



Snowmass Neutrino Computing Discussion
Mike Kirby (with help from Heidi Schellman)
Sep 24, 2021

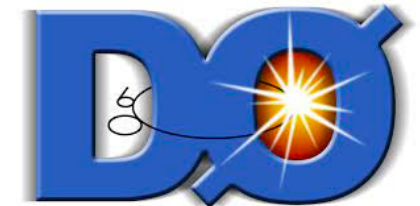
Questions from the session conveners

- What are your concerns about computing; what keeps you up at night?
- What do we need to be aware of so that it ends up in our report?
- What are requirements projections related to software and computing that we should be aware of? Is there existing documentation?
- Are there new developments on the horizon that would drive software and computing challenges? New physics, new instrumentation, new simulations?

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I'm speaking on behalf of myself, but here is my past history...



What keeps me up at night?

- Raw data volumes
 - 2 GB/FD interaction + 100+ TB for SN (w/ 3x compress)
 - storing and moving those volumes efficiently
 - shoving it into memory for processing - uncompressed and multiple copies in flight
- Not adequately utilizing GPU/coprocessors/HPCs to jump start low-level LAr TPC data processing
- far detectors and near detectors not using common frameworks, data encoding/formats, or containers
- 200 TB of Supernova and a 6 hour turn around time scares the bajeebus outta me
- Federated identity and authentication
- My biggest concern - Making sure that there is funding for software development that doesn't fit the LHC/collider event model - DUNE specifically has much larger data volumes at the trigger record stage and physics with low-energy signatures that makes processing challenging - getting computing on project
- Coach K retiring and Duke Mens Basketball no longer being nationally competitive

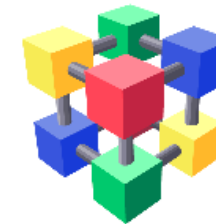


What do we need to be aware of so that it ends up in our report?

- That there are needs for software and technology development that go beyond LHC framework/tools/services
 - OSG and WLCG have been essential to DUNE computing (and most neutrino exp in US)
 - DUNE is a stakeholder, but Neutrino experiments need to drive their own requirements
- The intensity frontier missed out on the IRIS-HEP funding that is a strong contributor to the HL-LHC computing development and we need to make sure we don't get left out again
- neutrino experiments have a lot of common issues
- small number of common projects like LarSoft
- More common computing projects in infrastructure and algorithms and joint support for those efforts.
- Any parallel to the IRIS-HEP should include a broad range of neutrino experiments



Open Science Grid

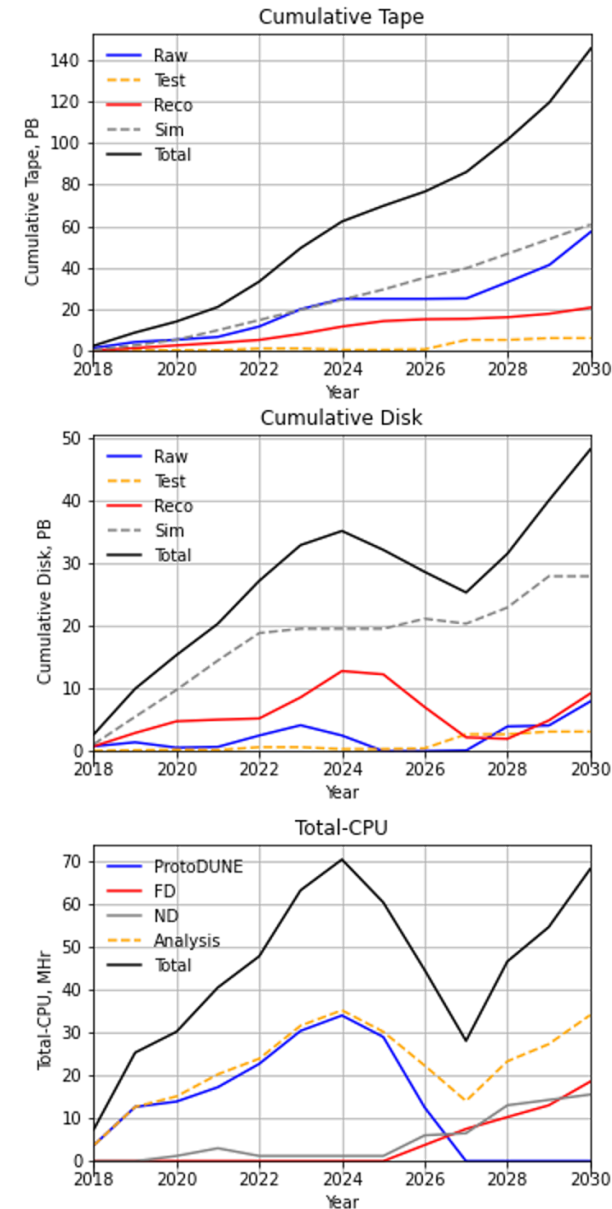


WLCG
Worldwide LHC Computing Grid



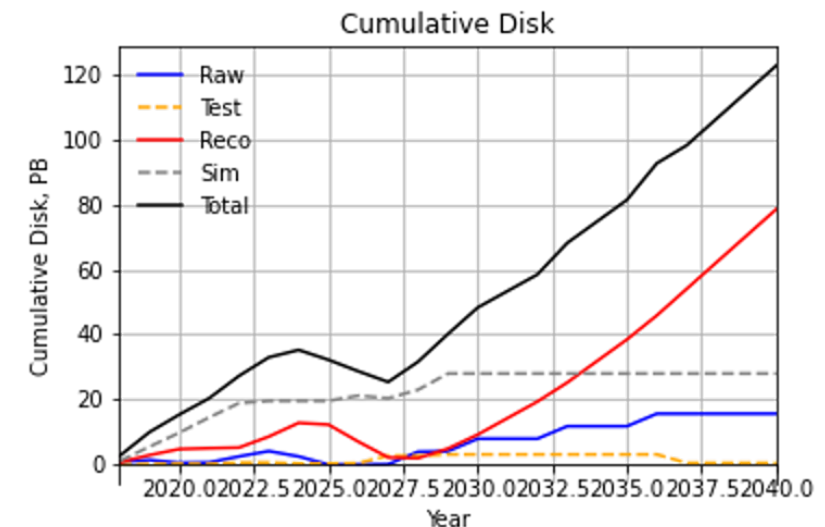
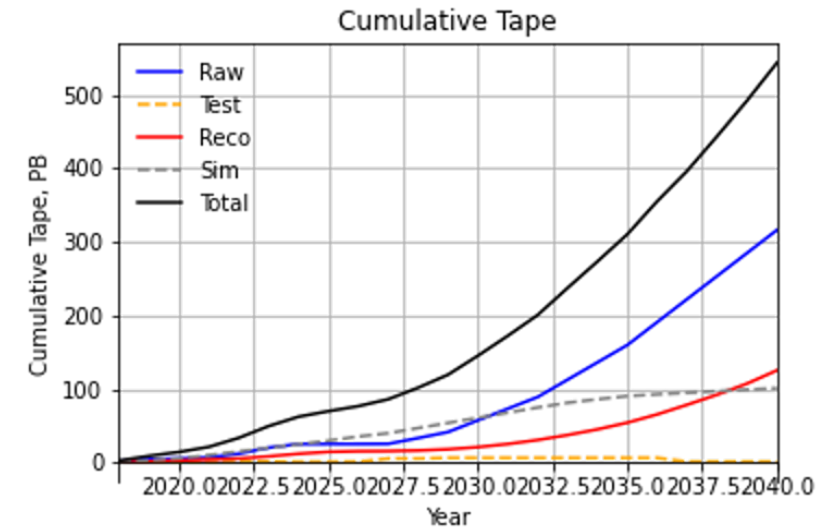
What requirements projections related to S&C that we should be aware of?

- Projects for resources (CPU, GPU, disk, tape, and network) are on the scale of 1/10th of the LHC resource needs, so large but not yet exabyte scale computing
 - 140 PB of tape by 2030
 - 50 PB disk by 2030
 - utilize tape and disk resources around the world - strict data lifetime policy for derived datasets
- Physical resources are not the greatest concern
- Dedicated and directly funded effort is of concern



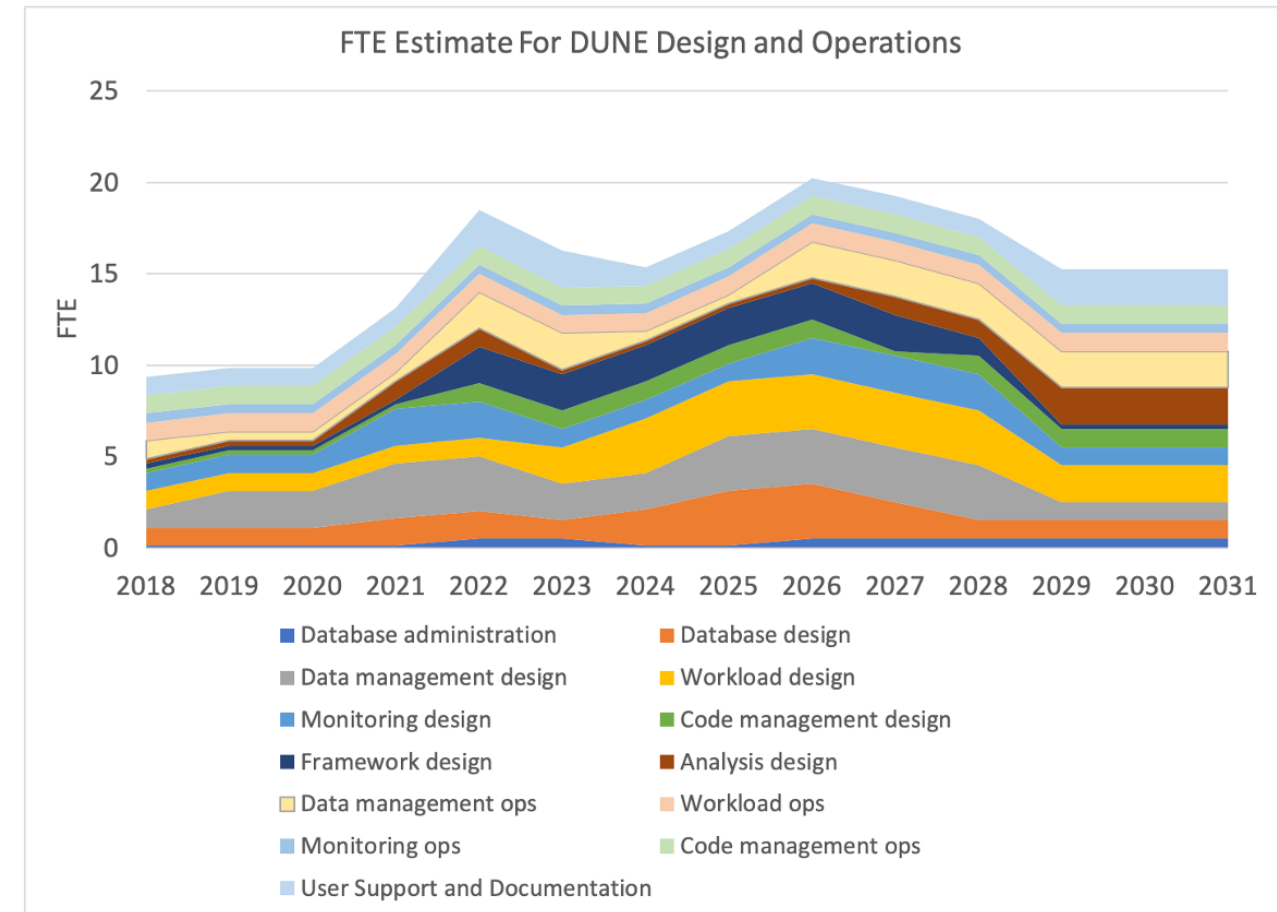
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New developments on the horizon that would drive S&C challenges? New physics, new instrumentation, new simulations?

- Triggering and DAQ for the ND and FD are going to be critical to reducing data volumes coming out of the DAQ and allowing for efficient streaming/processing of the raw data
 - this is both changing the thresholds for efficient triggering, but also regions of interest and zero-suppression
- Updates to neutrino generators are always important to computing and analysis
 - both theoretical work & support for the people making them usable
 - there are good starts in that direction which are much appreciated
- Having HPC with CPU, coprocessors, and external connectivity could make HPC work extremely well for both fast turn around processing and regular raw data processing

Neutrino

“~~Hadron~~ collider physics is about three things: trigger, trigger, and trigger.”

- Abraham Lincoln

