



LArSoft Steering Group Meeting Notes, September 21, 2022

Attendees: Angela Fava, Wesley Ketchum, Tingjun Yang, Tom Junk, Erica Snider, Katherine Lato

LArSoft Update: Erica

- Reviewed the purpose of the Steering Group and the 2022 work plan for LArSoft since we had a new spokesperson. Welcome Angela Fava.
- Work plan status updates:
 - Multi-threading is one of the high priority items the project addresses due to resource limitations and the need to run software efficiently. Multi-threading allows you to run on multiple slots simultaneously when memory demands require multiple slots per job. One of the issues faced over the last few years is that the LArSoft team has become smaller as people are pulled off to work on projects for which the lab has received funding. Some of the objectives of this funded work align with the goals of LArSoft and can be included, such as the work to optimize hit finding on HPC resources, which now runs in LArSoft. The multi-threading work on a DUNE production workflow is another example of overlap. The consequence is that work is progressing more slowly than desired, but there is progress being made, e.g., on the DUNE workflow.
 - Starting from a suggestion from DUNE and endorsed by other experiments, we are considering a workshop on multi-threading to focus on solving specific problems of interest to the experiments. The plan would include bringing in experts with short term commitments to assist with the work. We are currently seeking additional input from the experiments to define a program. Details can be found at: [☰ Multithreading LArSoft Workshop 2022 Information](#)
 - Discussed role of Spack in modernizing the build system used by art / LArSoft to use a community supported product. Spack work is continuing, having reached an important milestone earlier this summer. The timeline from here is somewhat uncertain due to the presence of some unexplored problems. More information should be available in the coming weeks.
 - There was discussion about the DUNE DAQ using Spack in a way that at least superficially appears the same as that needed by LArSoft. The question was raised as to whether LArSoft was aware of this effort on DUNE, and whether there was any coordination between efforts.
 - Reply: all of the work on Spack is being coordinated by a single group, so the DAQ build leverages the same tools that were part of the recent LArSoft milestone. The DAQ code, however, has many fewer packages and external dependencies than does LArSoft, which allows the DAQ group to fully adopt Spack at this earlier stage. LArSoft requires more functionality from Spack, so needs additional tool development before migrating fully to Spack.

- Pixel detectors. The concept of wires is baked into our geometry system, so pixel detectors break that, and possibly the dual phase detectors as well. LArSoft has lacked the necessary people on the experiment side to help work on this until recently, when Tingjun began an effort to integrate the DUNE ND simulation into LArsoft. We are now pushing forward on a plan to allow the geometry to accommodate different readout schemes. Though we are still at an early phase, we hope to have a full proposal by the end of this year.
- Documentation. After submitting a site map, and modifying pages in response to Google reports, google searches can find the LArSoft wiki pages. We have asked to be notified of any searches that don't work.

Round table discussion:

SBN, Wes:

- Pushing to have a production ready release this week, to have ICARUS ready to do the keep-up reconstruction processing. We're then hoping to use the same release as a base for a full-scale, high-level simulation and reconstruction release due in December, which will be used to launch large scale data processing. Once we formalize a release that is ready for production, we will let you know so we can properly track that on the LArSoft side. Expect to retire the previous production release series and drop support for that in the not too distant future. Thinking to have appropriate patch releases as needed would be our plan. Don't know of anything that would need to change in LArSoft except for allowing different lifetimes in different cryostats.
 - Discussion - Not sure if the topic of different lifetimes has already been addressed. It came up a long time ago. Wes will check and if it is still an issue, he will file an issue. There are other minor things like that to be careful about going forward. Still need to decide if we want a full scale update by the end of the calendar year (i.e., moving to a different base release).

DUNE, Tom:

- Near Detector have grown their own tools and environment, but there is consideration with the offline management that a common solution would be better. Many prefer their own tools to shared tools, which is a difficult situation in a collaborative environment. Currently need buy in from our own collaborators, not just LArSoft. This task is easier the more features that LArSoft provides 'for free'. DUNE initially went with LArSoft because it benefited from all the prior work. Need to try to make that true for the DUNE ND.
 - Discussion: There are places where we should be able to demonstrate the value added. The simulation is one clear case that does not require much additional work. It was also noted that while the C++ in LArSoft confers a speed advantage, there are areas in the ND code that can run on GPUs. Electron drift, for example, though that is not a large consumer of CPU. In the last profiling check, binomial random number generation consumed a lot of CPU time.

- Geant4 has (or will soon have) GPU-enabled tracking for photons. Would need to introduce new code to do electron drifting.
- DUNE wants it to be noted that there are times when the DUNE code should probably be changed rather than trying to make everything work exactly as it does now. DUNE felt that some of the multi-threading work tried too hard to retain existing interfaces and functionality. An example was the channel map, where re-writing the code would perhaps have been easier than trying to make the existing code thread-safe.

DUNE, Tingjun:

- Thanks for the nice summary and LArSoft continuing to support pixel readout. He is working to build support within DUNE for using LArSoft for the ND. One worry is whether this will be officially supported. May help if you make a more public support that LArSoft team will support Near Detector.
 - Hope that rolling out the geometry changes will be a strong statement of that, but can make this clear earlier if it would be helpful.
- Have GArSoft. A lot of code was copied from LArSoft. Someone asked if we can use LArSoft to simulate a GArTPC.
 - Discussion: The Geant4 part should be completely straight forward, including the additional detector elements. Just need the appropriate geometry file. The ND detector simulation takes energy deposits as input, so should be possible to swap in new LArG4 on the front end with no more than a data format conversion. And there are examples of doing exactly this. The TPC is more complicated, since the pixels look very different from those in the LAr ND. [But the new geometry system might be able to accommodate that, if desired.]
 - Need input from the experiment during the 2023 work-plan development discussions to help prioritize this work.