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 "CSSI" grant (http://www.nsf.gov/pubs/2016/nsf16532/nsf16532.htm). The work proposed here is most appropriate to the software category, which features small-scale and medium-scale awards. The small-scale grant awards \$500K over three years and is due in mid-April. The medium-scale grants have a broader scope and typically award \$1M over five years and are due in 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 binary-data descriptor language - or adopt an existing one, such as kaitai-struct or DFDL
  - develop a 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
  - a tool that, given your binary data and a text file describing your data format, will package your data into ROOT or HDF5 files
  - an event builder

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 the precursor to the CSSI grant, "Software Infrastructure" proposals - both small and medium-scale - was about 20%. Small-scale grants run for three years, and typically provide $500K in total. Medium-scale grants run for five years, and typically provide $1M in total. An 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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