Software status and future developments

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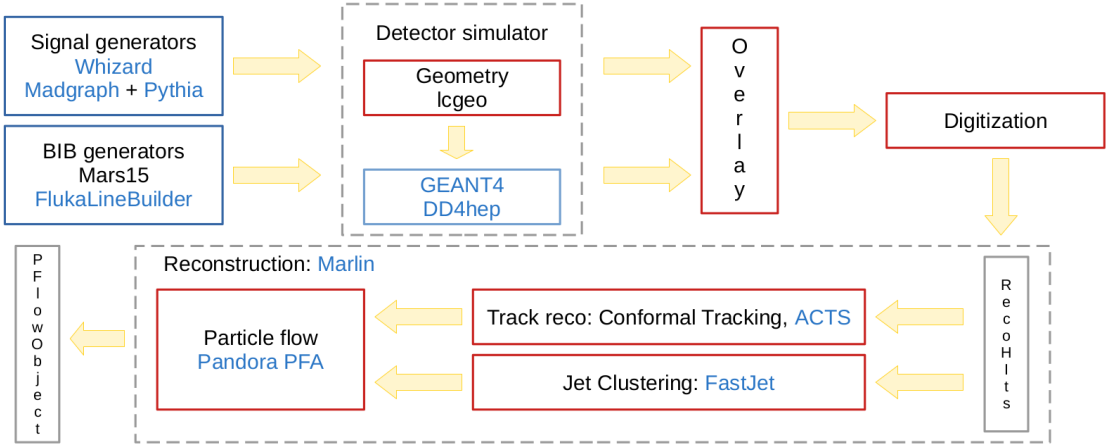
The starting point

The challenge

Setup a complete environment for simulation and analysis of the Muon Collider detector behavior and performances
Create a versatile platform for the development of new components
The environment must scale on heterogeneous computing infrastructures

- The framework used by the CLIC experiment (iLCSoft) has been chosen as a starting point.
- Both the simulation and the reconstruction are done within a single framework.

The framework



MuonC customizations I

The custom packages specific to Muon Collider detector are maintained in the public github Muon Collider Software repository

detector-simulation	Implement the Muonc Collider detector geometry: **MuColl_v1**. Add new **Crilin** calorimeter.
lcgeo	Added support of Z segmentation to ZPlanarTracker class (used in the new digitizer).
MuonCVXDDigitiser	New digitiser processor for vertex detector (not released).
Overlay	Optimize merging for the unusual BIB.
ConformalTracking	Implement new strategies to take care of the BIB: regional tracking, cone-tracking...

MuonC customizations II

MarlinTrkProcessors	Optimize general digitization process (introduce a time window). Add some filtering processor: Double-layer, cone, time...
LCTuple	Add some information useful for analysis
DDMarlinPandora	Add some new strategies like the BIB subtraction in the calorimeter cells. Works with a new type of calorimeter (**Crilin**)
ACTSTracking	Integrate and use the new **ACTS** library
ProductionConfig	Collections of configuration files used in the official production simulation/reconstruction

Distribution

- The reference artifact for the production is a docker container, published in Docker Hub and mirrored on Cern cvmfs (/cvmfs/unpacked.cern.ch/registry.hub.docker.com/infnpd): last version is **v02-07-MC**
- Development and production previously based on CentOS 8, temporary moved to CentOS 8 Stream (last version has been released for both SO).
  Waiting for a final solution from CERN/FermiLab
- Conversion from docker image into apptainer (i.e. singularity) one is performed.
  It is distributed via storage element at INFN-CNAF (srm://storm-fe-archive.cr.cnaf.infn.it:8444/muoncoll/SoftwareReleases)

Experimental setup

A complete set of RPM packages is ongoing; third-party dependencies are already available.
A set of rpms is ready for testing (see Software → Installation page in confluence site)

Future works

- A Github-based CI has been configured by LBL people, but other solution can be evaluated to guarantee a convenient way for designing new components and testing them directly on a distributed system
- A set of tests need also to be developed and integrated
- Large overlap with the Key4HEP stack: planning full transition in the future

Resources I

CloudVeneto

Openstack based cloud infrastructure
200 VCPU, 740 GB RAM, 100 Virtual machines
Platforms available: Docker, Kubernetes, batch clusters on demand
Storage on volumes: 90TB
Object storage: 75TB

Can be used only by INFN (PD) people with some exception

Other local resources are used in various sites (INFN-Trieste, INFN-Bari, LBL, FermiLab..)

Resources II

INFN-CNAF

Batch system based on HTCondor, with 6 CEs
Storage: 150TB on INFN StoRM

Access to batch system is possible only for INFN people
The access to Storage Element can be obtained with a valid grid certificate with the VOMS extension of the VO muoncoll.infn.it

CERN site

Batch system based on HTCondor
Storage: 100TB on CERN EOS
Now in pre-production

Policies for access and use are under discussion... seen next presentation.

References for feed-back

For a manually setup of environment and for further details:
https://confluence.infn.it/display/muoncollider/Installation

For available dataset:
https://confluence.infn.it/display/muoncollider/Monte+Carlo+Simulated+Samples

Tutorial on simulation software available at:
https://indico.fnal.gov/event/45187/

Any other technical information can be found on:
https://confluence.infn.it/display/muoncollider/Muon+Collider+Home

For any feed-back about infrastructure and software the mailing list is:
muon_collider_software@lists.infn.it