

Belle II Computing in Italy

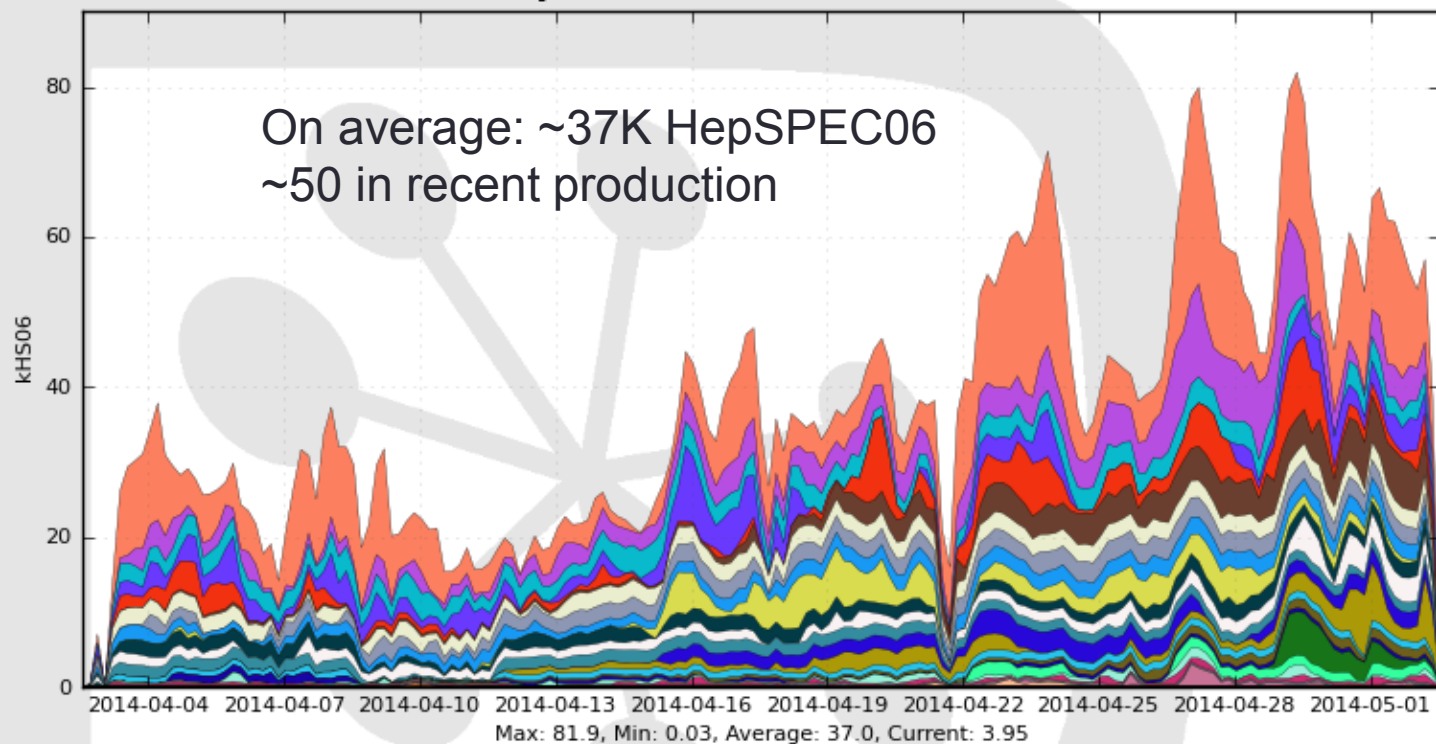
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Spring 2014 MC Campaign

Normalized CPU usage by Site

30 Days from 2014-04-02 to 2014-05-02



Pisa 5.5%
CNAF 4.4%
Napoli 4.4%
Frascati 0.9%
Legnaro 0.8%
Torino 0.6 %

LCG.DESY.de	22.9%	LCG.Napoli.it	4.4%	LCG.Frascati.it	0.9%
LCG.KIT.de	9.2%	LCG.CYFRONET.pl	4.0%	LCG.KISTI.kr	0.9%
LCG.UA-ISMA.ua	6.6%	LCG.SIGNET.si	3.8%	LCG.Legnaro.it	0.8%
LCG.KEK2.jp	5.5%	LCG.Melbourne.au	3.5%	LCG.TORINO.it	0.6%
LCG.PISA.it	5.5%	LCG.CESNET.cz	2.8%	SSH.KMI.jp	0.4%
DIRAC.BINP.ru	5.4%	DIRAC.UVic.ca	2.8%	DIRAC.Niigata.jp	0.4%
LCG.KMI.jp	5.2%	LCG.ULAKBIM.tr	2.0%	OSG.Nebraska.us	0.3%
DIRAC.PNNL.us	5.0%	DIRAC.KrakowCloud.pl	1.2%	OSG.FNAL.us	0.2%
LCG.CNAF.it	4.4%	LCG.McGill.ca	1.0%	... plus 6 more	

Generated on 2014-05-02 14:36:33 UTC

Belle II Computing Model

- Two copies of raw data
- 3 copies of miniDST for Data and MC
 - Asia, America, Europe
- Processing at KEK; reprocessing were second copy of raw data is.
 - Location of second copy is under investigation
- MC Production & Analysis everywhere according to PhD fraction
- Assumptions:
 - Sizes of event in raw data from DAQ people
 - Size of event in miniDST from estimate/measurement
 - CPU for Reco (MC generation and reconstruction) from current code
 - CPU for Analysis from scaled Belle experience

Global Resource Estimate

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Tape @ PNNL [PB]	0.00	0.00	0.00	0.00	9.23	28.51	52.45	76.80	102.32
Tape @ KEK [PB]	0.00	0.00	0.33	1.17	9.23	28.51	52.45	76.80	102.32
Tape KEK offset [PB]	2.00	2.00	1.67	0.83	0.00	0.00	0.00	0.00	0.00
Tape [PB]	2.00	2.00	2.00	2.00	18.46	57.01	104.90	153.60	204.64
Disk DST [PB]	0.00	0.00	0.01	0.02	0.18	0.57	1.05	1.54	2.05
Disk mDSTx4[PB]	0.00	0.00	0.24	0.87	6.89	21.28	39.16	57.34	76.40
Disk DST+mDSTx4	0.00	0.00	0.25	0.89	7.08	21.85	40.21	58.88	78.44
Disk MCx3 [PB]	0.00	0.00	0.70	2.49	11.09	21.37	34.14	47.13	60.74
Disk Analysis[PB]	0.00	0.00	0.03	0.10	0.82	2.53	4.66	6.83	9.09
Disk Challenge[PB]	2.00	4.00	5.00	2.00	0.00	0.00	0.00	0.00	0.00
Disk KEK offset [PB]	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Disk PNNL offset [PB]	0.70	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Disk [PB]	3.19	4.40	5.98	5.49	18.98	45.76	79.01	112.83	148.27
CPU Data [kHS]	0.00	0.00	1.87	4.79	46.00	109.98	136.60	138.93	145.59
raw data proc @ PNNL [kHS]	0.00	0.00	0.75	1.91	18.40	43.99	54.64	55.57	58.23
CPU mDST repr.	0.00	0.00	6.85	24.40	96.53	74.54	137.15	200.82	267.55
CPU MC [kHS]	0.00	0.00	9.85	25.25	121.30	145.01	180.11	183.18	191.96
CPU MC repr. [kHS]	0.00	0.00	27.09	96.52	143.37	138.15	220.69	304.65	392.63
CPU Analysis [kHS]	0.00	0.00	0.93	3.33	26.33	81.32	149.61	219.08	291.87
CPU Challenge [kHS]	133.25	133.25	111.04	161.80	0.00	0.00	0.00	0.00	0.00
CPU KEK offset [kHS]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPU PNNL offset [kHS]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPU [kHepSPEC]	133.25	133.25	157.64	316.08	433.53	548.99	824.16	1,046.67	1,289.61

Resources in Italy

O(10% of previous slide)

Site or Tier 1 fraction	Italy	This can be a site name as given on the Sites sheet or a number
Data fraction		If this is empty the data fraction will be equal to the number given on the Sites sheet or 0 for numerical Tier 1
Used Tier 1 fraction	0.10	The fraction of MC production and user analysis done at the site
Used data fraction	0.40	The fraction of mDST data stored at the site

Regional Center resources:

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Disk (data) [PB]	0.00	0.00	0.02	0.08	0.66	2.03	3.73	5.46	7.28
Disk (MC) [PB]	0.00	0.00	0.03	0.12	0.55	1.07	1.71	2.36	3.04
Disk (analysis) [PB]	0.00	0.00	0.00	0.01	0.08	0.25	0.47	0.68	0.91
Disk (challenges) [PB]	0.20	0.40	0.50	0.20	0.00	0.00	0.00	0.00	0.00
Disk [PB]	0.20	0.40	0.56	0.42	1.29	3.35	5.90	8.50	11.22
CPU (MC) [kHepSPEC]	0.00	0.00	3.61	11.97	25.46	27.11	38.58	47.26	56.86
CPU (an.) [kHepSPEC]	0.00	0.00	0.09	0.33	2.63	8.13	14.96	21.91	29.19
CPU (ch.) [kHepSPEC]	13.32	13.32	11.10	16.18	0.00	0.00	0.00	0.00	0.00
CPU [kHepSPEC]	13.32	13.32	14.81	28.48	28.09	35.24	53.54	69.17	86.05
CPU [# of cores 14.72HS/core]	905.21	905.21	1,006.09	1,934.70	1,908.20	2,393.92	3,637.27	4,698.73	5,845.59
WAN (data) [Gbit/s] (inward)	0.00	0.00	0.02	0.08	0.39	0.50	0.74	0.92	1.12
WAN (MC) [Gbit/s] (outward)	0.00	0.00	0.02	0.08	0.21	0.15	0.21	0.25	0.30
WAN (MC) [Gbit/s] (inward)	0.00	0.00	0.05	0.16	0.42	0.29	0.41	0.50	0.60
WAN (ch.) [Gbit/s] (in/out)	0.32	0.64	0.64	0.48	0.00	0.00	0.00	0.00	0.00
WAN [Gbit/s] (outward)	0.32	0.64	0.66	0.56	0.21	0.15	0.21	0.25	0.30
WAN [Gbit/s] (inward)	0.32	0.64	0.71	0.72	0.81	0.79	1.15	1.42	1.72

Plus user space, plus a fraction of the raw data

Costing of Resources in Italy

Cost for Analysis and MC Production										
Item	Totale 2014-2022	2014	2015	2016	2017	2018	2019	2020	2021	2022
Disco (PB) da tabella ufficiale		0.20	0.40	0.56	0.56	1.32	3.50	5.90	8.50	11.20
Disco (PB) user space (10% e poi 5% dal 2019)		0.02	0.04	0.06	0.06	0.13	0.18	0.30	0.43	0.56
Disco(PB) totale		0.22	0.44	0.62	0.62	1.45	3.68	6.20	8.93	11.76
Disco(PB) da comprare (rimpiazzo dopo 5 anni)			0.44	0.18	0.00	0.84	2.22	2.96	2.91	2.84
Disco: Costo per PB in KE (-20% anno)			265.00	212.00	169.60	135.68	108.54	86.84	69.47	55.57
Disco costo totale (KE)	1125.09	0.00	116.60	37.31	0.00	113.43	241.29	257.03	201.87	157.55
CPU(KHEPSpec) da tabella ufficiale		13.00	15.00	15.00	28.00	28.00	36.00	54.00	79.00	85.00
CPU(KHEPSpec) analisi n-tuple (10% e poi 5% dal 2019)*0.4		0.52	0.60	0.60	1.12	1.12	0.72	1.08	1.58	1.70
CPU(KHEPSpec) totale		13.52	15.60	15.60	29.12	29.12	36.72	55.08	80.58	86.70
CPU(KHEPSpec) da comprare (rimpiazzi dopo 4 anni)			15.60	0.00	13.52	0.00	23.20	18.36	39.02	6.12
CPU: Costo Unitario per KHEPSpec in KE (-20% anno)			12.00	9.60	7.68	6.14	4.92	3.93	3.15	2.52
CPU costo totale (KE)	615.41	0.00	187.20	0.00	103.83	0.00	114.03	72.19	122.75	15.40
Gran totale	1740.50	0.00	303.80	37.31	103.83	113.43	355.33	329.23	324.62	172.96

Frazione della seconda copia dei raw data non inclusa

Where to locate the resources in Italy ?

- CNAF: 40% + fraction of raw data (including CPU to process them)
- Tier2 Federation: 60% shared between Napoli, Pisa and Torino
 - Site resources allocate to Belle II should be comparable
- How to increment resources yearly the Tier2 ?
 1. $1/3 + 1/3 + 1/3$ per year ?
 2. Increment only a site each year and rotate among sites ?
- We propose option 2

Request for 2015

- Servono 450 TB + 15 KHEPSpec
- CNAF: Abbiamo 50 TB + 0.7 KHEPSpec.
Vogliamo arrivare a 150 TB + 5 KHEPSpec.
Servono:
 - 100 TB -> 28 KE
 - 4 KHEPSpec -> 48 KE
- Napoli (fornite da RECAS)
 - 300 TB
 - 10 KHEPSpec
- Risorse a Pisa e Torino nei prossimi anni