gleaned from S&T. Therefore, MEXT conducts activities to strengthen an S&T platform ("R&D of Analysis Platform Software for Web society" is one example) that will enable the efficient use of large-scale data. Furthermore, in order to create an environment that is feasible for efficiently using both large quantities and a wide variety of data through innovative and scientific techniques, MEXT held the "Investigative Commission Regarding the Academic Cloud Community" on April 2012, and made a proposal on July 2012 that summarized "Academia's challenge on the big-data age." This proposal lists R&D on the progression of data science, the research on a system towards construction of an academic cloud and the establishment of a model that uses big data as R&D subjects that MEXT should promote. MEXT also conducts the establishment of an Innovative, High-performance Computing Infrastructure (HPCI) in order to respond to the requirements of the progress that has been made in precise scientific analysis, understanding and prediction, and by practically using the information gleaned from S&T (refer to 4 (1) in Part 1 Chapter 2 Section 1). Furthermore, since FY 2012, MEXT has conducted a symposium on the "Architecture of an IT-Integrated System for Optimizing Social-System Services," a highly cooperative, integrated, problem-solving based IT consolidated system that collects society's real information, determines optimum solutions and possible directions for solving problems, and then provides society with feedback. In regard to strengthening disaster-resistance and increasing the processing capacity and super-low energy consumption of IT systems, MEXT promotes the "development of new technology in strengthening information infrastructure that supports creating innovation."

(Creation of innovation by taking advantage of mathematics and the mathematical sciences)

As one of the activities for establishing a framework with which various problems in the areas of science and industry can be solved and with which new values (mathematical innovation) can be created by practically using mathematics and mathematical scientific knowledge, MEXT has started the "Research Promotion Program for creating innovation in collaboration with mathematics, the mathematical sciences, and other sciences and industry" since FY 2012. This program chooses subjects that can be mathematically solved when important themes are considered, such as big data and the use of mathematics for optimization and controls. MEXT also promotes a partnership between mathematical scientists and other science researchers by holding workshops and other relevant events to work toward specific solutions.

(2) Upgrading and networking of common and basic facilities and equipment

Facilities and equipment for research are two platforms that are necessary for the promotion of S&T, and it is essential to support all S&T activities through basic research and the creation of innovation. Therefore, it is important to plan for the enhancement and effective use of these facilities and equipment; thus, in the "R&D Enhancement Act[1]," it is stipulated that the government shall take necessary measures to promote the sharing of research facilities and the sharing of equipment owned by Universities and Independent Administrative Institutes.

Therefore, in addition to promoting the effective and practical use of common and base facilities and equipment used in a wide range of S&T throughout the various research institutions of industry,

1 "Act of Strengthening R&D Capability and the Efficient Promotion of R&D by the Promotion of R&D System Reform" (2008, Law number 63)

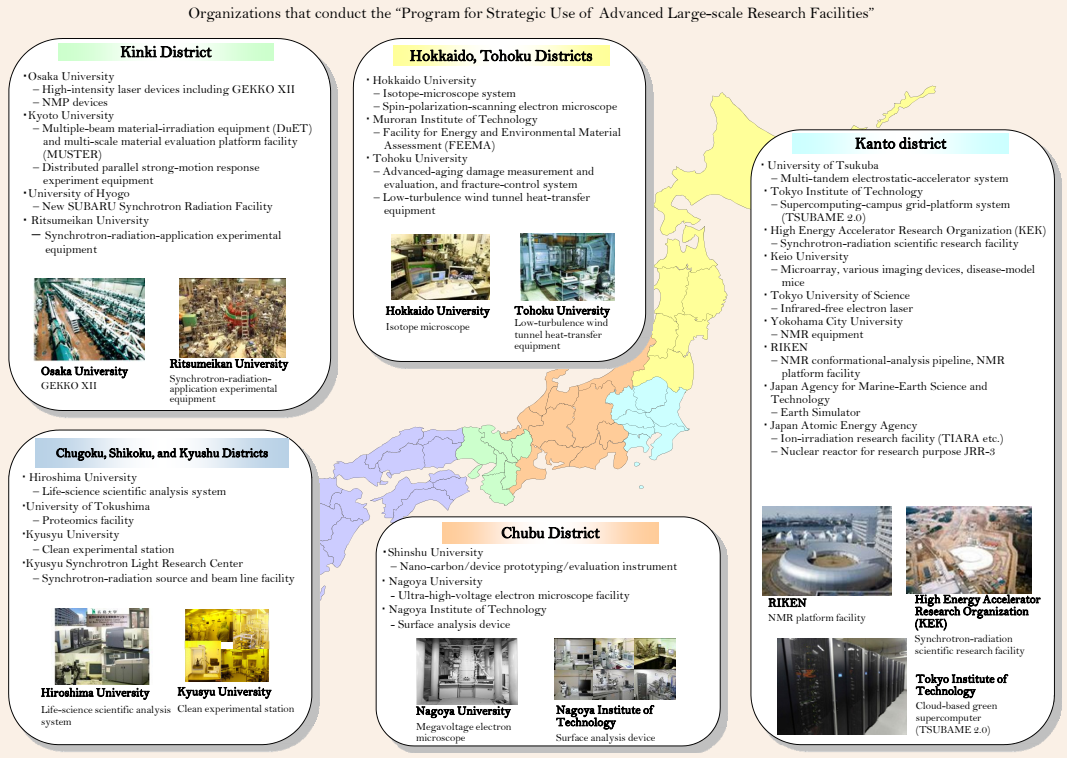
academia and government, the government also makes efforts to promote networking between these facilities, and promotes the sharing of equipment and aims to improve the usability, mutual complementarities, and the ability to respond in the case of an emergency.

MEXT promotes sharing among researchers from industry, academia and government through large, specified, leading-edge research facilities and through subsidized support that is necessary for such sharing as pursuant to the "Act on the Promotion of Shared Use of Specified, Large-Scale, High-Technology Research Facilities[1]" (1994 Law No. 78) (referred to as hereinafter "Sharing Act"). (This will be discussed later in this paper.)

Regarding the cutting-edge R&D facilities and equipment owned by universities and other independent administrative institutions that conform to Specified Large-Scale High Technology Research Facilities, "The Program for the Strategic Use of Advanced Large-scale Research Facilities" was performed, and twenty eight facilities were supported in FY 2012 (Figure 2-3-8). Furthermore, in order to promote the sharing of these facilities and to lead to further achievements, "Sharing NAVI" (a composite navigation site for sharing research facilities) was established as a comprehensive portal website for basic information about the facilities and equipment, including facility location, usage application, available times etc. Also, MEXT has established a nationwide, shared system that offers opportunities in using cutting-edge equipment and advanced technical support for the users of industry, academia and government through the "Nanotechnology Platform" by collaborating closely with other independent institutions that own cutting-edge research facilities and equipment as well as the know-how necessary for using them. Furthermore, having the supercomputer known as "the K computer" as its core, MEXT promotes the establishment of an Innovative, High-performance Computing Infrastructure (HPCI) that realizes a computing environment that supports the various needs of users by networking the major supercomputers installed at universities and research institutes across the nation. MEXT has also conducted an "HPCI Strategic Program" to enhance R&D in strategically important areas, and has operated Japan's computing S&T system.

1 The Sharing Act defines the specified synchrotron radiation facility (Super Photon ring-8 GeV (SPring-8),the X-ray free electron laser facility (SACLA), the specified high-speed commuter facility (supercomputer "K computer"), and the specified neutron facility (Japan Proton Accelerator Research Complex (J-PARC)).

Figure 2-3-8/ Organizations that conduct the "Program for the Strategic Use of Advanced Large-scale Research Facilities"



Source: Created by MEXT

With the progression of globalization and the increased mobility of talented personnel due to strong international competition for excellent minds, it is important to increase the number of opportunities available to Japanese researchers who have studied abroad, so they can actively contribute upon their return to Japan. It is also necessary to realize an international "brain circulation" that allows excellent foreign researchers to actively work in Japan.

Therefore, MEXT conducted an "Advanced research infrastructure project" in order to attract domestic and overseas researchers who are early in their careers and to enhance research facilities that can create cutting-edge research results. MEXT supported 10 such projects in FY 2012.

(Specified, large-scale, high technology research facilities)

Particularly important large-scale research facility is defined as a "Specified, Large-Scale, High-Technology Research Facility," pursuant to the Sharing Act, in which planned enhancement and fair and impartial sharing are stipulated, in order to promote innovation in Japan's S&T and to practically use investment for R&D in an effective and efficient manner.

○ Super Photon ring-8 GeV (SPring-8)

The Super Photon ring-8 GeV (SPring-8) is the world's best performance research platform facility; it enables scientists to analyze the structure and function of substances at the atomic and molecular levels by using "synchrotron radiation," which is an extremely bright light that is generated when the light

beam, which contains electrons that are travelling close to the speed of light, is bent. The facility started its service in 1997, and has contributed to innovative R&D in the areas of life innovation and green innovation, both of which contribute to Japan's economic growth.

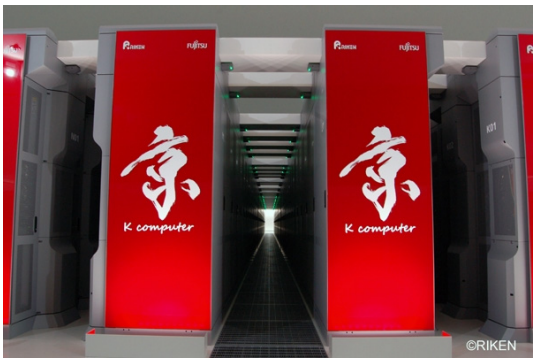
○ X-ray free electron laser facility (SACLA)

The X-ray free, electron-laser facility (SACLA) is a world-leading research platform facility that conducts analysis that was impossible with previous methods; it does so by oscillating an ultimate light beam that has both laser and synchrotron radiation characteristics. The facility started being shared from March 2012. In FY 2012, the facility started a "research subject focused on the strategy of an X-ray free electron laser," which is a commissioned business that is aimed at leading the innovative creation of achievements though the development of medicines and fuel cells, and through the understanding of photosynthetic mechanisms. In FY 2012, the facility started a "research subject focused on the strategy of an X-ray free electron laser," which is a commissioned business that is aimed at leading the innovative creation of achievements that lead to the development of medicines and fuel cells, and to the understanding of photosynthetic mechanisms through the instantaneous measurement and analysis of the hyperfine structure at an atomic level, the super-high-speed movement of the chemical reaction and the change that occurs.

Super Photon ring-8 GeV (SPring-8) and the X-ray free electron-laser facility (SACLA) (The long shaped building on the left is SACLA. The round building on the right is Spring-8.)
Courtesy of RIKEN

○ Supercomputer "K computer"

In addition to theory and experimentation, simulation with a supercomputer is indispensable as a third method of modern science and technology. The supercomputer known as the "K computer" was completed as a system in June 2012, and started being shared from September of that year. By using the "K computer," the creation of breakthrough achievements that lead the world in various areas are expected; these include advancing processes for developing new drugs, the development of the next generation's energy-saving semiconductors, innovative manufacturing, the mitigation of damages caused by earthquakes or tsunamis and the discovery of the origins of the universe and the origin of matter.



Supercomputer: "K computer"
Courtesy of RIKEN