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First Applications of MARTe2/MDSplus/Simulink framework for real-time control applications.

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A set of MDSplus devices which abstract MARTe2 components and their communications has been developed. As these are applied to real applications, they are being refined and expanded. Generic versions of the Simulink and python GAMs have been developed obviating the need to create a new MDSplus device type for each simulink component or python routine. These provide a mechanism to quickly integrate new Simulink and python modules into control systems using the framework.

The framework has been used in the ITER Neutral Beam test facility for two applications. The first application provides the required management of acceleration grid breakdowns, consisting in switching off the grid power supplies and, after a given amount of time, driving again the power supply following a given waveform. In this case the system is driven by a 1kHz clock and receives an synchronous trigger whenever the breakdown occurs, using a DAC device to generate the required waveform in real-time. In the second application, a set of algorithms are implemented to derive online calorimetric measurements in the cooling system. The system, running at a rate of 10 Hz is driven by the reception of around 100 input signals communicated via MDSplus events and produces a similar number of output signals that are both stored in the MDSplus pulse file and again sent out via MDSplus events for online display.

At MIT a control system demonstration platform has been constructed to test and learn about the framework and real-time computing and networking platforms. This is a 10CM levitated magnet which can run the complete architecture of a distributed, multi-timescale control system, including supervisory control, alternate scenario (soft landing) and actuator sharing. This will be used both to validate the framework for use with the SPARC tokamak, and to drive the development of new features.

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