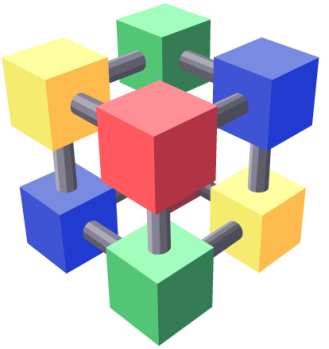
10 years of WLCG

A short overview of



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M.Górski,
NCBJ, Warsaw, Poland

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1) A short history of WLCG – why, what and how
2) Current status

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What do we need grid computing for?

- *"OLD" model (as in LEP times) -*
every laboratory has its own computing centre with all necessary data (events, calibration, geometry, history logs, ….)
- *"NEW" model – too much data to store them in each of ~100 centres*
network throughput sufficient to quickly transfer data between centres (O(1 – 10 Gb/s)) -
decentralize data storage and processing

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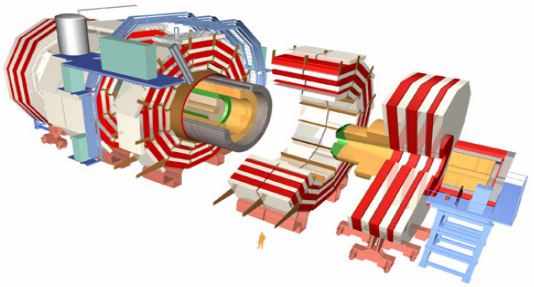
A LHC experiment data flow:



- Detector - ~ 100 M channels
- 40 MHz collision frequency, then
- Level 1 trigger accepts ~ 100 KHz candidates
- Level 2 trigger – 100-1000 Hz recorded events, ~ 1MB data/event

=> 100MB/s => 10TB/day => 15 PB/year

- and MC studies (very important!)

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Some more precise numbers:

- Data stored at CERN tier0 today: 50 PB
- ATLAS and CMS store 600 MB/s during highest luminosity periods
- CMS and ALICE store 4GB/s during Heavy Ion data taking!!!

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When did WLCG start?

In 2002 as a consortium to:

- Provide possibility to analyze data originating from LHC experiments
- Store 15 Petabytes/year of data generated by experiments
- Distributed computing model – analysis programs go to where data are present

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CERN – TIER0, GREEN BLOBS – TIER1'S, BLUE- TIER2'S

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WHAT WE HAVE:

- *world's largest “computing organization”*
- *~140 computing centres*
- *In 34 countries*
- *Large transfer data capacity and storage*
- *Hierarchical structure from top(tier0) through tiers1, 2 till 3*
- *Ability to process several tens of millions jobs/month*

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Tier0 – CERN (but expanding toBudapest)
Tiers1 – in 11 labs
Tiers2 – remaining 130 labs

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Member countries:

Australia, Austria, Belgium, Brazil, Canada, China, Czech Republic, Estonia, Finland, France, Germany, Hungary, India, Israel, Italy, Korea, Netherlands, Norway, Pakistan, Poland, Portugal, Romania, Russian Federation, Slovenia, Spain, Switzerland, Sweden, Taiwan, Turkey, United Kingdom, Ukraine, United States.

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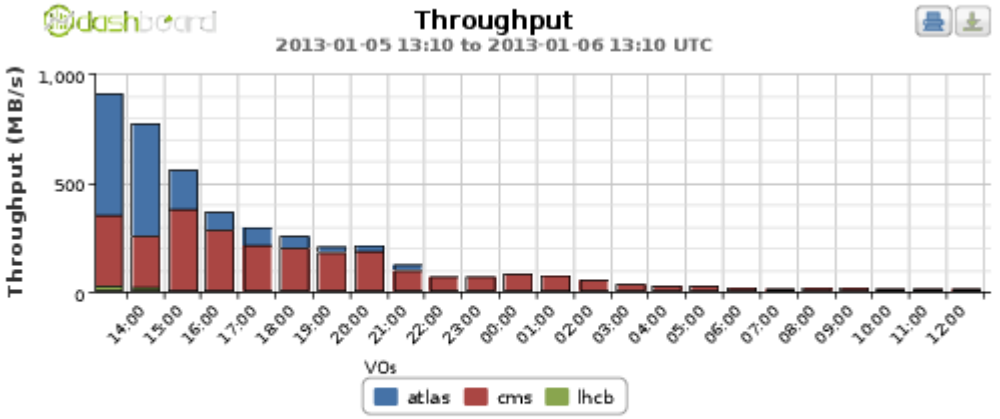
What WLCG provides:

The day-to-day monitoring, e.g:



Last 24 hours throughput

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- Keeping track of software evolution, e.g.:
  - *conversion to new operating system - Scientific Linux CERN 6*
  - *IP4 → IP6 (Internet addressing scheme)*
  - *Evaluation of new processors, benchmarking – recommendations of new hardware purchases*

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- *User identification/validation*
- *Protecting against unauthorized access*
- *Keeping track of where particular data reside*
- *Proposing removal of obsolete data (storage is always too small, no matter how much you have got)*

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The WLGC continues to grow:

The CERN's tier0 expands to Hungary

The WIGNER Research Centre was chosen to host tier0 “second leg”

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But all of tiers grow also:

The global WLCG processing/storage capacity grows by ~20%/year

year	CPU (HEP-spec06)	Disk space PB	Tape PB
2010	1137000	98	82
2011	1529000	134	132
2012	1809000	154	169
2013(pledges)	2005000	170	179

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Poland's participation in WLCG

We have a “divided” tier2 - Poznań, Kraków, Warszawa
Installed resources in 2012:
CPU: 15800 HEP-spec06
Disk: 1010 TB

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More complete information on early stages of Poland's participation in WLGC may be found in:
M. Turala,
LHC Grid Computing in Poland,
Polish Particle Physics Symposium, Warsaw April 2008

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Final remarks:

The WLCG continues to grow and has become the indispendable tool for analyzing data originating from LHC experiments