

Updated CMS Computing Resource Requests 2008 – 2010 and Resources Requirements for 2011 and 2012

Summary

CMS has reviewed its overall computing requirements for the years 2008 – 2010 and extended the requirements to the years 2011 and 2012. The modified LHC running schedule has been used as the basis for the planning. For 2011 and 2012 stable LHC running as in 2010 is assumed. No reason has been found to revise the basic CMS computing model. However, the expected event sizes together with the CPU estimate for Monte Carlo production have been revised based on the analysis studies performed since the last update. The targets for the high-level trigger accept rate were reviewed and changed for the years 2010, 2011 and 2012. A reduction in the number of simulated events has been made in order to partially compensate for the increase in resources required. We present in this document the revised resource estimates for CERN, Tier-1 and Tier-2 centers. It is worth noting that the estimates include uncertainties due to the fact that real analysis experience will only be gained once a sizable real event sample becomes available.

Revision of requirements requests

During the last year significant amounts of MC events have been produced and analyzed with the new CMS software framework for physics trigger studies. A better understanding has been gained on the software performance and event sizes for analysis. We have to increase our estimates for the CPU consumption for Monte Carlo event production and that for the event sizes of reconstructed raw (RECO) and simulated (SIMRECO) as well as for the AOD events. We recognize that these changes have a large impact on storage requirements at all levels and cannot be handled by the currently pledged resources without changes that, at least partially, compensate these increases. We would therefore reduce the number of simulated events. The details of the changes are given below.

The high-level trigger rate was reviewed and increased to 300 Hz for 2008 and 200 Hz / 150Hz for 2009 / 2010 at the previous revision of the resources estimate in Fall 2006. The main arguments were:

- To accumulate a large ‘physics-rich’ event sample in the startup years with reduced LHC efficiency and shorter running time.
- The HLT performance during the early commissioning is somewhat reduced; in the long term the required CPU burden on the HLT can be reduced and as such increase the safety margin on the Level-1 trigger accept rate and/or the acceptance of the entire trigger system.
- The lowering of LT physics objects thresholds increases the efficiency for many important channels in discovery and standard model physics. This will allow faster understanding of the Standard Model processes, which is required before any discoveries can be claimed.
- A substantial rate of technical, minimum-bias and calibration triggers enhances the understanding of the detector and trigger performance.

While some of these arguments address the special situation in the first years of LHC running and CMS detector operation we are convinced that, apart from

the first argument, they hold true also for the years 2010 and beyond. We plan to run with an HLT accept rate of 200Hz during these years.

Requirements for 2011 and 2012

For the years 2011 and 2012 we assume similar running parameters to the year 2010 for LHC and for CMS. The resource requirements scale up linearly and take into account the total statistics accumulated for data analysis.

Details of changes in the Computing Resource Requests:

- The CPU requirement for Monte Carlo event production is changed to 90 kSI2k (from 45 kSI2k) increasing to 180 kSI2k (from 90 kSI2k) for higher luminosity to reflect the target from current performance.
- The RECO event size has been increased to 0.5/0.4/0.4/0.4 MB (from 0.25 MB) for the years 2008/09/10/11/12 respectively. For the year 2008 the additional information for detector commissioning increases the event size by 100k over the steady state value.
- The SIMRECO event size will be 0.5 MB; it was previously estimated to be 0.4 MB.
- The target for the AOD event size is estimated to be 0,1 MB; it was previously estimated to be 0.05 MB.
- We plan to run with an HLT accept rate of 200Hz for 2010 and beyond, this was previously estimated to be 150Hz.
- Precision studies and physics analysis rely on significant Monte Carlo event samples. In previous resource planning a MC / RAW event ratio of 1 was foreseen. Due to increased resource requirements described above we cannot simulate as many events, the MC / RAW event ratio has been reduced to 75% for the years 2008-2012. The impact of this change has still to be studied in detail. For 2011 and 2012 this number should be increased back to 1 if possible in order to perform high statistics measurements; this will be reviewed in 2009.

Revised Resource Requests

The revised request for Tier-0/CAF, Tier-1 and Tier-2 computing resources is summarized in the following table, along with the previous planning, and the currently pledged resources. It is based on the current LHC schedule.

	2008			2009			2010			2011		2012	
	Request	06 Req.	Pledge	Request	06 Req.	Pledge	Request	06 Req.	Pledge	Request	Pledge	Request	Pledge
T0 CPU	5,3	3,9	3,9	9,8	6,1	5,4	19,1	10,6	7,6	19,1	7,6	19,1	
CAF CPU	2,1	3,8	3,8	3,9	5,8	5,0	9,7	11,5	7,4	13,4	10,6	17,0	
CERN total	7,3	7,7	7,7	13,7	11,9	10,4	28,8	22,1	15,0	32,5	18,2	36,1	
T0 Disk	0,4	0,3	0,3	0,2	0,3	0,4	0,4	0,5	5,5	0,4	5,5	0,4	
CAF disk	1,8	1,3	1,3	2,3	2,0	2,3	3,4	3,3	3,8	4,6	5,3	5,7	
CERN total	2,2	1,6	1,6	2,5	2,3	2,7	3,8	3,8	9,3	5,0	10,8	6,1	
T0 tape	4,4	3,6	3,6	7,3	6,7	7,7	11,1	10,9	13,8	14,9	21,4	18,7	
CAF tape	0,9	1,5	1,5	2,0	2,7	3,4	3,2	4,1	5,1	4,8	7,1	7,1	
CERN total	5,3	5,1	5,1	9,3	9,4	11,1	14,3	15,0	18,9	19,7	28,5	25,8	
T1 CPU	9,6	12,4	11,3	16,3	16,9	15,2	34,8	36,9	30,0	42,2		50,3	
T1 disk	7,2	5,6	5,3	9,7	8,5	7,7	15,4	13,7	11,3	19,4		23,5	
T1 tape	9,8	13,1	9,2	15,0	23,5	16,7	23,2	36,6	25,5	32,3		41,2	
T2 CPU	13,4	15,2	16,8	28,1	25,6	25,3	76,6	45,2	43,0	105,7		134,7	
T2 disk	5,1	4,2	4,2	5,7	8,4	7,1	7,6	13,3	10,5	11,0		14,4	

Units are in MSI2k, PB