summary of CMS simulation tools

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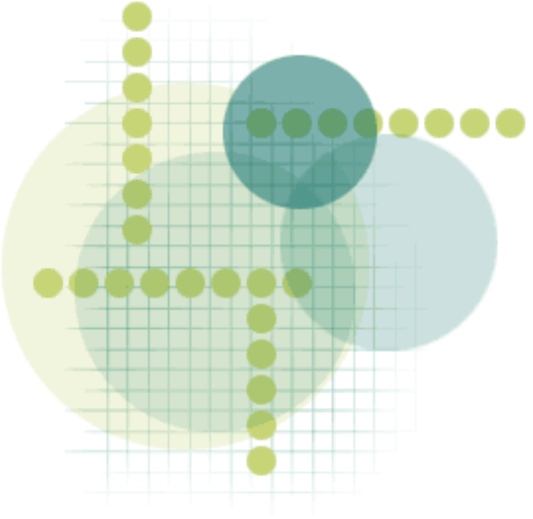
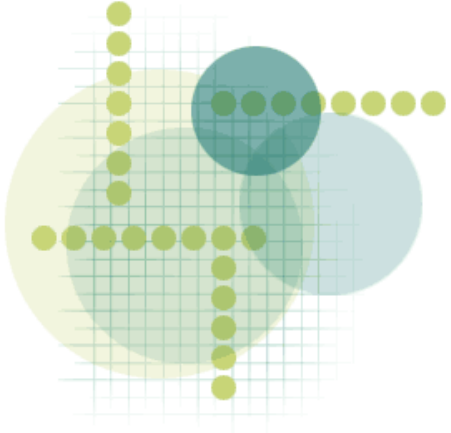


CMS simulation

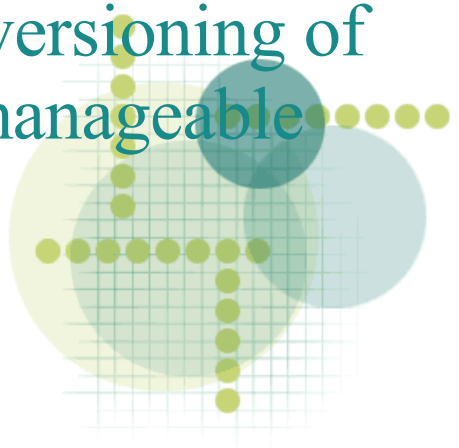
[from conversation with P.Azzi (coord. fast sim.) and F. Cossutti (coordinator full sim.)]

- three approaches in a unified framework:
  - detailed simulation in Geant4
    - currently in use
  - fast simulation, no Geant4
    - currently under validation tests
    - O(1000) speed factor
  - fast simulation in Geant4
    - ideas for the future, O(100) speed improvement



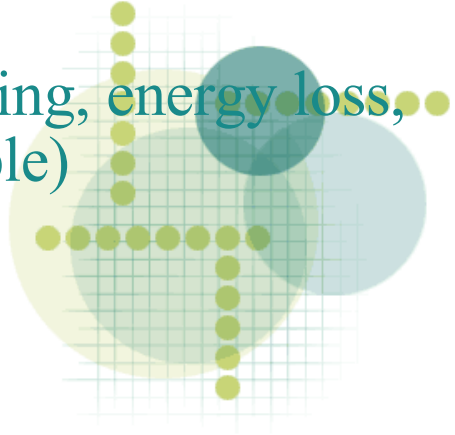
Geant4

- geometry (+ other simulation parameters) in XML file
  - C++ code complements the description of the geometry obtained from the XML file
  - planning to move to GDML; have to define a way of specifying additional parameters now not foreseen in GDML
  - planning to introduce a Condition Database: versioning of various detector configurations is getting unmanageable



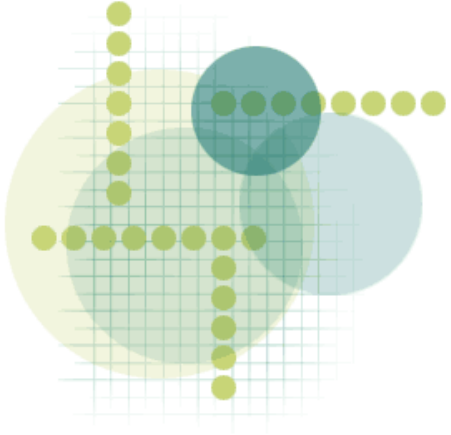
Fast Simulation (I)

- rather ambitious goal: aiming for the same level of accuracy of the detailed simulation!
  - with parametrization taken from the latter
- integrated with the full simulation framework
  - same geometry description
  - same objects produced in output (sim. hits, reco hits.)
- material effects included:
  - Bremsstrahlung, photon conversion, mult. scattering, energy loss, in-flight decays, nucl. interac. (1.5 Mevents sample)



Fast Simulation (II)

- fast reconstruction provides tracks from hits using MC truth information
  - pattern recognition emulation
  - no fake tracks (not felt to be a big problem at the moment)
  - inefficiencies due to BG are handled
- showers simulated with a GFlash approach
- more details: http://indico.cern.ch/contributionDisplay.py?contribId=21&sessionId=11&confId=16956



Fast Simulation in Geant4

- tracking stays the same
- shower simulation provided by GFlash (requires tuning)
- for the hadr. showers may turn out to be easier to tune the fast simulation than to fix Geant4