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WLCG Networking workshop

CERN, 10th February 2014

WLCG Overview

High level view from WLCG

- Networking is working very well
- There is no perceived problem
- Indeed the intention is to make more and better use of the networks to more effectively manage data and storage resources

LHCOPN

- The LHCOPN guarantees the raw data export traffic between Tier 0 to the Tier 1s
  - Necessary to fulfil the requirements of the MoU for the Tier 1s and the data export
  - No desire or reason to change this
  - New Tier 1s should also fulfil this requirement and join the LHCOPN

(Aside – the MoU requirement:)

- 99% availability averaged over a year to accept raw data
  - This is essentially a 3.5 day/year allowed downtime; and is achieved to all Tier 1s

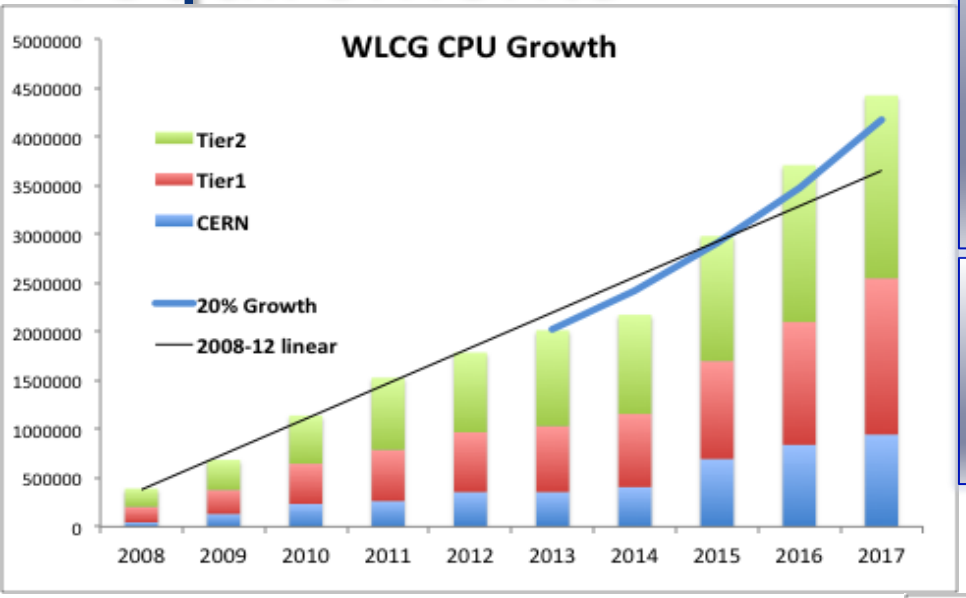
Inter-Tier traffic

- Originally LHCOne was proposed as a way to address a perceived problem
- Today many countries have more than adequate bandwidth internally that LHCOne is not needed
  - Often using LHCone may incur additional costs
- Some countries find it a useful concept
  - May be a political need – helps to get funding and better bandwidth
  - Some NRENs like to segregate LHC from other science traffic
- Therefore: essentially a national (NREN) decision driven by national needs and funding scenario
- From WLCG point of view: keep LHCOne structure in place for those countries that find it useful
  - Address operational models

perfSONAR deployment

- WLCG agreed on perfSONAR as the core toolkit for network monitoring in the infrastructure
  - Strong push came from experiments
- Deployment of perfSONAR has been (and still is) sometimes problematic
  - Some sites refuse to install it at all
  - Some sites still run very old versions
- perfSONAR needs to be treated as any other service in WLCG
  - Including the level of commitment in installing, configuring, operating it.

Evolution of requirements



Higher trigger (data) rates driven by physics needs

Based on understanding of likely LHC parameters;

Foreseen technology evolution (CPU, disk, tape)

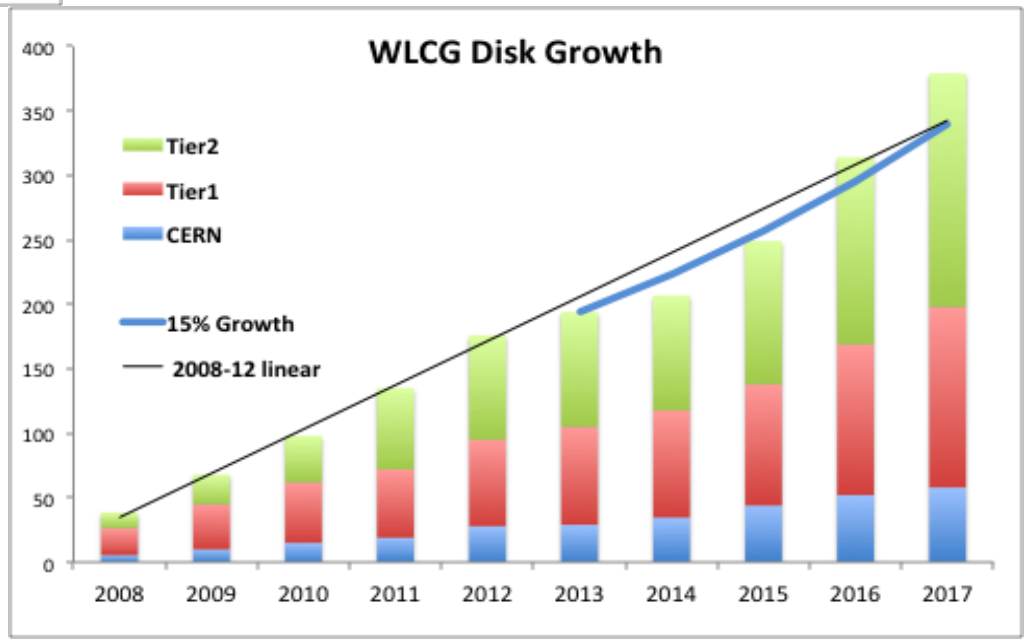
Experiments work hard to fit within constant budget scenario

Estimated evolution of requirements 2015-2017

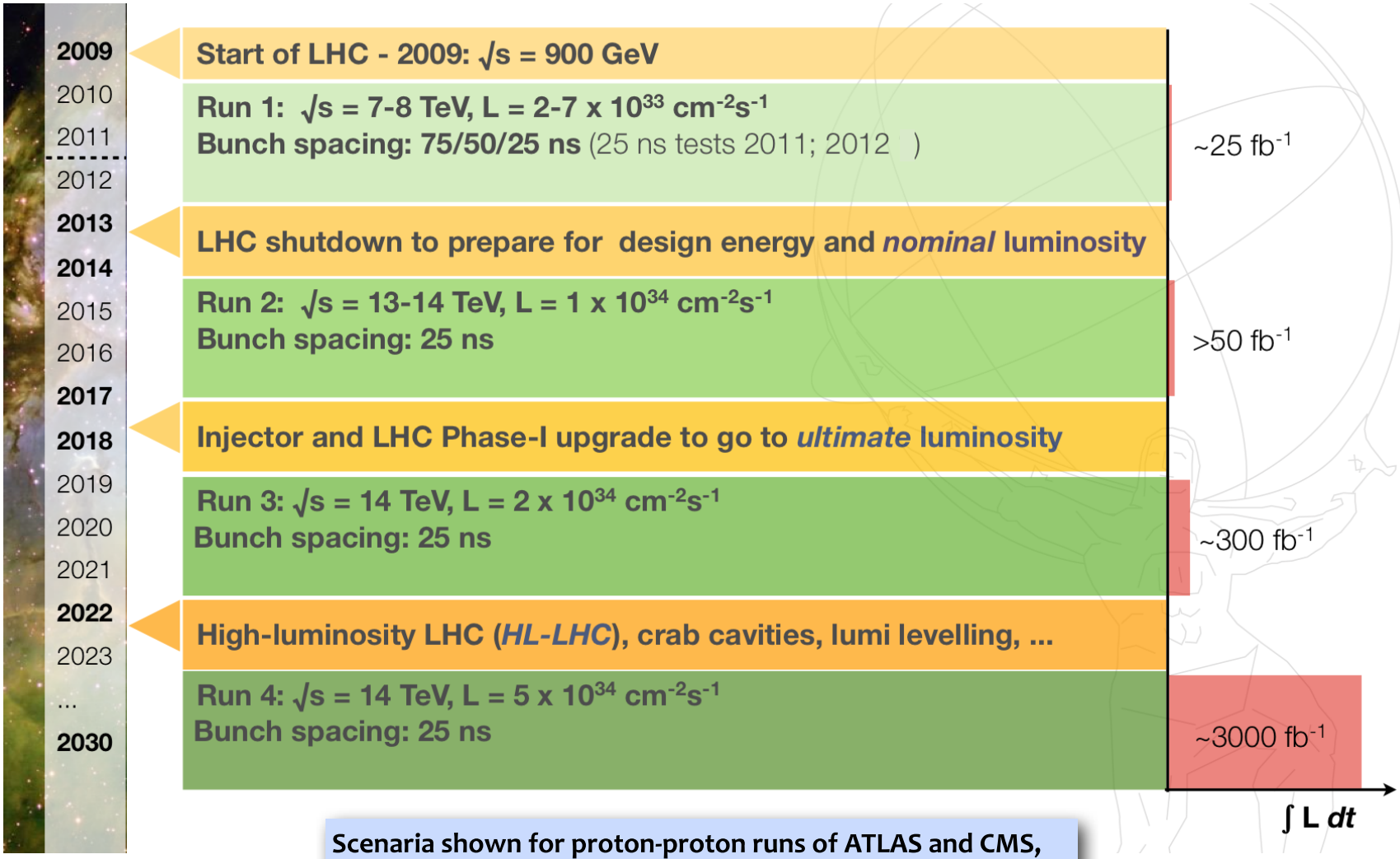
2008-2013: Actual deployed capacity

Line: extrapolation of 2008-2012 actual resources

Curves: expected potential growth of technology with a constant budget (see next)
- CPU: 20% yearly growth
- Disk: 15% yearly growth

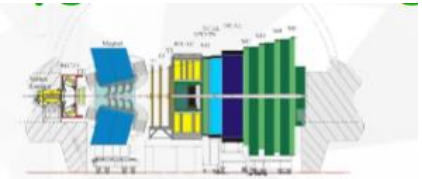


A lot more to come …



Scenaria shown for proton-proton runs of ATLAS and CMS, LHCb and Alice follow different strategies.

LHCb & ALICE @ Run 3



40 MHz

DAQ

40 MHz

LLT: μ,e/γ, hadrons

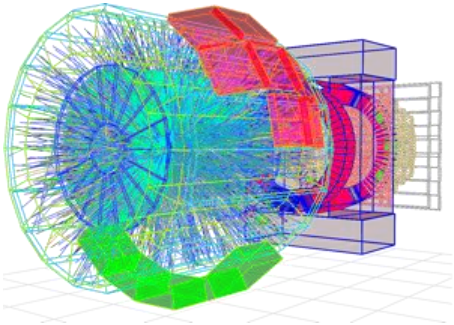
5-40 MHz

HLT: event recon.

20 kHz (0.1 MB/event)

Storage

2 GB/s



50 kHz

Reconstruction + Compression

50 kHz (1.5 MB/event)

Storage

75 GB/s

← PEAK OUTPUT →

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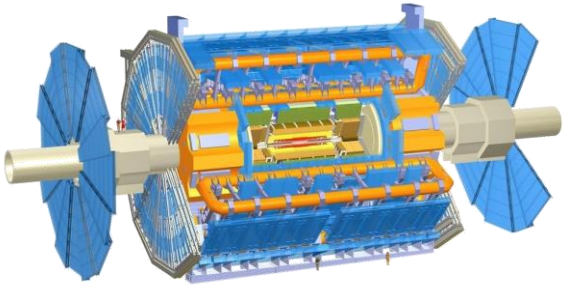
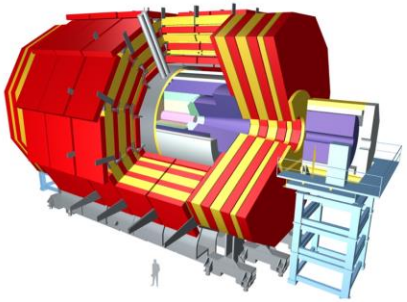
ATLAS & CMS @ Run 4





Level 1

HLT

5-10 kHz (2MB/event)

Storage

Level 1

HLT

10 kHz (4MB/event)

Storage

10-20 GB/s ← PEAK OUTPUT → 40 GB/s

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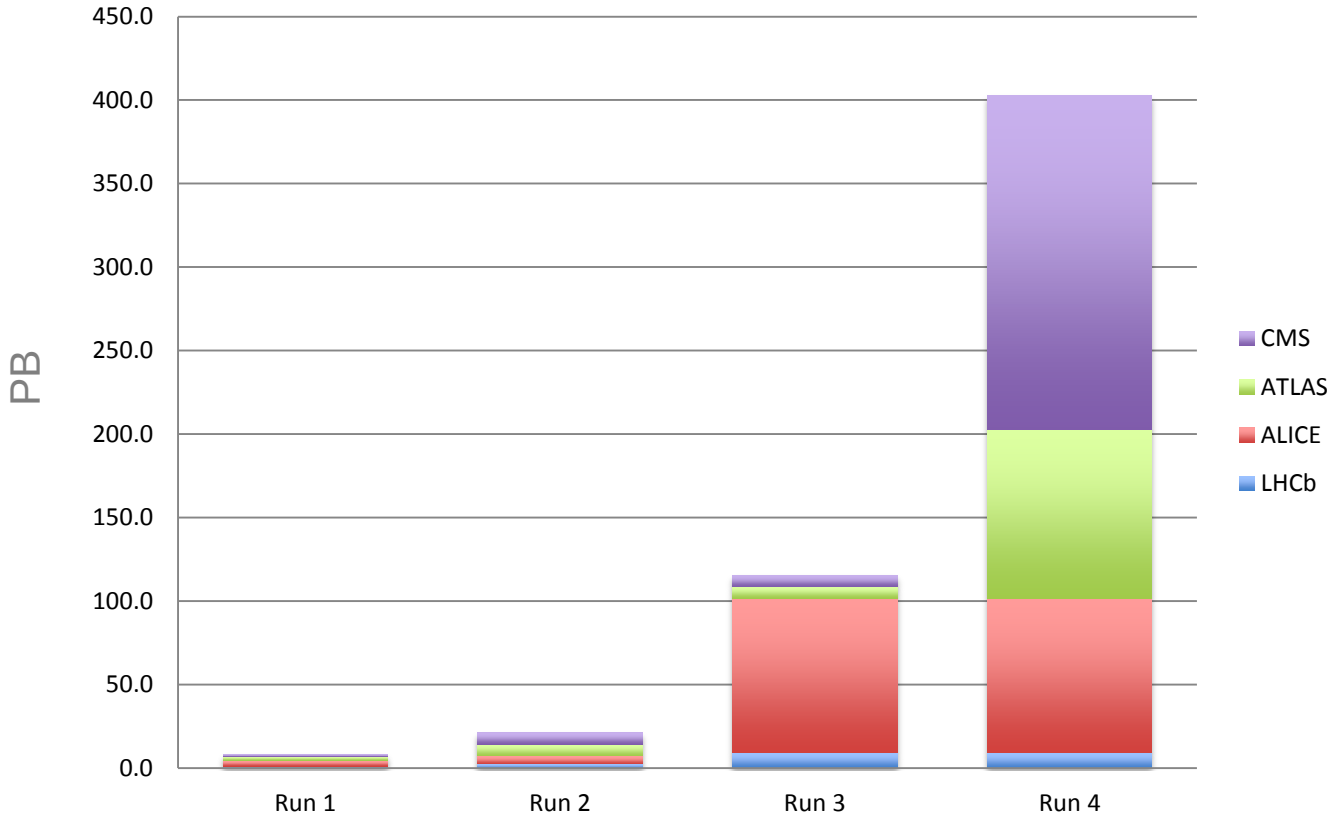
Data: Outlook for HL-LHC



- Very rough estimate of a new RAW data per year of running using a simple extrapolation of current data volume scaled by the output rates.
  - To be added: derived data (ESD, AOD), simulation, user data…

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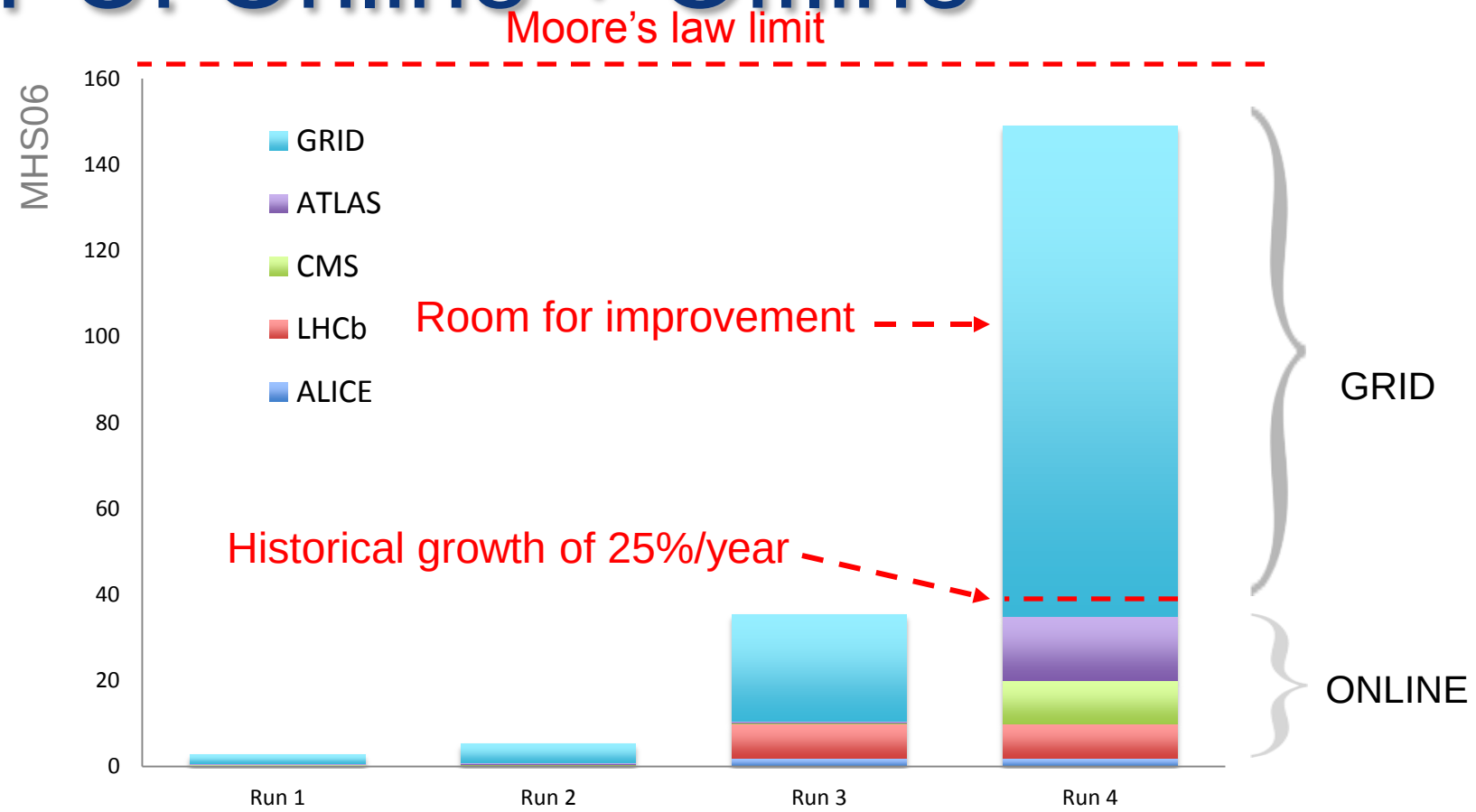
CPU: Online + Offline



- Very rough estimate of new CPU requirements for online and offline processing per year of data taking using a simple extrapolation of current requirements scaled by the number of events.
- Little headroom left, we must work on improving the **performance**.

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Conclusions

- Networking has been shown to be a very stable and functional service for WLCG
  - Has enabled us to significantly evolve the computing models
- Networking is key for the future evolution of WLCG
- Bandwidths needed will fit within the expected evolution of technology (given 25 year history), even on the HL-LHC timescale
- No reason to change to current way of using LHCOPN or the general Tier-Tier connectivity
- The real problem to be addressed is the connectivity to Eastern Europe, Asia, Africa, etc.