

ND Software Integration Overview

Mathew Muether

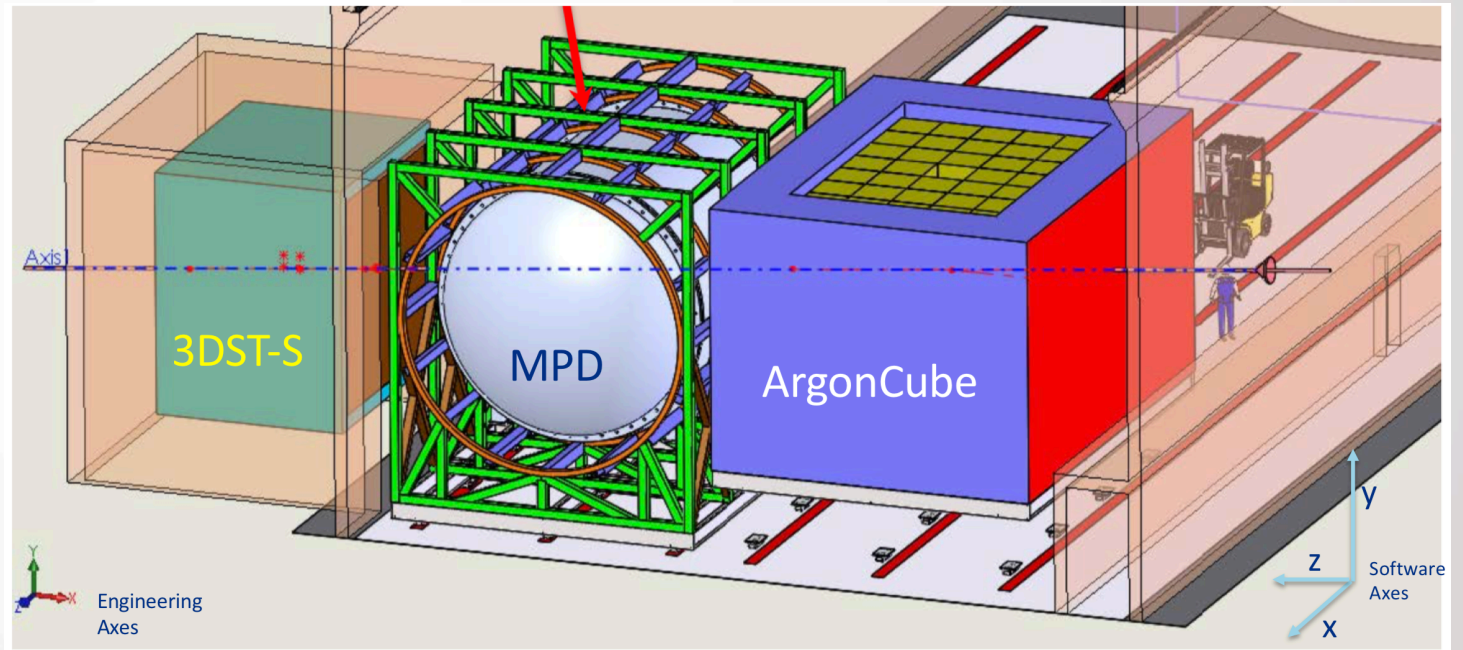
Mathew.Muether@wichita.edu

6th ND Worskshop - DESY

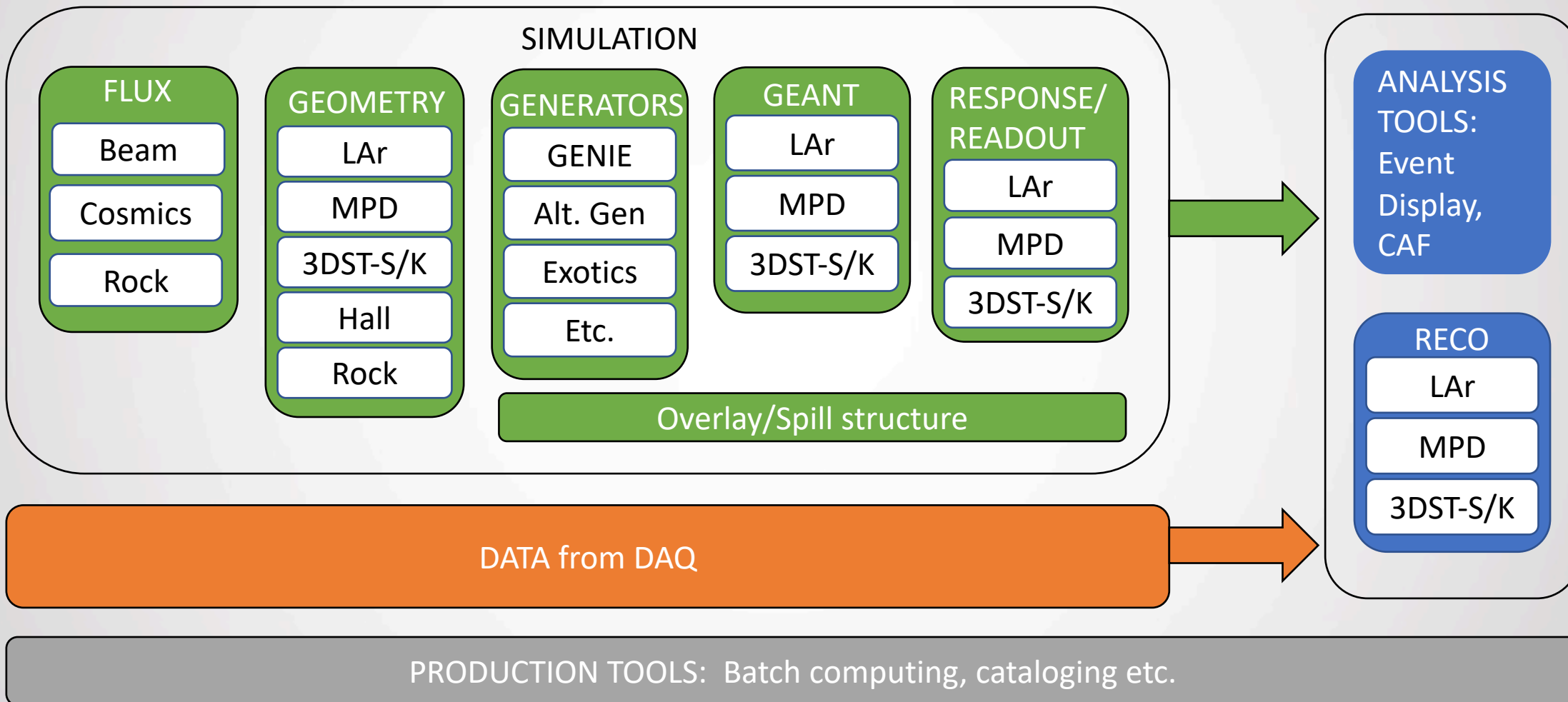
October 23, 2019

ND Software Integration

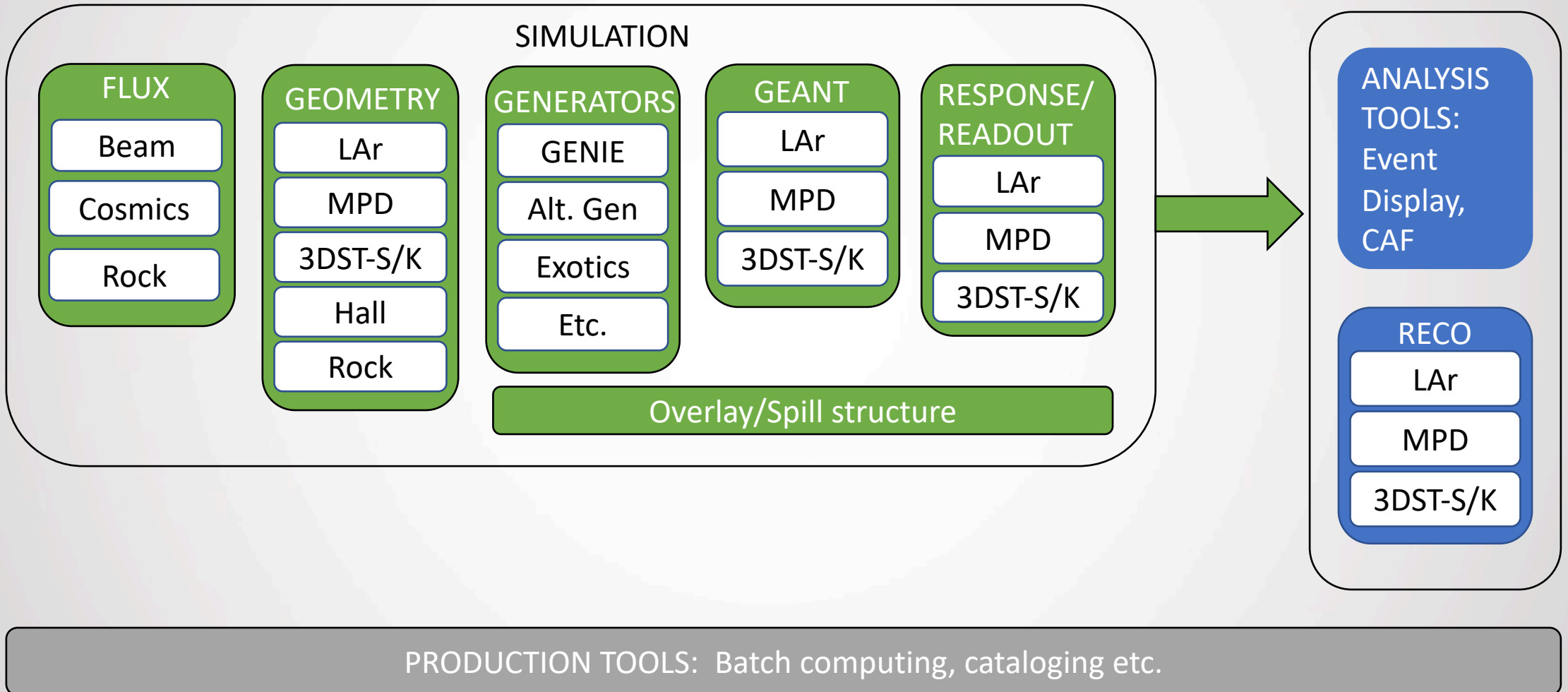
- Kickoff workshop on ND SW integration on July 24th
 - <https://indico.fnal.gov/event/21249/other-view?view=standard>
- Charge was to bring together ND detector system groups and DUNE physics groups to build a plan to get us to a full ND simulation and software suite.



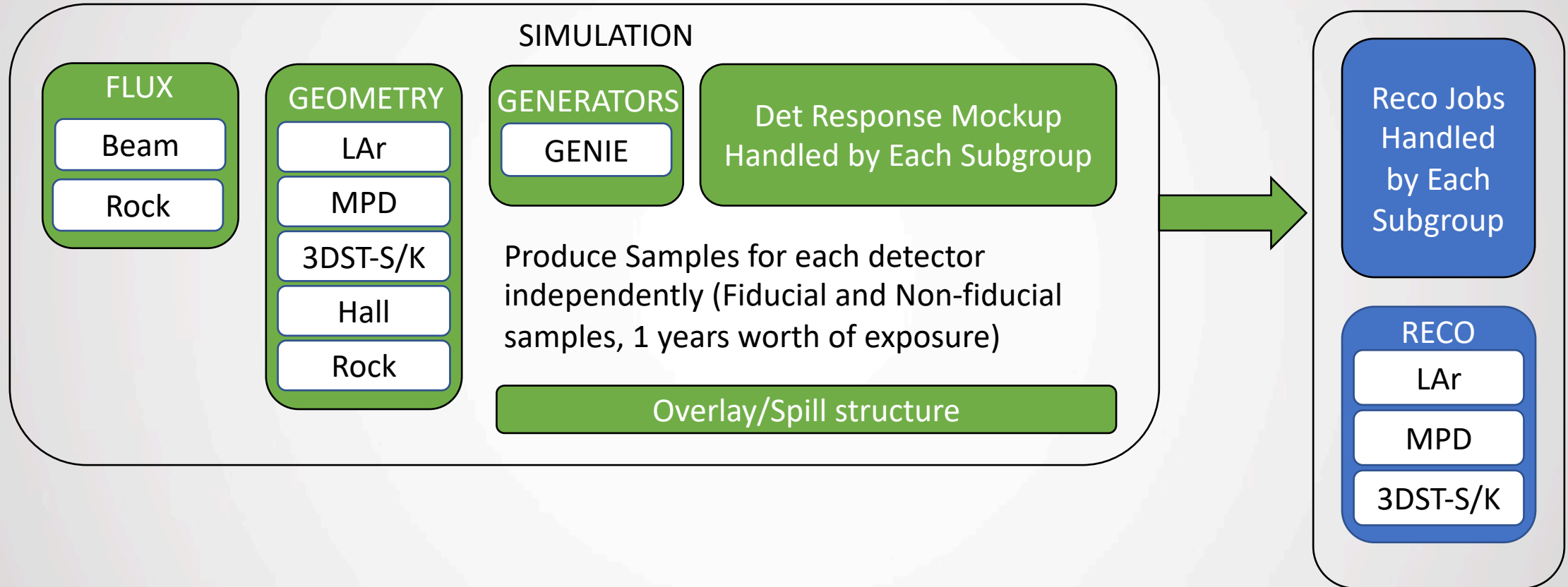
Overview of the Software (Roadmap)



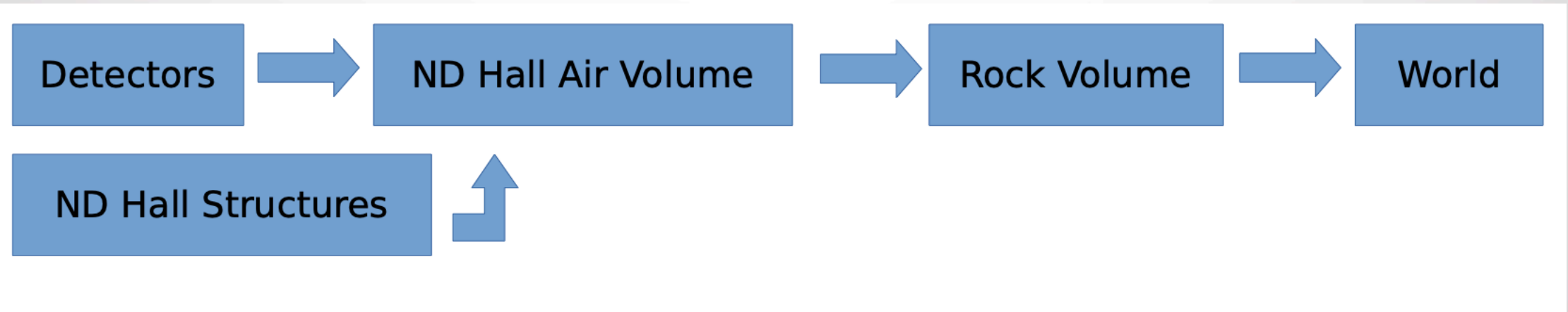
Overview of the Software (TDR Goal)

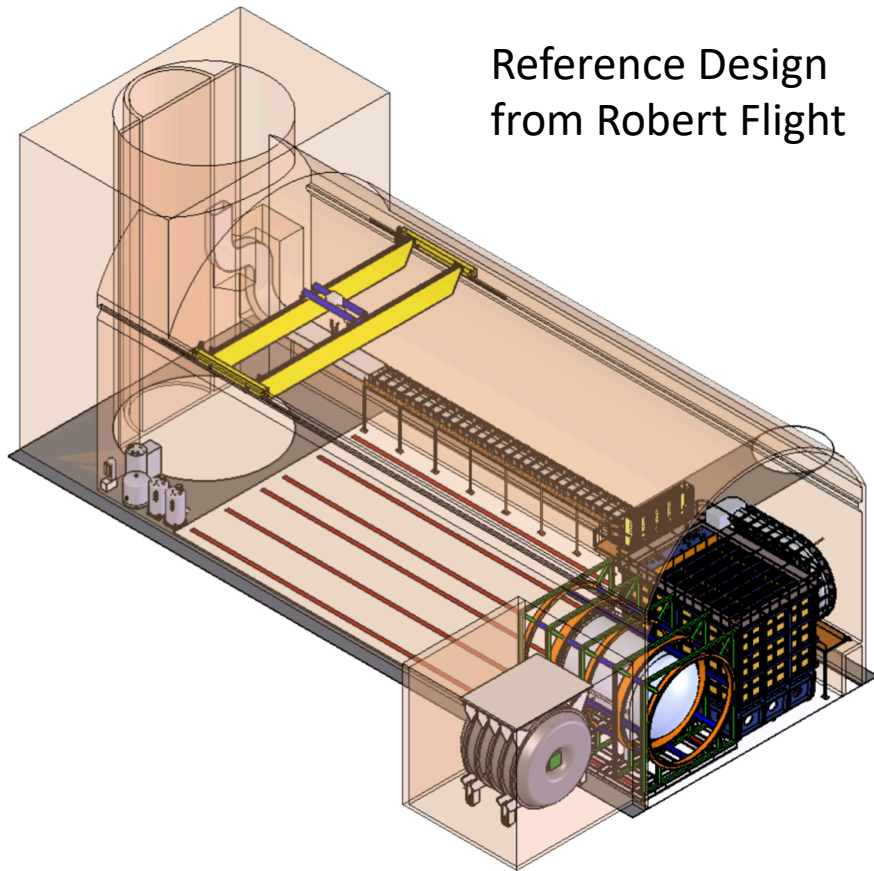


Overview of the Software (CDR Goal)

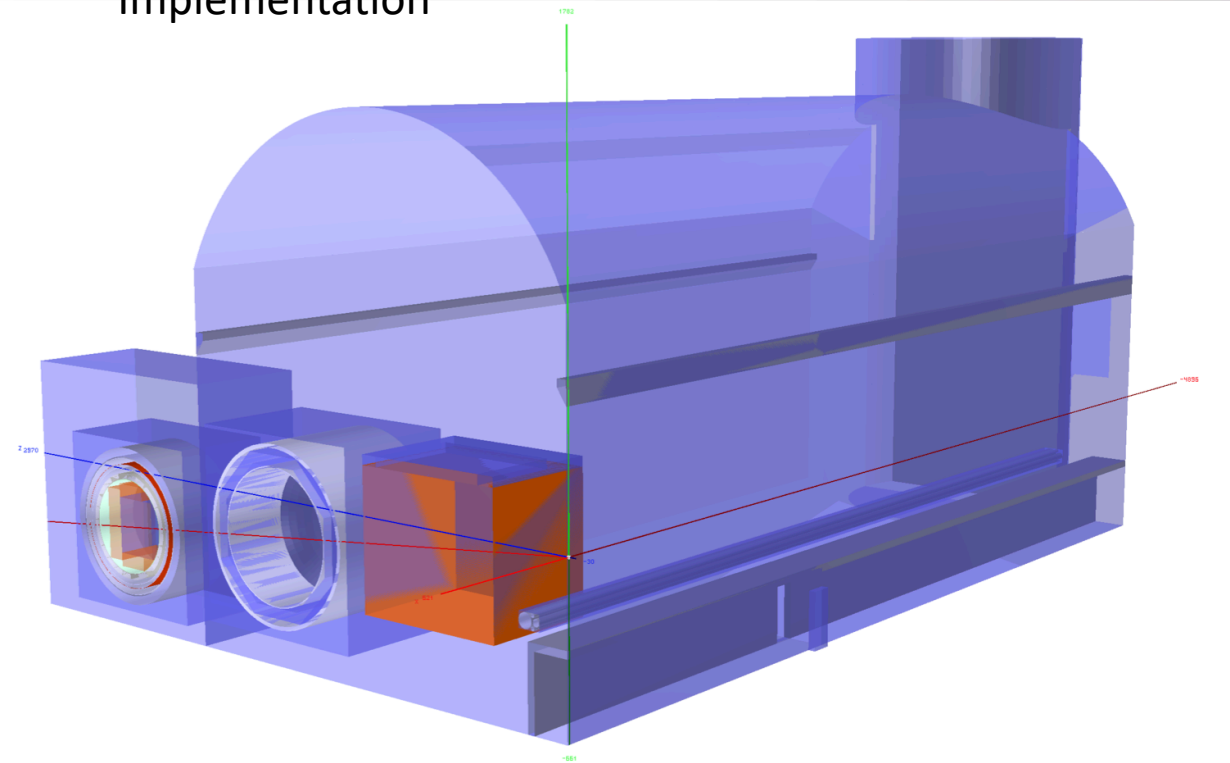


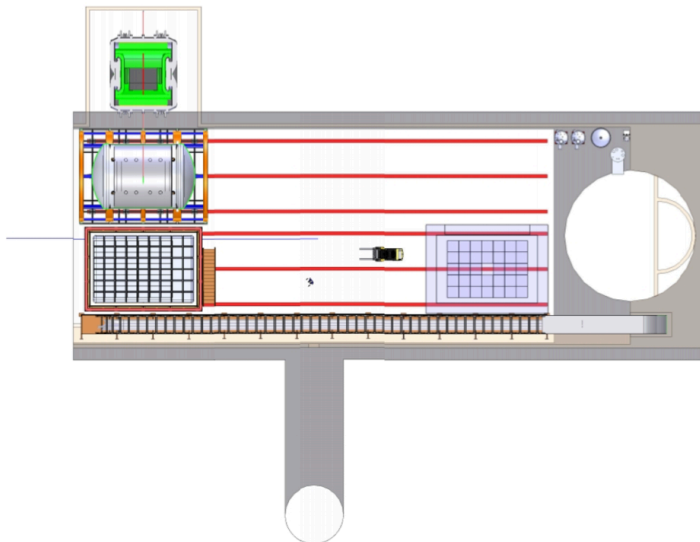
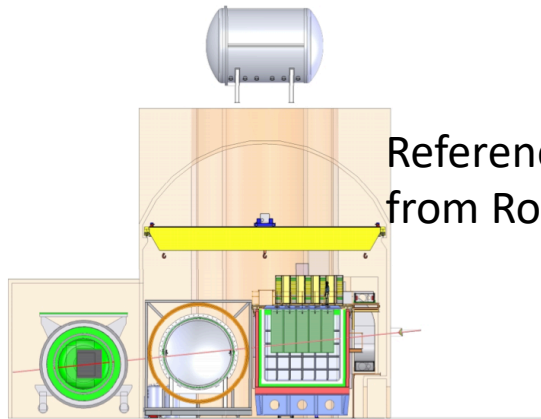
- Perri Zilberman, Guang Yang, Michael Kordosky, Eldwan Brianne have put together a full ND geometry with several rock options using DUNENDGGD framework.
- Logical Volumes placed inside each other using sub-builders to allow for easy integration of updated detector designs.





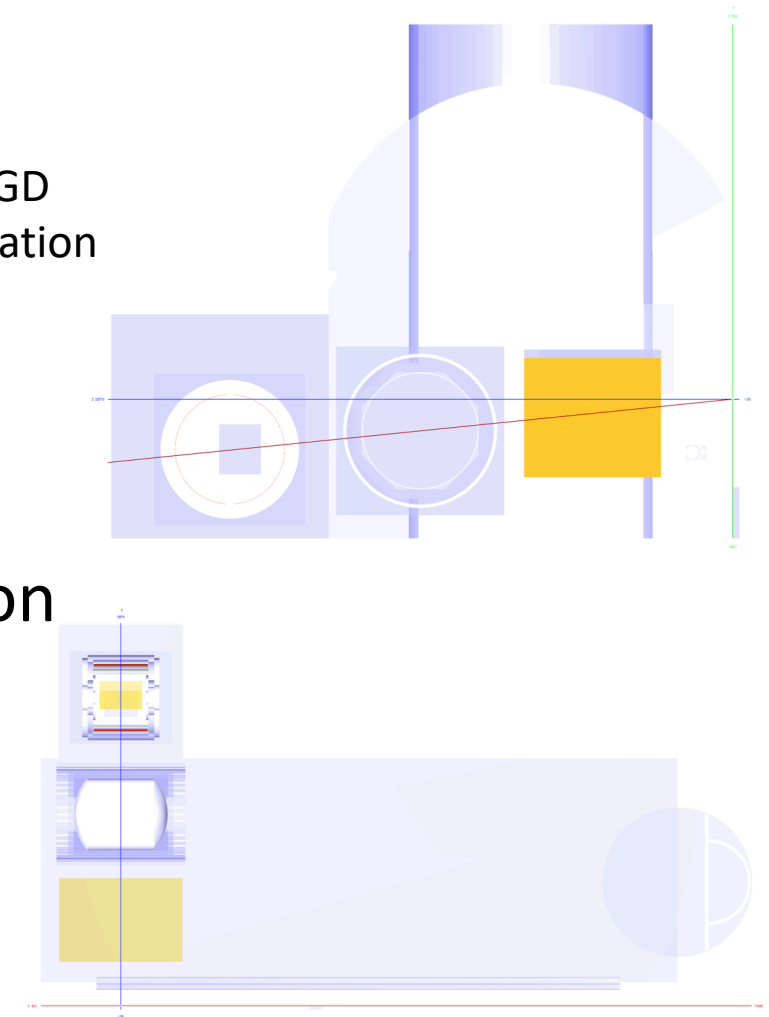
DUNENDGGD
Implementation





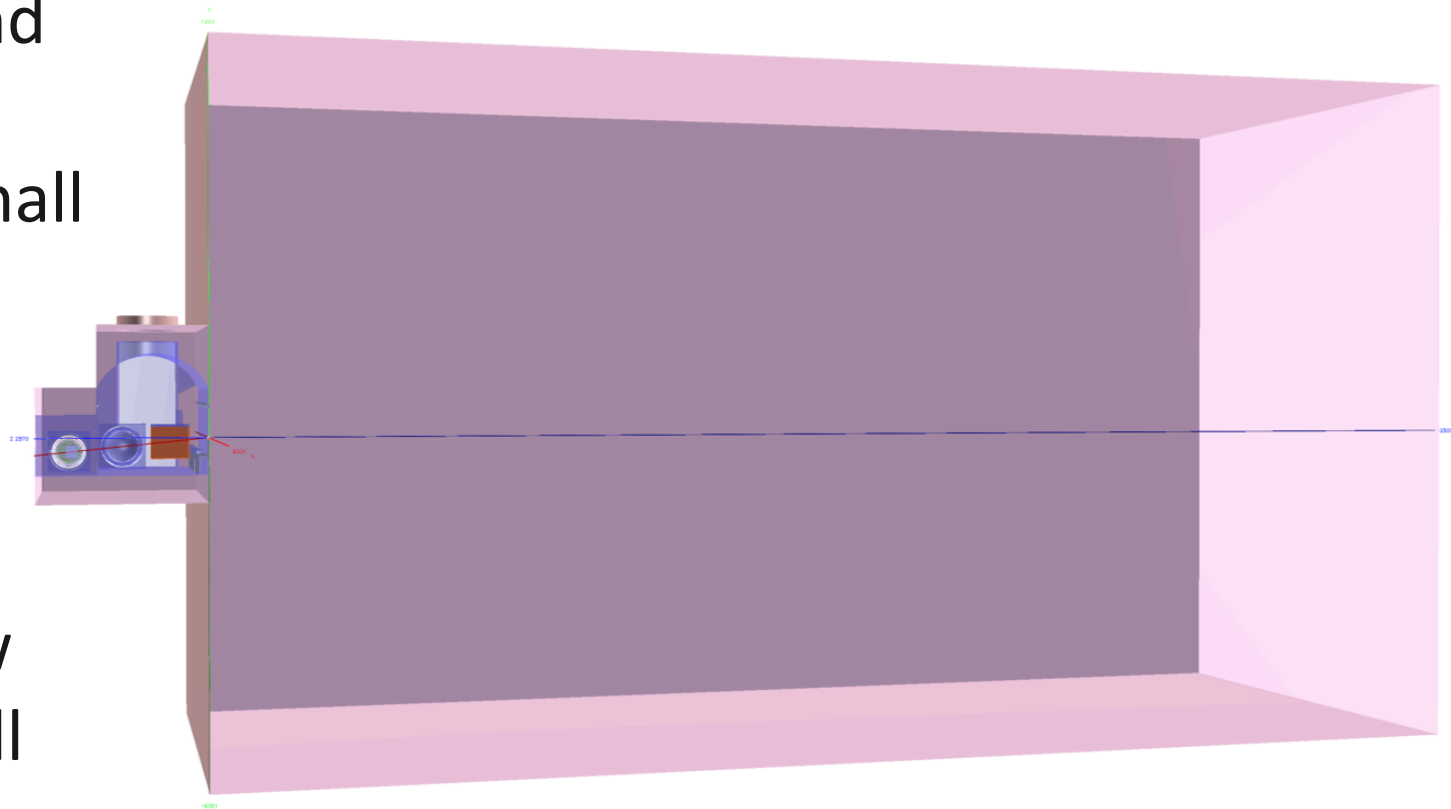
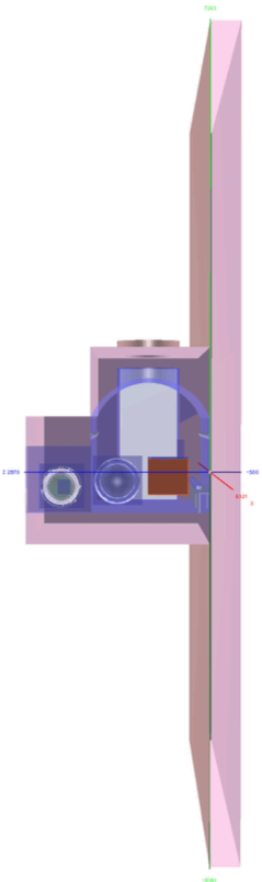
DUNENDGGD Implementation

- Origin at beam center on entering hall wall
- Z-axis in beam direction
- Y-axis: up
- X-axis: along rails



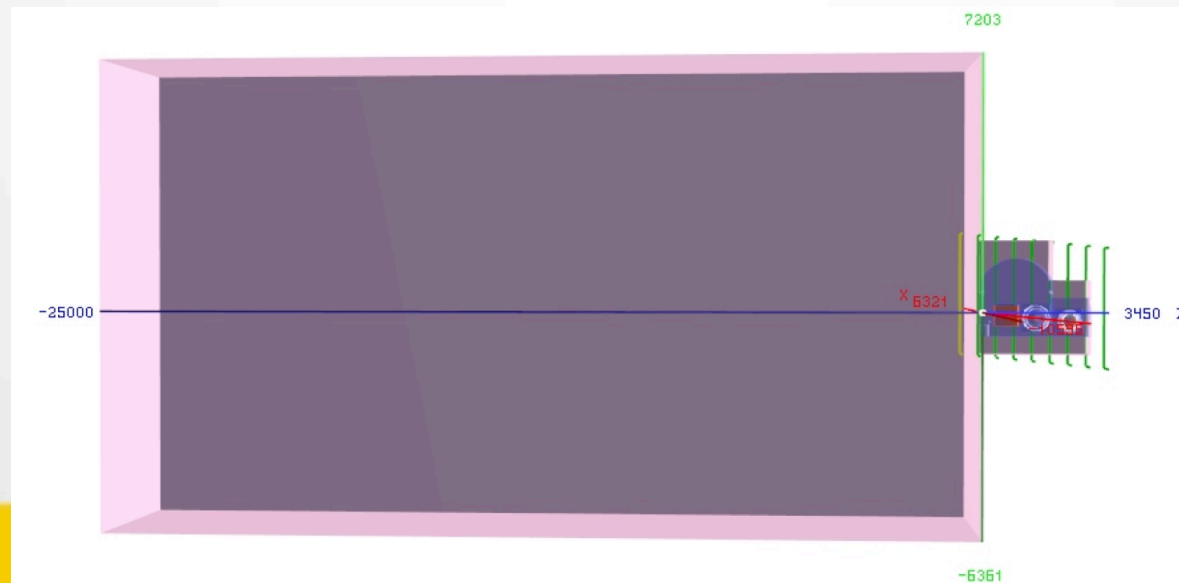
Rock Geometry

- 5m above, below, and on sides of hall
- 0m downstream of hall
- 5m above shaft
- 5m (for hadrons) or 250m (for muons) upstream of hall
 - 57m above, below and to sides of hall



Flux Status

- Started with the official flux comes from the optimized & engineered beam design effort of 2017. (dk2nu files)
- Produced Gsimple (simplified ntuple format for storing flux rays for use by the GENIE flux driver) files for rock, ND Hall and various subdetectors. More details from Tanaz in the next talk.



Genie generation

- CDR Samples
 - Tanaz has produced an initial set of files:
 - Rock propagated ghep records: `pnfs/dune/persistent/users/mtanaz/rock_propagated`.
 - (250k neutrino interactions in the corresponding top volume, which leads to anywhere between 1M-2M primary particles.)
 - 3DST: `/pnfs/dune/persistent/users/mtanaz/genie_3DST`
 - LArTPC: `/pnfs/dune/persistent/users/mtanaz/genie_LAr_CDR`
 - MPD: `/pnfs/dune/persistent/users/mtanaz/genie_MPD`
- Detector group should validate and give feedback.
- What else do groups need for CDR?
 - More stats? “1-years” worth?,
 - Fiducial/non-fiducial samples
- We need to put these in a more permanent location.



CDR Request and Status

- Request: Full spill ND Suite simulation through GENIE w/ parameterized performance assessments.
 - ✓ Full hall geometry with upstream rock
 - ✓ Choice of origin
 - ✓ Flux windows for event and rock generation
 - ✓ Gsimple file production
 - ✓ Rock event production
- Detector event production (In Progress)
- Overlaying (In Progress)

Some Next Steps

- GEOMETRY
 - Versioning: Need Distinct naming convention.
- Need a module to allow Geant4 step sizes etc by volume.
 - Run full hall jobs.
- Computing- What's are expected data volumes from ND raw data, processed data, simulation.
- Generators
 - Other neutrino interaction generators (Neut, NuWro, etc)
 - Cosmics
- Reconstruction Framework
 - Will need matching algorithms for full analysis.



Getting involved effort

- Please get involve with additional generation, validation of existing files, spill overlays and future development.
 - We are behind schedule for CDR.
- Details of existing available tools have been captured at:
https://cdcv.s.fnal.gov/redmine/projects/dune-neardet-design/wiki/DUNE_NearDet_Design
- There is also now a mailing list for the this effort
 - DUNE-ND-SW-INTEGRATION@LISTSERV.FNAL.GOV.
- Also #nd_software_integrate on slack.
- Weekly Meeting currently on Fridays at 2pm central.