An Overview of the Experiments Upgrades

RRB 37

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CERN

Assumptions

- Baseline schedule:
  - In depth discussion during the RLIUP workshop (Oct. 29-31, 2013)
- Phase-I upgrades figures and timelines pretty consolidated
- Phase-II figures and timelines still based on LOI and to R&D results
- A guideline for further reflections.

“The Baseline Schedule”

	J	F	M	A	M	J	J	A	S	O	N	D
2011		1	2	3	4	5	6	7	8	9	IONS	
2012			1	2	3	4	5	6	7	8	9	
2013	IONS	IONS	**LS1 - SPLICE CONSOLIDATION**									
2014												
2015	CHECK-OUT	RECOM	RECOM	RAMP-UP	2	3	4	5	6	7	IONS	
2016		RAMP-UP	1	2	3	4	5	6	7	8	IONS	
2017		RAMP-UP	1	2	3	4	5	6	7	8	IONS	
2018	**LS2 (LIU UPGRADE: LINAC4, BOOSTER, PS, SPS…)**											
2019	RECOM	RECOM	RAMP-UP	1	2	3	4	5	6	7	IONS	
2020		RAMP-UP	1	2	3	4	5	6	7	8	IONS	
2021		RAMP-UP	1	2	3	4	5	6	7	8	IONS	
2022	**HL-LHC UPGRADE**											

- Technical stop or shutdown
- Proton physics
- Ion Physics
- Recommissioning
- Intensity ramp-up

Courtesy Mike Lamont

Presented by Austin in RLIUP on behalf of 4 LHC expts

LHC experiments on same page

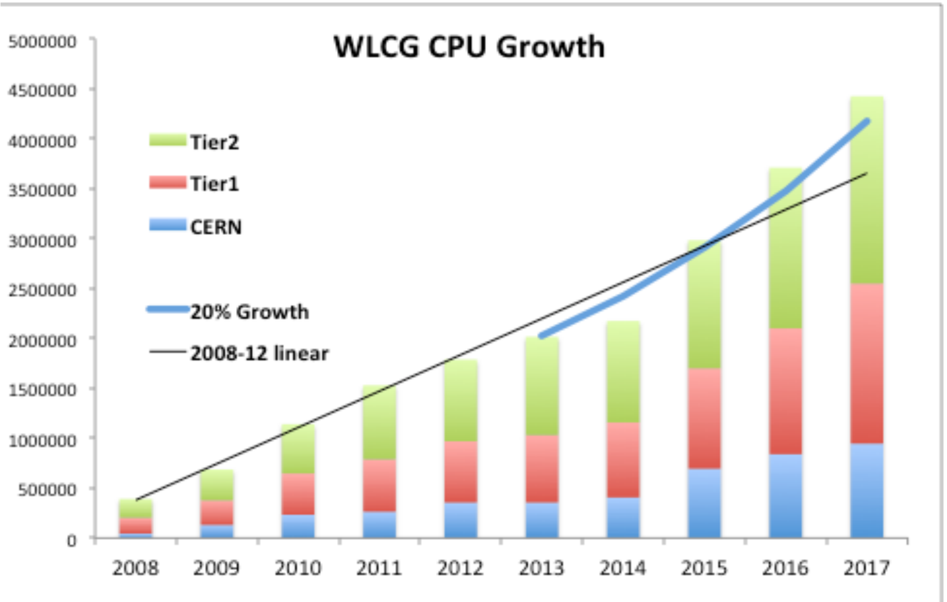
	ATLAS		ALICE		CMS		LHCb	
YETS 2016-17 duration	Min needed by LHC		Min needed by LHC		4.5 mo (i.e. 6w more)	Pixel upgrade	Min needed by LHC	
Preferred LS2 start	end 2017	Trigger upgrade	end 2017	ITS,TPC & readout upgrade	end 2018.	HCAL upgrade	end 2018	Readout upgrade
Required LS2 duration	14 mo	Trigger upgrade µ Small wheels	18 mo	ITS, TPC 4GEM, MFT	14 mo	HCAL upgrade & Phase 2 start .	18 mo	VELO, RICH, Tracking, 40MHz readout.
Preferred LS3 start	end 2021	Tracker replace-ment ready	3 y after LS2 end		end 2022 < 500fb-1		3 y after LS2 end	
Preferred LS3 duration	27-35 mo		Min needed by LHC		30-35 mo	Tracker, EE and HE repl.	Min needed by LHC	

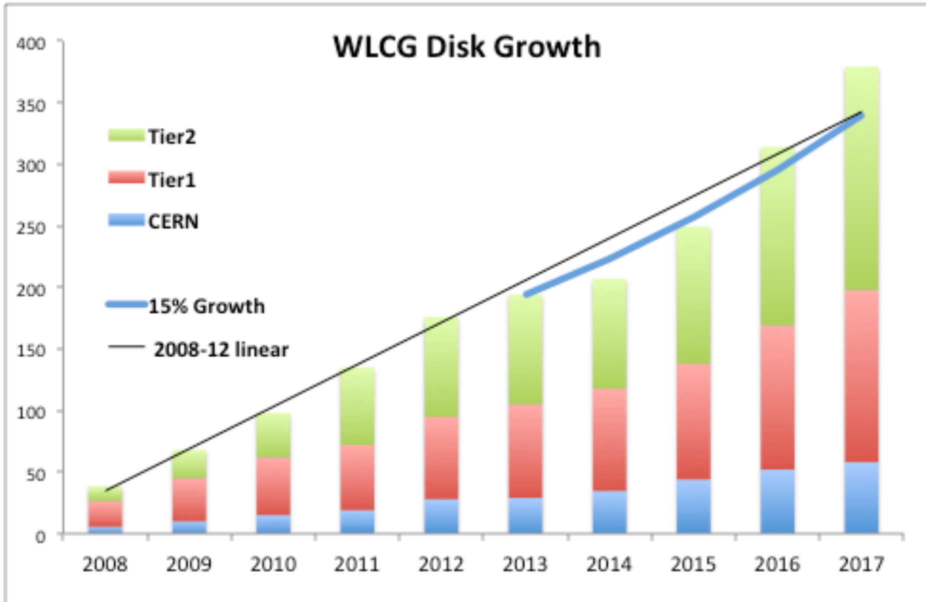
Computing Model update

- Requested by LHCC
  - Initial draft delivered in September; final version due for LHCC meeting in December
- Goals:
  - Optimise use of resources
  - Reduce operational costs (effort at grid sites, ease of deployment and operation, support and maintenance of grid middleware)
- Evolution of computing models – significant improvements that have already been done; areas of work now and anticipated; including several common projects
- Evolution of grid model: use of new technologies
  - Cloud/virtualisation
  - Data federations, intelligent data placement/caching, data popularity service

Computing model – 2

- Resource outlook for Run 2 (2014-2017)
  - Higher trigger (data) rates driven be physics needs
  - Based on understanding of likely LHC parameters;
  - foreseen technology evolution (CPU, disk, tape)
  - Experiments work hard to fit within constant budget scenario





Software

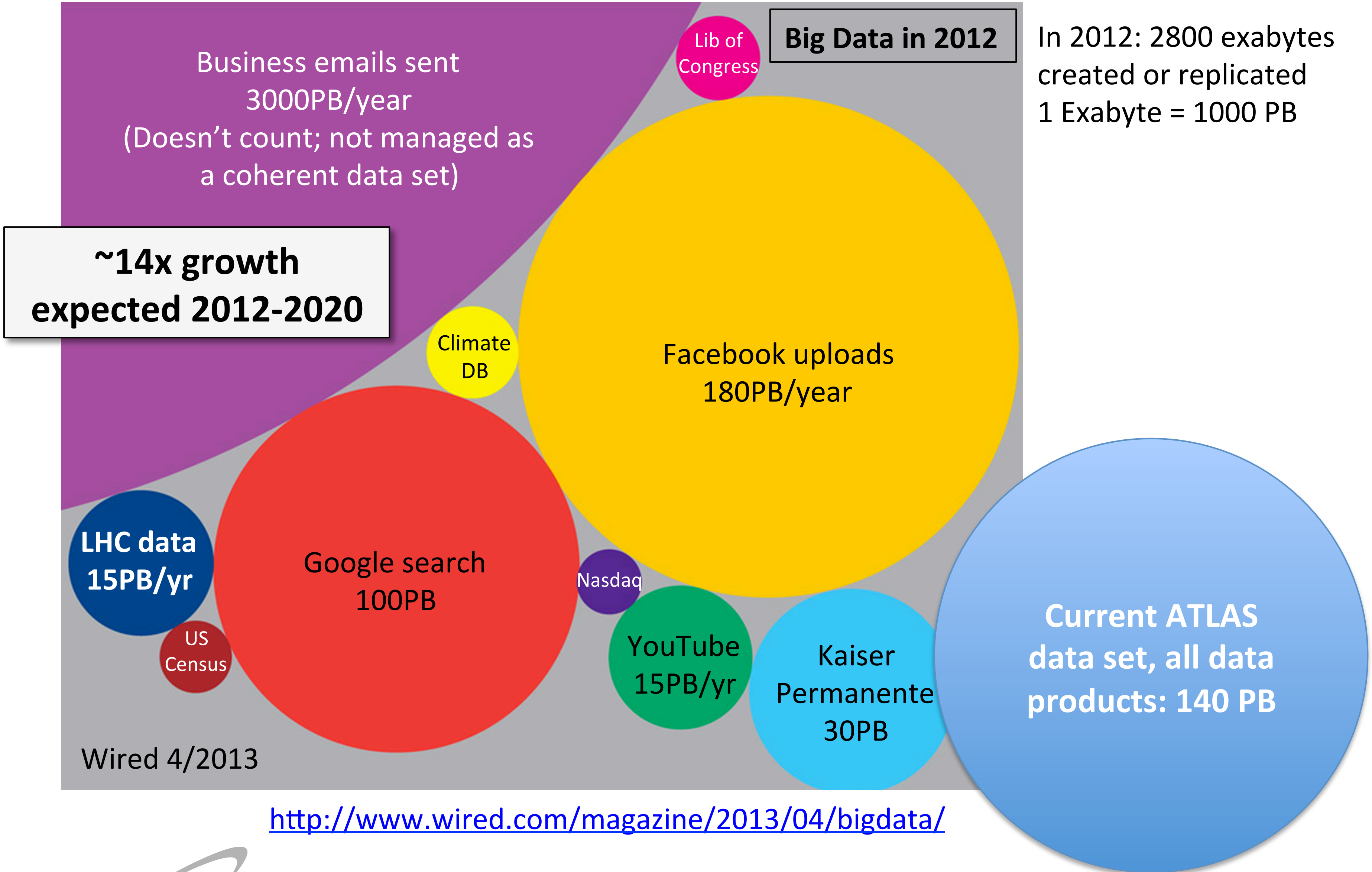
- Moore's law only helps us if we can make use of the new multi-core CPUs with specialised accelerators etc. (Vectorisation, GPUs, …)
  - No longer benefit from simple increases in clock speed
- Ultimately this requires HEP software to be re-engineered to make use of parallelism at all levels
  - Vectors, instruction pipelining, instruction level pipelining, hardware threading, multi-core, multi-socket.
- Need to focus on commonalities:
  - GEANT, ROOT, build up common libraries
- This requires significant effort and investment in the HEP community
  - Concurrency forum already initiated
  - Ideas to strengthen this as a collaboration to provide roadmap and incorporate & credit additional effort

From: Torre Wenaus, CHEP 2013

Data Management

Where is LHC in Big Data Terms?

In 2012: 2800 exabytes created or replicated
1 Exabyte = 1000 PB



http://www.wired.com/magazine/2013/04/bigdata/