Experiment Computing Models

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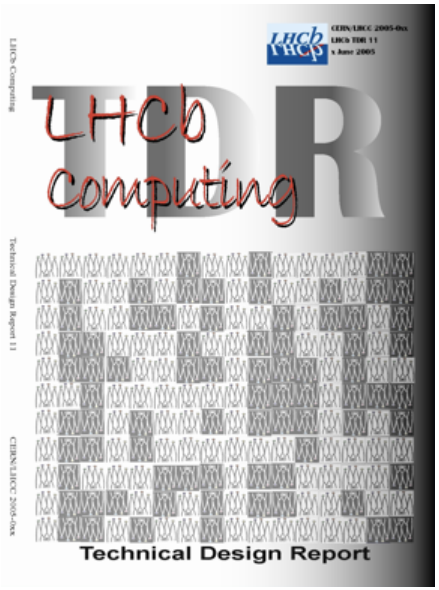
Experiment Computing Models

- The LHC experiment Computing Technical Design Reports were produced in ~2005, with the best knowledge available at the time.
  - No plan survives the reality, in this case the arrival of the data:
    - Operational experience introduced significant modifications and improvements in Run 1.
    - Significant technological evolution until today also impacted (and continues to impact) the optimal operational models:
      - For example network bandwidths increased more than anticipated, one can make better use of resources with more dynamic data movement.
  - 'In-house' technical solutions custom-made by experiments to optimize the operation proliferated:
    - Several solutions to the same problems.
    - Expensive to maintain and develop in terms of manpower.
    - Awareness that searching for common use cases between experiments could boost the activities and economize manpower is becoming crucial in view of the current financial climate.



Run 2 Computing Models

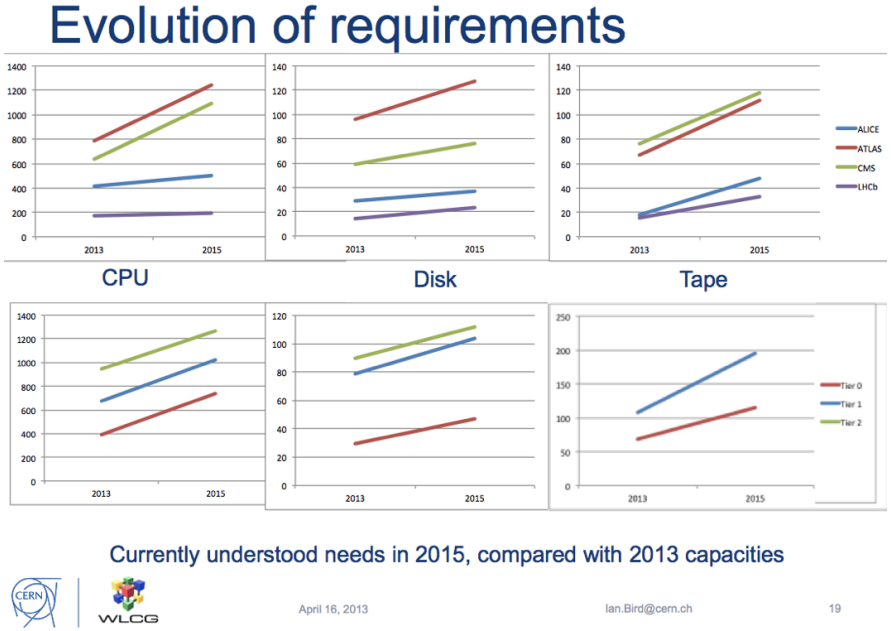
- WLCG and LHC computing a big success in Run 1!
  - Computing was not a limiting factor for the Physics program of the LHC experiments.
  - Many thanks to our Grid sites for their excellent performance and contributions!
- The LHC experiments have even more ambitions Physics plans for Run 2!
  - with a more demanding LHC environment, especially in terms of higher pile-up of collisions.
  - For example, increasing the trigger rates by experiments up to 1 kHz (ATLAS, CMS):
    - Physics motivated, to preserve the robust trigger thresholds from Run 1.
- The demands in computing resources to accommodate the Run 2 physics needs increase:
  - The experiments need to show that they exercise due diligence in evolving their Computing models, software and operational models to optimally use the required resources.
- Request from the LHCC referees to prepare an updated and common Computing model document by the 4 LHC experiments.
  - Quite some work but also an opportunity to clearly present our plans and identify the areas of common interest and collaboration potential.

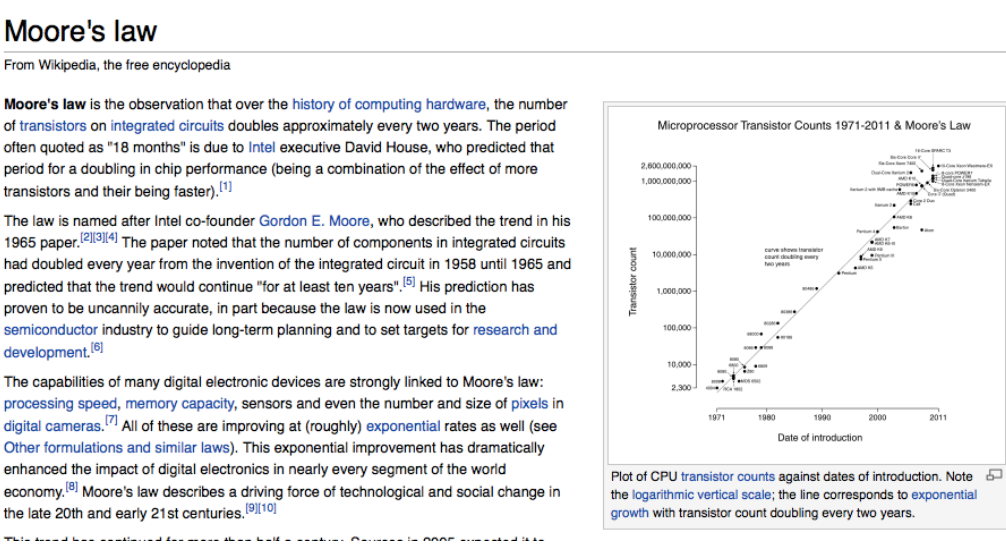
Brief Content Overview

- Many topics need to be covered in this document:
  - Data models – types of data, event sizes, relationships, etc.
    - The operational workflows are strongly correlated to these.
  - Data flows, replication and placement policies.
    - Optimal use of resources to provide the best possible physics throughput.
    - Role of Tiers and sites with emphasis on functionalities and services required.
  - Anticipated event rates and data streams in Run-2.
  - Non-event data handling.
    - For example evolution of database usage and technologies, e.g. Oracle, Frontier, Hadoop, CVMFS...
  - Software evolution.
    - Further software optimization in terms of processing speed, event sizes, parallelization etc..
  - Data preservation.
  - ... and several more..
- An important point is to demonstrate clearly also the progress we made from the Computing TDRs until now, not just the envisaged progress towards Run2.
- Also, clearly identify the envisaged commonalities between experiments and potential input from the wider scientific community.

Resource projections for Run-2

- Resource requirements and their evolution in 2015-2018 by the four experiments are to be part of the common document.
  - Certainly big uncertainties still exist: we are all currently evaluating, prototyping and developing our software to optimize it as much as possible (within the manpower constraints).
  - There are several topics that have not been commonly addressed in the past and the experiments need to understand, which should be part of these projections:
    - Determine what is a 'flat budget' - what is reasonable to expect in terms of technological advancement with a constant budget including replacements? Is Moore's law too optimistic?
    - What are the optimal metrics for 'optimal utilization' of disk, CPU, network?
  - Last, but not least, provide the common method and coherence on how the resource needs are estimated by the experiments.





To Sum Up...

- A new coherent effort by the four experiments to provide the updated joint computing models and derived resource requirements for Run-2 is in the making, as required by the LHCC.
- Quite some work, but a good opportunity to provide high quality documentation on the experiment plans for the Run 2 computing.
  - A special focus on the future common efforts.
- A milestone in providing the plans for the best possible Physics throughput in Run-2!