Service Challenges

Kors Bos (GDB Chair)

LHCC Review Meeting, March 7 2005

Why Service Challenges

To test Tier-0 ←→ Tier-1 ←→Tier-2 services

- Network service
  - Sufficient bandwidt: ~10 Gbis/sec
  - Backup path
  - Quality of service: security, help desk, error reporting, bug fixing, ..
- Robust file transfer service
  - File servers
  - File Transfer Software (GridFTP)
  - Data Management software (SRM, DCache)
  - Archiving service: tapeservers,taperobots, tapes, tapedrives, ..
- Sustainability
  - Weeks in a row un-interupted 24/7 operation
  - Manpower implications: ~5 fte/site
  - Quality of service: helpdesk, error reporting, bug fixing, ..
- Towards a stable production environment for experiments

Network

- **GDB Standing Working Group for Networking created**
  - http://lcg.web.cern.ch/LCG/PEB/gdb/nw-grp.htm
  - Most NRENs represented (also US and AP)
  - First meeting last January in Amsterdam
- **Network Architecture Subgroup created**
  - first architecture document ready
  - Physical connectivity: 10 Gig and 1 Gig lightpaths WAN- and LAN-PHY
  - Logical Connectivity: IPV4 routed (layer 3) and non-routed (layer 2)
  - Every T1 responsible for (and pay) connectivity to CERN
  - CERN provides interfaces to connect T1 link termination points
  - IP addressing, BGP routing, Backup Connectivity, Security, Operations, Monitoring,

Dedicated connections for SCs

Tier1	Location	NRENs	Status dedicated link
ASCC	Taipei, Taiwan	ASnet, SURFnet	1 Gb via SURFnet, testing
BNL	Upton, NY, USA	ESnet, LHCnet	622 Mbit shared
CNAF	Bologna, Italy	Geant2, GARR	1 Gb now, 10 Gb in Sept
FNAL	Batavia, ILL, USA	ESnet, LHCnet	10 Gb, tested
IN2P3	Lyon, France	Renater	1 Gb now, 10 Gb in Sept
GridKa	Karlsruhe, Germany	Geant2, DFN	10 Gb, tested
SARA	Amsterdam, NL	SURFnet	10 Gb, testing
NorduGrid	Scandinavia	Geant2, Nordunet	Not participating yet
PIC	Barcelona, Spain	Geant2	Not participating yet
RAL	Didcot, UK	Geant2, Ukerna	2 x 1 Gb via SURFnet soon
Triumf	Vancouver, Canada	Canet, LHCnet	1 Gb via SURFnet, testing

Overall Milestones

- **2004**
  - November SC1: initial tests with SARA, GridKa, FNAL, BNL
- **2005**
  - March SC2: 2 weeks sustained disk-to-disk file transfers
  - July SC3: 4 weeks sustained disk-to-tape file transfers
  - November SC4: all T1's plus some T2's, full test at reduced rate
  - Sept. – Dec. : stable service for experiments' data challenges
- **2006**
  - Q1: full scale installation with all T1's and T2's
  - Q2: test at twice the nominal rate
  - Q3: first delivery, data taking with cosmic rays
- **2007**
  - Q3: final system for LHC data taking with beams

SC2: March 14 - 28

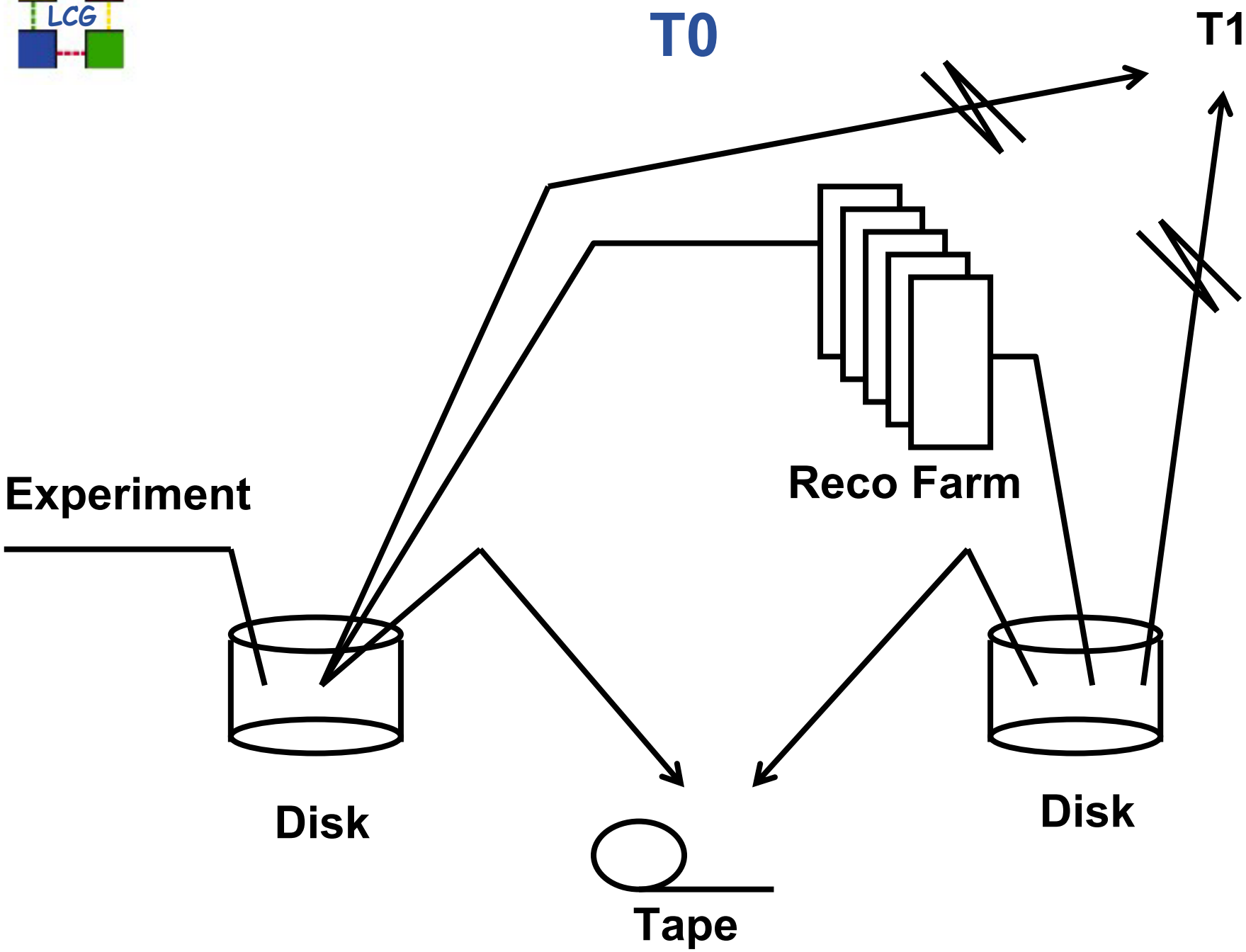
- **Participants**
  - CNAF, FNAL, GridKa, CCIN2P3, RAL, SARA concurrently
- **Tests**
  - sustained (over Easter) disk-to-disk file transfers
  - Aggregated rate out of CERN ~500 Mbytes/sec
  - Using Radiant software suite
  - Monitoring & logging prototype
- **This week**
  - CERN is setting up 20 node servers
  - Initial tests of all sites
  - Decide on monitoring and logging
- **Next week**
  - Start of SC2
  - SC Meeting in Lyon on Tuesday

For SC3: month of July

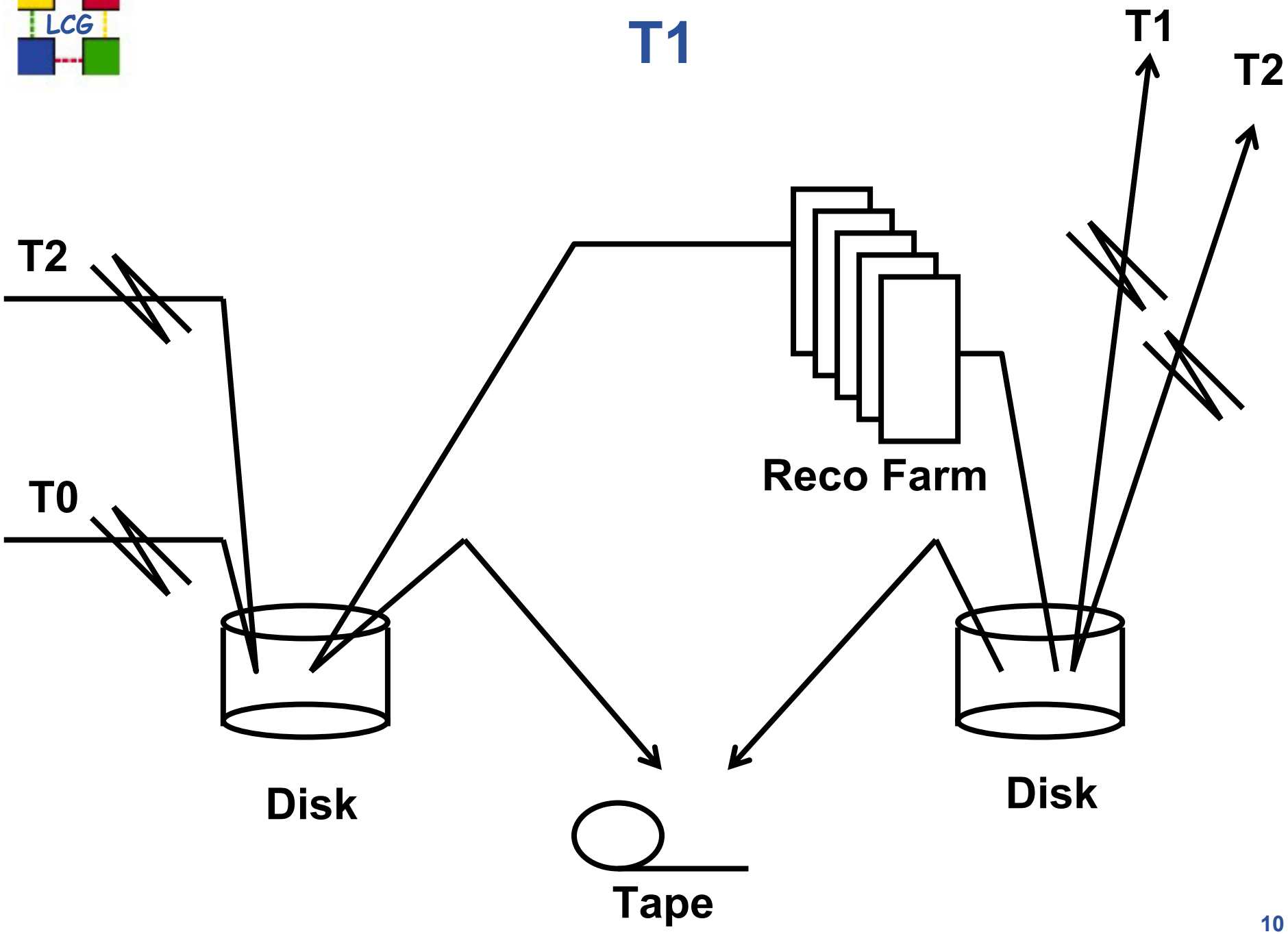
- **Participants**
  - As for SC2 .and. BNL, Taipei and Vancouver
- **Tests**
  - sustained disk-to-tape file transfers
  - Tape writing speed at Tier-1's: 60 Mbyte/sec
- **Hardware**
  - More machines and disk arrays in Production Service at CERN
  - Tape servers at T1's
- **Software**
  - Using SRM (and DCache)
  - Monitoring & Logging infrastructure
- **Experiment involvement**
  - Using experiments specific software like FedEx (CMS)
  - Discuss at next SC Meeting in Lyon on Tuesday

Tier-1 Centres *(December 2004)*

				ALICE	ATLAS	CMS	LHCb	
1	GridKa	Karlsruhe	Germany	X	X	X	X	4
2	CCIN2P3	Lyon	France	X	X	X	X	4
3	CNAF	Bologna	Italy	X	X	X	X	4
4	NIKHEF/SARA	Amsterdam	Netherlands	X	X		X	3
5	Nordic	Distributed	Dk, No, Fi, Se		X			1
6	PIC	Barcelona	Spain		X	X	X	3
7	RAL	Didcot	UK	X	X	X	X	4
8	Triumf	Vancouver	Canada		X			1
9	BNL	Brookhaven	US		X			1
10	FNAL	Batavia, Ill.	US			X		1
11	ASCC	Taipei	Taiwan		X	X		2
				5	10	7	6	28


T0
T1
Experiment
Reco Farm
Disk
Disk
Tape

T1



Resources

Resources requested by the experiments
Resources provided by the Tier-1's
Some remarks about the Tier-2's
Resources in use at present
Accounting

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Experiments' requirements

numbers collected by Jamie Shiers from Computing Model papers

CPU(MSI2k.yr)	***2006***	***2007***	***2008***	***2009***	***2010***
CERN	0,27	0,54	0,9	1,25	1,88
Tier-1's	1,33	2,65	4,42	5,55	8,35
Tier-2's	2,29	4,59	7,65	7,65	7,65
Total	**3,89**	**7,78**	**12,97**	**14,45**	**17,88**
Disk(TB)					
CERN	248	496	826	1095	1363
Tier-1's	730	1459	2432	2897	3363
Tier-2's	7	14	23	23	23
Total	**984**	**1969**	**3281**	**4015**	**4749**
MSS (TB)					
CERN	408	825	1359	2857	4566
Tier-1's	622	1244	2074	4285	7066
Total	**1030**	**2069**	**3433**	**7144**	**11632**

Alice

The following table shows the requirements for ALICE. The build-up in the years 2007 – 2008 is assumed to be 20% and 40% of the installed capacity required for the 3rd year of LHC operation with an annual increase of 30% thereafter (see pp 18-19 of the ALICE Computing Model).

CPU(MSI2k.yr)	***2006***	***2007***	***2008***	***2009***	***2010***
CERN		1.5	3	7.5	
Tier-1's		2.76	5.52	13.8	
Tier-2's		2.74	5.48	13.7	
Total		7	14	**35**	
Disk(TB)					
CERN		20	40	100	
Tier-1's		1500	3000	7500	
Tier-2's		520	1040	2600	
Total		**2040**	**4080**	**10200**	
MSS (TB)					
CERN		460	920	2300	
Tier-1's		1500	3000	7500	
Total		**1960**	**3920**	**9800**	

Atlas

The numbers shown below have been taken directly from chapter 5 "Resource Requirements" and in particular figures 1 – 4.

CPU(MSI2k.yr)	***2006***	***2007***	***2008***	***2009***	***2010***
CERN T0		1.826	4.058	4.058	8.239
CERN AF		0.974	2.822	4.286	8.117
CERN total		2.8	6.88	8.344	16.356
Tier-1's		7.899	26.502	47.6	81.332
Tier-2's		7.306	21.108	31.932	52.174
Total		18.005	54.49	87.876	149.862
Disk(TB)					
CERN T0		164.692	354.1764	354.1764	495.847
CERN AF		751.1699	1812.943	2342.153	3463.75
CERN total		915.8619	2167.119	2696.329	3959.597
Tier-1's		5541.362	15464.46	23093.6	41872.46
Tier-2's		3213.207	10103.14	16990.02	26620.77
Total		9670.431	27734.71	42779.95	72452.82
MSS (TB)					
CERN T0		1956.684	6164.608	10372.53	16263.62
CERN AF		208.0896	567.2796	824.8605	1261.443
CERN total		2164.774	6731.888	11197.39	17525.06
Tier-1's		3015.246	10114.47	18535.89	30873.28
Total		5180.02	16846.36	29733.28	48398.34

CMS

Only the numbers for the first full year of LHC operation, assumed to be 2008, are currently available in the Computing Model document.

CPU(MSI2k.yr)	***2006***	***2007***	***2008***	***2009***	***2010***
CERN			4.6		
Tier-1's			14.9		
Tier-2's			20.7		
Total			**40.2**		
Disk(TB)					
CERN			400		
Tier-1's			7800		
Tier-2's			5500		
Total			**13700**		
MSS (TB)					
CERN			3800		
Tier-1's			12900		
Total			**16700**		

LHCb

The numbers shown in table 25 on page 31 of the LHCb Computing Model have been used.

CPU(MSI2k.yr)	***2006***	***2007***	***2008***	***2009***	***2010***
CERN	0.27	0.54	0.9	1.25	1.88
Tier-1's	1.33	2.65	4.42	5.55	8.35
Tier-2's	2.29	4.59	7.65	7.65	7.65
Total	**3.89**	**7.78**	**12.97**	**14.45**	**17.88**
Disk(TB)					
CERN	248	496	826	1095	1363
Tier-1's	730	1459	2432	2897	3363
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