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ITER Remote Experimentation Center (REC) on International Fusion Energy Research Center (IFERC) under the Broader Approach activities

Broader Approach (BA) Activities is the joint implementation based on the agreement between the Government of Japan and the EURATOM for support of ITER project and an early realization of fusion energy. BA activities comprise the three projects of 1) Engineering Validation and Engineering Design for Activities for the International Fusion Materials Irradiation Facility (IFMIF/EVEDA: 2007-2017), 2) International Fusion Energy Research Centre (IFERC: 2007-2017) and 3) Satellite Tokamak Programme (2007-2019) for Participation to upgrade of JT-60 Tokamak to JT-60SA and its exploitation. IFERC project (Project leader is N. Nakajima) consists of three sub-projects of a) DEMO Design and R&D Coordination Centre, b) Computational Simulation Centre and c) ITER Remote Experimentation Centre (REC).

Objectives of REC

Objectives of REC activity are 1) to identify the functions and solve the technical issues for the construction of the REC for ITER at Rokkasho, 2) to develop the remote experiment system and verify the functions required for the remote experiment by using the Satellite Tokamak (JT-60SA) facilities in order to make the future experiments of ITER and JT-60SA effectively and efficiently implemented, and 3) to test the functions of REC and demonstrate the total system by using JT-60SA and existing other facilities in EU.

Activites of REC

1) Remote experiment room, where the remote participation to the ITER experiment is available, is made in the Rokkasho Research Institute.

2) Network Connection with the broad band width between Rokkasho and EU is constructed, and fast data transfer system of the huge amount of experimental data to the remote site is developed and demonstrated.

3) Remote experiment system, such as setting of experiment parameters, shot scheduling, real time data streaming, communication, and so on.

4) Storage system that can store/access the huge amount of experimental data, including a data mining issues,

5) Data analysis software for the data viewing of the diagnostic data on the storage system in a user-friendly manner,

6) Numerical simulation for preparation and estimation of the shot performance by the appropriate implementation of the simulation code, such as the integrated simulation code

Simulation on shot schedule
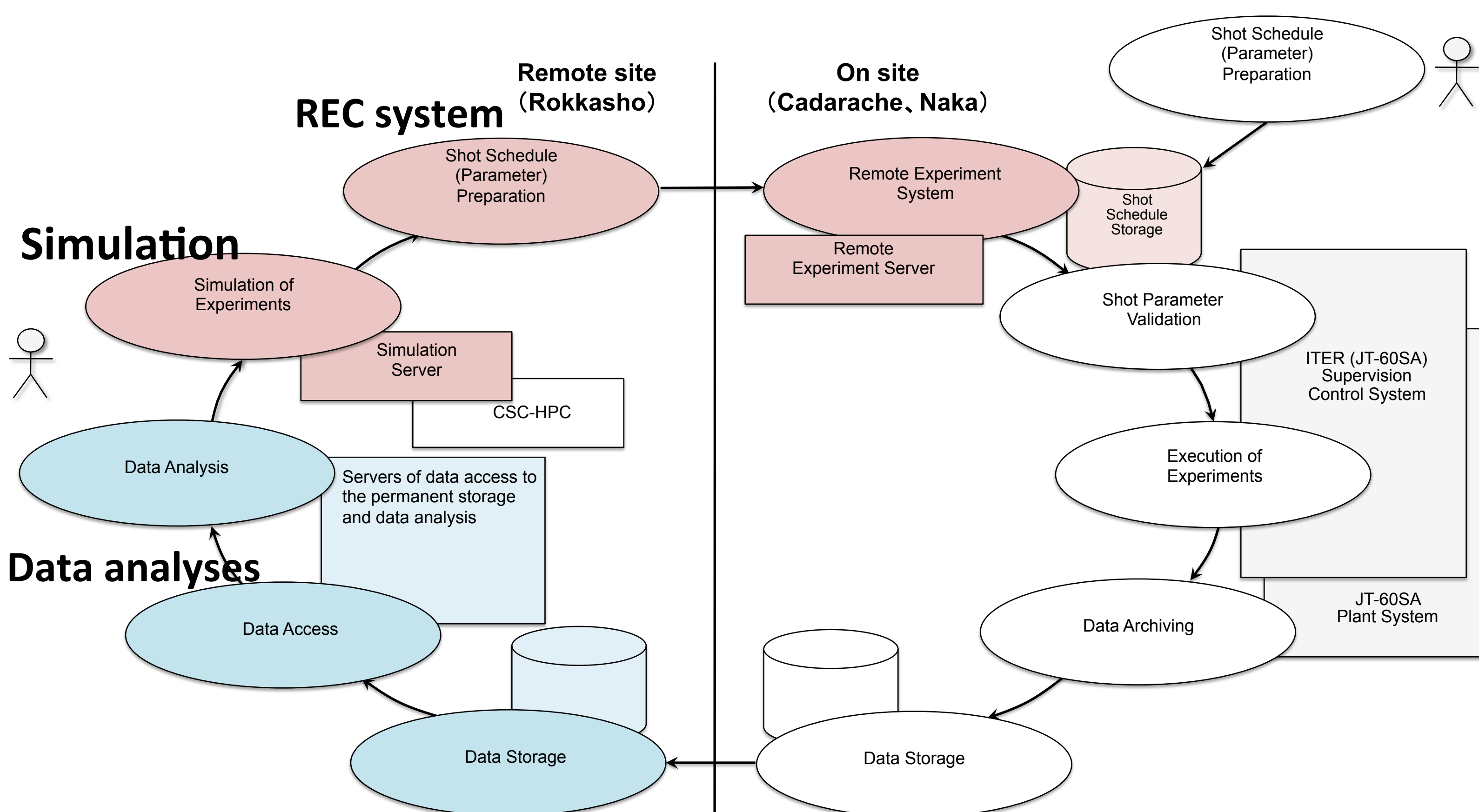
Role of Simulation on REC

In order to make effective use of the limited machine time, it is important to improve the environment for the shot preparation and the data analyses. This can be performed by detailed data analysis and more efficient plasma performance prediction by the simulation.

Proposals for the scope are 1) the customisation of an Integrated Transport Code for JT-60SA and ITER, 2) the customisation of a 2D magnetic equilibrium code for JT60-SA and ITER, 3) the design and the prototyping of an ITER-relevant plasma boundary reconstruction code.

## Remote experiment room at Rokkasho site

REC room:
The room is used for the control room of the remote experiment.

In addition to this, REC room is used for multi purpose, such as a large meeting room, and a working are of visitors for the collaboration.


Network connection and test

10 Gbps link (SINET 4) dedicated to ITER and LHC has been established between Osaka DC and Washington (US) DC of SINET 4 with 10 Gbps link (GEANT) between Washington DC of SINET 4 and Geneva of GEANT in March 2013. In collaboration with National Institute of Informatics (NII), the bandwidth of SINET 4 between Hirosaki DC to Sendai DC was upgraded up to 10 Gbps, ensuring a 10 Gbps occupied bandwidth between Rokkasho and Tokyo DC of SINET 4 in April 2014. Tests of fast data transfer from IFERC in Rokkasho site are ongoing by collaborators in NII and NIFS.
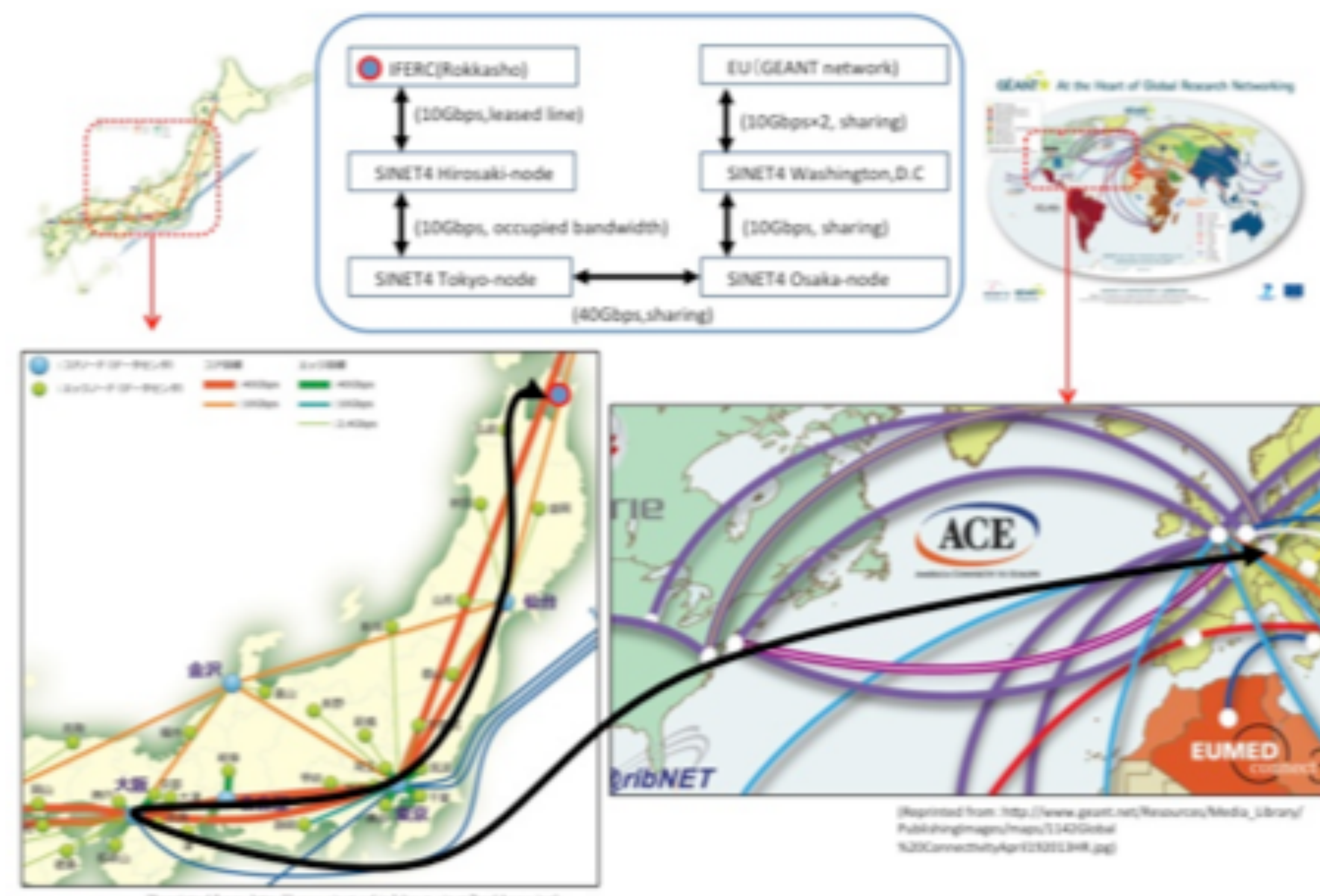
Remote experiment system

Functions of the remote experiment system (RES): 1) Setting of discharge parameters, 2) Monitoring of discharge sequence, 3) Monitoring of facility operation and plant status, 4) Displaying of discharge result data, 5) Displaying of plasma discharge status in real time, etc.

Users in the REC room at the IFERC-site can use these functions of the RES on the dedicated client PCs by connecting to the remote experiment server (RESVR) using SSL-VPN across the SINET4
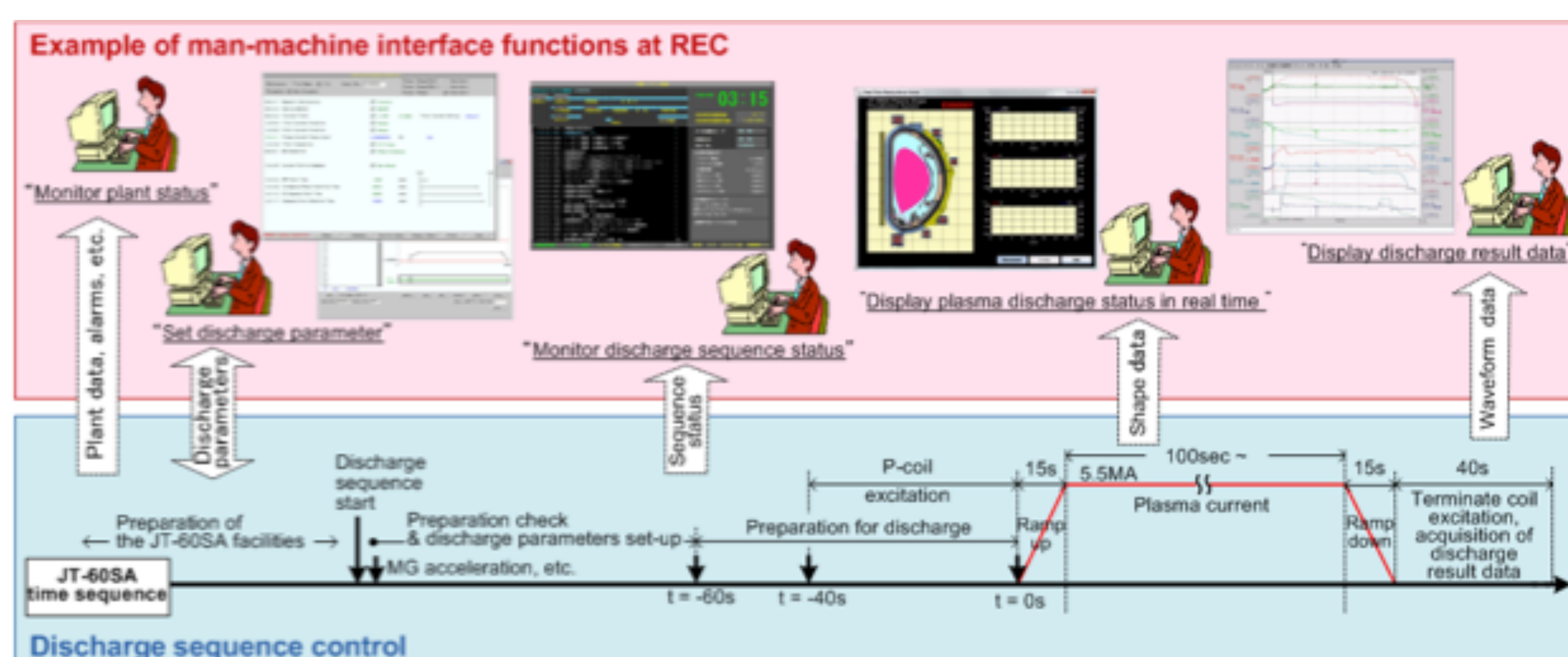
Summary

Main functions of REC will be built by 2016, and they will be tested from the later in 2016 and the total system will be demonstrated at March in 2017.