



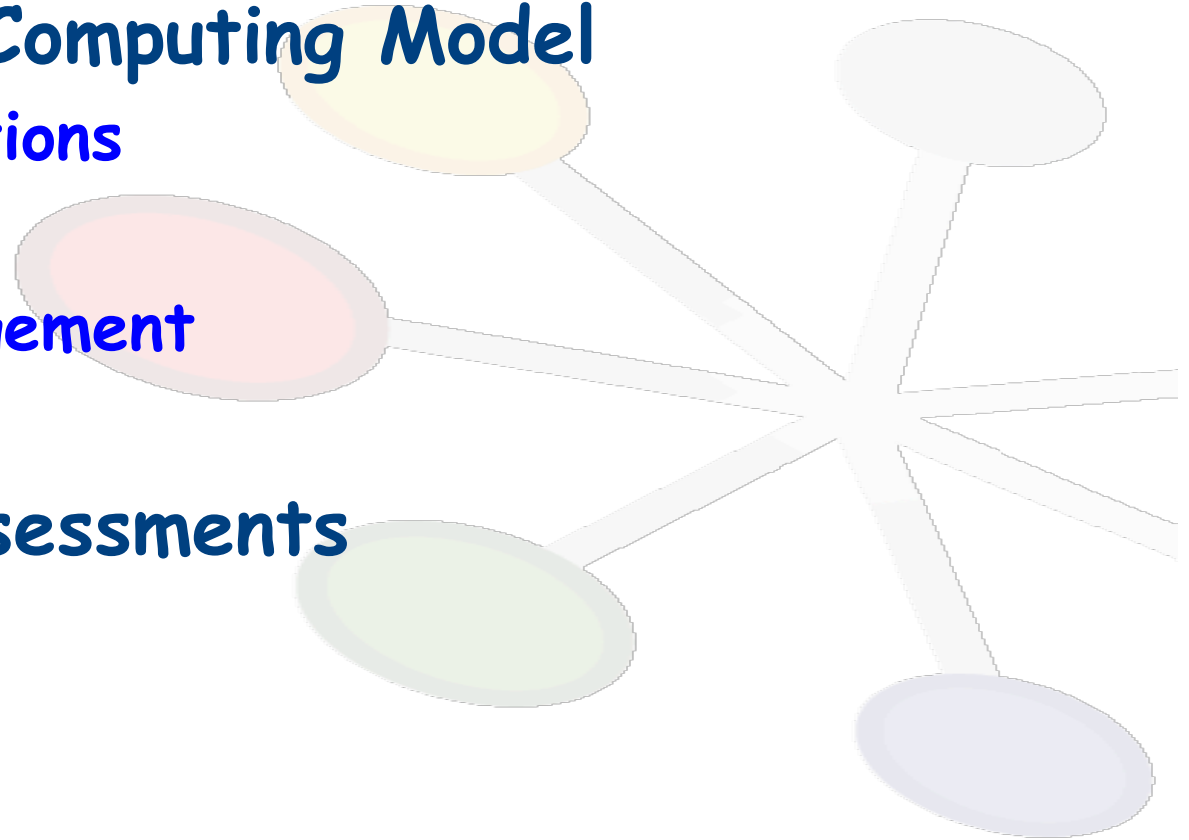
Re-assessment of Resource Usage for 2011

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Lyon 7-8 March 2010

Summary from LHCb-PUB-2011-009



- 2011 Pledges
- Changes to Computing Model
 - DAQ Conditions
 - Physics
 - Data Management
 - Efficiency
- 2011 Re-assessments
 - CPU
 - Storage
- Summary





Usage of the CPU pledge

HS06	Pledge	WLCG	LHCb	WLCG(%)	LHCb(%)
CERN	23000	7166	6640	31%	29%
CNAF	7480	3817	2440	51%	33%
GRIDKA	9742	4039	3005	41%	31%
IN2P3	5500	2437	1834	44%	33%
NL-T1	8992	3188	1981	35%	22%
PIC	2632	1412	1070	54%	41%
RAL	8184	3255	2299	40%	28%

- **Average work April 2010-Jan 2010**



2011 Pledges

Date	Site	kHS06	Disk (TB)	Tape (TB)
Apr'11	CERN	21	1500	2500
	Tier-1	70	3817	3933
	Tier-2	48		

Tier1s	CPU		Disk		Tape	
Site	HS06	%	TB	%	TB	%
GRIDKA	11050	17.0%	600	17.1%	590	17.0%
IN2P3	19773	30.4%	1065	30.4%	1056	30.4%
CNAF	8000	12.3%	450	12.9%	400	11.5%
NIKHEF/ SARA	14992	23.1%	807	23.1%	1000	28.8%
PIC	4527	7.0%	244	7.0%	242	7.0%
RAL	12090	18.6%	651	18.6%	645	18.6%

- From: [WLCGResources-2010-2012_15DEC2010.pdf](#)



Changes to Computing Model (I)

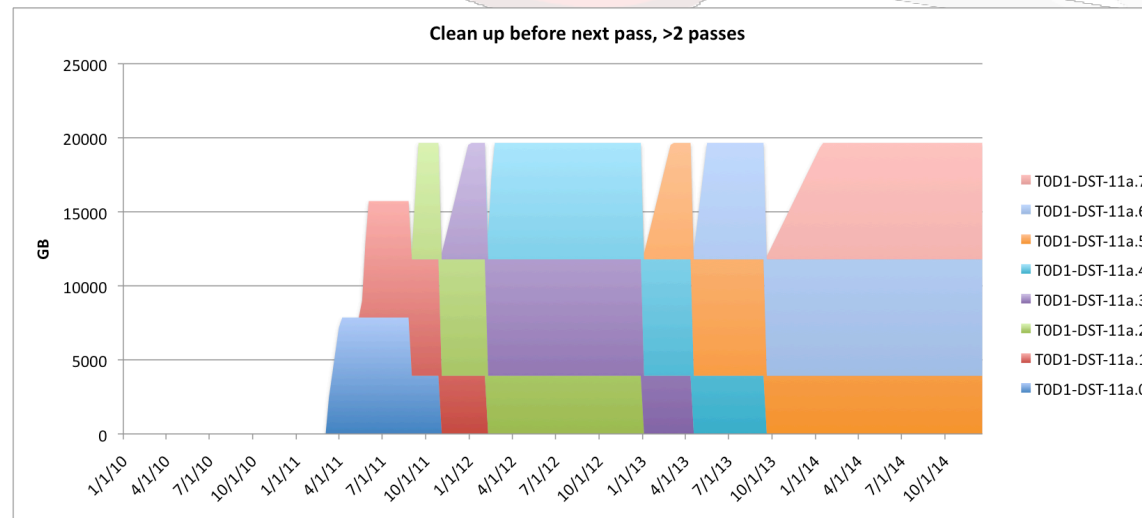
- LHC has increased mean number of visible proton-proton collisions per bunch crossing:
 - from 0.4 to 2.0
- This implies changes to basic parameters of the model:

Process	CPU (HS06-s/evt)		Data Type	Storage (kB/evt)	
	New	Old		New	Old
Data Taking			RAW	50	30
Reconstruction	25	12	SDST	40	25
Stripping	1.75	0.8	DST	130	80
			MDST	13	
Simulation	1700	376	DST	400	300



Changes to the Computing Model (II)

- Reduce number of replicas:
 - 2 master: T1D1
 - 2 extra: TOD1
- Archival:
 - Not possible to migrate from T1D1 to T1D0
 - 2 archive: T1D0 (at CERN T2D0?)
- Removal of old data:
 - 2 versions + $\frac{1}{2}$ of next version





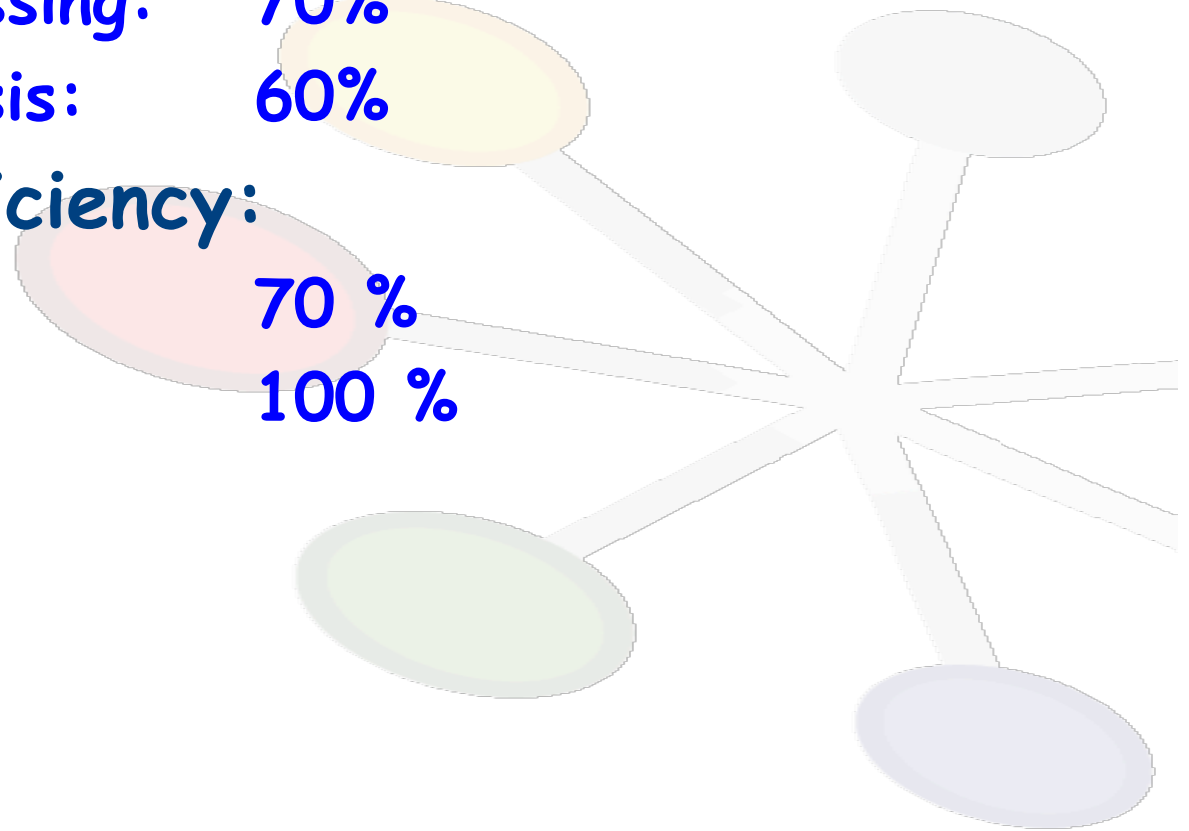
Changes to Computing Model (III)

- ✓ **b Physics:**
 - ✓ 2 kHz of Trigger
 - ✓ 10% retention in Stripping
 - ✓ RAW: 500 TB/year
 - ✓ SDTS: 400 TB/pass
 - ✓ DST: 130 TB/pass
- **New c Physics**
 - 1 kHz of Trigger
 - 100% retention in Stripping
 - 10% reduction in event size
 - ☆ RAW: 250 TB/year
 - ☆ MDST: 65 TB/pass
- **Monte Carlo dedicate to b/c samples**
 - ☆ DST: 300 TB/year



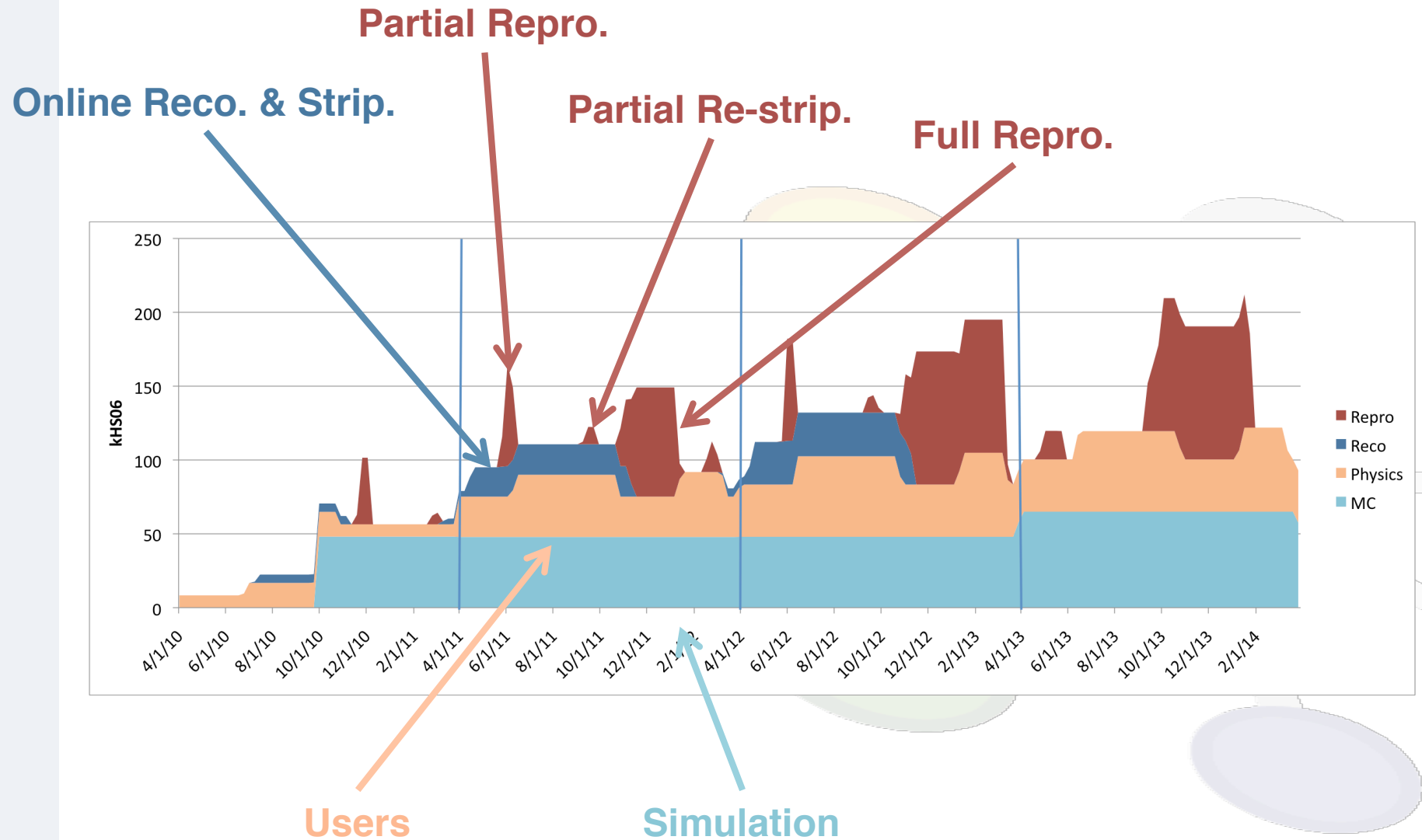
Changes to Computing Model (IV)

- CPU efficiency:
 - Simulation: 80%
 - ✓ Data Processing: 70%
 - ✓ User Analysis: 60%
- Storage efficiency:
 - Disk: 70 %
 - Tape: 100 %





2011 Re-assessment CPU





2011 Re-assessment CPU

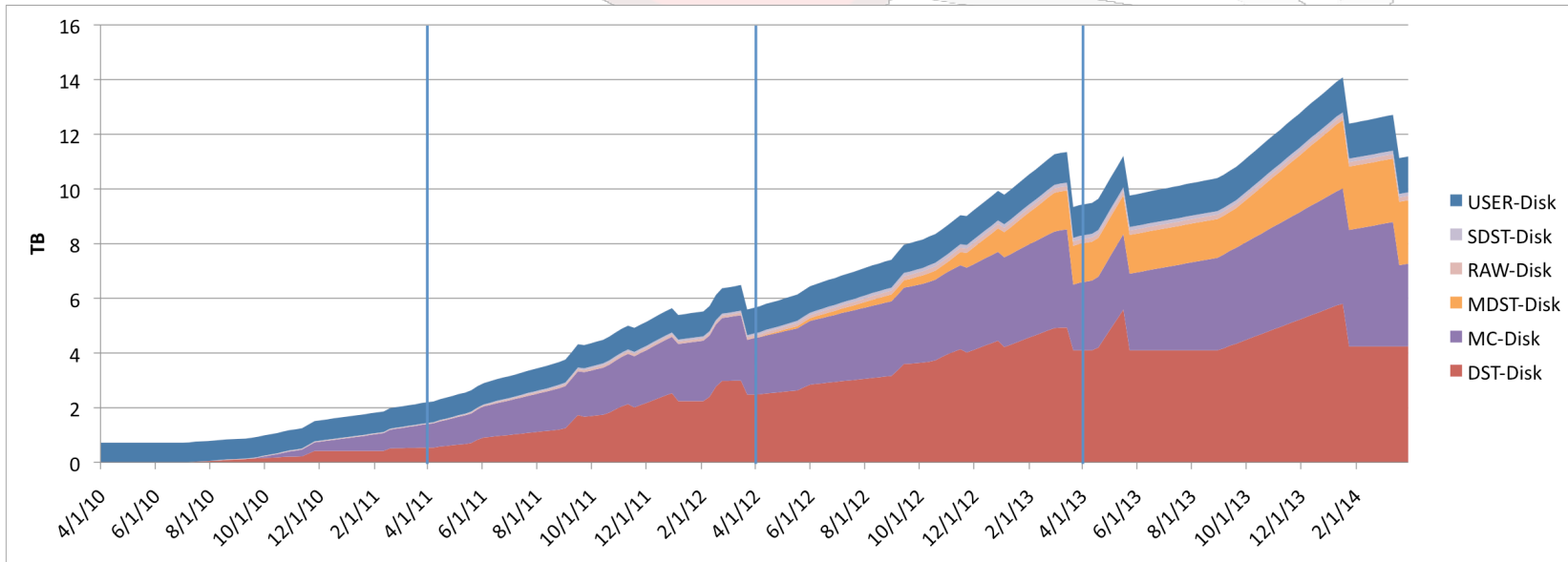
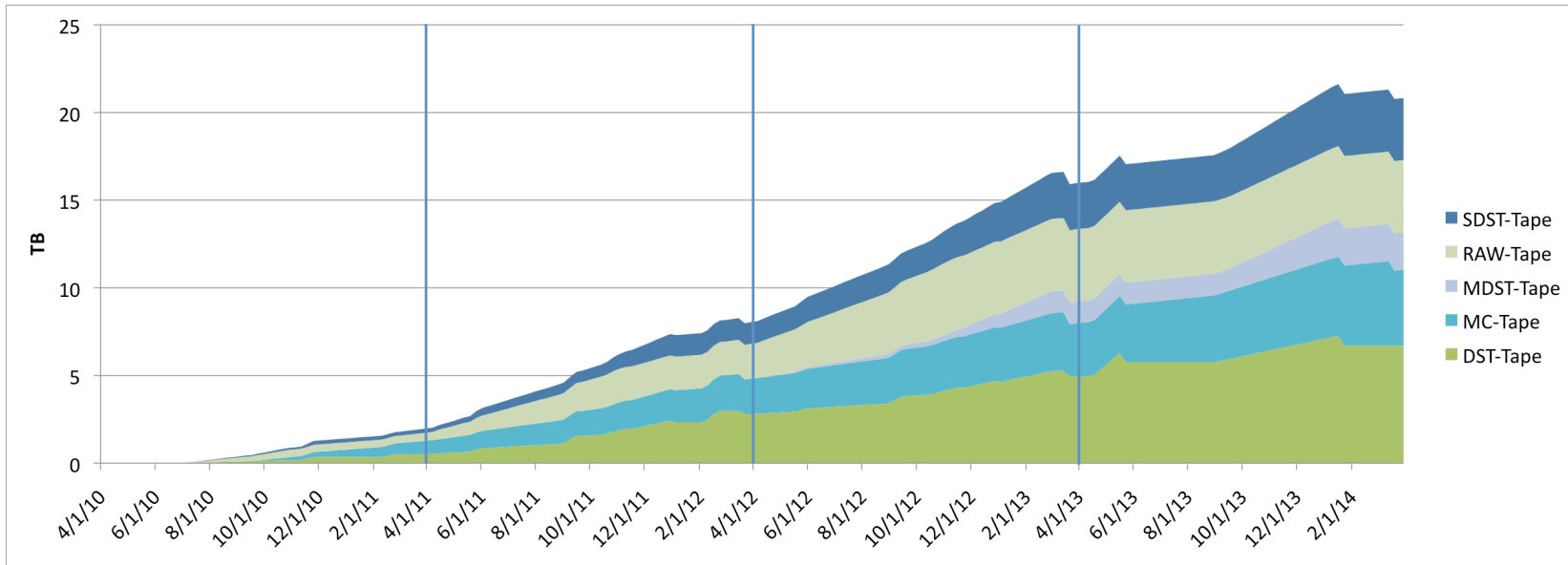
Work	2011	
	kHS06*y	%
Tier0	17	14
Tier1	58	47
Tier2	48	39

Power	2011	
	kHS06	%
Tier0	27	16
Tier1	90	55
Tier2	48	29

- ✓ Average work fits well within pledge
- ✗ Peak power during full reprocessing exceeds the average pledge



2011 Re-assessment Storage





2011 Re-assessment Storage

Disk	2011	
	PB	%
Tie0	1.9	26
Tier1	5.3	74

Tape	2011	
	PB	%
Tie0	5.6	57
Tier1	4.3	43

- ✓ Small amount of extra disk needed
- ✗ A lot of extra tape

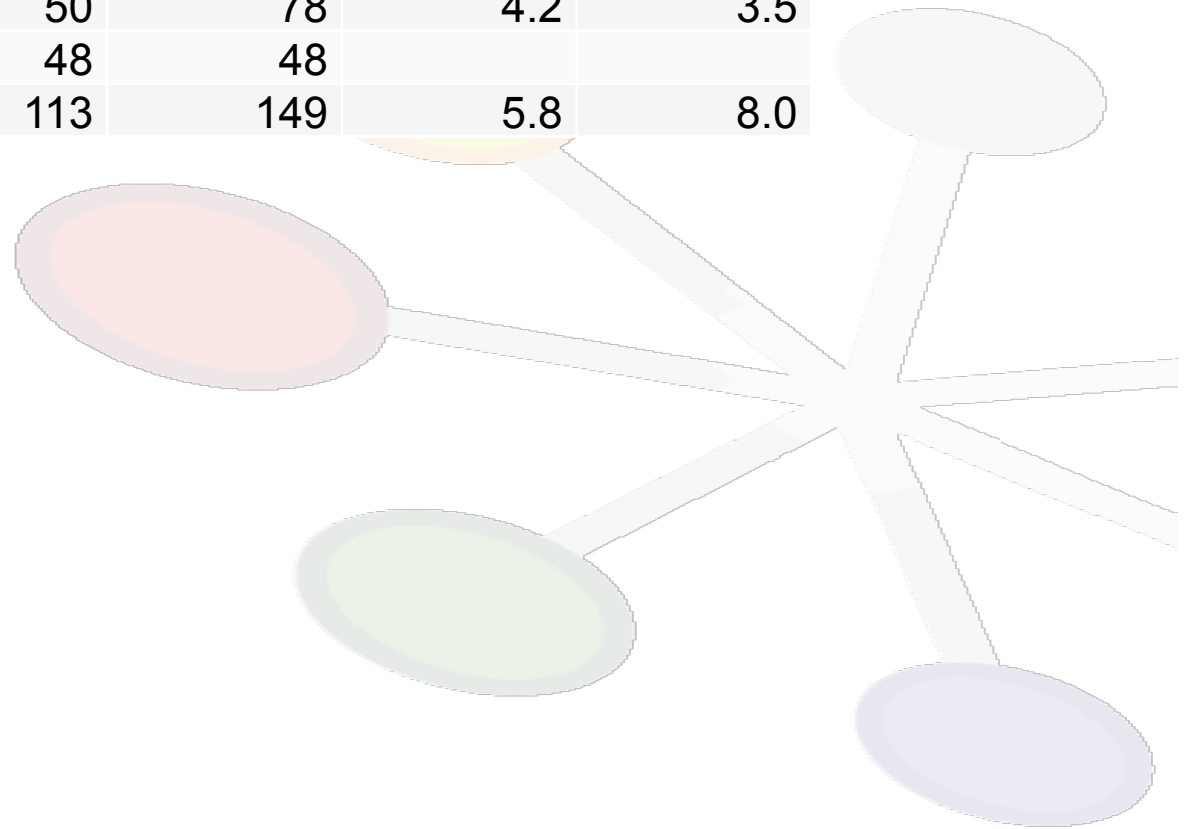


- Fully review the computing model:
 - 2010 experience
 - New LHC conditions
 - Extended physics program
- New simulation tool.
- Main uncertainty:
 - LHC conditions
- 2011 Re-assessments:
 - CPU requirements fit within pledge
 - ☆ Some work will be necessary for full reprocessing at the end of data-taking
 - Some extra Disk might be needed
 - ☆ Extra within error of the model
 - Need to review Tap usage
- Request for 2012 under review by C-RSG.



2011 Re-assessment (w/o Charm)

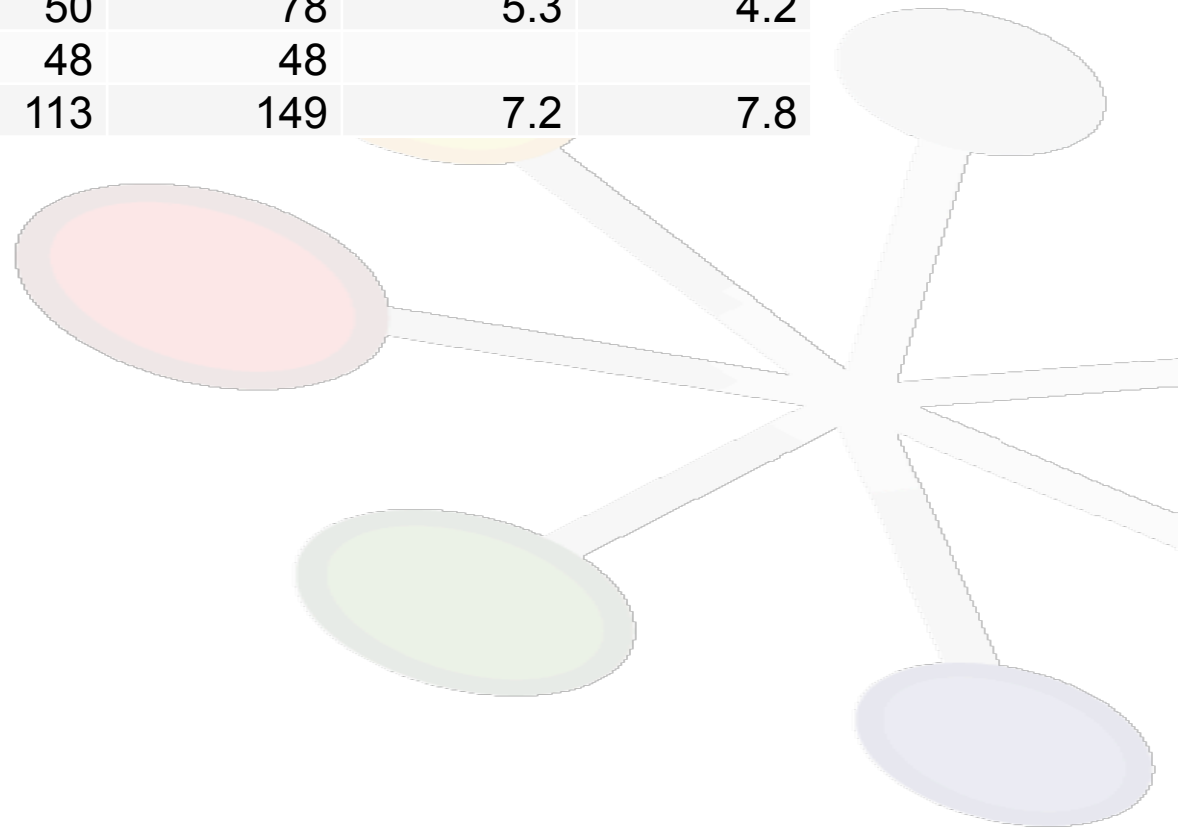
No Charm	CPU		Disk	Tape
	kHS06*y	kHS06	TB	TB
Tier0	15	23	1.5	4.5
Tier1	50	78	4.2	3.5
Tier2	48	48		
All	113	149	5.8	8.0





2011 Re-assessment (w/o T1D0 at CERN)

No Charm	CPU		Disk	Tape
	kHS06*y	kHS06	TB	TB
Tier0	15	23	1.9	3.6
Tier1	50	78	5.3	4.2
Tier2	48	48		
All	113	149	7.2	7.8





Estimates till 2013 (I)

Work	2011		2012		2013	
	kHS06*y	%	kHS06*y	%	kHS06*y	%
Tier0	17	14	24	15	22	15
Tier1	58	47	80	52	74	51
Tier2	48	39	48	33	48	34
MC	48	39	48	33	65	45
Physics	36	29	46	32	46	32
Reco	17	14	17	12	0	0
Repro	23	19	40	24	33	23
All	124	100	151	100	144	100



Estimates till 2013 (II)

Power	2011		2012		2013	
	kHS06	%	kHS06	%	kHS06	%
Tier0	27	16	34	17	33	17
Tier1	90	55	113	58	110	58
Tier2	48	29	48	25	48	25
MC	48	29	48	25	65	34
Physics	44	27	57	29	57	30
Reco	30	18	30	15		
Repro	90	55	90	46	90	47
All	165	100	195	100	190	100



Estimates till 2013 (III)

Disk	2011		2012		2013	
	PB	%	PB	%	PB	%
Tie0	1.9	26	3.5	26	3.7	26
Tier1	5.3	74	9.6	73	10.4	74
RAW	0.1	1	0.2	1	0.2	1
SDST	0.1	1	0.1	1	0.1	1
DST	2.3	32	4.1	31	5.8	41
MDST	1.4	20	3.9	30	2.5	18
MC	2.4	33	3.6	28	4.6	32
User	0.9	13	1.1	9	1.3	9
All	7.2	100	13.0	100	14.1	100



Estimates till 2013 (IV)

Tape	2011		2012		2013	
	PB	%	PB	%	PB	%
Tie0	5.6	57	10.7	56	13.4	55
Tier1	4.3	43	8.5	44	10.8	45
RAW	2.7	27	4.8	25	4.8	20
SDST	1.2	12	2.6	14	3.5	15
DST	2.7	27	5.0	26	6.7	28
MDST	1.3	13	3.4	18	4.2	18
MC	2.1	21	3.4	17	4.8	20
All	10.0	100	19.2	100	24.1	100