

Developing and building the supercomputer

The Next-Generation Supercomputer will be a general-purpose computer system with the highest performance in the world. RIKEN is the core organization for the development of this world-leading supercomputer.

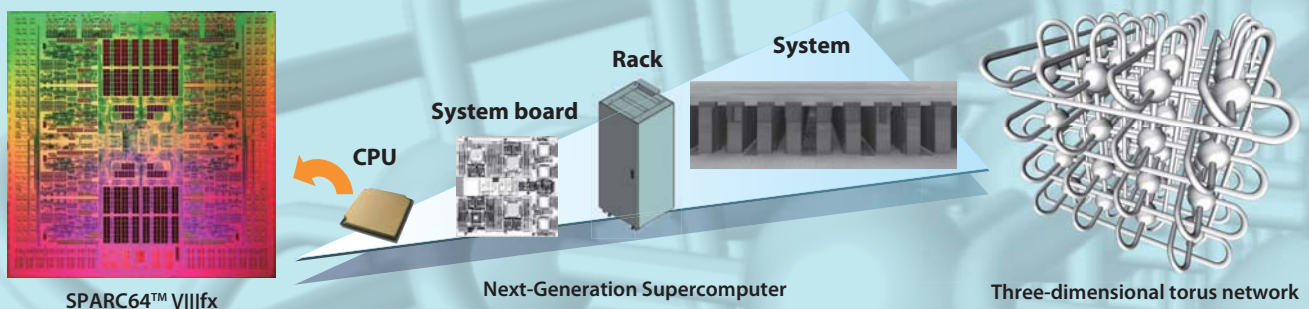
The world's most advanced scalar-type¹ supercomputer system

[System architecture and features]

- The system will use scalar CPUs (SPARC64™ VIIIfx, 8 cores, 128 gigaflops) manufactured with 45nm process technology. To achieve high performance and high scalability to ultra-large-scale system, the CPU will additionally support SIMD (Single Instruction Multiple Data) processing, and will be furnished with functions for instruction retry as well as conventional error detection/correction, contributing to high performance and reliability in application execution in an environment with huge numbers of CPUs.
- The network between the computing nodes will consist of a direct-connection network², ensuring high flexibility and scalability and enabling ultra-large-scale connectivity. Users can create application programs adapted to either a one-, two- or three-dimensional torus network, contributing to improvements in convenience, fault-tolerance and interoperability.
- With its water cooling system, the supercomputer will maintain a low temperature in the CPU and other LSIs, minimizing the failure rate and reducing power consumption.
- An ultra-large-scale file system with high functionality, scalable to several hundred petabytes, will provide several dozen petabytes for user areas.
- The system will have an interface for the NAREGI (National Research Grid Initiative) middleware, one example of external uses of the system through the Science Information NETWORK (SINET).

¹ A scalar-type supercomputer is a set of computing nodes with scalar CPUs connected by a network. CPUs operate on data in small chunks in sequential order. Scalar-type supercomputers are today a common style of supercomputer system used throughout the world. These supercomputers are well-suited to computations involving complex data access, such as those involved in structural analyses of nano-scale devices as well as analyses of gene and protein data.

² There are two styles of networks, direct-connection networks and indirect-connection networks. In a direct-connection network, the entire network consists of numerous connections between pairs of nodes. In an indirect-connection network, a switch sits between multiple nodes. A three-dimensional torus network is a kind of direct-connection network where the nodes are organized into a three-dimensional structure, and each is linked to six others, forming a ring structure on each dimension.



[System software]

System software, which manages hardware and application software, is indispensable in making full use of hardware capability.

The Next-Generation Supercomputer harnesses the following system software in order to offer users a high-performance computing environment:

- The adoption of Linux Operating System (OS) providing high portability
- A rich programming language suite that allows for continuity of software assets
- MPI (Message Passing Interface) Library used in advanced data communication for parallelization
- High-performance, highly functional and system-optimized scientific and numerical library