU 64.3TF + GPU 1.56PF) can be used simultaneously. Computational resources allocated by number of units. 1 unit = 3,000 node hours (0.34 node years). Please add the desired total number of units to the application form and clearly indicate the number of units desired for each quarter (shared with general users). Maximum amount of resource allocated per 1 project: 22 units (7.5 node years)  (Expected to provide resources through the Successor Model of TSUBAME 2.5 starting from December 2016)</p>	14
Information Technology Center, Nagoya University	<p>① Fujitsu PRIMEHPC FX100: approximately 3.2PF (2880 nodes) ② Fujitsu PRIMERGY CX400/25050: approximately 447TF (384 nodes) ③ Fujitsu PRIMERGY CX400/270: approximately 279TF (184 nodes+ 184 Xeon Phi) ④ SGI UV2000: about 24.5TF, 20TB Memory, 1280 cores Maximum amount of resources allocated per 1 project: 15 units : 86 node years. All resource provided for sharing with general users. 1 unit = 50,000 node hours (equivalent to 180,000 JPY of additional cost). When using a large-scale storage, conversion of 10TB: 5000 node hours used.</p>	<p>① + ② + ③ + ④: 10</p>
Academic Center for Computing and Media Studies, Kyoto University	<p>Cray XE6 (Camphor) ① (32 nodes, 1,024 cores, 10.24 TFLOPS : Max. 32 nodes × ½ year per 1 project) ② (128 nodes, 4,096 cores, 40.96 TFLOPS : Max. 256 nodes × weeks per 1 project) (① : First period: April to end of August, shared between all groups, ② : 2 weeks/group allocation) Cray XC30 (Magnolia: Xeon×2/node) ③ (32 nodes, 896 cores, 32.97 TFLOPS : Max. 16 nodes × ½ year per 1 project) ④ (128 nodes, 3,584 cores, 131.89 TFLOPS : Max. 256 nodes × weeks per 1 project) (③ : First period: April to end of August, shared between all groups, ④ : 2 weeks/group allocation) Cray XC30 (Camellia: Xeon + Xeon Phi/node) ⑤ (128 nodes, 1280+7680 cores, 154.99 TFLOPS : Max. 40 nodes × years per 1 project) (⑤ : All year (paused during September), shared between all groups Next period system (provisional name) (in procurement) (Architecture : x86 64) ⑥ (128 nodes, more than 7,680 cores, more than 384 TFLOPS : Max. 40 nodes × ½ year per 1 project) (⑥ : Second Term (October to end of March), shared between all groups.</p>	<p>①②⑥:5 ② ④⑥:5 ⑤ :4</p>
Cybermedia Center, Osaka University	<p>① Supercomputer SX-ACE (For 1 project: Max. 22 node years) Computational nodes: Max. 512 nodes (141 TFlops) available all year for shared use up to 280,000 node hours. Storage: 20 TB per 1 project ② PC cluster for large-scale visualization (For 1 project: Max. 6 node years) Computational nodes: Max. 62 nodes (more than CPU 24.08TFLOPS, GPU 59.67 TFLOPS) available all year for shared use or dedicated use for up to 53,000 node hours.</p>	<p>① ②: 5</p>

	Furthermore, dedicated use of the PC cluster for large-scale visualization is required to work with the high resolution display system. Storage : 20 TB per 1 project	
Research Institute for Information Technology, Kyushu University	Maximum resources allocated for 1 project: 128 node years (shared with general users) (965 nodes, 1,930 CPU 500.25TFlops + 210 Xeon Phi 212.28TFlops) (shared with general users) (Maximum number of simultaneously usable nodes for 1 project 128 nodes) (Maximum number of simultaneously usable nodes for 1 job: 128 nodes. Up to 16 nodes can be used for Xeon Phi installed nodes)	8

●Advanced Software Development Environment “RENKEI-VPE”: While joint research can be implemented individually through four of the research sites with HPCI advanced software development environments (no need to do so with multiple research sites), the account issuing/management work of the computational system will be conducted by the Tokyo Institute of Technology's Global Scientific Information and Computing Center.

Name of Research Center	Computational Resource, Format of Use	Estimated number of Projects adopted
Information Initiative Center, Hokkaido University	Physical nodes: 1 node (40 cores, Memory: 128 GB, Hard-Disk: 2TB) 40 VM per 1 physical node (however, shared use with HPCI) VM Standard Specification: 1 core, 3 GB memory	1
Information Technology Center, The University of Tokyo	Physical nodes: 1 node (12 cores, Memory: 48 GB, Hard-Disk: 20 TB) (shared) 12 VM per 1 physical node VM Standard Specification: 1 core, 4 GB memory (provided until end of October 2016)	3
Global Scientific Information and Computing Center, Tokyo Institute of Technology	Physical nodes: 2 nodes (more than 6 VM per 1 physical node), VM Standard Specification : 1 CPU, 3 GB memory (unit of use: 3 VM/year)	3
Research Institute for Information Technology, Kyushu University	Physical nodes: 2 nodes (More than 24 VM functional) VM Standard Specification : 1 CPU, 3 GB memory, 100 GB Disk (unit of use: 1 VM/year)	3

(2) Software available for joint research:

- Information Initiative Center, Hokkaido University  
HITACHI SR16000/M1  
[language compiler] optimized FORTRAN90 (Hitachi), XL Fortran(IBM), XL C/C++(IBM)  
[library] MPI-2 (without dynamic process creation function), MATRIX/MPP, MATRIX/MPP/SSS, MSL2, NAG SMP Library, ESSL, Parallel ESSL, BLAS, LAPACK, ScaLAPACK, ARPACK, FFTW2.1.5/3.2.2  
[application software]Gaussian09

## Cloud System Blade Symphony BS2000

application server

[language compiler]Intel Composer XE 2011

[application software]LS-DYNA, Gaussian09, Amber, COMSOL, AVS/Express, Open FOAM

project server

[OS]CentOS 5.5

[language compiler]Intel Composer XE 2011 (XL server only), gcc

[library]Hadoop (excluding XL server), OpenMPI, OpenMP3.0

[application software]Gaussian09 (XL server only)

## Advanced Software Development Environment Hosting Server “RENKEI-VPE”

[OS]CentOS 6.3

[application software]gfarm, gfarm2fs, kvm

User may install an optional compiler/library/application

- Cyberscience Center, Tohoku University
  - [language compiler]FORTRAN90/SX,C++/SX, Intel Cluster Studio XE(Fortran, C, C++)
  - [library]MPI/SX, ASL, ASLSTAT, MathKeisan, MKL, NumericFactory
  - [application software]Gaussian09
- Information Technology Center, The University of Tokyo
  - Fujitsu PRIMEHPC FX10
  - [language compiler]FORTRAN90, C, C++
  - [library]MPI, BLAS, LAPACK/ScaLAPACK, FFTW, PETSc, METIS/ParMETIS, SuperLU/SuperLU\_DIST
  - [application software]OpenFOAM, ABINIT-MP, PHASE, FrontFlow/Blue, FrontFlow/Red, REVOCAP

## Advanced Software Development Environment Hosting Server “RENKEI-VPE”

[OS]CentOS 6.x, CentOS 5.x (scheduled), Scientific Linux 5.x, 6.x (scheduled)

User may install an optional compiler/library/application

- Global Scientific Information and Computing Center, Tokyo Institute of Technology
  - Cloudy green supercomputer “TSUBAME 2.5”
  - [language compiler]Intel C/C++ Fortran, PGI C/C++ Fortran compatible for accelerator, GNU C, GNU Fortran, CUDA for C, CUDA for Fortran, HMPP
  - [library]OpenMP, MPI(OpenMPI, MPICH2, MVAPICH2), BLAS, LAPACK, CULA
  - [application software]Gaussian 09, AMBER (limited to academic uses)
  - CST MW-STUDIO (limited to industrial uses)

## Advanced Software Development Environment Hosting Server “RENKEI-VPE”

[OS]CentOS 5, 6, 7 (scheduled)

User may install an optional compiler/library/application

- Information Technology Center, Nagoya University
  - Fujitsu PRIMEHPC FX100
  - [language compiler]Fortran, C, C++, XPFortran
  - [library]MPI, BLAS, LAPACK, ScaLAPACK, SSLII, NUMPAC, FFTW, HDF5
  - [application software]Gaussian, LS-DYNA, HPC portal
  
- Fujitsu PRIMERGY CX400
  - [language compiler]Fujitsu Fortran C C++ XPFortran, Intel Fortran C C++
  - [library]MPI(Fujitsu, Intel), BLAS, LAPACK, ScaLAPACK, SSLII(Fujitsu),  
MKL(Intel), NUMPAC, FFTW, HDF5
  - [application software]ABAQUS, ADF, AMBER, GAMESS, Gaussian, Gromacs, HyperWorks,  
LAMMPS, LS-DYNA, NAMD, OpenFOAM, Poynting,  
STAR-CCM+, AVS/ExpressDev/PCE, EnSightGold, IDL, ENVI, ParaView,  
HPC portal
  
- SGI UV2000
  - [language compiler]Intel Fortran C C++
  - [library]MPT(SGI),MKL(Intel), FFTW, HDF5, NETCDF
  - [application software] AVS/ExpressDev, EnSightDR, IDL,  
ENVI(SARscape), ParaView, POV-Ray, NICE DCV, JINDAJI, 3DAVS Player
  
- Academic Center for Computing and Media Studies, Kyoto University
  - [language compiler]Fortran90/C/C++ (Cray, Intel, PGI)
  - [library]MPI, BLAS, LAPACK, ScaLAPACK, IMSL, NAG(XE6)
  - [application software]Gaussian09(XE6)
  
- Cybermedia Center, Osaka University
  - [language compiler]FORTRAN90/SX, C++/SX, Intel(R) Fortran Compiler,  
Intel(R) C Compiler
  - [library]ASL-SX, MPI/SX, MathKeisan
  - [application software]Nastran, Marc, AVS, IDL, etc.
  
- Research Institute for Information Technology, Kyushu University
  - HITACHI HA8000-tc/HT210
  - [language compiler]Intel Cluster Studio XE(Fortran, C, C++), Hitachi Optimized Fortran

[library]BLAS, LAPACK, ScaLAPACK, MKL, FFTW, HDF5, NetCDF  
 [application software]Gaussian09, AMBER, Ensight, WRF, GAMESS, GROMACS, etc.

Advanced Software Development Environment Hosting Server “RENKEI-VPE”

[OS]CentOS 6.2 (scheduled)

[application software]gfarm, gfarms2fs, kvm,

User may install an optional compiler/library/application

(3) Other equipment/resources available for joint research:

- Information Initiative Center, Hokkaido University
  - User terminal
  - 3-dimensional visualization equipment (AVS/ExpressViz, EnSight, FieldView)
  
- Cyberscience Center, Tohoku University
  - Large-format color printer
  - Three-dimensional visualization equipment (12-screen flat stereo visualization system (1920×1080 (Full-HD) 50-inch projection module × 12 screens), visualization server × 4. 3-dimensional visualization software (AVS/Express MPE), liquid crystal shutter glasses)
  
- Global Scientific Information and Computing Center, Tokyo Institute of Technology
  - Remote GUI environment : VDI (Virtual Desktop Infrastructure) system
  
- Information Technology Center, Nagoya University
  - Visualization system  
 High-definition 8K display system (185-inch digital display 16 screens), Full HD circularly polarized light spectroscopic system (150-inch screen, projector, circularly polarized glasses, etc.), remote visualization system, head-mounted display system (mixed reality, VICON, etc.), dome-type display system, on-site use system (for data transfer)
  
- Cybermedia Center, Osaka University
  - High-definition display system: 24-screen flat stereo visualization system  
 Suita Main Building, Cybermedia Center, Osaka University  
 1920 × 1080(Full-HD): 50-inch projection module × 24 screens  
 Image-processing PC: 7 units (AVS Express/MPE VR, IDL, ParaView)  
 (Note) This is prioritized for users conducting visualization using PC clusters for large-scale visualization.
  - High-definition display system: 15-screen cylindrical stereo visualization system  
 Umekita Center, Cybermedia Center, Osaka University  
 1366x768 (WXGA) 46-inch LCD × 15 screens  
 Image-processing PC: 5 units (AVS Express/MPE VR, IDL, ParaView)  
 (Note) This is prioritized for users conducting visualization using PC clusters for large-scale visualization.