EPICS AND MDSPLUS INTEGRATION IN THE ITER NEUTRAL BEAM TEST FACILITY

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SPIDER, the full ITER-size Ion Source Test Bed in the framework of the ITER Neutral Beam Test Facility, is a middle-size fusion experiment requiring a complex central system to provide control and data acquisition. Control is required to manage the production of an ion beam in H^-/D^-, with energy up to 100keV, extracted current density >355/285 A/m^2, beam-on time up to 3600s. Due to the R&D nature of the experiment, data acquisition will be extensive, to provide a deep insight in the experiment operation.

The experiment software architecture relies on EPICS and MDSplus that are open-source, collaborative software frameworks. EPICS and MDSplus are targeted to control and data acquisition applications, respectively. The motivations behind this choice are as follows. EPICS Channel Access has been selected as CODAC middleware. As the final deliverable of the Neutral Beam Test Facility is the procurement of the ITER Heating Neutral Beam Injector, to be integrated with CODAC, we decided to converge early toward this ITER technology. MDSplus is a software package for data management, supporting advanced concepts such as platform independency, independency of underlying acquisition hardware, self description data, and data driven model.

The combined use of EPICS and MDSplus is not new in fusion [1, 2]. The novelty in SPIDER is the level of integration between the two frameworks. Differently from the previous experiences, the SPIDER design uses a single data archive, to organize coherently data related to both EPICS and MDSplus. As in the MDSplus concept, the archive contains the acquired raw data along with all configuration parameters required to give them physics/engineering significance. The SPIDER design also pursues a deeper integration by developing a more refined data access layer between the two frameworks.

The paper presents the design of the integration software to use effectively EPICS and MDSplus in SPIDER. This includes the definition and implementation of appropriate EPICS records to communicate with MDSplus and the implementation in MDSplus of EPICS Channel Access Server and Client. The MDSplus and EPICS archive concepts are compared on the basis of peformance tests executed to highlight performance limitations.

[1] D. Mastrovito, W. Davis, J. Dong, P. Roney, P. Sichta, Integrating EPICS and MDSplus, Fusion Engineering and Design 81 (2006) 1847-1851

[2] K.H. Kim, C.J. Ju, M.K. Kim, M.K. Park, J.W. Choi, M.C. Kyum, M. Kwon, The KSTAR integrated control system based on EPICS, Fusion Engineering and Design 81 (2006) 1829–1833