


How Muon Reconstruction is Done

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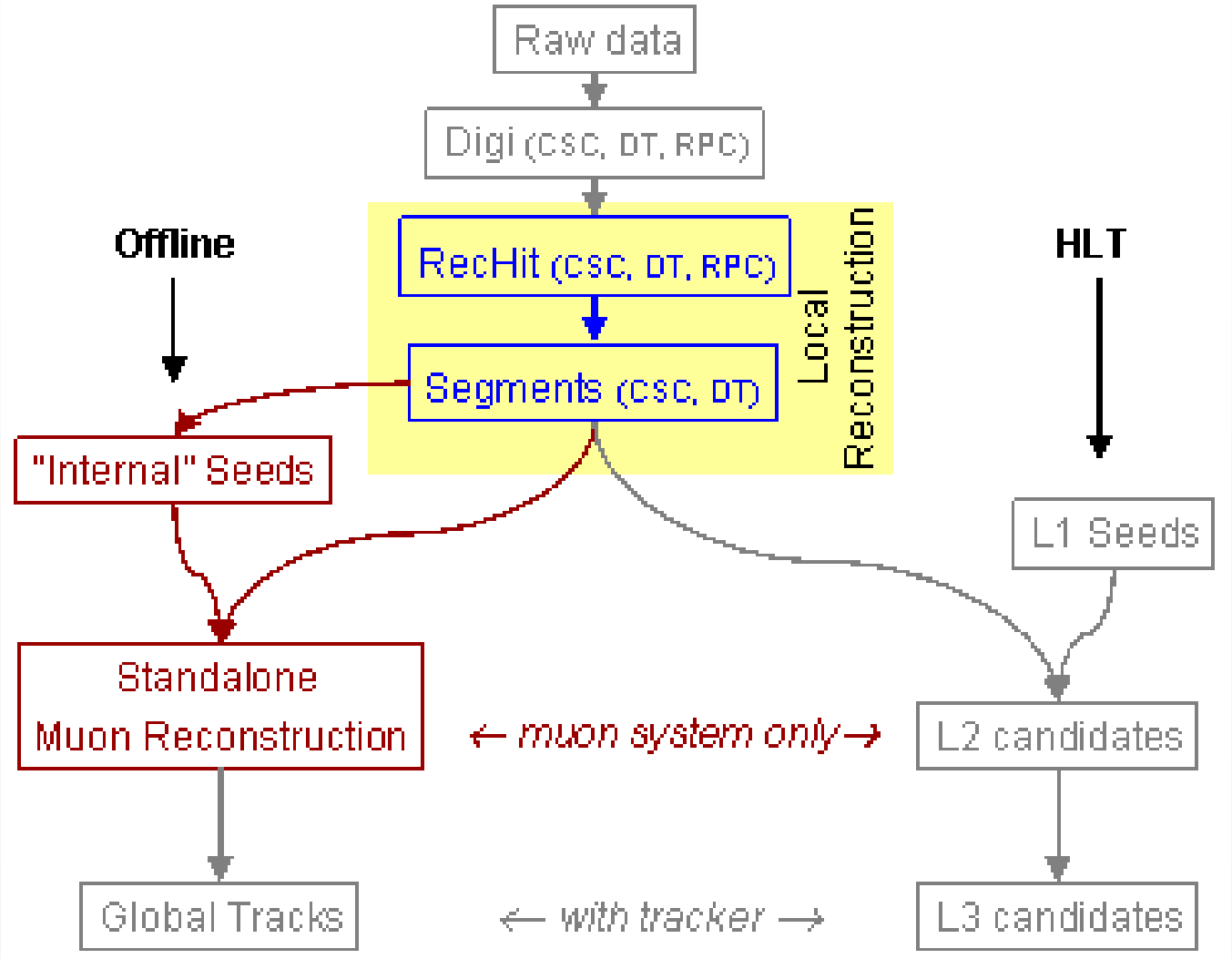
The Procedure

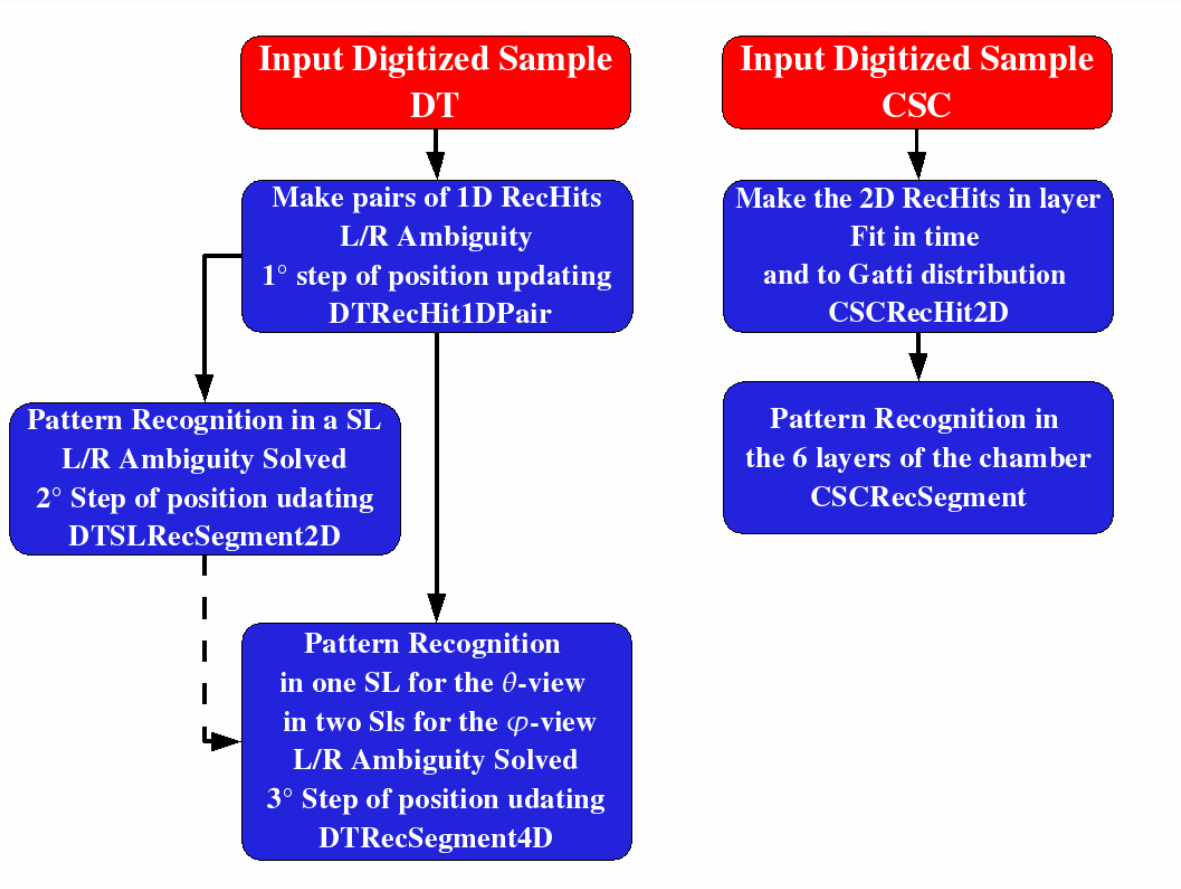
1. Translate raw data into Digis, Digis into RecHits
2. Resolve left/right ambiguity
3. Construct segments
4. Fit to a "stand-alone" muon track
5. Do all silicon tracking
6. Match silicon-only tracks with muon-only tracks
7. Combine the fits, present reco::Muon

Stand-alone muons are probably *not* used to seed silicon track-finding.


Raw data
Digi (CSC, DT, RPC)
RecHit (CSC, DT, RPC)
Segments (CSC, DT)
Local Reconstruction
Offline
HLT
"Internal" Seeds
L1 Seeds
Standalone Muon Reconstruction
← muon system only →
L2 candidates
Global Tracks
← with tracker →
L3 candidates

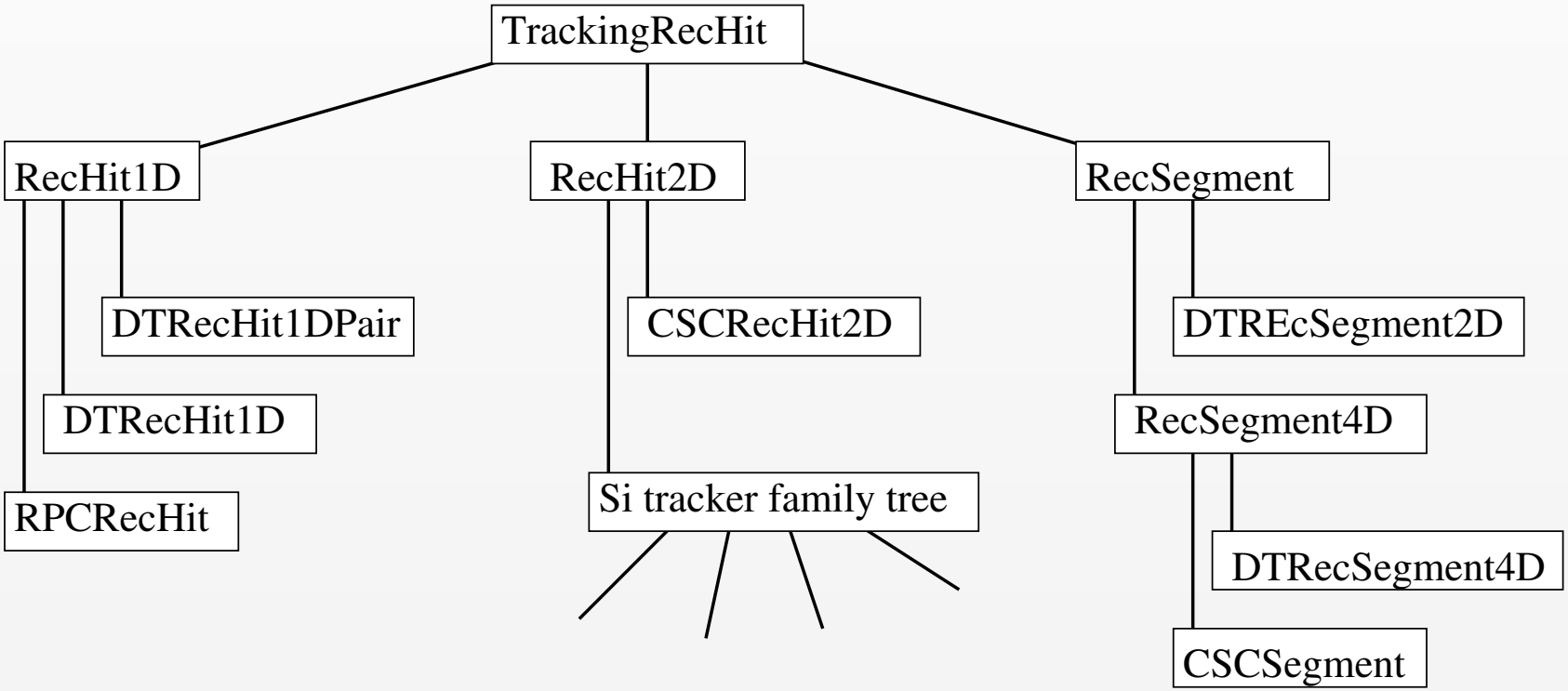
Local Reconstruction

Drift tubes (DT) and Cathode Strip Chambers (CSC) are reconstructed independently.



Local Reconstruction

All the hits and segments are TrackingRecHits, the same object used in silicon tracking.



Local Reconstruction Status

Completed before June Annual Review

CMSSW/RecoLocalMuon

Current directory: [CMSSW] / CMSSW / RecoLocalMuon

File
.admin/
CSCCalibrateDigis/
CSCRecHit/
CSCRecHitB/
CSCSegment/
CSCStandAlone/
DTRecHit/
DTSegment/
RPCRecHit/
doc/

cvsadmin@cmscvs.cern.ch Help on ViewCVS 0.9.2

10 May Tutorial

`https://uimfon.cern.ch/twiki/bin/view/CMS/MuTutorialSegments`

Stand-alone Muon Reconstruction

1. CosmicMuonSeedGenerator constructs TrajectorySeeds out of matched segments (TrajectorySeed is the same object used by silicon tracking)
2. StandAloneMuonProducer performs the fit and creates reco::Tracks (same object as silicon tracking)

SteppingHelixPropagatorESProducer is the simplest track/errors propagator through material and non-uniform magnetic field. Two alternatives are in development.

9 May talk on propagation by Nicola Amapane

`http://indico.cern.ch/conferenceDisplay.py?confId=1929`

Stand-alone Reconstruction Status

6 July Tutorial: "not yet a reliable tool. We are working on it!"

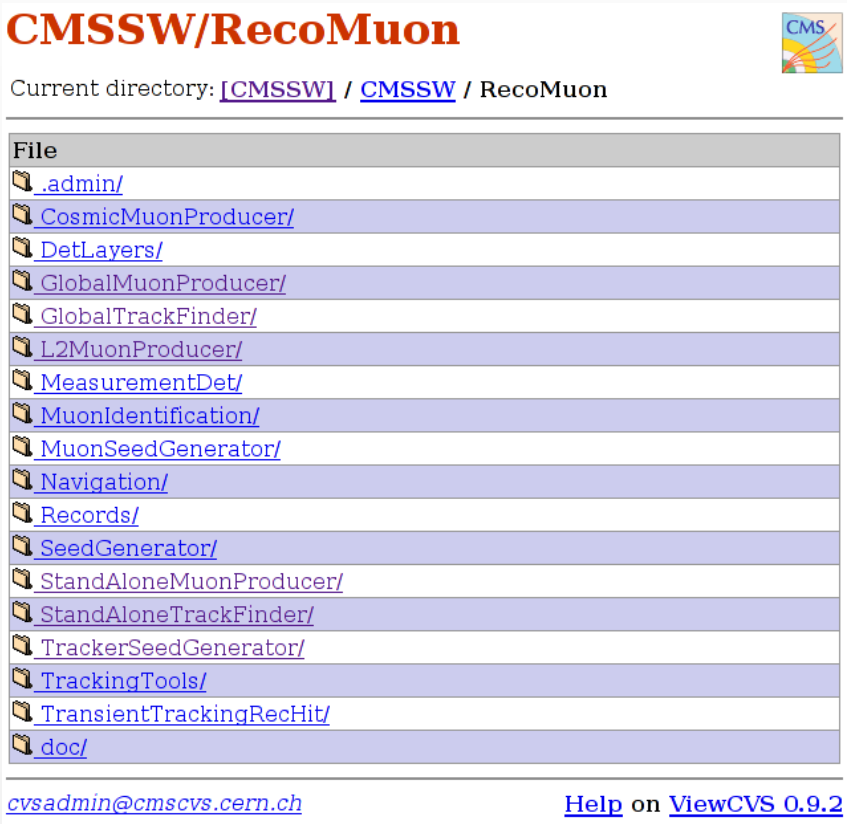
`https://twiki.cern.ch/twiki/bin/view/CMS/July06MuonReco`

22 August PRS/mu:

"seems to be basically working in all muon detectors!"

and

"formally working"



CMSSW/RecoMuon

Current directory: [CMSSW] / CMSSW / RecoMuon

File
.admin/
CosmicMuonProducer/
DetLayers/
GlobalMuonProducer/
GlobalTrackFinder/
L2MuonProducer/
MeasurementDet/
MuonIdentification/
MuonSeedGenerator/
Navigation/
Records/
SeedGenerator/
StandAloneMuonProducer/
StandAloneTrackFinder/
TrackerSeedGenerator/
TrackingTools/
TransientTrackingRecHit/
doc/

cvsadmin@cmscvs.cern.ch Help on ViewCVS 0.9.2

Combining Muon Tracks with Silicon Tracks

What I can determine from the code:

- GlobalMuonProducer inputs stand-alone tracks and outputs reco::Muons.
- reco::Muon contains references to stand-alone muon track, silicon-only track, and combined track.
- The actual work is done by these classes:

CMSSW/RecoMuon/GlobalTrackFinder/src

Current directory: [CMSSW] / CMSSW / RecoMuon / GlobalTrackFinder / src
Files shown: 4

File	Rev.	Age	Author	Last log entry
Attic/ [show contents]				
GlobalMuonSeedCleaner.cc	1.1	3 months	cliu	initial commit
GlobalMuonTrackMatcher.cc	1.26	4 days	bellan	use MuonServiceProxy instead of the ES percolation
GlobalMuonTrajectoryBuilder.cc	1.44	3 days	neumeist	cleanup
MuonTkNavigationSchool.cc	1.3	5 weeks	neumeist	*** empty log message ***

Global Muon Fit Status

Probably a work in progress.

Actively-pursued Alternative

UCSB (Claudio Campagnari, Dmitriy Kovalskyi, Slava Krutelyov, Jacob Ribnik) wish to simplify the process, replacing

$$\text{stand-alone muon track} + \text{silicon-only track} \longrightarrow \text{global track}$$

with

$$\text{silicon-only track} + \text{muon segments} \longrightarrow \text{global track}$$

See Dmitriy Kovalskyi's talk at 22 August PRS/mu meeting

`http://indico.cern.ch/conferenceDisplay.py?confId=5292`

Where to find things

- There are *no* CMS-NOTES (except 2006/010 for ORCA)
- The PRS/mu group meets every other Tuesday (most recently 5 September) 10:30–12:30 our time

  `http://indico.cern.ch/categoryDisplay.py?categId=25`
- June 2006 Annual Review

  `http://indico.cern.ch/conferenceDisplay.py?confId=3247`
- Muon Software TWiki ($\longrightarrow$ tutorials)

  `https://uimon.cern.ch/twiki/bin/view/CMS/MuonSW`
- Doxygen Muon Overview (only lists packages)

  `https://uimon.cern.ch/twiki/bin/view/CMS/MuonSW`