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Using MQtt as Heterogeneous Distributed Messages Infrastructure at WEST CODAC

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Control, Data Acquisition and Communication (CODAC) real-time software are essential for fusion device operation, machine protection and for the optimization of plasma experiments. In 2019, following the WEST project (W -for tungsten- Environment Steady-state Tokamak) upgrade, a major migration of the inter-process message transport infrastructure has been initiated.

Originally, on Tore Supra, proprietary RTWorks™ middleware was used for all communications between the various sub-systems in the real-time acquisition network. With an increasing number of processes and a growing traffic, a number of malfunctions during WEST operation, especially in the streaming of real-time data from measurement instruments, were observed possibly due to an apparent overload of the low-level infrastructure. Given the high maintenance costs of RTWorks™, the little monitoring functionalities it offers to investigate the observed errors, a decision was made to migrate to a less expensive solution with a higher quality of service.

Keywords: WEST; Tore Supra; CODAC; RTWorks; MOM; MQTT; LynxOS; Linux; Windows; Legacy Message Transport

The paper describes all the steps concerning the migration of the inter-process messaging middleware to an open-source replacement: the selection criterion, the qualification tests, the integration into the WEST CODAC framework, the progressive release, and performance checks at the limits.

The message oriented middleware MQtt was partially deployed on WEST during the C5 experimental campaign. The results clearly demonstrate enhanced performances and maintainability compared to the former message transport infrastructure.

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