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Modernizing embedded controllers at the NIF

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As the world's most energetic laser, the National Ignition Facility (NIF) plays a critical role in advancing high energy density physics and inertial confinement fusion research. The NIF relies on a distributed control system to automate setup and execution of experiments. This includes over 1,000 embedded controllers split between 17 distinct types. Most of these controllers were designed in the late 1990s to early 2000s, using platforms ranging from Lontalk microcontrollers to STD Bus single board computers.

Over the decades, many of our chosen software technologies, hardware components, and platforms have reached end of life. Therefore, we have begun a modernization effort for the NIF embedded controllers. Modern hardware/software will allow us to procure additional units in order to maintain adequate spares and support upcoming upgrades to the NIF. It will also allow us to tackle incompatibilities developing between our existing firmware and modern IT infrastructures. This paper will provide an overview of our embedded controller strategy. It will focus on component selection, minimizing risk during the transition using an automated test bench, and firmware/hardware upgrades to minimize on-going maintenance costs.

Footnotes

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