

## Progress with Remote Participation Tools in ITER Control System

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This contribution gives an update on the progress of remote participation in the ITER conventional control system (CODAC) since the previous IAEA technical meeting in 2021. Six out of seven ITER partners have been connected 24x7, two of them using high-performance Open Systems Interconnection (OSI) level 2 virtual private networks. A new, high-bandwidth network connection node has been commissioned in Marseille (80 km from ITER). An audit of control system perimeter networks has been conducted, resulting in providing stricter network segregation. CODAC installation at remote centers has been streamlined with standardized CODAC deployment architecture, for both services and terminals. A hardware/software extension “kit” for CODAC terminals has been developed, which enables remote participation capabilities for plant operators. Third-party communication software such as Microsoft Teams has been adapted for use in control rooms. New software tools have been developed, including unidirectional “diode” software for EPICS (Experimental Physics and Industrial Control System) traffic, software for controlled file exchange inside the control system perimeter, as well as a high-performance video distribution service. CODAC client use has been demonstrated on wearables like tablets and augmented-reality smart glasses. Together with one of the ITER participants, a project has been initiated to allow integrating CODAC online data into virtual reality scenery, potentially eliminating the need for a classical computer terminal altogether.

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