

## The problem

Experimental physics research needs good data on disk. And DAQ software is both time consuming and, often, entirely custom. I might spend a month building a useful trigger-rate display tool, but you can't use it - your data format is different.

Even within an institution, a working DAQ can be alarmingly fragile. A smooth experiment sometimes depends on access to a single, DAQ-knowledgeable person. Don't panic, but he's on vacation!

## The idea

The NSF offers a "Software Infrastructure for Sustained Innovation - SSE & SSI" grant (<http://www.nsf.gov/pubs/2016/nsf16532/nsf16532.htm>). Work on specific software is most appropriate to the SSE grant, which typically awards \$500K over three years and is due in February. SSI grants have a broader scope and typically award \$1M over five years; SSI grants are due each September.

I'm interested in writing a grant to (1) define standards for data acquisition and (2) develop and test one to two tools that use those standards.

I think this proposal is strongest as a joint effort from two groups that use different data acquisition software - such as Midas and the NSCLDAQ, used at Michigan State.

If funded, I imagine supporting two postdocs over three years - one at a CDMS (Midas) institution, and the other at an NSCLDAQ institution. The work I'd hope to accomplish by the end of the grant would be

- develop and publish a core set of DAQ standards
  - develop a descriptor language and protocol for streaming data - or adopt an existing one, such as protobuf
  - *possibly* develop a set of HTTP APIs that allow users to control the DAQ
- develop, test, and publish at least one tool based on these standards that works with both Midas and the NSCLDAQ
  - an event builder
  - *possibly* a scheduler
- be able to evaluate if standards work merits further funding through an NSF SSI or S2I2 grant

## The benefits

The proposed work would at minimum result in an event builder, which is required for the completion of the CDMS project. A performant event builder would also be a significant boon to the beam-based nuclear physics community, as they move increasingly towards digitized readouts.

Ideally, successful standards extend locally-developed software tools to the entire community. Practically, community-wide standards adoption demands significant time and effort.

This grant provides some initial manpower: roughly one full-time-equivalent postdoc apiece for CDMS and our NSCLDAQ partner, for three years. I would expect grant work to split approximately equally between standards work and concrete tool development.

## The odds

The success rate for “Software Infrastructure” proposals - both SSE and SSI - is about 20%. SSE grants run for three years, and typically provide \$500K in total. SSI grants run for five years, and typically provide \$1M in total. The S2I2 institute grant provides more, longer-term funding but is not a good fit for this limited-scope proposal.

These software grants generally support work that impacts an entire field; work benefiting a single collaboration rarely receives funding. I think that our Midas-based group working with an NSCLDAQ partner to explore DAQ standards would be competitive.

Abstracts of funded projects are available at <https://sites.google.com/site/softwarecyberinfrastructure/software/software> and <http://www.nsf.gov/awardsearch/simpleSearchResult?queryText=SI2&ActiveAwards=true>.

## Worth it?

The money is there for the taking, but this is collaborative work at its hardest.

Nuclear physics demands an impressive breadth from its data acquisition - the standards must be flexible as well as clear and usable.

The full benefits of this project - shareable DAQ tooling - will require years of work. Meanwhile, building and maintaining community involvement will be critical to broader success.

The software infrastructure grants are here to provide muscle. Let's build a set of standards for data acquisition, and work together to get good data on disk.

## **Get in touch**

This proposal is in beta. If you have thoughts, suggestions, or edits of any kind, please get in touch!

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