Status of offline software (SpdRoot)

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SPD Collaboration Meeting
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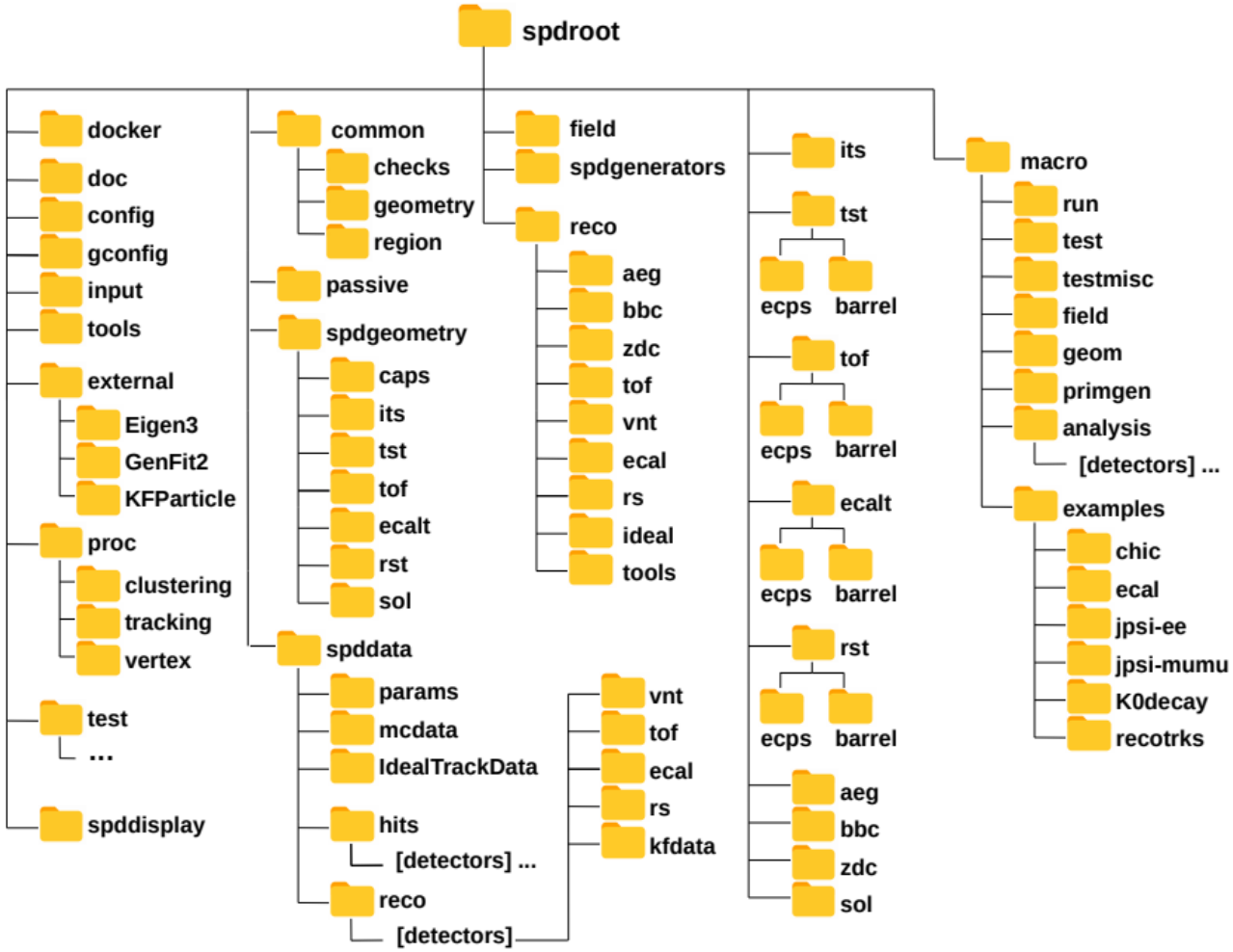
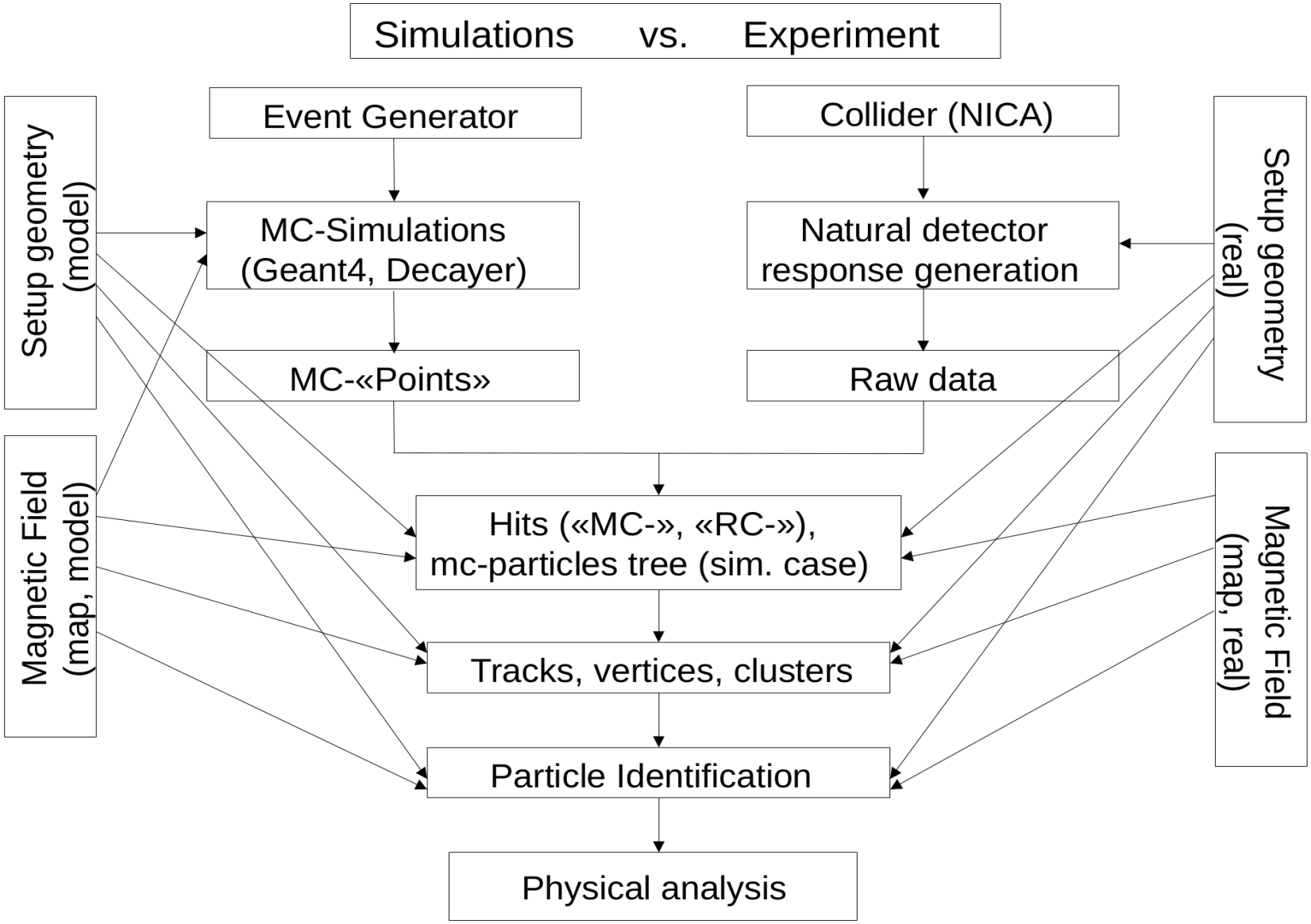
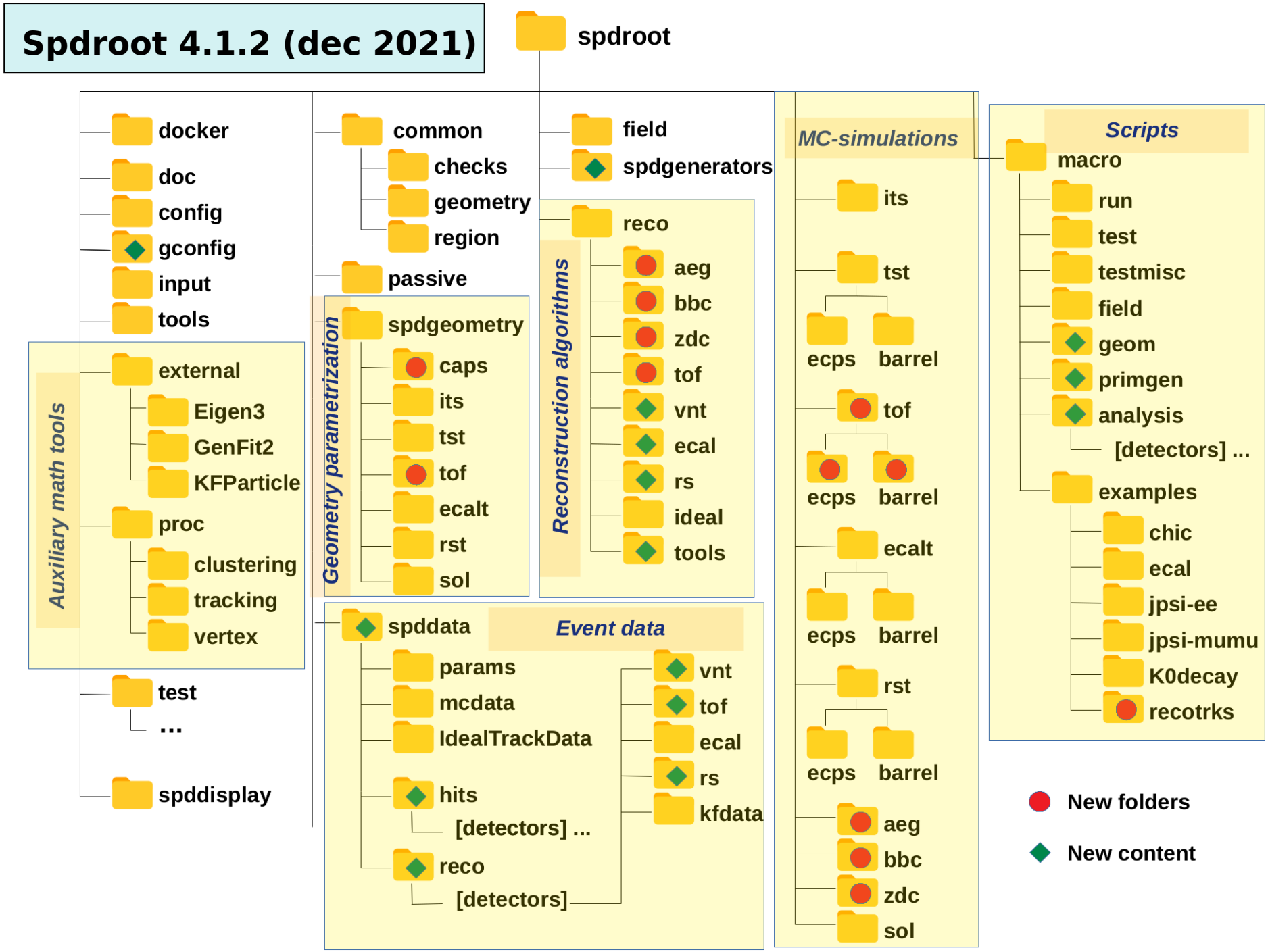
SpdRoot (general notes)



Git repository: http://git.jinr.ru/nica/spdroot
Last release: v4.1.2, December 6, 2021

Simulations & reconstruction (scheme)




Spdroot 4.1.2 (dec 2021)
spdroot
docker
doc
config
gconfig
input
tools
external
Eigen3
GenFit2
KFParticle
proc
clustering
tracking
vertex
Auxiliary math tools
test
...
spddisplay
common
checks
geometry
region
passive
spdgeometry
caps
its
tst
tof
ecalt
rst
sol
Geometry parametrization
field
spdgenerators
reco
aeg
bbc
zdc
tof
vnt
ecal
rs
ideal
tools
Reconstruction algorithms
spddata
params
mcdata
IdealTrackData
hits
[detectors] ...
reco
[detectors]
Event data
vnt
tof
ecal
rs
kfdata
MC-simulations
its
tst
ecps
barrel
tof
ecps
barrel
ecalt
ecps
barrel
rst
ecps
barrel
aeg
bbc
zdc
sol
Scripts
macro
run
test
testmisc
field
geom
primgen
analysis
[detectors] ...
examples
chic
ecal
jpsi-ee
jpsi-mumu
K0decay
recotrks
New folders
New content

Simulations

Detectors: **Its, Ts, Ecal, Rs** + **TOF, ZDC, BBC, AEG**

- **Event generator:** SpdPythia8(new), SpdPythia8Generator(updated) (*spdgenerators/*)

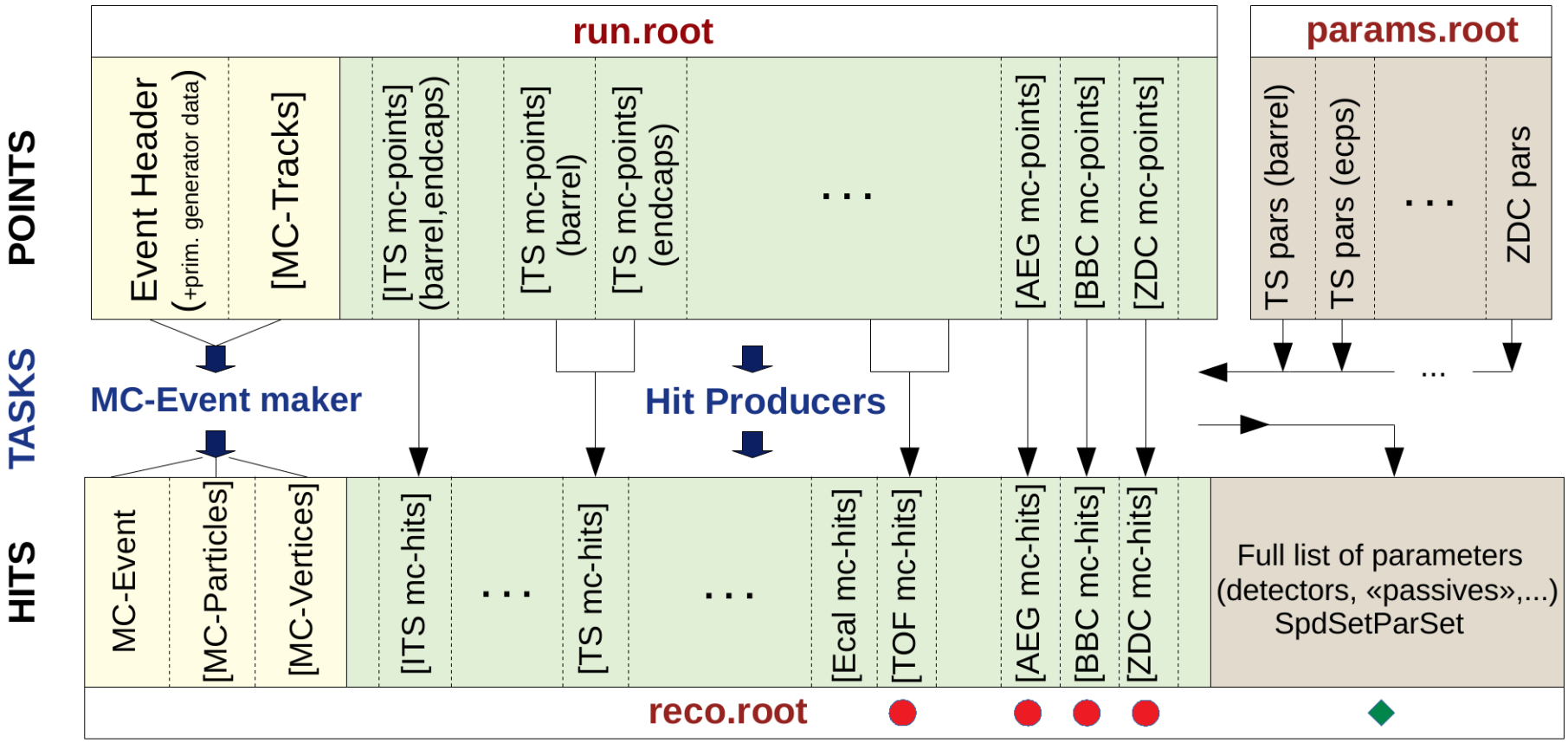
Simulations:

- External decayer: SpdPyhia8Decayer (/spdgenerators, /gconfig/DecayConfigPythia8.C);
- TOF geometry: detailed description, barrel + endcaps (/tof/barrel, /tof/ecps);
- ZDC, BBC, AEG: simple geometry for «fast simulations» (zdc/, bbc/, aeg/);
- MC-points and run parameters for TOF, ZDC, BBC and AEG (tof/, zdc/, bbc/, aeg/);

Update to standard macros:

- geometry tests for every module (macro/geom);
- testing macro for Pythia8 decayer & generator (macro/primgen);
- simu-macros (spdroot/macro): SimuQslPy6.C & SimuQslPy8.C (SpdPyhia8Decayer now is used);
- macros to check ouput: data & parameters (macro/analysis);
- \+ macro/examples (now we use SpdPyhia8Decayer for SpdPyhia8Generator anywhere).

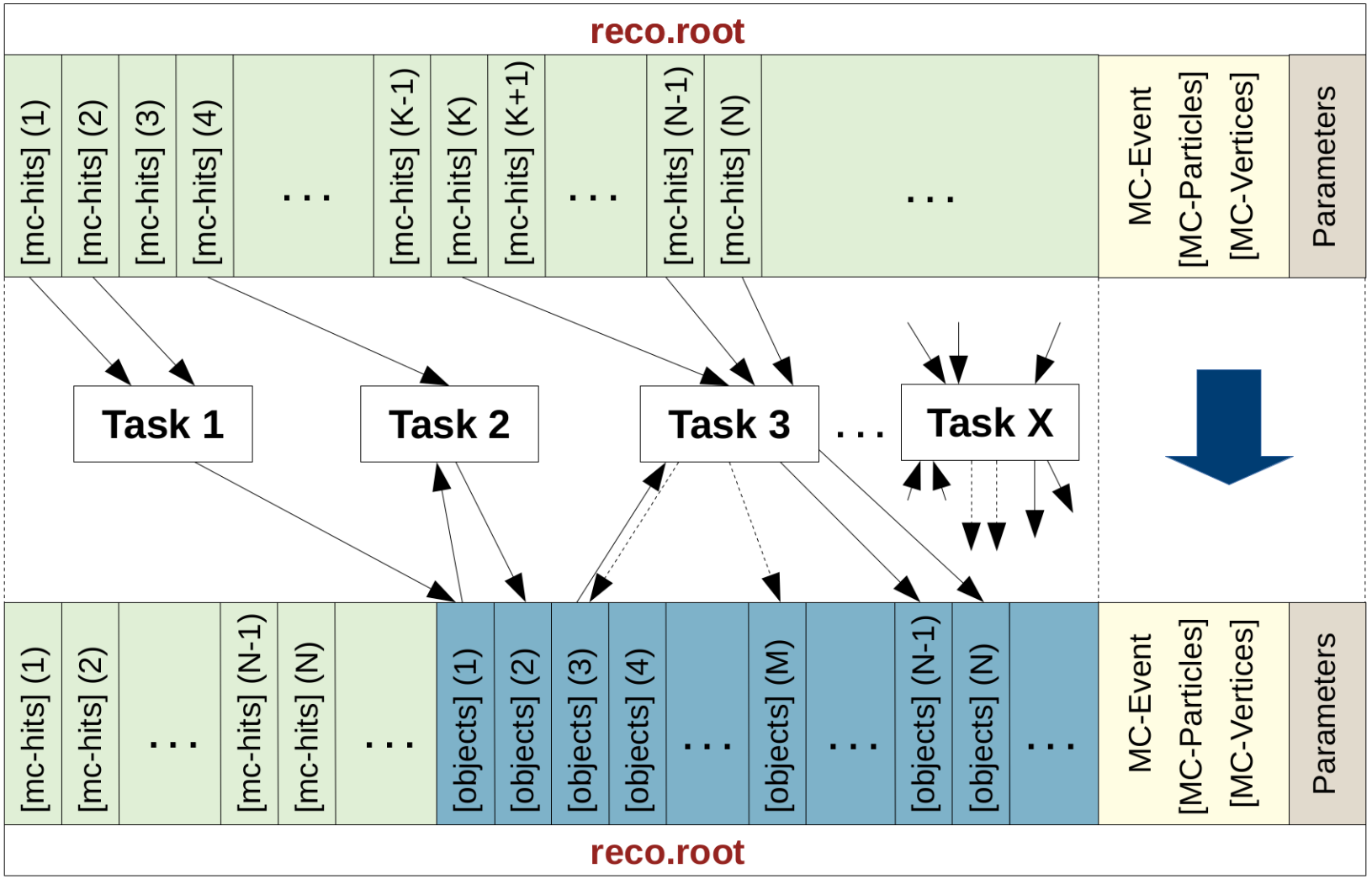
Reconstruction (MC-Event making & hits production)



Order of the tasks (hit producers) is arbitrary.

- New hit producers for TOF and AEG, BBC, ZDC modules.
- New hits (spddata/hits) and parameters in the output file.
- Update to standard macros:
  (macro/analysis/ ReadEventBase.C, ReadEventFull.C, ReadDataSimple.C).

Event reconstruction & analysis (common view)

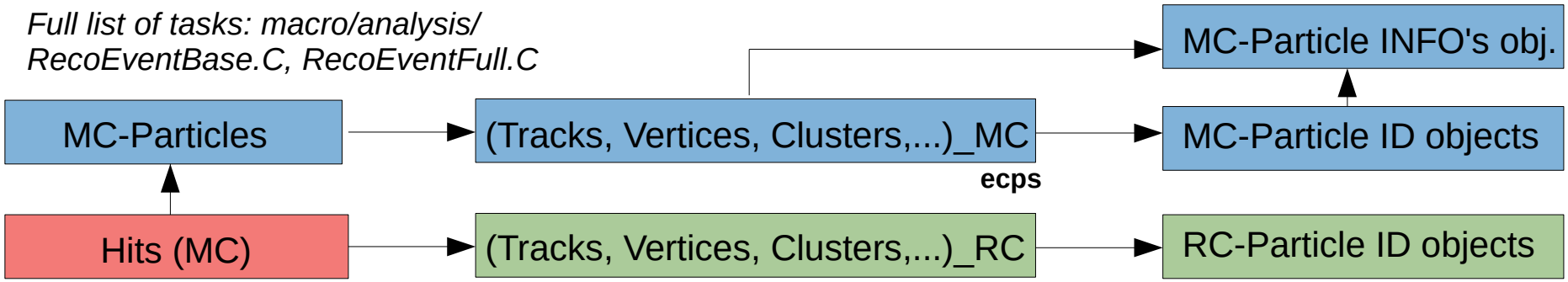


Task 1. Gets: mc-hits(1,2); creates: objects(1).
Task 2. Gets: mc-hits(4), objects(1); creates: objects(2).
Task 3. Gets: mc-hits(K,N-1,N), objects(3); creates: objects(M,N-1,N); modifies: objects(3,M).

Order of the tasks matters!

Reconstruction (Objects production & Particle identification)

Full list of tasks: macro/analysis/ RecoEventBase.C, RecoEventFull.C



MC-Particle INFO (SpdMCParticleInfo):
MCTrackId, MCProductionVertrexId, MCDecayVertexId, PIDs.

- **Pseudo-reconstruction (MC) algorithms.**
  - **Ecal.** Task: SpdEcalClusterMCInfoMaker (reco/ecal);
    Output: [SpdMCEcalClustersInfo],[SpdEcalMCParticle] (spddata/reco/ecal)
  - **RS.** Task: SpdRsMCClusterMaker (reco/rs);
    Output: [SpdRsMCClusters], [SpdEcalMCParticle] (spddata/reco/rs).

  Update to standard macros: RecoEventFull.C, RecoEventOjects.C, ReadRecoData.C, ReadRecoData2.C, ReadDataSimple.C.

- **Track finding algorithm (RC)** *(Vladimir Andreev report, wednesday 15).*
  Tasks: SpdRCTrackSeedsFinder, SpdRCTracksFinder (reco/vnt)
  Output: [SpdTrackRCSeed], [SpdTrackRC] (spddata/reco/vnt).
  How to run: new example — macro/examples/recotrks.

- **RS.** Update to hit producer (the possibility to produce 2D-hits).
- **Prototypes** for some future tasks and ouput data objects.

Summary I: What has been done

- Update to event generaton tools: SpdPythia8, SpdPyhia8Generator.

- The new particle decayer (SpdPythia8Decayer) compatible with Pythia8 generator has been tested and added to SpdRoot.

- New modules with simplest edcap-like geometry: BBC, AEG, ZDC for fast simulations.

- Detailed geometry descripition for TOF detector (for barrel and endcaps parts) .

- Pseudo-reconstruction algorithms for ECAL and RS.

- Update to Range System hit producer.

- A set of classes and realistic (RC-) algorithms for track finding.

- A lot of fixes, tests and minor improvements.

Summary II: What's planned to be done

- Detailing the geometry of setup subsystems and updating of SPD geometry as a whole.

- Spd-geometry and simulations for alternative version of the vertex detector (Micromegas Vertex Tracker).

- Tracking and pattern recognition algorithms improvement.

- Pattern recognition algorithms for RS.

- Realistic hit production models.

- Further development and implenmentation of algorithms on particle identification (first of all, for straw tracking system и TOF).

- Start working on multithreaded reconstruction.

- Testings, bug fixes and various improvements.

Thank you for attention!