REMOTE PARTICIPATION IN ITER EXPLOITATION – CONCEPTUAL DESIGN

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One of the challenges arising from the ITER treaty is provision of facilities for participating countries to conduct remote experimentation on the ITER machine in order to fully benefit from scientific and technological outcome of the ITER exploitation. The remote access will be an integral part of the ITER control system (CODAC). ITER CODAC introduces notion of a Plant Operation Zone (POZ), which hosts networks and equipment used for ITER operation. The interfaces between the POZ and the general network consist of two main components: a) a data bank serving outgoing data requests, and b) an operation request gatekeeper (ORG) overseeing incoming configuration requests. The gatekeeper was a particular item for a dedicated study and prototyping in CODAC during the last year.

In the prototype the gatekeeper was conceived as follows. It has two independent parts with the associated databases, located both inside (ORG-POZ) and outside the POZ (ORG-EXT). The incoming request is submitted to the ORG-EXT where it is examined against the known user and role database and for formal correctness which does not require knowledge of the data content. It is then saved to the external database. The internal component of ORG polls the external database to see if new requests are available. Upon availability, the request is pulled in the ORG-POZ database where it is again checked for user/role correctness and submitted for validation by one or more logical modules capable to understand the nature and consequences of the request. The validation may include several chained or parallel evaluations, each yielding a simple yes/no result. The evaluation may also include a man-in-aloop approval for any sort of sensitive requests. Upon successful validation the request is marked as valid and made available to CODAC subsystems. Like any other request, it is checked for validity right before execution by a particular CODAC subsystem it is addressed to. The status of the request processing is communicated back to the ORG-EXT and is then made available to the remote initiator of the request. If the request execution yields data to be sent outside the POZ, the data shall be accessed through a read-only data access system of CODAC.

The prototype of the gatekeeper was installed in a working environment of the KSTAR tokamak (Daejon, South Korea) in the end of 2009 and was successfully tested during the ongoing experimental campaign. It was used to submit prepared pulse configuration files (schedules in ITER terminology) from remote physicists in San-Diego, USA to the KSTAR control system, where the schedules were approved and passed for execution. The test confirmed the viability of the ORG concept and transparence and controllability of the ORG operation. This paper will report on principal results of R&D activity on the gatekeeper functionality conducted jointly by the ITER Organization, General Atomics and MIT. It will also give overview of the current state of design of the remote access to ITER experimentation.