

## First look at the update of ACTS software

Shyam Kumar, Annalisa Mastroserio, Domenico Elia  
INFN Bari, Italy

## Version

**v28.2.0**

Link by Shujie

<https://github.com/acts-project/acts/releases>

### Fix

- Reset navigation state correctly in KF reverse pass (#2368) ( a22a8be ) (@andiwand)
- Exa.TrkX edge duplicate removal (#2373) ( dd8188a ) (@benjaminhuth)
- Fix AMVF finding with negative cov (#2374) ( 1c459a9 ) (@andiwand)
- Track parameter estimation might give inf time (#2353) ( 10b40b7 ) (@paulgessinger)

### Refactor

- Exa.TrkX boost track building & unit test (#2361) ( 0eb5954 ) (@benjaminhuth)
- Move some implementation from header to source (#2371) ( 543bd5a ) (@benjaminhuth)
- Use Particle::qOverP in Fatras simulation (#2375) ( c83f8fc ) (@andiwand)
- Use map instead of two vectors in AdaptiveGridTrackDensity (#2338) ( f96b048 ) (@felix-russo)
- Remove direction from NavigationOptions and drop constructor (#2345) ( 0f745ae ) (@andiwand)

### Feature

- ExaTrkX edge building KDTree on CPU + fixes + refactor + tests (#2360) ( 0486e42 ) (@benjaminhuth)
- Read CSV clusters and measurement-particles-map & refactor (#2103) ( 342899b ) (@benjaminhuth)
- Make SourceLink SBO size configurable via CMake (#2357) ( 7ae364d ) (@paulgessinger)
- Configurable maximum number of bins in SP grid (#2325) ( e9977db ) (@LuisFelipeCoelho)

**ACTS: A Common Tracking Software**

# How to Install EIC Recon with a ACTs version

Thanks to Wouter for commands

<https://github.com/eic/EICrecon/issues/623#issuecomment-1694702542>

- Scripts is better for repetitive work, I put the commands in script format (I always use it)

- The script name is **Install\_Acts.sh**

## Link of Script

<https://drive.google.com/drive/folders/17DwFi3qDp-ZZhW5ITHpyVtOdkCD8MmB2>

- First download EIC container from the command in the script and type ./eic-shell

- **source Install\_Acts.sh v21.1.0** (This will compile successfull tested)

- **source Install\_Acts.sh v28.1.0** (This gives the error)

- It will automatically compile acts first (works fine always), then try to compile EICRecon with that ACTs version

- CMakeLists.txt in EICRecon/

We can do one by one



```
add_subdirectory( src/services )
add_subdirectory( src/algorithms )
add_subdirectory( src/benchmarks )
add_subdirectory( src/detectors )
add_subdirectory( src/examples )
add_subdirectory( src/global )
add_subdirectory( src/scripts )
add_subdirectory( src/tests )
add_subdirectory( src/utilities )
```

Even if it compiles we need to fix for running

CMake: two tasks compile and creating shared objects (.so) files  
concept of dynamic linking

```
78%] Built target ECTRK_plugin
79%] Building CXX object src/detectors/B0TRK/CMakeFiles/B0TRK_plugin.dir/B0TRK.cc.o
79%] Building CXX object src/global/tracking/CMakeFiles/tracking_library.dir/TrackParamTruthInit_factory.cc.o
79%] Building CXX object src/algorithms/reco/CMakeFiles/algorithms_reco_library.dir/JetReconstruction.cc.o
79%] Building CXX object src/services/io/podio/CMakeFiles/podio_plugin.dir/podio.cc.o
80%] Building CXX object src/algorithms/reco/CMakeFiles/algorithms_reco_plugin.dir/JetReconstruction.cc.o
80%] Building CXX object src/detectors/FOFFMTRK/CMakeFiles/FOFFMTRK_plugin.dir/OffMomentumReconstruction_factory.cc.o
80%] Building CXX object src/algorithms/reco/CMakeFiles/algorithms_reco_plugin.dir/MC2SmearedParticle.cc.o
80%] Linking CXX shared library podio.so
80%] Linking CXX shared library MPGD.so
```

object files (.o files)

shared objects (.so)

# Install EIC Recon with a ACTs v28.1.0

```
[ 7%] Built target dd4hep_plugin
[ 7%] Building CXX object src/algorithms/pid/CMakeFiles/algorithms_pid_plugin.dir/IrtCherenkovParticleID.cc.o
[ 8%] Building CXX object src/services/io/podio/CMakeFiles/G_datamodel_vectors.dir/G_datamodel_vectors.cxx.o
[ 8%] Building CXX object src/algorithms/digi/CMakeFiles/algorithms_digi_library.dir/SiliconTrackerDigi.cc.o
[ 9%] Building CXX object src/services/geometry/richgeo/CMakeFiles/richgeo_plugin.dir/IrtGeo.cc.o
/home/shyam/eic/EICrecon/src/algorithms/tracking/ActsGeometryProvider.cc: In member function 'virtual void ActsGeometryProvider::initialize(dd4hep::Detector*,
std::string, std::shared_ptr<spdlog::logger>, std::shared_ptr<spdlog::logger>)' :
/home/shyam/eic/EICrecon/src/algorithms/tracking/ActsGeometryProvider.cc:130:17: error: invalid initialization of reference of type 'const Acts::Logger&' from
expression of type 'Acts::Logging::Level'
130 |         acts_init_log_level,
```

```
^~~~~~
In file included from /home/shyam/eic/EICrecon/src/algorithms/tracking/ActsGeometryProvider.cc:16:
/home/shyam/eic/acts/install/include/Acts/Plugins/DD4hep/ConvertDD4hepDetector.hpp:104:55: note: in passing argument 2 of 'std::unique_ptr<const Acts::Trackin
gGeometry> Acts::convertDD4hepDetector(dd4hep::DetElement, const Logger&, BinningType, BinningType, BinningType, double, double, double, const std::function<v
oid(std::vector<dd4hep::DetElement&>&)>&, const GeometryContext&, std::shared_ptr<const IMaterialDecorator>, std::shared_ptr<const GeometryIdentifierHook>)'
104 |         dd4hep::DetElement worldDetElement, const Logger& logger,
```

```
gmake[2]: *** [src/algorithms/tracking/CMakeFiles/algorithms_tracking_library.dir/build.make:76: src/algorithms/tracking/CMakeFiles/algorithms_tracking_librar
y.dir/ActsGeometryProvider.cc.o] Error 1
gmake[1]: *** [CMakeFiles/Makefile2:1479: src/algorithms/tracking/CMakeFiles/algorithms_tracking_library.dir/all] Error 1
gmake[1]: *** Waiting for unfinished jobs....
[ 9%] Building CXX object src/algorithms/pid/CMakeFiles/algorithms_pid_plugin.dir/MergeParticleID.cc.o
[ 9%] Built target G_datamodel_vectors
[ 9%] Building CXX object src/services/geometry/richgeo/CMakeFiles/richgeo_plugin.dir/IrtGeoDRICH.cc.o
[10%] Linking CXX static library libalgorithms_digi.a
[10%] Built target algorithms_digi_library
[10%] Building CXX object src/services/geometry/richgeo/CMakeFiles/richgeo_plugin.dir/IrtGeoPFRICH.cc.o
gmake[2]: *** [src/algorithms/tracking/CMakeFiles/algorithms_tracking_plugin.dir/build.make:76: src/algorithms/tracking
dir/ActsGeometryProvider.cc.o] Error 1
gmake[1]: *** [CMakeFiles/Makefile2:1453: src/algorithms/tracking/CMakeFiles/algorithms_tracking_plugin.dir/all] Error 1
[11%] Building CXX object src/services/geometry/richgeo/CMakeFiles/richgeo_plugin.dir/ReadoutGeo.cc.o
[11%] Building CXX object src/services/geometry/richgeo/CMakeFiles/richgeo_plugin.dir/RichGeo_service.cc.o
^Z
[1]+  Stopped                  cmake --build build --target install -- -j8
nightly> shyam@shyam:~/eic/EICrecon$ root -l
```

Change in the class and type blue command again for compile again

```
OPEN FILES
ActsGeometryProvider.h
Logger.hpp
ActsGeometryProvider.cc
SpdlogToActs.h

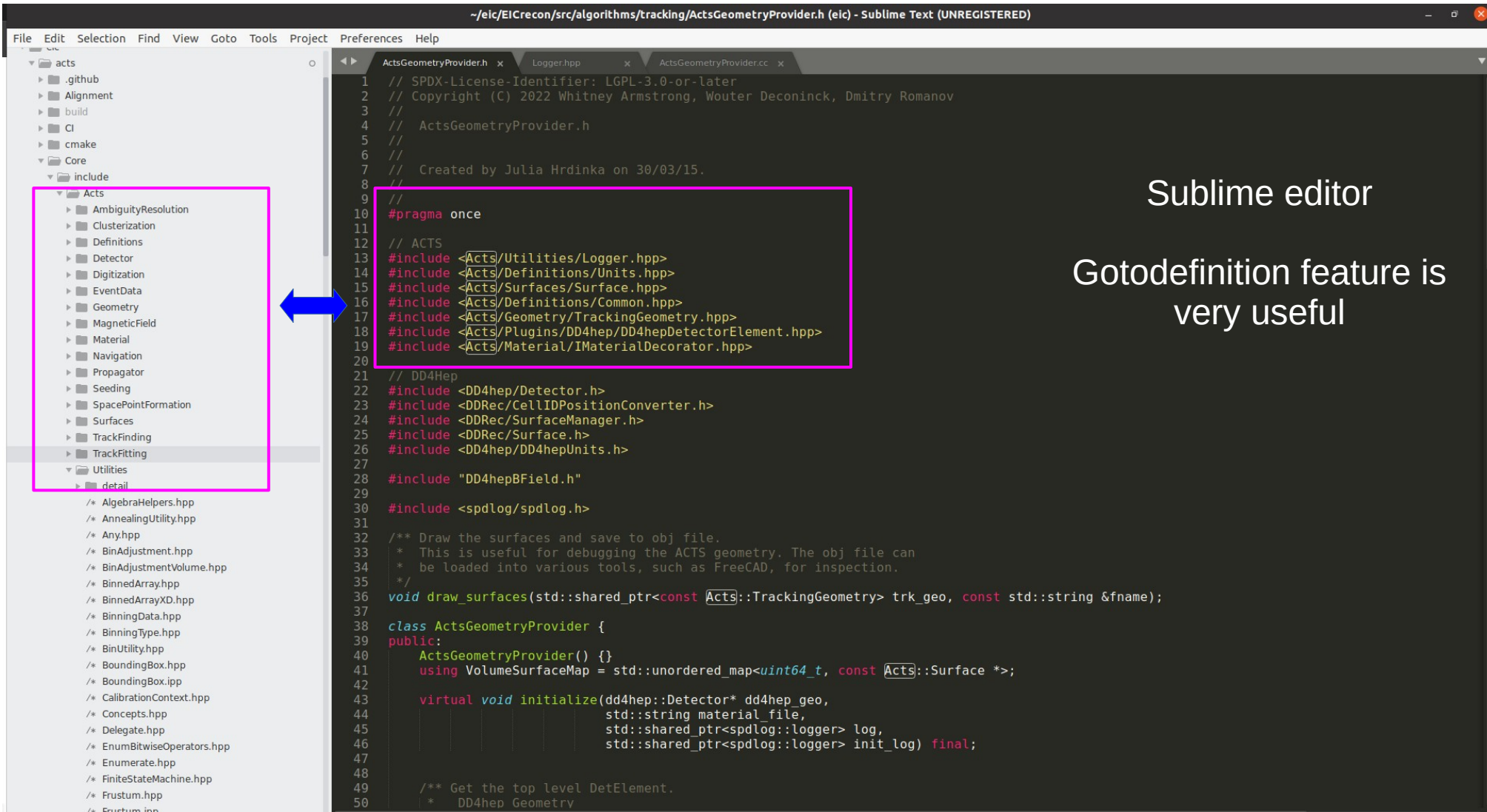
FOLDERS
eic
  .github
  Alignment
  build
  CI
  cmake
  Core
  include
    Acts
      Clusterization
      Definitions
      Digitization
      EventData
      Geometry
      MagneticField
```

```
File Edit Selection Find View Goto Tools Project Preferences Help
103 // }
104
105 // Load ACTS materials maps
106 if (!material_file.empty()) {
107     m_init_log->info("Loading materials map from file: " + material_file);
108     // Set up the converter first
109     Acts::MaterialMapToJsonConverter::Config jsonGeoConvConf;
110     m_materialDeco = std::make_shared<const Acts::JsonMat
111 } else {
112     m_init_log->warn("No ACTS materials map has been load
113     m_materialDeco = std::make_shared<const Acts::Materi
114 }
115
116 // Convert DD4hep geometry to ACTS
117 m_init_log->info("Converting DD4hep geometry to ACTS...")
118 Acts::BinningType bTypePhi = Acts::equidistant;
119 Acts::BinningType bTypeR = Acts::equidistant;
120 Acts::BinningType bTypeZ = Acts::equidistant;
121 double layerEnvelopeR = Acts::UnitConstants::mm;
122 double layerEnvelopeZ = Acts::UnitConstants::mm;
123 double defaultLayerThickness = Acts::UnitConstants::fm;
124 using Acts::sortDetElementsByID;
125
126 try {
127     m_trackingGeo = Acts::convertDD4hepDetector(
128         m_dd4hepDetector->world(),
129         acts_init_log_level,
130         bTypePhi,
131         bTypeR,
132         bTypeZ,
133         layerEnvelopeR,
134         layerEnvelopeZ,
135         defaultLayerThickness,
136         sortDetElementsByID,
137         m_trackingGeoCtx,
138         m_materialDeco);
139 } catch (std::exception &ex) {
140     m_init_log->error("Error during DD4hep -> ACTS geomet
141     m_init_log->info("Set parameter acts::InitLogLevel=
142     throw JException(ex.what());
143 }
144
145 m_init_log->info("DD4hep geometry converted!");
146
147 // Visit surfaces
148 m_init_log->info("Checking surfaces...");
149 if (m_trackingGeo) {
150     draw_surfaces(m_trackingGeo, m_trackingGeoCtx, "track
```

# Acts Classes

Sublime editor

Gotodefinition feature is very useful



```
1 // SPDX-License-Identifier: LGPL-3.0-or-later
2 // Copyright (C) 2022 Whitney Armstrong, Wouter Deconinck, Dmitry Romanov
3 //
4 // ActsGeometryProvider.h
5 //
6 //
7 // Created by Julia Hrdinka on 30/03/15.
8 //
9 //
10 #pragma once
11
12 // ACTS
13 #include <Acts/Utilities/Logger.hpp>
14 #include <Acts/Definitions/Units.hpp>
15 #include <Acts/Surfaces/Surface.hpp>
16 #include <Acts/Definitions/Common.hpp>
17 #include <Acts/Geometry/TrackingGeometry.hpp>
18 #include <Acts/Plugins/DD4hep/DD4hepDetectorElement.hpp>
19 #include <Acts/Material/IMaterialDecorator.hpp>
20
21 // DD4hep
22 #include <DD4hep/Detector.h>
23 #include <DDRec/CellIDPositionConverter.h>
24 #include <DDRec/SurfaceManager.h>
25 #include <DDRec/Surface.h>
26 #include <DD4hep/DD4hepUnits.h>
27
28 #include "DD4hepBField.h"
29
30 #include <spdlog/spdlog.h>
31
32 /** Draw the surfaces and save to obj file.
33  * This is useful for debugging the ACTS geometry. The obj file can
34  * be loaded into various tools, such as FreeCAD, for inspection.
35  */
36 void draw_surfaces(std::shared_ptr<const Acts::TrackingGeometry> trk_geo, const std::string &fname);
37
38 class ActsGeometryProvider {
39 public:
40     ActsGeometryProvider() {}
41     using VolumeSurfaceMap = std::unordered_map<uint64_t, const Acts::Surface*>;
42
43     virtual void initialize(dd4hep::Detector* dd4hep_geo,
44                           std::string material_file,
45                           std::shared_ptr<spdlog::logger> log,
46                           std::shared_ptr<spdlog::logger> init_log) final;
47
48     /** Get the top level DetElement.
49      * DD4hep Geometry
50     */
```



# Summary

- First look at the compilation of ACTs works fine with v21.1.0.
- There are so many errors v28.1.0 but if we can go one by one for each directory fix for compile and test for some example code

**Thank You !!**