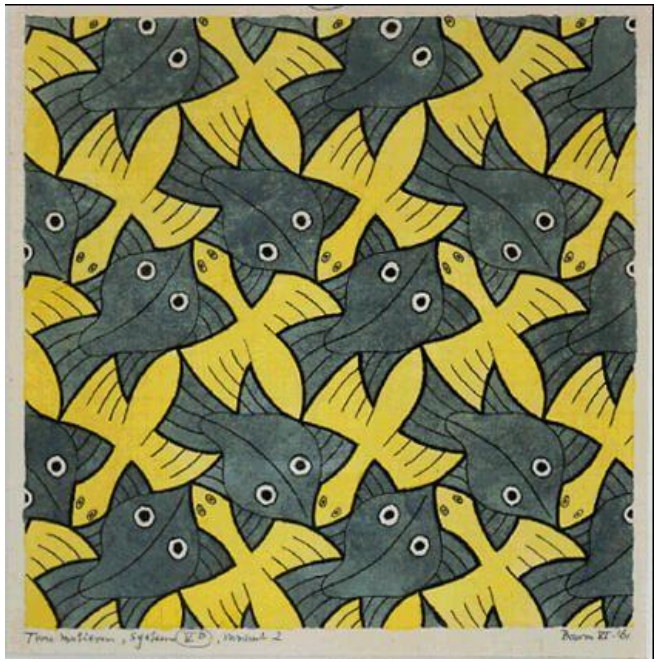
Metrics? Efficiency? Cost?

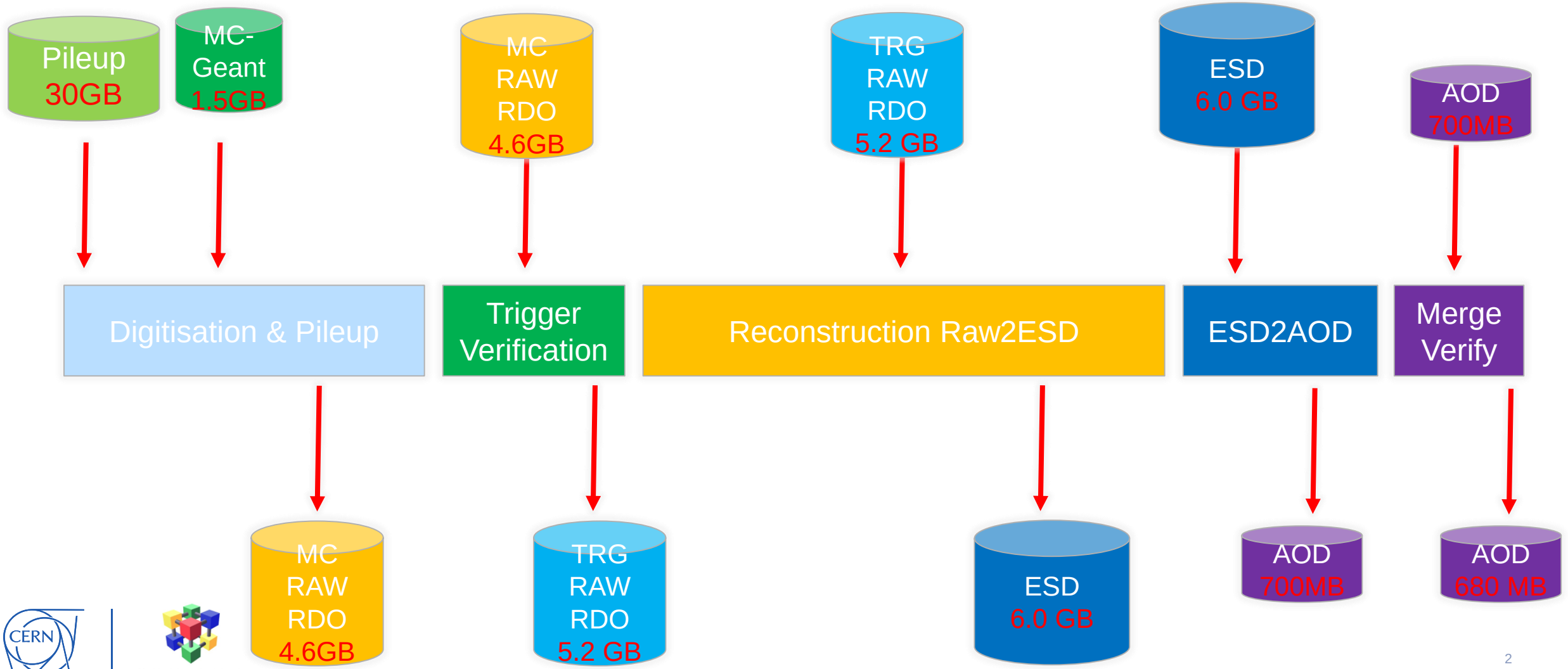
Markus Schulz, Andrea Sciaba



The problem

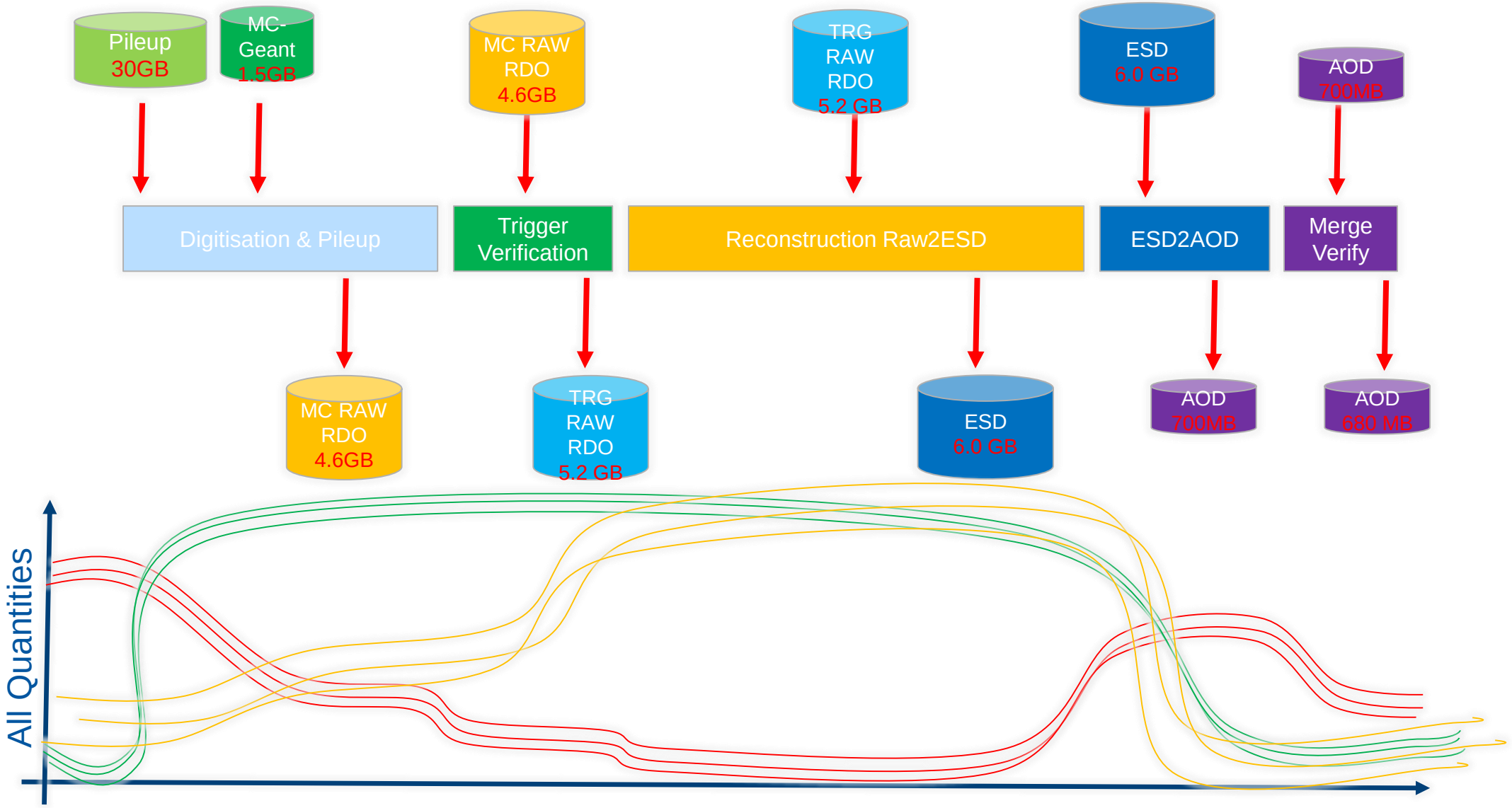
- Our workloads are not simply structured
  - They often are workflows on their own
  - Mix of different activities
  - Different usage at different times
- Example: Atlas pileup + digitization + reco jobs
  - 8 concurrent processes
  - Following pictures inspired by measurements, but not measurements. For illustration only!

A Workload: 2000 MC Events, 8 cores



We have to describe the jobs resourceusage in many dimensions

- CPU/Core
  - User, system, idle, Nice, I/Owait.....
  - Instruction level parallelism
  - Cache utilization
  - Active Cores
  - Performance counters.....
- Memory
  - Virtual, physical, swap, throughput .....
- Storage
  - Volume, access, read/write speeds, physical I/O vs logical I/O
  - ...
- Network
  - Bandwidth, latency ....


Pileup
30GB
MC-Geant
1.5GB
MC RAW RDO
4.6GB
TRG RAW RDO
5.2 GB
ESD
6.0 GB
AOD
700MB
Digitisation & Pileup
Trigger Verification
Reconstruction Raw2ESD
ESD2AOD
Merge Verify
MC RAW RDO
4.6GB
TRG RAW RDO
5.2 GB
ESD
6.0 GB
AOD
700MB
AOD
680 MB
All Quantities

We Monitor most of this, but:

- What is limiting the jobs throughput?
- What fraction of the maximum performance do we utilize?
- What is the throughput/resource unit?
- What are the dependencies?
- What phases should be separated?
  - And how?
- .....

Performance and Efficiency and Cost?

- What does this mean for us?

- Events processed for a workload in a given time?
  - Using how many resources?
- Fraction of the theoretical capability of the system utilized?
  - Doing what?

High level:

- Defining Performance
- Defining Efficiency
- Defining Cost
- Classify Job Phases
- Define Metrics
- Build Differential equations describing the dependency of PEC from the metrics