Joint Usage/Research Center
for Interdisciplinary Large-scale Information Infrastructures

Network of 8 centers

Interdisciplinary research to explore infinite ∞ possibilities

Challenge to new research

JHPCN: Japan High Performance Computing and Networking
plus Large-scale Data Analyzing and Information Systems

https://jhpcn-kyoten.itc.u-tokyo.ac.jp

2020–2021

Network of 8 centers

Contributing to nationwide academic research

An Introduction to the network-type Joint Usage/Research Center for Interdisciplinary Large-scale Information Infrastructures
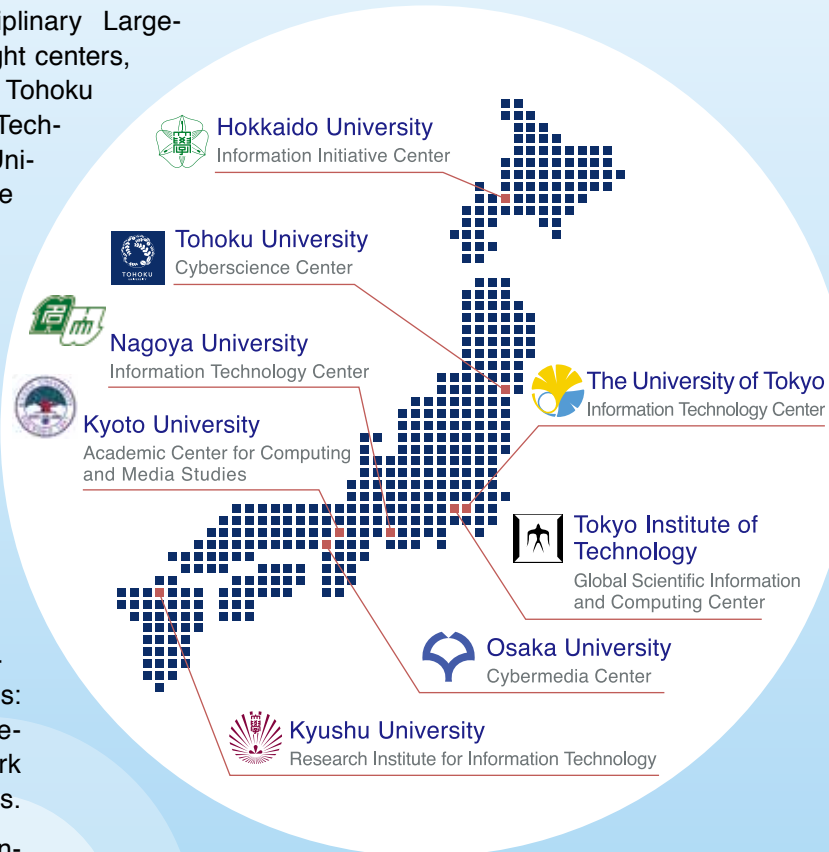
The Joint Usage/Research Center for Interdisciplinary Large-scale Information Infrastructures is made up of the eight centers, equipped with supercomputers, of Hokkaido University, Tohoku University, the University of Tokyo, Tokyo Institute of Technology, Nagoya University, Kyoto University, Osaka University, and Kyushu University. This is a network-type joint usage and research center, and its core institution is the Information Technology Center of the University of Tokyo. After it was got certified by the Japanese Ministry of Education, Culture, Sports, Science & Technology (MEXT) in April 2010, the Center has been leading interdisciplinary research on and with large-scale information infrastructures in Japan.

The formal title of this program is "Joint Usage/Research Center for Interdisciplinary Large-scale Information Infrastructures," but it is also known as "Japan High Performance Computing and Networking plus Large-scale Data Analyzing and Information Systems (JHPCN)." This alternative name indicates that research here is carried out in four areas: very large-scale numerical computation, very large-scale data processing, very large capacity network technology, and very large-scale information systems.

The objective of the program is to promote the continuous progress of academic research and to lay the groundwork for interdisciplinary collaborative research in Japan. The program strives to tackle highly challenging problems, previously thought extremely difficult to solve, by using information infrastructures such as very large-scale numerical computation, very large-scale data processing, and very large capacity network technology. Areas of the program include but not limited to global environmental science, energy science and technology, material science and technology, life science, astronomy and space science, informatics, and economics. In FY2020, 86 research projects, including 34 exploratory ones, are accepted. (As of May 2020)

Network-type Center structure offers close collaboration opportunities and synergistic advantages

The research topics dealt with at each center are shared with other centers in the network that can offer their research potential to help solve problems. This means that highly complex problems being considered at one center can be solved more effectively through collaborative research with other centers.

This kind of synergistic advantage can contribute to the more efficient joint use of each center's facilities, and result in more effective collaborative research, through the flexible integration of the facilities available across the network.

From 2013 onwards, the JHPCN's centers, as part of the High Performance Computing Infrastructure (HPCI), are responsible for the operation of those joint research resources named the HPCI-JHPCN system. Through collaboration with the wider research community, the program will promote interdisciplinary joint research. In addition, from 2016, JHPCN accepts three new kinds of joint research projects that are international, industrial, and exploratory joint research projects, to promote a wider range of joint research activities.

Hokkaido University
Information Initiative Center

Tohoku University
Cyberscience Center

Nagoya University
Information Technology Center

Kyoto University
Academic Center for Computing and Media Studies

The University of Tokyo
Information Technology Center

Tokyo Institute of Technology
Global Scientific Information and Computing Center

Osaka University
Cybermedia Center

Kyushu University
Research Institute for Information Technology

Interdisciplinary research to explore infinite ∞ possibilities

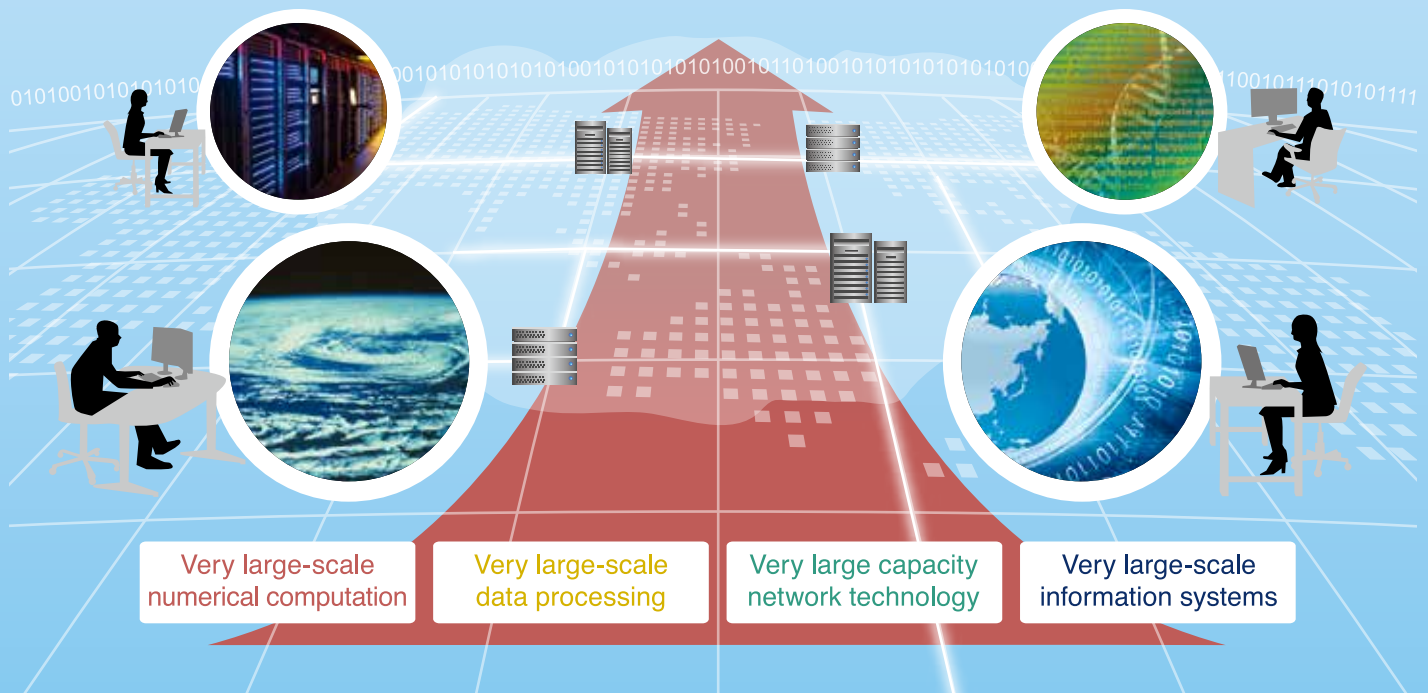## Toward grand challenges in science and engineering

JHPCN

The target research areas of this network-type Center are: very large-scale numerical computation, very large-scale data processing, very large capacity network technology that allows very large volume data sharing, as well as very large-scale information systems that integrate the aforementioned three areas. The Center facilitates and supports interdisciplinary research on problems in computational science and engineering, conducted based on the fundamental knowledge of computer science and applied mathematics.

Computational Science Engineering

Support

Support

Applied Mathematics

Computer Science

Collaboration・Cooperation
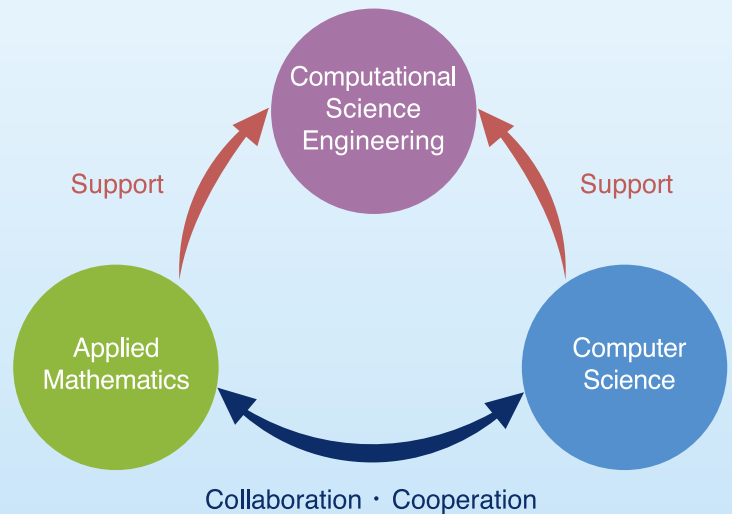
Toward grand challenges in science and engineering

Our eight centers all have huge computing infrastructures which are rare in terms of their scale. These are available for joint usage and collaborative research by multiple researchers working in the aforementioned four areas. The research activities carried out at this network-type Center therefore account for the majority of highly challenging research projects in these areas in Japan.

Toward grand challenges in science and engineering

| Very large-scale numerical computation | Very large-scale data processing | Very large capacity network technology | Very large-scale information systems |

Our knowledge and technology in very large-scale numerical computation, very large-scale data processing, very large capacity network technology, and very large-scale information systems are of key importance for the facilitation of significant progress in science and technology. This means they also play a critical role in sustaining economic prosperity in Japan.

Challenge to new research

Research collaboration among the eight centers

Research on the center's four specialist areas of very large-scale numerical computation, very large-scale data processing, very large capacity network technology, and very large-scale information systems can be carried out more effectively by taking advantage of the infrastructures at all eight centers and collaborating on each center's research topics too. Furthermore, considering the impressive scale of the combination of the eight centers' supercomputer resources and the collaboration among their researchers, the program is expected to contribute significantly to the advancement of academic research nationwide.

Information Initiative Center
Hokkaido University
https://www.iic.hokudai.ac.jp/En/

High performance computing, Numerical linear algebra, Large-scale application, Program development technology, Intercloud

Information Technology Center
Nagoya University
http://www.icts.nagoya-u.ac.jp/en/center/

Auto-tuning, Middleware for high performance numerical computing, Numerical simulation for large-scale data and its visualization

Cyberscience Center
Tohoku University
https://www.cc.tohoku.ac.jp/map_en.html

Performance optimization (Vector/parallel programming), High-performance computer architecture, System software technology for high-performance computing, Advanced simulation technology

Academic Center for Computing and Media Studies
Kyoto University
http://www.media.kyoto-u.ac.jp/accms_web/en/

High-performance computational programming, Architecture and foundational software for supercomputers, Academic content and archive creation technology, Network architecture technology for regional universities

Information Technology Center
The University of Tokyo
https://www.itc.u-tokyo.ac.jp/en/

Large-scale system management technology, Statistical machine learning, Information retrieval via Web, Advanced networking technology, Parallel numerical simulation, Performance tuning

Cybermedia Center
Osaka University
https://www.cmc.osaka-u.ac.jp/

Optimization of vector and scalar hybrid computing, Management technology for vector and scalar hybrid computers, Large-scale data visualization technology, Inter-cloud technology, Advanced structure-preserving numerical methods, Machine learning

Global Scientific Information and Computing Center
Tokyo Institute of Technology
https://www.gsic.titech.ac.jp/en

GPU computing and large-scale HPC applications, Design and management of new-generation supercomputer, Big data and data science, Artificial intelligence (AI), Deep learning

Research Institute for Information Technology
Kyushu University
http://ri2t.kyushu-u.ac.jp/en/index-e.html

Large-scale simulation, Massively parallel algorithms, Foundational software development, Analysis and visualization of large-scale dataset in distributed parallel environment, Industry-Promoting Applications

We have also established a human network, comprising a working group of staff from the eight centers, in order to drive forward program activities.

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