The optimisation of ALICE code

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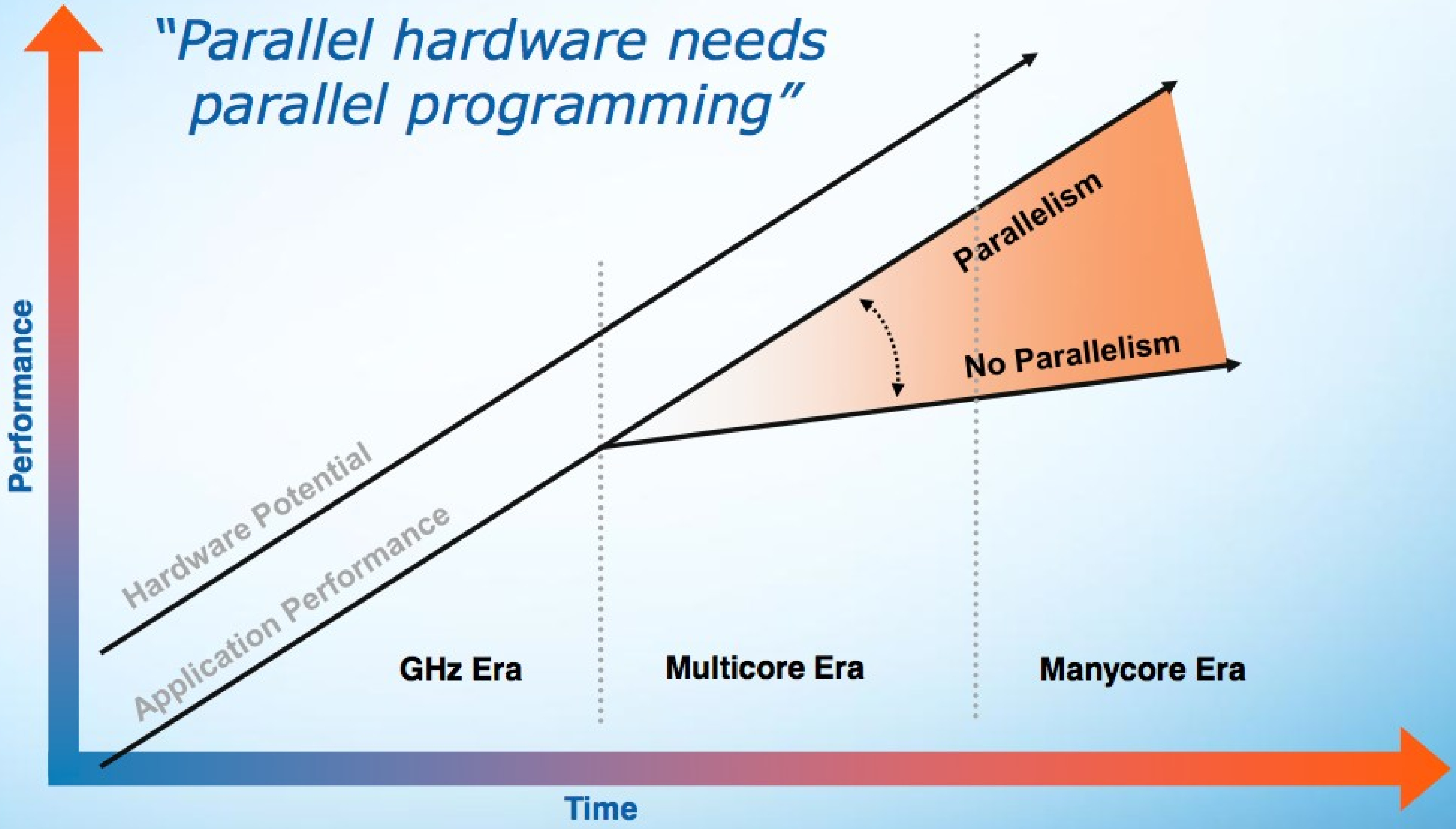
parallelism

Motivation: Performance

From a recent talk by Intel



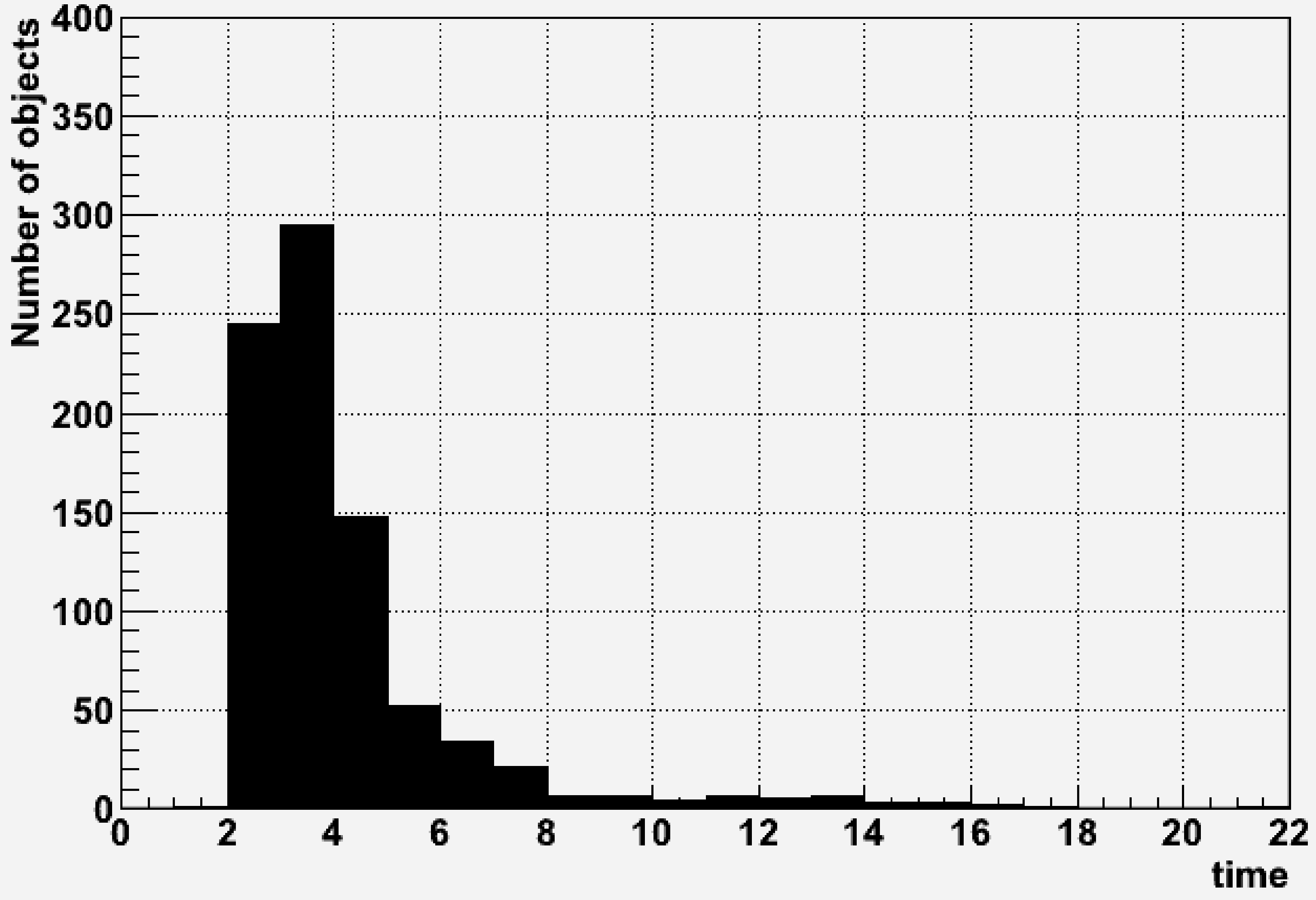
Why it is so difficult?

- No clear kernel
- C++ code generation / optimisation not well understood
- Most of the technology is coming out now
  - Lack of standards
  - Technological risk
- Non professional coders
- Fast evolving code
- No control on hardware acquisition

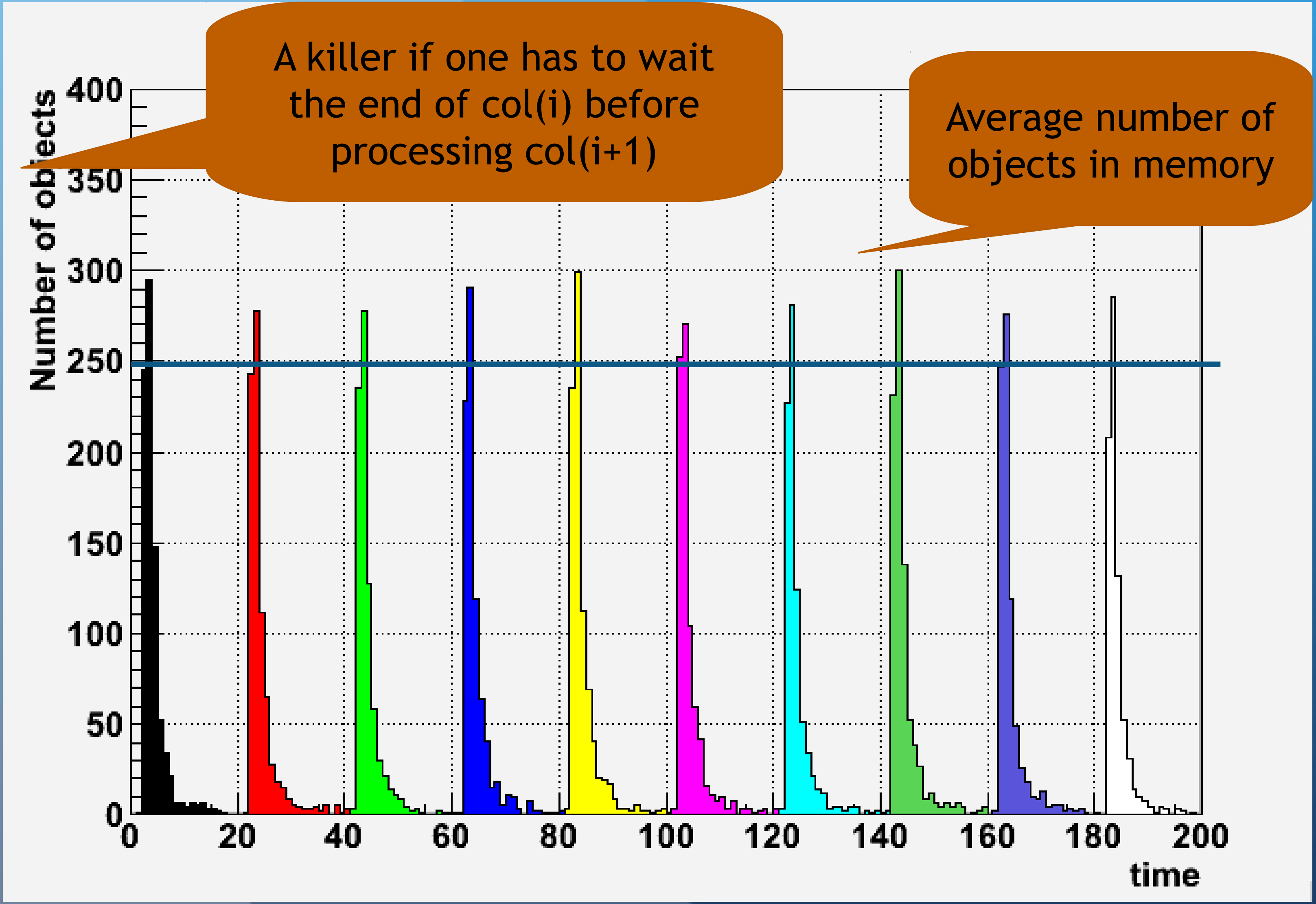
ALICE strategy (unauthorised)

- Use the LSD-1 to essentially re-write AliRoot
- Use the LSD-2 to expand the parallelism to the Grid
  - Hopefully the major thrust will be on MiddleWare
- Refactor the code in order to expose the maximum of parallelism present at each level
- Keep the code in C++ (no CUDA, OpenCL etc.)
- Explore the possible use of #pragma’s (OpenMP, OpenACC)
- Experiment on all hardware at hand (OpenLab, but not only)

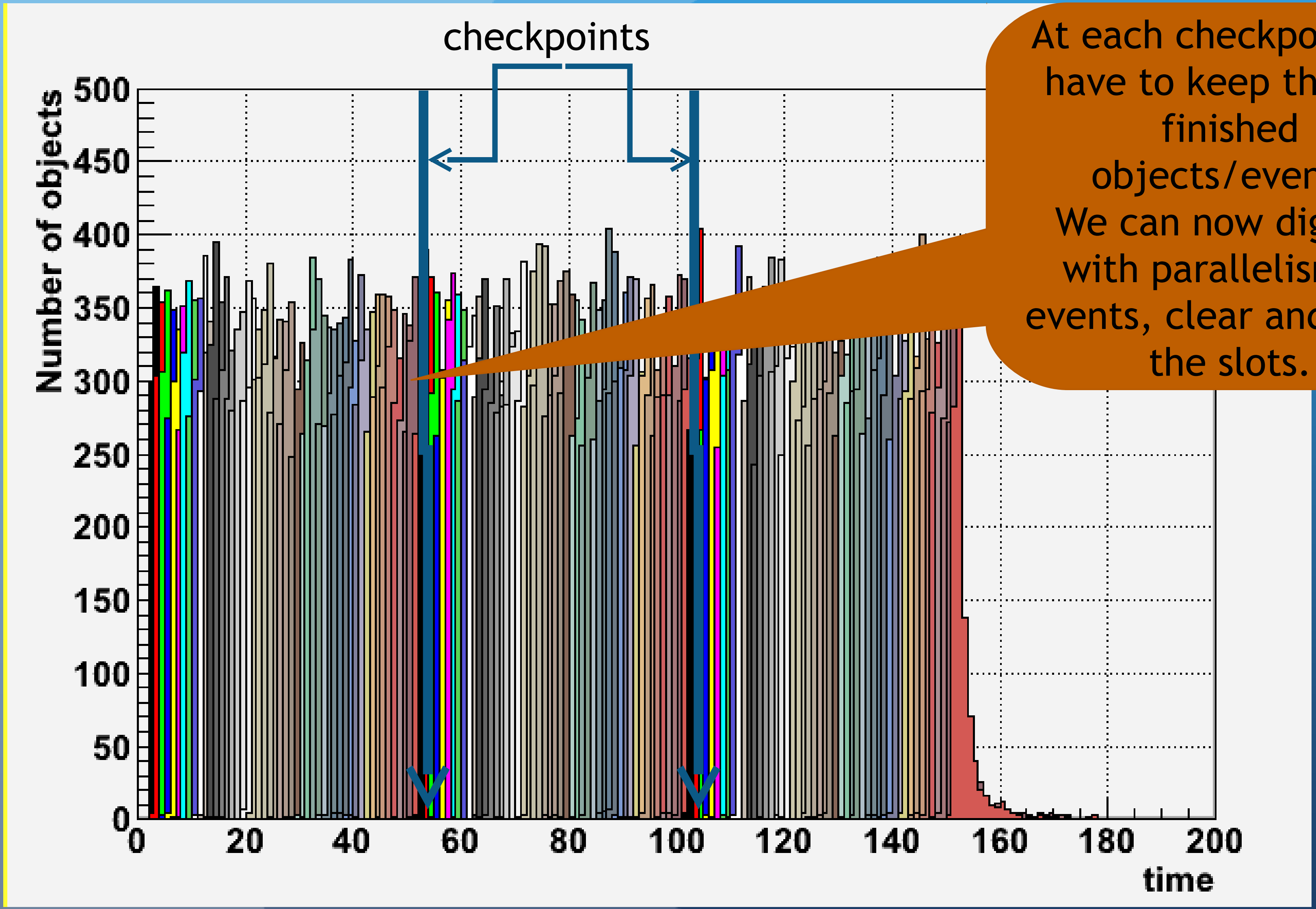
tails, tails, tails



Tails again


A killer if one has to wait the end of col(i) before processing col(i+1)
Average number of objects in memory
Number of objects
time
0
50
100
150
200
250
300
350
400
0
20
40
60
80
100
120
140
160
180
200

A better better solution



At each checkpoint we have to keep the non finished objects/events.
We can now digitize with parallelism on events, clear and reuse the slots.

With CC-IN2P3

- Meeting ALICE + CC held in January
- ALICE proposes collaboration
  - We provide infrastructure
    - multi-core, many-core, clusters of GPU, MICs... will be defined soon
  - They test and give feedback
- According to the outcome, ALICE will push to work on such parallel resources
- Interesting performance test for us
- We will give access to system monitoring tools
- Use of VM (ex-CAPRI)

Another solution proposed

- Use of Grid'5000
- Full access to machines (root)
  - Deploy different OS, kernel, VM etc.
- Useful for thorough comparative tests
- ALICE must write an official request to access those machines

Conclusion

- ALICE parallel computing kick-off meeting in May
- CCIN2P3 will have new manycore machines
- Tests will begin in a few months