Software update

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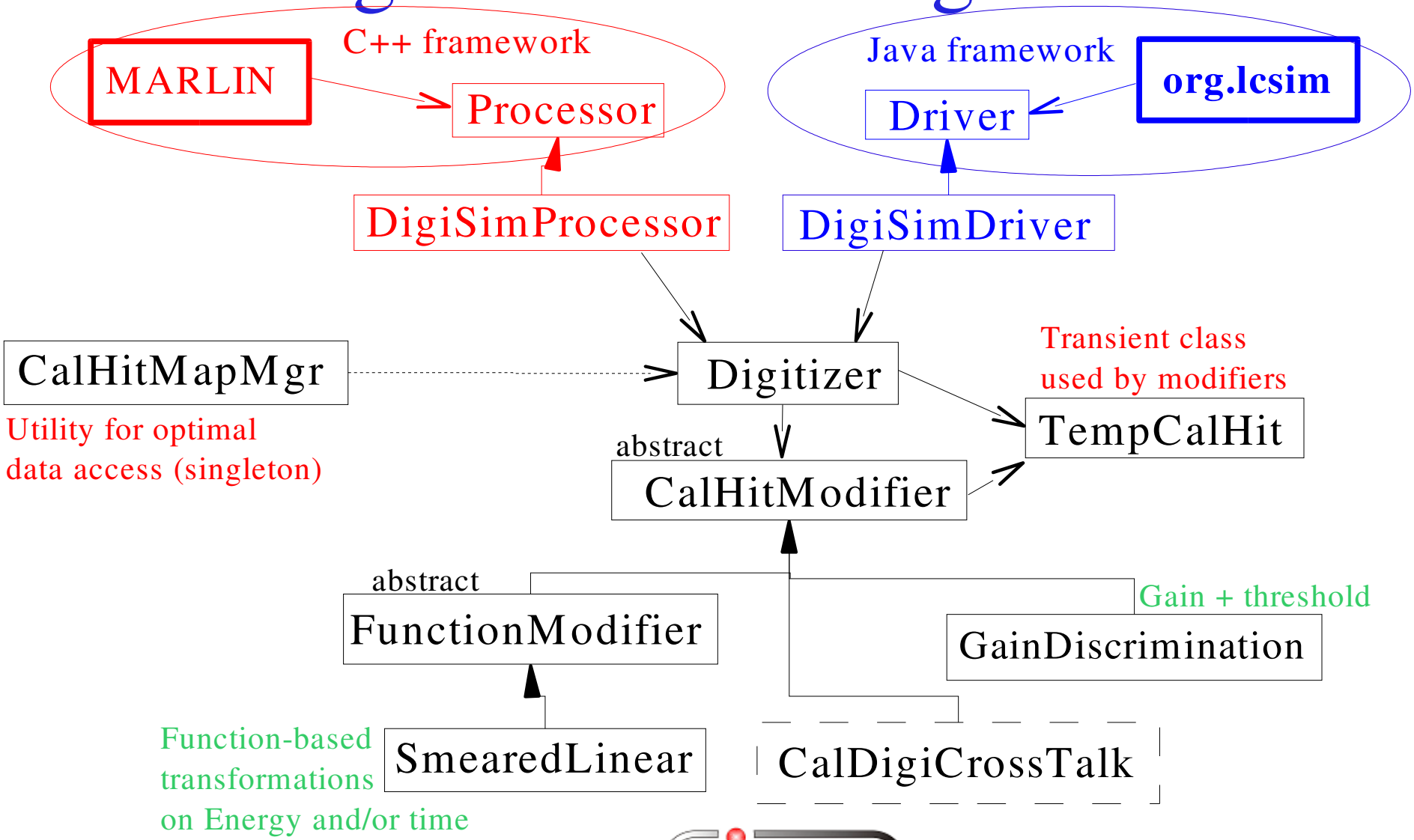
DigiSim updates

- SmearedLinear modifier also tested
- From last week's “to do list”:
  - Split DigiSimProcessor, to separate digitizer logic from framework interface (done)
  - Implement run-time configuration (done)
  - Need to develop/test complex digitizer schemes
    - Ecal+HCal, barrel+endcaps (done)
    - Digitizer configurations with multiple modifiers (done)

DigiSim class diagrams



Steering file example

```
##########################################
#  Example steering file for DigiSim
##########################################
.begin Global  ----------------------------------------
# specify one or more input files (in one or more lines)
LCIOInputFiles inputfile

# the active processors that are called in the given order
ActiveProcessors CalHitMapProcessor
ActiveProcessors EcalBarrelDigitizer
ActiveProcessors EcalEndcapDigitizer
ActiveProcessors HcalBarrelDigitizer
ActiveProcessors HcalEndcapDigitizer
ActiveProcessors OutputProcessor

# limit the number of processed records (run+evt):
MaxRecordNumber 500
.end Global  ----------------------------------------
```

Configuring processors and modifiers

```
##########################################################
# A subdetector digitizer.  It instantiates one or more calorimeter hit
#  "modifiers", which together represent the full digitization process
.begin HcalBarrelDigitizer

ProcessorType       DigiSimProcessor
InputCollection     HcalBarrHits
OutputCollection    HcalBarrRawHits
Raw2SimLinksCollection  HcalBarrRaw2sim

ModifierNames    HBlightYield HBlightCollEff SiPMQEandAmplif
# Parameters:
#modifierName   type                  gainNom  gainSig  thresh   thrSig
HBlightYield   GainDiscrimination  10000000        0       0        0
HBlightCollEff GainDiscrimination    0.0111   0.0029       0        0
# 15% Qeff * 601 amplification
SiPMQEandAmplif GainDiscrimination    90.15        0       0        0

HBGainThresh   GainDiscrimination   1000000    50000     120      2.4

# A function-based modifier       ElinNom  ElinSig  TlinNom  TlinSig
HBDigiIdent    SmearedLinear           1        0        1        0

.end ----------------------------------------------------------------
```

(As many as needed)

Using four digitizers

JAS3

File Edit View Tuple Loop LCD LCIO Window Help

digisim.slcio

DataSets

Welcome | LCSim Event

Run:0 Event: 0

Event
- TkrEndcapHits
- EcalEndcapHits
- VtxBarrHits
- HcalBarrRaw2sim
- HcalBarrHits
- HcalEndcapHits
- EcalBarrRaw2sim
- HcalEndcapRaw2sim
- EcalBarrRawHits
- EcalEndcapRaw2sim
- LumEndcapHits
- MuonBarrHits
- MCParticle
- TkrBarrHits
- HcalBarrRawHits
- EcalBarrHits
- HcalEndcapRawHits
- EcalEndcapRawHits
- MuonEndcapHits

LCIO Event Header

Run	0
Event	0
Time Stamp	-1749709824
Detector Name	sdjan03

Blocks

Name	Type
HcalBarrRaw2sim	org.lcsim.event.LCRelation
EcalBarrRaw2sim	org.lcsim.event.LCRelation
HcalEndcapRaw2sim	org.lcsim.event.LCRelation
EcalEndcapRaw2sim	org.lcsim.event.LCRelation
EcalEndcapRawHits	org.lcsim.event.RawCalorimeterHit
HcalBarrRawHits	org.lcsim.event.RawCalorimeterHit
EcalBarrRawHits	org.lcsim.event.RawCalorimeterHit
HcalEndcapRawHits	org.lcsim.event.RawCalorimeterHit
MCParticle	org.lcsim.event.MCParticle
EcalBarrHits	org.lcsim.event.SimCalorimeterHit
EcalEndcapHits	org.lcsim.event.SimCalorimeterHit
HcalBarrHits	org.lcsim.event.SimCalorimeterHit
HcalEndcapHits	org.lcsim.event.SimCalorimeterHit
LumEndcapHits	org.lcsim.event.SimCalorimeterHit
MuonBarrHits	org.lcsim.event.SimCalorimeterHit
MuonEndcapHits	org.lcsim.event.SimCalorimeterHit
TkrBarrHits	org.lcsim.util.lcio.SIOSimTrackerHit
TkrEndcapHits	org.lcsim.util.lcio.SIOSimTrackerHit
VtxBarrHits	org.lcsim.util.lcio.SIOSimTrackerHit

```
DetCondConv.getType... Det.class=class org.lcsim.geometry.Detector
```

Analyzed 1 records in 1129ms

12.4/70.2MB

Using JAS3 to look at output

JAS3

File Edit View Tuple Loop LCD LCIO Window Help

digisim.slcio

DataSets

Welcome | LCSim Event

Run:0 Event: 0

Event
- TkrEndcapHits
- EcalEndcapHits
- VtxBarrHits
- HcalBarrRaw2sim
- HcalBarrHits
- HcalEndcapHits
- EcalBarrRaw2sim
- EcalBarrRawHits
- MuonBarrHits
- LumEndcapHits
- MCParticle
- TkrBarrHits
- HcalBarrRawHits
- EcalBarrHits
- MuonEndcapHits

Collection: EcalBarrRaw2sim size:390 flags:80000000

From	To	Weight
EcalBarrRawHits[0]	EcalBarrHits[313]	1.0000
EcalBarrRawHits[1]	EcalBarrHits[368]	1.0000
EcalBarrRawHits[2]	EcalBarrHits[129]	1.0000
EcalBarrRawHits[3]	EcalBarrHits[7]	1.0000
EcalBarrRawHits[4]	EcalBarrHits[149]	1.0000
EcalBarrRawHits[5]	EcalBarrHits[109]	1.0000
EcalBarrRawHits[6]	EcalBarrHits[111]	1.0000
EcalBarrRawHits[7]	EcalBarrHits[260]	1.0000
EcalBarrRawHits[8]	EcalBarrHits[372]	1.0000
EcalBarrRawHits[9]	EcalBarrHits[156]	1.0000
EcalBarrRawHits[10]	EcalBarrHits[177]	1.0000
EcalBarrRawHits[11]	EcalBarrHits[90]	1.0000
EcalBarrRawHits[12]	EcalBarrHits[91]	1.0000
EcalBarrRawHits[13]	EcalBarrHits[345]	1.0000
EcalBarrRawHits[14]	EcalBarrHits[154]	1.0000
EcalBarrRawHits[15]	EcalBarrHits[412]	1.0000
EcalBarrRawHits[16]	EcalBarrHits[409]	1.0000
EcalBarrRawHits[17]	EcalBarrHits[248]	1.0000
EcalBarrRawHits[18]	EcalBarrHits[192]	1.0000

Analyzed 1 records in 486ms

4.90/5.73MB

Crosstalk will produce weights < 1.0

Software status report

Overall goal: detector optimization and PFA studies for Snowmass (August)

- org.lcsim: Official java framework for LCIO analysis
  - DigiSim port for java is complete! Next steps: noise, hot/dead channels, crosstalk modifiers
  - Non-projective geometries
- PFA development
  - Cluster interface into clustering algorithms Superlayers (old) and neighborhood density (new)
  - Investigate existing tools for PFA integration
- DigiSim
  - Crosstalk modifiers (started before LCWS)
- LCDG4 maintenance
  - EMCal cell staggering (tests)
  - Multiple primary vertices (diagnostics)
- NP geometries into SLIC and LCCDD