Switching from Phar Lap ETS to National Instruments Linux Real Time Operating System on Hall D's 8840 PXI Controller

Brian Eng, Mary Ann Antonioli, Peter Bonneau, Aaron Brown, Pablo Campero, George Jacobs, Mindy Leffel, Tyler Lemon, Marc McMullen, and Amrit Yegneswaran

Physics Division, Thomas Jefferson National Accelerator Facility, Newport News, VA 23606

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This note presents the attempt made to switch the operating system of Hall D's National Instruments (NI) PXI controller used for the voltage taps of the solenoid from Phar Lap ETS to Linux real time operating system (RTOS).

With the release of LabVIEW 2019 [1] and it's associated add-ons, there is now the option of using Linux RTOS instead of the Phar Lap ETS [2] operating system on certain models of PXI controllers. The PXI controller 8840 quad core, Fig. 1, used for the voltage taps of the Hall D Solenoid is one of the models for which the operating system could be made.
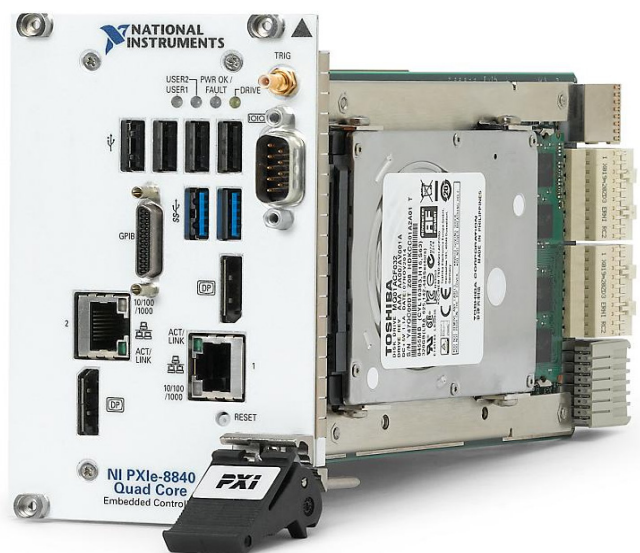

FIG. 1. NI's PXIe 8840 Quad Core module in use in Hall D for the solenoid magnet's voltage taps.

In addition to standardizing to a single RTOS across multiple types of NI systems, having the controller run Linux allows for more customization compared to Phar Lap.

As an example, there are only four options for precision time protocol (PTP) when run on Phar Lap ETS, but Linux controllers use PTP daemon (PTPd) [3], which has an extensive configuration file.

The first hurdle to using Linux on the PXI controller is that the method of installation has changed compared to previous versions [4], namely, requiring open package management (opkg) to install additional software. This is a unique situation as most devices are on protected subnets that use a proxy to only allow access to whitelisted addresses. Once properly configured, installing software was no more or no less difficult to install than previous versions; the one benefit of using opkg was that the software being installed on the PXI isn't required to be on the host computer any more.

Upon further evaluation, it was found that not all add-ons and functionality have yet been ported to NI Linux RTOS. The major show-stoppers was the lack of an EPICS Client/ Server, which is needed to pass parameters to other systems (IOCs, operator screens, archivers, etc), and EtherNet/IP, which is required to send data from the PXI controller to a PLC that does additional interlocking.

To conclude, until the above mentioned software packages are available for the NI PXI controller, NI Linux RTOS cannot be deployed.

[1] National Instruments. (2019). *NI Linux Real-Time Support for PXI Controllers.* Retrieved from https://knowledge. ni.com/KnowledgeArticleDetails?id=kA00Z0000004BI9 SAM.

[2] Ardence. *Phar Lap ETS.* Retrieved from www.ikon-gmbh. com/pdf/ardence_pharlap_ets.pdf.

[3] https://github.com/ptpd/ptpd.

[4] National Instruments. (2019). *Installing Software on NI Linux Real-Time PXI Controllers.* Retrieved from http:// www.ni.com/tutorial/55152/en/https://ni.scene7.com/is/ image/ni/10221513_0418?$ni-card-lg$ https://ni.scene7. com/is/image/ni/10221513_0418?$ni-card-lg$.