Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY15

Project ID: FNAL-LDRD-2015-020
Project title: Off-the-Shelf Data Acquisition System
Principal investigator: Ryan Rivera

Project description: (short description and explanation of cutting edge, high-risk, high-potential science or engineering)

Define and evaluate a low-cost, scalable data acquisition (DAQ) system architecture based on commercial technology being developed for the emerging "Internet of Things" (IoT). This approach connects intelligent front-end digitizers directly to a standard network which is used for data acquisition, event building, detector controls, online and offline data storage/processing, and control room interfaces. The system is scalable from a few MBytes/sec to hundreds of GBytes/sec using inexpensive commodity networking equipment and interface modules.

Tie to Mission: (explain the project's relevance or anticipated benefits to Fermilab's and DOE's missions)

A wide range of experiments and test beam studies rely on data acquisition systems that in the past were often based upon relatively expensive and short-lived technologies. As experiments are reluctant to subsidize the development of niche standards, an off-the-shelf DAQ enabled by the IoT has the potential to satisfy the requirements of a large range of experiments and studies at a very modest cost.

Previous year's accomplishments: (as applicable)

A number of software tasks have been completing including evaluation of web server infrastructure, developing a generic UDP receiver framework for artdaq, developing a web interface infrastructure. Several proof-of-concepts have been demonstrated such as compatibility with Fermilab passwords, widgets in JavaScript, and a website interface. A number of hardware tasks have been completed. Ethernet FPGA code has been added to various interfaces. The performance of the low-end candidate has been characterized. The mid and high-end candidates for evaluation have been selected. Several proof-of-concepts have been demonstrated. Much of the recent work has been to achieve the minimum viable product beginning at the website and communication with hardware through a GUI.

Work proposed for current fiscal year and anticipated / desired results:

The Minimum viable product will continued to be refined. A number of interested users including the test beam facility users, LCLS-II work, CMS HGCAL and outer tracker have been identified. There is a balance between working towards refined development and supporting initial users. This balance will be evaluated and the project will be brought to completion and taken over by user demand.

Project funding profile: (costs, budgets, projected budgets, and total)

Prior year(s) costs	FY15	FY16	FY17	Total
N/A	264640	173978	151000	589,618

Project Start Data: 2/1/2015 (est) Total Approved Project funds: $ 589,660