

EIC Detector-1 Software Stack

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Detector-1 Software: History

- 2/3 proposals had major software efforts, ATHENA and ECCE
 - ATHENA chose to develop a new stack based on variety of common software tools
 - ECCE chose to utilize existing tools within Fun4All framework
 - Pros and cons to both...
- Now, in detector-1 consolidation phase, the future of the EIC software stack is being determined

Detector-1 Software: Present

- Presently the software/computing and simulation/QA groups are leading a process to define a single framework for detector-1 to use
- Discussing possible technologies based on a set of requirements and based on the [EIC Software Principles](#)
- List of [discussions](#) over the next several weeks to decide on these technologies
 - Join the discussion! Your opinion matters!

		Discussion topic(s)	Decision topic(s)	comments	Point of Contact	
May	4	AIWG				
	11	Transition Period	Present procedure. Decide on list and order of decision topics			
	18	No meeting (Streaming Readout X Workshop)				
	25	Code Repository	Repository: - Location (GitHub, GitLab+Host) - Admins - Access		David Lawrence	
Jun	1	Discussion Schedule	Schedule: - Decide most critical decisions to make before July 27th EICUG meeting - Schedule of topic discussions			
	8	Geometry	Geometry: - Package (e.g. DD4HEP)		Markus Diefenthaler	
	15	Data Model	Data format - Generated events - Simulated data - Processed data (e.g. ROOT w/ specific tree format)		Whitney Armstrong	
	22	Data Model				
	29	Reconstruction Framework	Reconstruction Framework - Package			
Jul	6	Reconstruction Framework				
	13	Data and Analysis preservation	Data Preservation - What is preserved (simulated, DSTs, ...) - Location(s) - Access (S3, xrootd, rucio, ...)			
	20	Documentation	Documentation: - Location of User documentation (wiki, repository,...) - Who will set up skeleton with list of topics (e.g. "Getting Started")			
	27	EICUG Meeting				
Aug	3	Continuous Integration	Continuous Integration			
	10	Containerization Official buids	Containerization - platform (Singularity, Docker, multi, ...) - Supported OSes - Location of images (e.g. cvmfs) Official builds - Location (e.g. cvmfs, container image, ...)			
	17	Calibration DB Conditions DB	Calibration / Conditions DBs - Package - Server/Host - Access			
	24	Calibration DB Conditions DB				
	31	Distributed Campaign Workflow	Distributed Campaign Workflow - Package (DIRAC, PanDA, STAR(?), ...)			
Sep	7					
	14					

Detector-1 Software: Present

- Two discussions already occurred:
 1. Repository
 - Github or institution managed Gitlab service
 - Github for code hosting + mirrored Gitlab for CI runners
 2. Geometry package
 - DD4Hep or direct-G4 geometry implementation (example case: Fun4All)
 - Discussions ongoing
- This week: data model

Thoughts on Software

- Building a software stack is like building a detector
 - We need to make (certain) decisions now that will serve the lifetime of the experiment
 - We need to make decisions that will utilize the latest and greatest technologies while mitigating long term risk
 - We need to build a stack that will enable the broadest possible EIC science program
- This can be especially challenging in computing where the landscape changes quickly
 - e.g. heterogeneous computing architectures

Software Towards CD2

- Once decision on key software technologies has been made, we will need to prepare the stack for CD2
- Will be extremely important to get more realistic software in place, e.g.
 - Realistic track reconstruction + backgrounds
 - More detailed simulations of chosen detector technologies
 - e.g. at CD2 sPHENIX already had 2-3 (!) calorimeter test beams to compare simulations to actual data performance
- And more...

Software Research (Long term)

1. Streaming readout

- Technical challenge - ALICE, LHCb, and sPHENIX implementing now

2. Real time analysis

- Technical challenge - LHCb leading this area at hadronic colliders

3. AI and ML

- How do we integrate new intelligence technologies throughout the software stack?

Ways to Contribute Now

1. Get involved with the software stack decision process. Share your experiences and opinions!
2. Single software stack will begin to take shape soon. Identify relevant tasks and start working to implement them, in discussion with the various software/computing conveners
 - e.g. track reconstruction, calo simulation, PID reconstruction, and more...