Government of Japan's Approach to High Performance Computing

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Office of Supercomputer Development Promotion
MEXT（Ministry of Education, Culture, Sports, Science and Technology）
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MEXT
MINISTRY OF EDUCATION,
CULTURE, SPORTS,
SCIENCE AND TECHNOLOGY-JAPAN

Outline of the 3rd S&T Basic Plan

1. Fundamental Concept

- Recent situation revolving around S&T
- Basic stance toward the 3rd plan
- Fundamental ideas and policy goals
- Total gov'tal R&D investment: \25 trillion ($200 billion)

2. Strategic Priority Setting in S&T

- Promotion of basic researches
- Prioritization of R&D for policy-oriented subjects
  Primary prioritized areas; Life science, IT, Environmental sciences, Nano-tech. & materials
  Secondary prioritized areas; Energy, MONODZUKURI tech., Infrastructure, Frontier (outer space & oceans)
- Promotion strategy for the prioritized areas

3. S&T system reforms

- Fostering S&T personnel and providing opportunities
- Progress in science and leading to innovation
- **Upgrading infrastructures for S&T promotion**
- Strategic commitment on international S&T activities

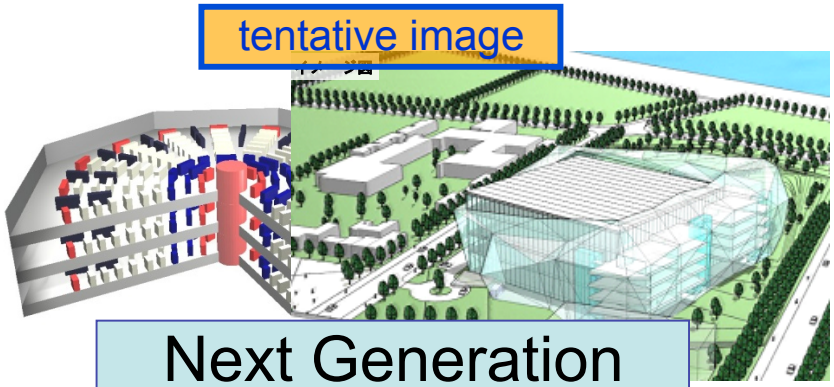
4. Public Confidence and Engagement

- Responsible actions regarding ethical, legal and social issues
- Reinforcement of accountability and public relations of S&T activities
- Promotion of public understanding of S&T
- Facilitation of public engagement with S&T-related issues

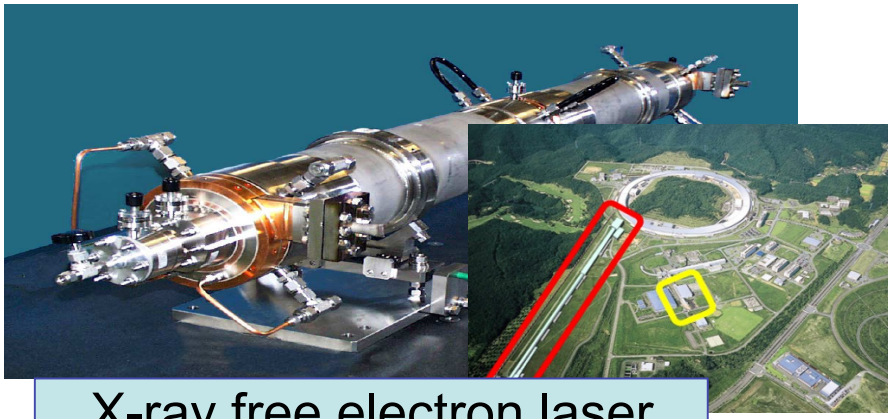
5. Missions of the CSTP

- More efficient and effective management of governmental R&D
- Break of institutional or operational bottle necks
- Follow-up of the Plan and promotion of progress in S&T

Key Technologies of National Importance



Next Generation Supercomputer



X-ray free electron laser

Space transport system

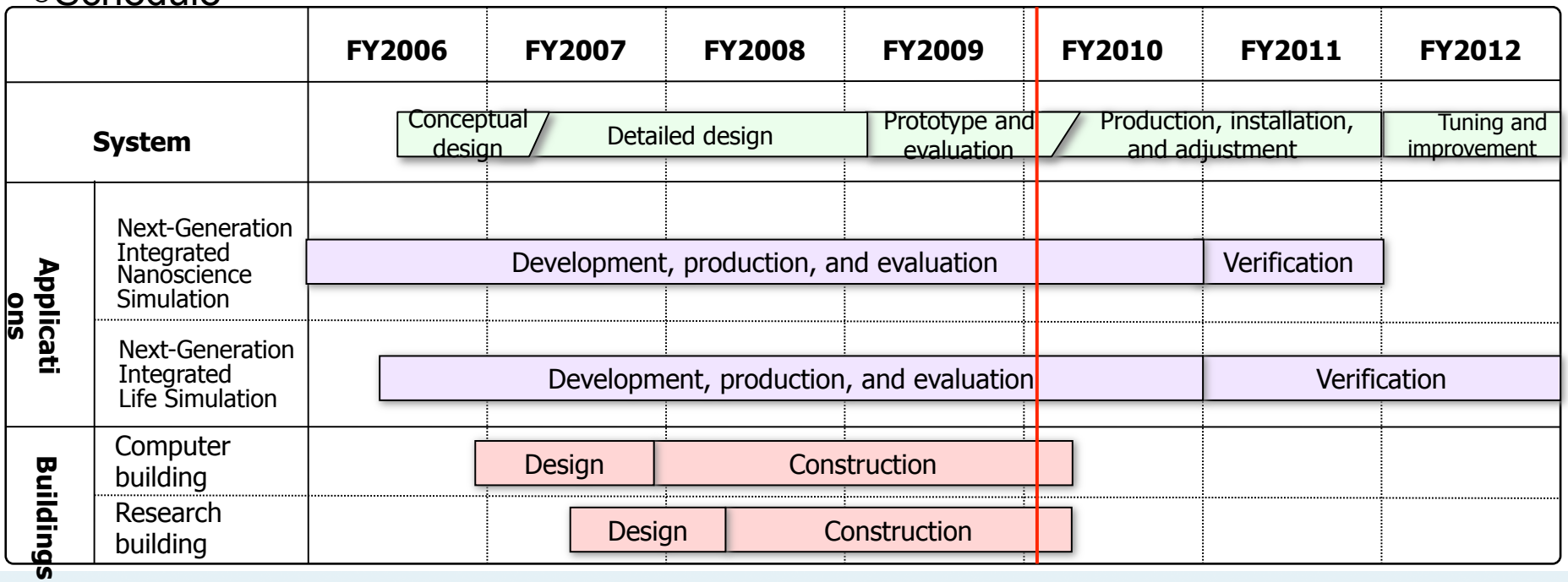
Ocean & earth exploration system

Fast breeder reactor technology

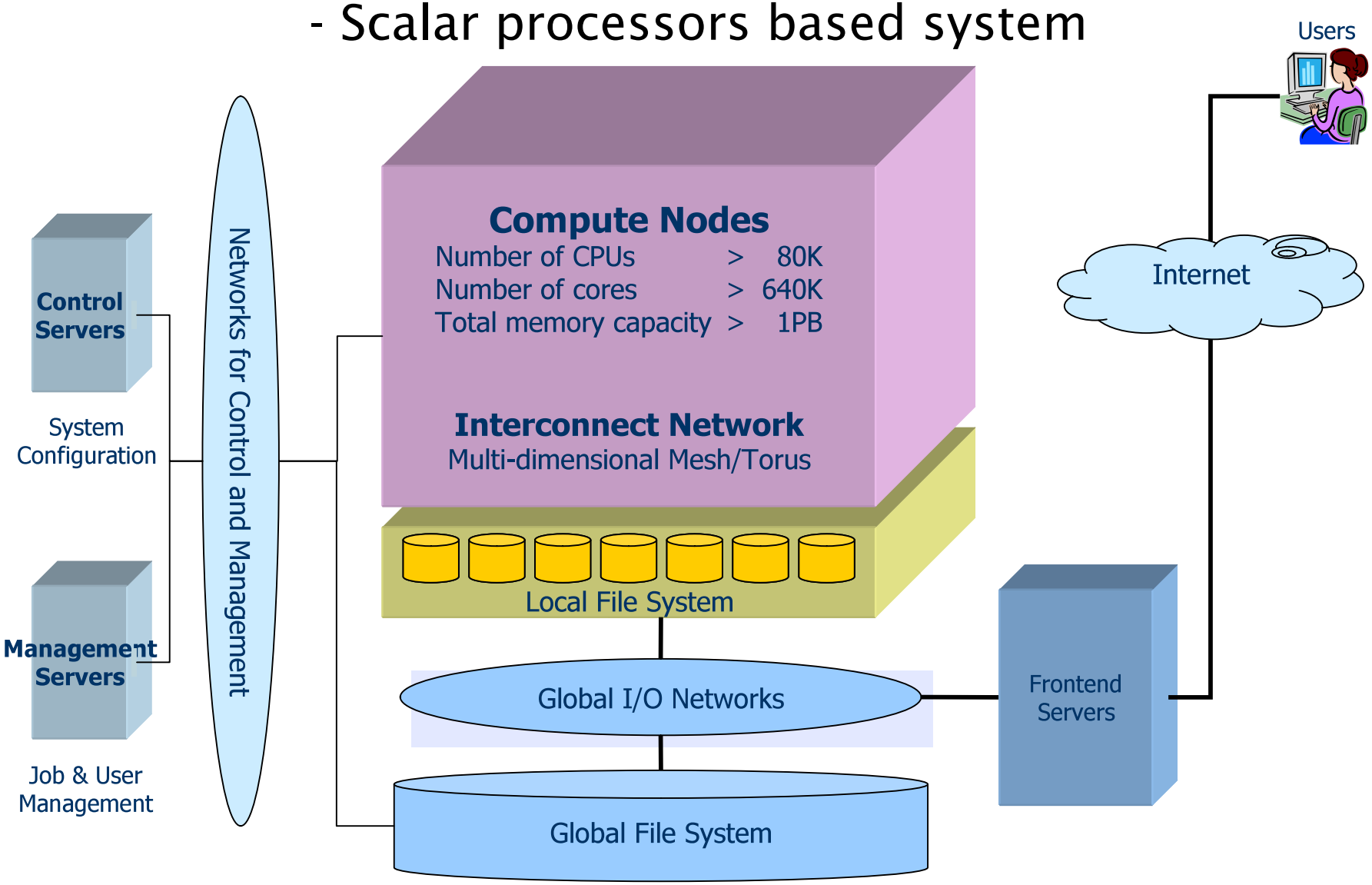
The Next-Generation Supercomputer Project

- Development and installation of the advanced high performance supercomputer system (10petaflops)
- Development application software
- Establishment of "Advanced Computational Science and Technology Center" (tentative name)

○Schedule



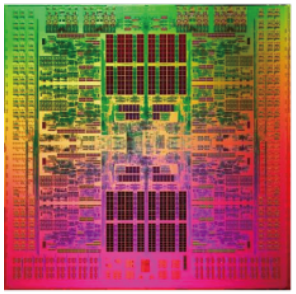
Current System Configuration
- Scalar processors based system



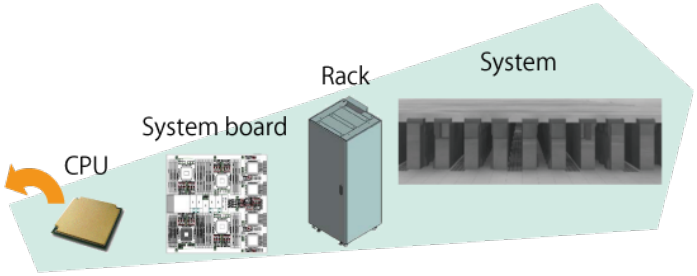
Characteristics of the System

【Massively Parallel/Distributed Memory Supercomputer】

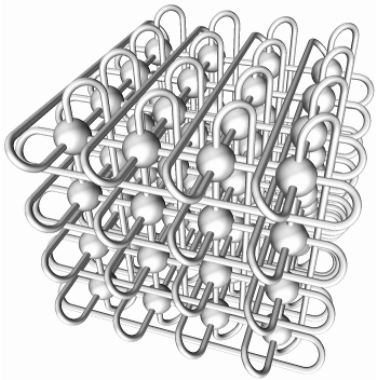
- Ultra high-speed/ high-reliable CPU
  - Advanced 45nm process technology
  - 8cores/CPU, 128GFLOPS
  - Error recovery (ECC, Instruction retry, etc.)
- High performance/highly reliable network
  - Direct interconnection network by multi-dimensional mesh/torus network
  - Expandability and reliablity
- System Software
  - Linux OS
  - Fortran, C, and MPI libraries
  - Distributed parallel file system



SPARC64™ VIIIfx



次世代スーパーコンピュータ（イメージ図）



Logical 3-dimensional torus network

Courtesy of FUJITSU

Site under Construction

Advanced Computational Science and Technology Center

An organization to be settled at Kobe Center has roles for full use of the Next Generation Supercomputer and for strong stimulations of computational sciences in Japan.

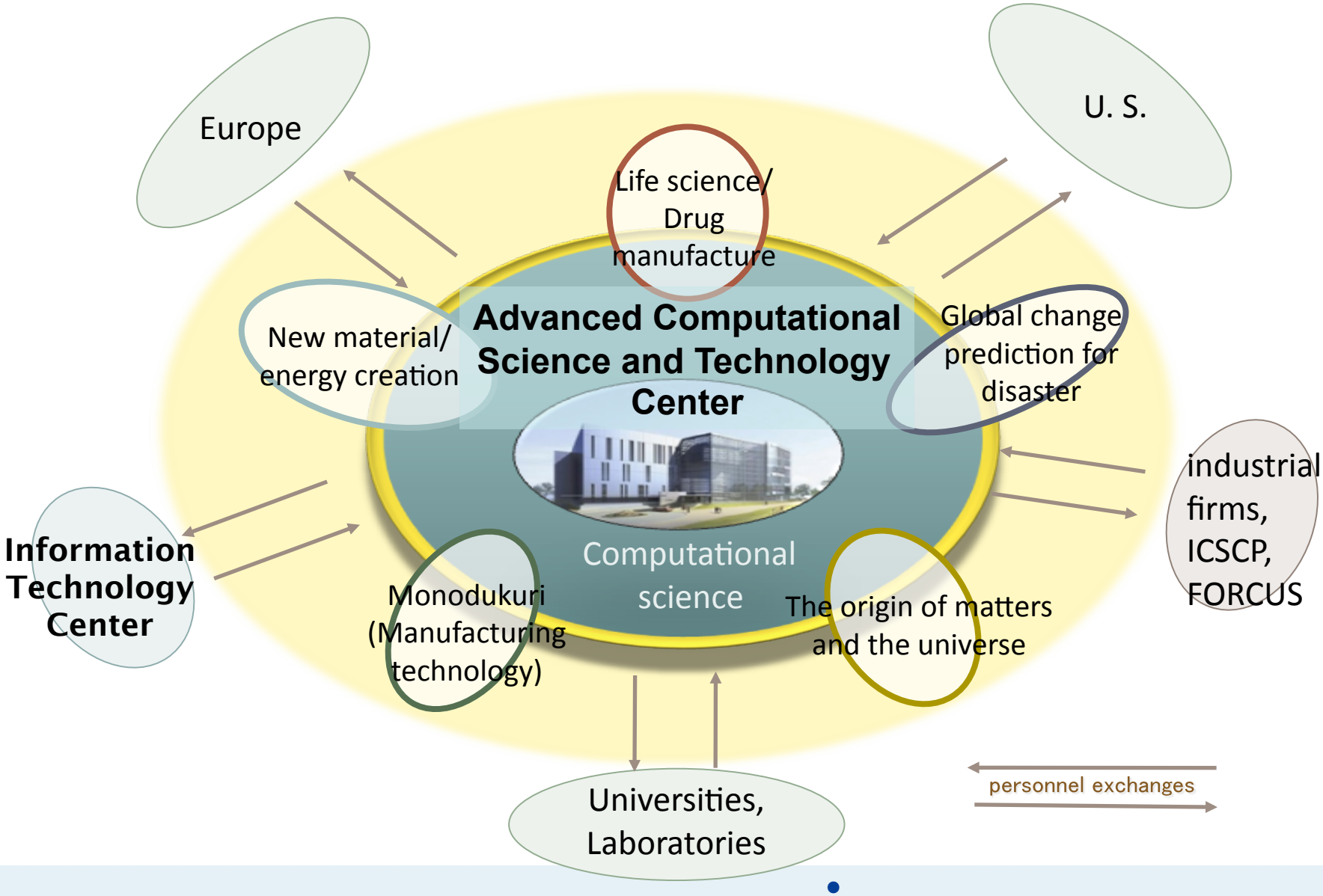
Its objectives:

1. To run the Next Generation Supercomputer efficiently for users of wide research areas
2. To lead leading edge computational science technologies and contribute for COE of computational science in Japan
3. To propose the future directions of HPC in Japan and to accomplish it

Features:

1. To lead strong collaborations between computational and computer scientists
2. To foster young scientists who manage both computational and computer science
3. To create new concepts for HPC in the future after the Next Generation Supercomputer
4. To prompt industrial use of HPC

Advanced Computational Science and Technology Center

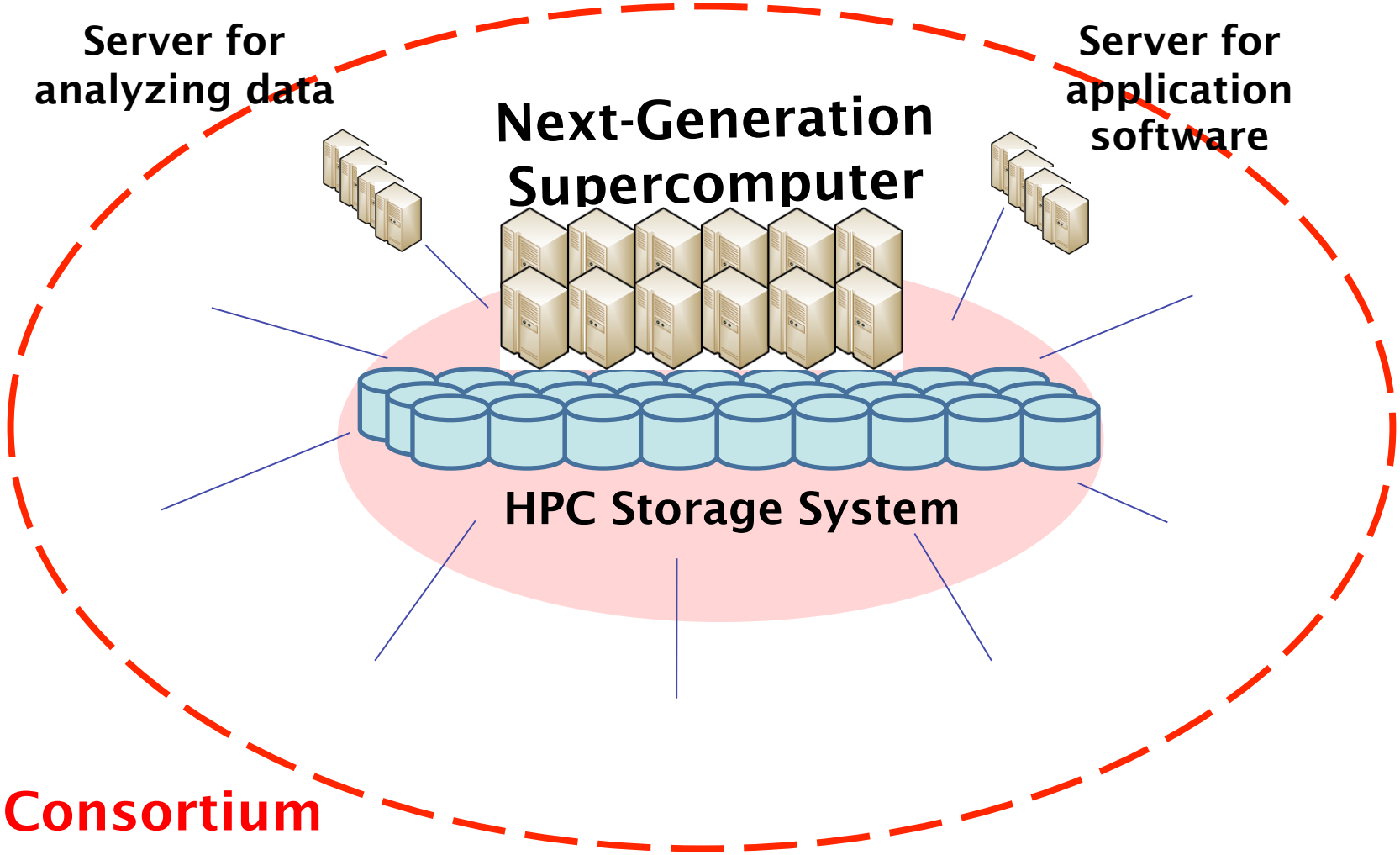


Creation of the Innovative High-Performance Conputing Infrastructure

The goal of the Next-Generation Supercomputer project has been reconsidered by the new government. The new project is called "Creation of the Innovative High-Performance Conputing Infrastructure (HPCI)".

- Organise the strong connections of the Next-Generation Supercomputer with other supercomputers
- Setting up a large-scale storage system near the Next-Generation supercomputer
- Establish a consortium, which will lead the creation of HPCI

High-Performance Computing Infrastructures



Current Funding for Supercomputing

- ✓ Adoption of the following scheme of use in the Next-Generation Supercomputer.:
  - General Use:

    The use for the needs of the researchers in many science and technology fields including industrial use and educational use
  - Strategic Use:

    MEXT selected 5 strategic fields from national viewpoint.
    - Life science/Drug manufacture
    - New material/energy creation
    - Global change prediction for disaster prevention/mitigation
    - Monodukuri(Manufacturing technology)
    - The origin of matters and the universe

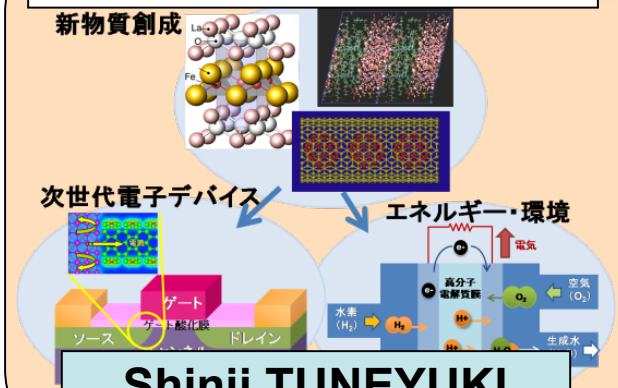
MEXT have funded 5 organizations to promote the several research fields and establish all-Japan system in the fields.

5 strategic fields from national viewpoint

Life science/Drug manufacture

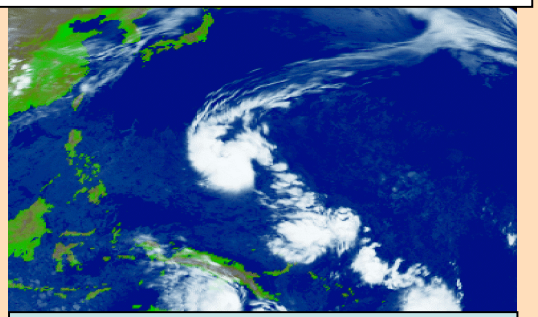
Toshio YANAGIDA
RIKEN

New material/energy creation



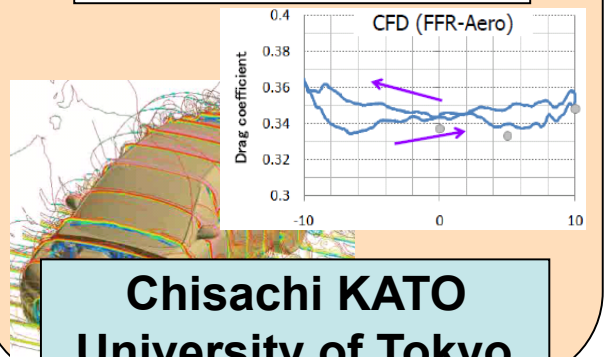
Shinji TUNEYUKI
University of Tokyo

Global change prediction for disaster prevention/mitigation



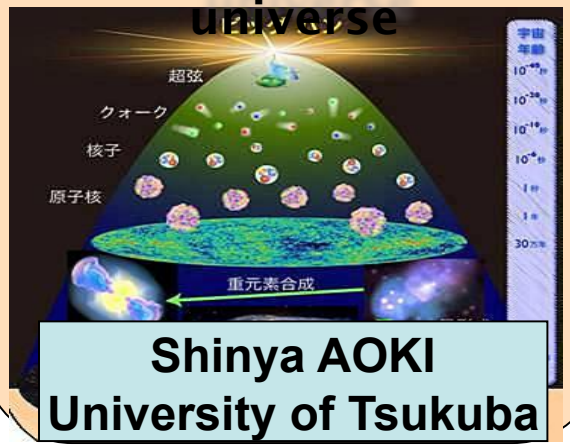
Shiro IMAWAKI
JAMSTEC

MONODUKURI (Manufacturing technology)



Chisachi KATO
University of Tokyo

The origin of matters and the universe



Shinya AOKI
University of Tsukuba

Current Funding for Supercomputing

"MEXT" E-Science Project

- Research and Development of Software for System Integration and Collaboration to Realize the E-Science Environment.
- Seamless and Highly-Productive Parallel Programming Environment.
- Research on resource sharing technologies to form research community.

Yutaka ISHIKAWA
University of Tokyo

"JST" ULP-HPC: Ultra Low-Power, High-Performance Computing via Modeling and Optimization of Next Generation HPC Technologies

Satoshi Matsuoka
Tokyo Institute of Technology

"JST" Technology Innovation and Integration for Information Systems with Ultra Low Power

Takashi NANYA
University of Tokyo

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Possible Future Funding for Supercomputing

- ✓The 4th Science and Technology Basic Plan (FY2011-FY2015)
  - ➢Now under discussion toward exaflops class HPC technology