Lightweight Distributed Computing System

LDCS

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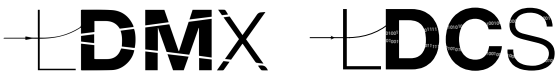
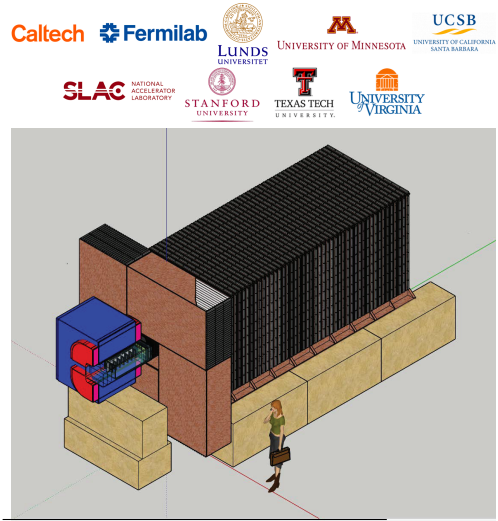


Light **D**ark **M**atter **Ex**periment (LDMX)[1]



- Accelerator-based Direct Dark matter detection experiment
- US/Sweden institutes
- Experiment to installed at SLAC making use of e^- beam from the Linac Coherent Light Source (LCLS) X-ray free-electron laser
- e^- beam with approximately 10^{14} electrons on target
- Backgrounds challenging and requiring ”large” data-sets

[1] https://link.springer.com/article/10.1007/JHEP04(2020)003
https://arxiv.org/abs/1808.05219

LDMX Computing software in a nutshell

What it is

- Framework based on Geant4 (C++)
- Wrapper interface for configuration (Python)
- Three types of tasks
  - Simulation: Geant4 Simulation with the selected geometry creation of new files
  - Reconstruction: Particle track reconstruction based on detector response based on already simulated files
  - Analysis: User based analysis which could take either input

what it needs

- Dataset cataloguing/archiving
- As much computing resources as possible to allow simulations/processing in a reasonable timescale
- Re-simulation/processing of older datasets that might have been deleted without hassle

LDMX Computing infrastructure needs

Reliable

- ↳ Small team
- ↳ Limited time availability including Sysadmins
- ↳ Ambitious program with tight schedule

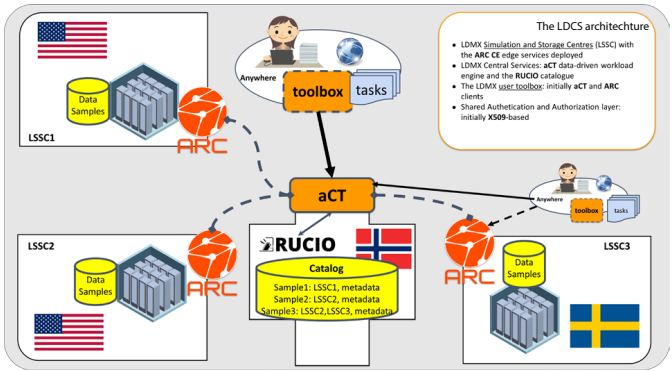
Scalable

- ↳ Expansions for new institutes / resources

Data driven load balancer

- ↳ In our use case computing power is less an issue (though always welcome more) but storage can be limited

Our solution: Not reinventing the wheel



Advanced Resource Connector (ARC)

Connect local resources and make them available to the system

ARC Control Tower (aCT)

Aggregate calls from external users and regulate each ARC-CE

Rucio

Data catalog management and metadata management

Advantages

- Extensive user base and extensive documentation for each of those tools.
- Everything is naturally integrated together already, for example in the ATLAS computing infrastructure
- Painless integration and set up
- Even though build for LDMX, **LDCS is a general computing solution idea for small / medium scale projects**

Summary

- Easily maintainable/scalable system.
- Not reinventing the wheel, but sometimes you do not need to.
- Enabled LDMX to significantly boost sample producton.
- Hopefully will be back with good physics results
- LDCS still evolving towards fully operational system

Thank you for your attention!