

some simulation benchmark numbers from ALICE

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for the ALICE simulation team

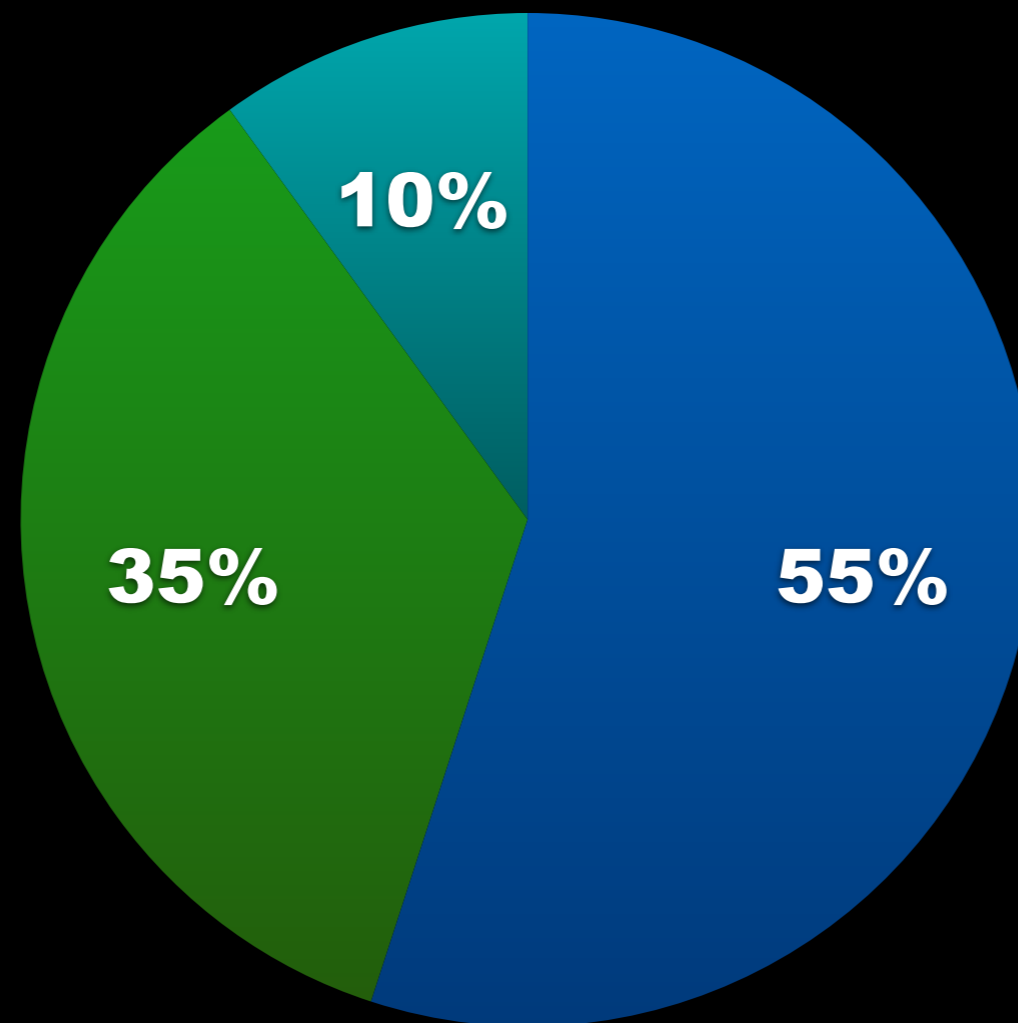


Short intro

- main software components used in simulation
 - Geant3 / TGeo
 - Geant4 / Geant4_VMC / TGeo (G3 tag 2-2; G4 10.1; ROOT 5.34)
- present some “order of magnitude” numbers based on latest code and simulating Pb-Pb collisions
 - includes hits simulation + digitization
 - generic picture that follows holds for G3 and G4
- overall scale: ~0.5 central Pb-Pb events / hour on GRID
 - huge spread
 - faster on modern desktop PCs

High-level time partition

Rest
• e.g., QA, RAW IO



Simulation

- physics
- geometry
- magnetic field
- hits creation
- user stepping actions
-

dominated by TPC, ZDC, TRD, EMCAL + envelope containers (ALIC)

Digitization

largely dominated by TPC

Where we spend our time (think “library components”)

rest of many smaller
items

ROOT base

- random numbers
- TLorentzVector
- etc ...

Mag-field

GEANT

- physics routines

Geometry (TGeo)

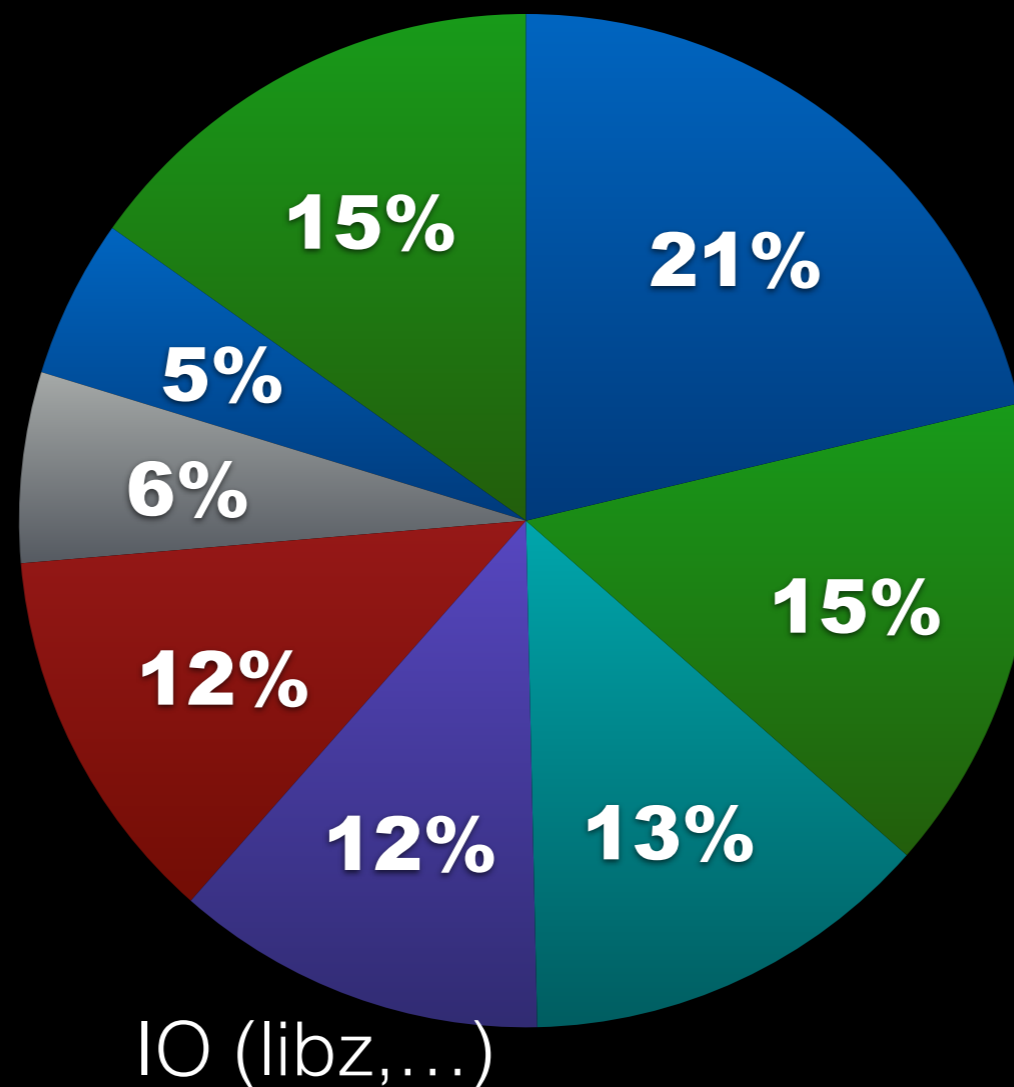
- navigation
- geometry primitives

Math (libm)

- log, exp, cos, sin, ...

TPC (detector)

- stepping + hits
- digitization



Our primary performance challenges

- Simulation:
 - primarily reduce time spent in geometry
 - tune the stepping
 - reduce time spent in math
 - ...
- Improve digitization:
 - study ways to improve digitization of TPC
 - can we benefit from SIMD vectorization in this area?
 - improve IO of hits/digits