



LHC Computing Grid Project – LCG

Planning the Phase 2 Challenges

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Planning for LHC Startup

- **December 2004**
 - Experiment requirements and computing models published
 - -- reviewed by LHCC in January 2005
 - Develop high level plan for the ramp-up to 2007, with service and computing challenges
- **First quarter 2005 – Phase 2 Planning Group**
 - Establish resource plans for Tier-0, Tier-1 and major Tier-2s
 - Understand the probable Tier-2/Tier-1 relationships
 - Detailed service and computing challenge plan
 - Initial plan for Tier-0/1/2 networking
- **MoU Task Force – prepare “final” version of the LCG MoU**
 - April 2005 → C-RRB
- **July 2005 – Technical Design Report**
 - Detailed plan for installation and commissioning the LHC computing environment



Service and Computing Challenges

- **Developing a plan for ramping up the services for Phase 2, linking**

-- Service Challenges

- check out the infrastructure/service to iron out the problems before the experiments get fully involved
- schedule allows time to provide permanent fixes for problems encountered

-- and Experiment Computing Challenges -

- checking out the computing model and the software readiness
- **not** linked to **data challenges**
 - *which should use the regular, permanent grid service*



Target Data Rates Tier-0 → Tier-1

- Simple model – **CERN Tier-0**
 - CERN Tier-0 distributes to the Tier-1s
 - One copy of the raw data
 - *n* copies of the ESD
- **Using the April 2004 estimates** of event sizes, trigger rates this gives a nominal data rate:
 - CERN → Tier-1s ~ 1.3 GBytes/sec**
- The service must be capable of sustaining **at least twice** this nominal data rate (catch up after problem at CERN)
- This does **not** include traffic generated by processing at the Tier-1s and Tier-2s (including the CERN Tier-1/2)
- Network provisioning must be much higher

Re-calculate when new estimates available at end 2004

Preliminary planning draft



Tier-0/Tier-1 Aggregate Data Rates (PP run)

Nominal acquisition rates from summer 2004

MBytes/sec

	<i>ALICE</i>	<i>ATLAS</i>	<i>CMS</i>	<i>LHCb</i>	<i>Total</i>
Raw (PP)	20	320	100	20	460
ESD (PP)	2	160	50	40	252
ESD copies	1	2	6	6	
ESD total rate	2	320	300	240	862
Total (PP)	22	640	400	260	1322

Preliminary planning draft



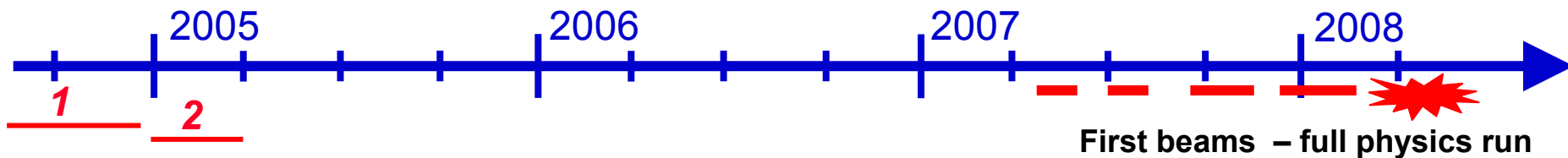
Service Challenge Programme to Ramp-up to LHC Startup

Dec04 - Service Challenge 1

- Basic high performance data transfer - 2 weeks sustained
- CERN + 3 Tier-1s (FNAL, NIKHEF, Lyon)
- Target - 500 MB/sec disk-disk between CERN and Tier-1s
 - Aggregate and individually

Mar05 - Service Challenge 2

- Reliable file transfer service
- CERN + ≥ 5 sites
- Target - 500 MB/sec mass store (disk) - mass store (disk)
- 1 month sustained



Preliminary planning draft



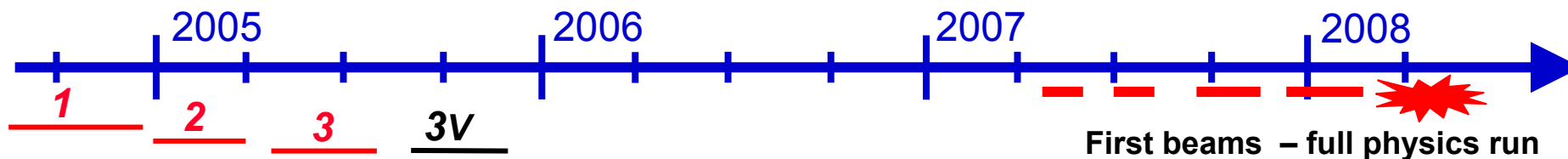
Service Challenge Programme to Ramp-up to LHC Startup

Jul05 - Service Challenge 3

- Tier-0/Tier-1 base service
 - acquisition - reconstruction - recording - distribution
 - *canned* applications, real data
- CERN + ≥ 5 Tier-1s
- 300 MB/sec. mass store (disk + **tape**)
- sustained 1 month
- ~5 Tier-2 centres at lower bandwidth

Preparation for --

Tier-0/1 model verification - two experiments concurrently at ~50% of nominal data rate



Preliminary planning draft



Service Challenge Programme to Ramp-up to LHC Startup

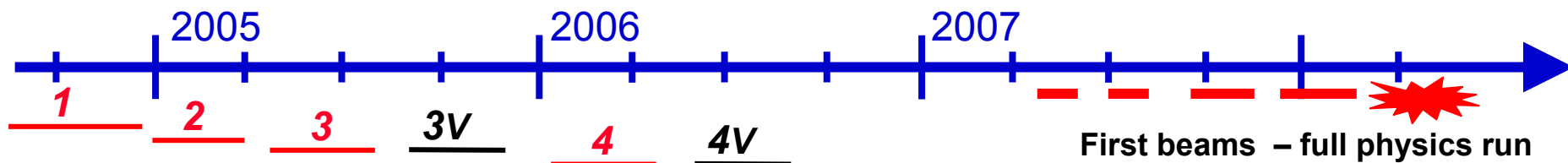
Apr06 - Service Challenge 4

- Tier-0, ALL Tier-1s, major Tier-2s operational at full target data rates (~ 1.2 GB/sec at Tier-0)
- acquisition - reconstruction - recording - distribution, *PLUS* ESD skimming, servicing Tier-2s

Preparation for ..

Tier-0/1/2 full model test - **All experiments**

- 100% nominal data rate, with processing load scaled to 2006 cpus
- sustained 1 month



Preliminary planning draft



Service Challenge Programme to Ramp-up to LHC Startup

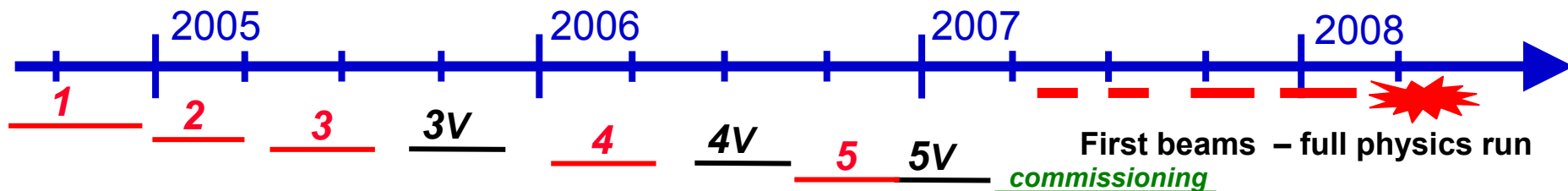
Nov06 - Service Challenge 5

- **Infrastructure Ready** at ALL Tier-1s, selected Tier-2s
- Tier 0/1/2 operation - sustained 1 month
- *twice* target data rates (~ 2.5 GB/sec at Tier-0)

Preparation for ..

Feb07 - ATLAS + CMS + LHCb + ALICE (proton mode)

- Tier-0/1/2 100% full model test



Preliminary planning draft