Status of Grid Activities in Pakistan

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Introduction of NCP-LCG2

- NCP-LCG2 is the only Tier-2 centre in Pakistan for Worldwide LHC computing Grid (WLCG).
- NCP-LCG 2 is collaborating with CMS experiment.
- In 2009 another Pakistani Grid site PAKGRID-LCG2 was merged with NCP-LCG2.

NCP-LCG2 Responsibilities

- Major data analysis to be performed by NCP
- Requirements include
  - Download data from corresponding Tier-1
  - Provision of managed disk storage
  - Provision of access to data stored by other centers of WLCG
  - Provision of other services e.g.
    - Data simulation
    - Ensuring network bandwidth and services for data exchange with Tier-1s
    - Dealing with end-user analysis facility

Grid Services

- User Interface (UI)
- Storage Element (DPM)
- Computing Element (CREAM CE)
- Worker Nodes (WN)
- BDII (Site_BDII)
- APEL
- VOBOX (For CMS and ALICE)
- PhEDEx (CMS data transfer tool)
- Xrootd (Storage for ALICE VO)

CMS Tier-2 site Proposed Setup

According to WLCG C-RRB, in 2011 with 33 CMS Tier-2s, cumulative requirements are as follows:

- 319500 HEP-SPEC06 of computational power
- 19900 TB of disk storage.
- The minimum bandwidth between Tier-1 & Tier-2s is 1 Gbps.

http://lcg.web.cern.ch/LCG/Resources/WLCGResources-2010-2012_25NOV2010.pdf

Resources For CMS

From 2011 to 2013

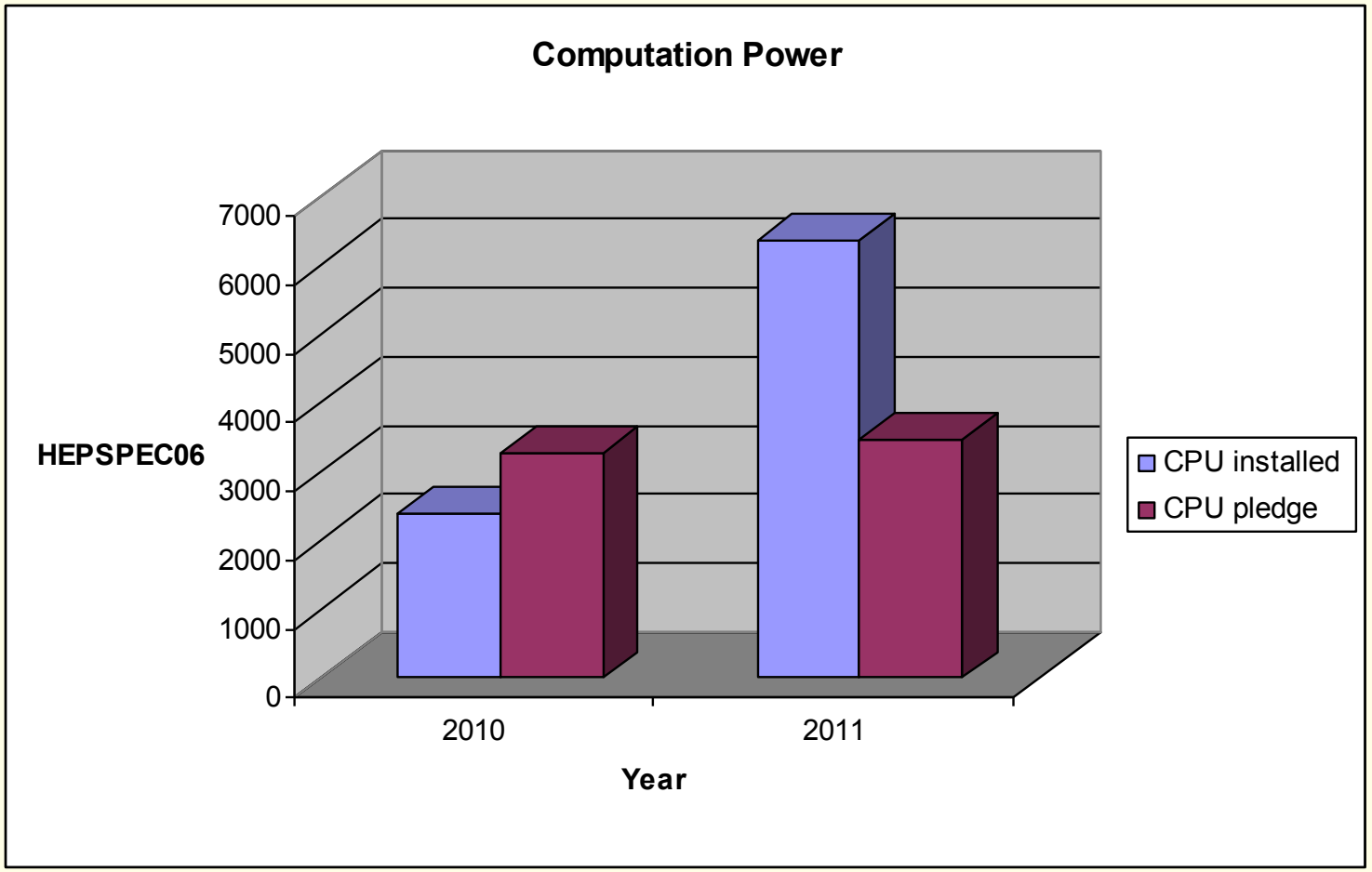
NCP-LCG2	Installed	Pledged		
	2011	2011	2012	2013
CPU (HEP-SPEC06)	6365	4352	5440	5440
Disk (TB)	70*	200	300	300
Network (Mbps)	155	53	66	66

*** Recently NCP purchased 110 TB of additional disk storage and it will be in production in April 2011**

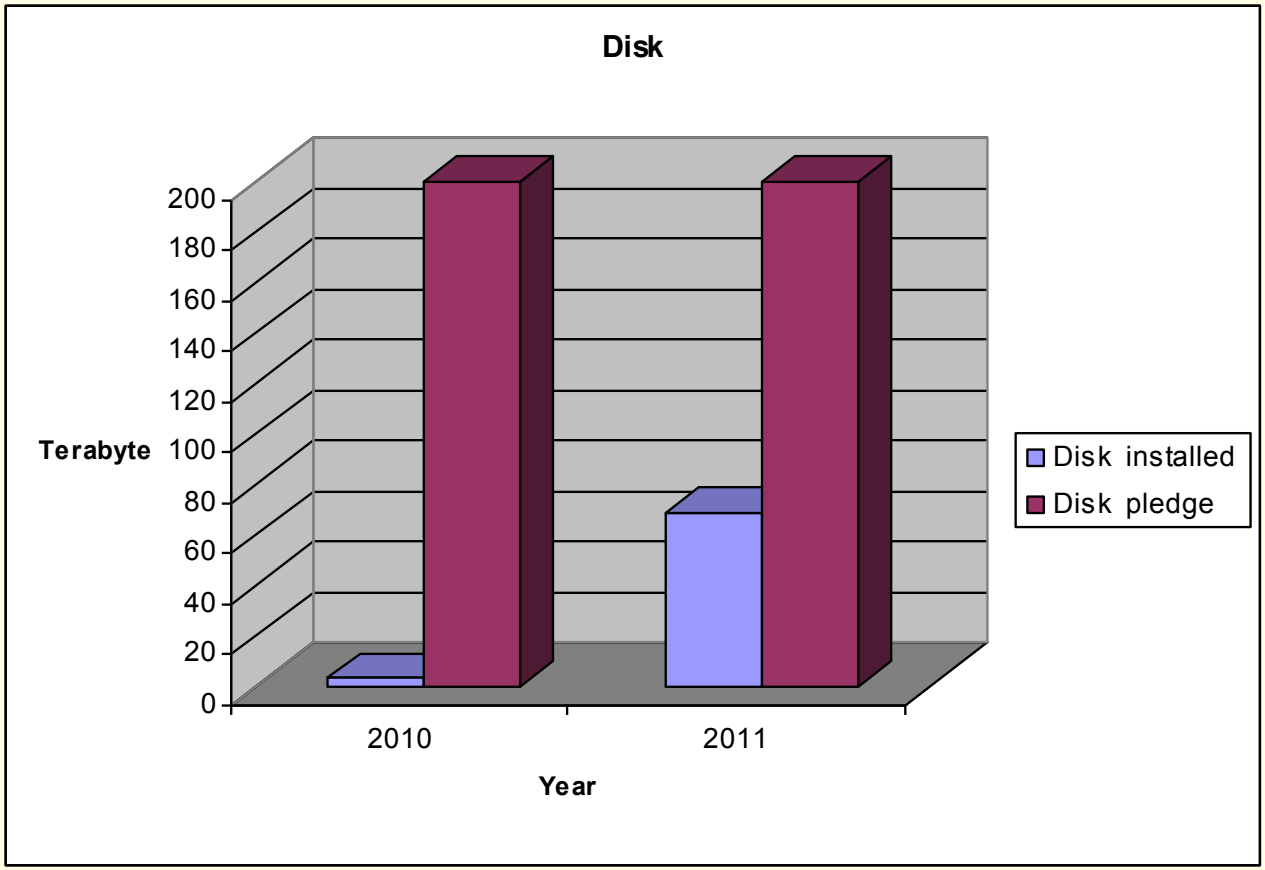
Installed Resources at NCP-LCG2
From 2008 to 2010

Year	CPU	HEPSPEC06	Storage	Network Connectivity
Jan-08	14	67.2	3.2 TB	2 Mbps (Shared)
April-08	36	172.8	3.2 TB	2 Mbps (Shared)
Sep-08	74	355.2	3.2 TB	10 Mbps (dedicated)
Feb-10	160	1600	3.2 TB	10 Mbps (dedicated)
Jun-10	240	2400	69 TB	155 Mbps (dedicated)

Comparison between Installed and Pledged Resources (2010-2011)



Comparison between Installed and Pledged Resources (2010-2011)



Hardware Specification (CPU)

- 28 Server Machines, Sun Fire X4150, 2 x Quad core Intel(R) Xeon(R) CPU X5460 @ 3.16GHz
  16 GB RAM.
  Number of Physical CPU's = 56
  Number of Logical Cores =224

- 25 Server Machines
  Dell Power Edge R610, 2 x Hex core processor Intel(R) Xeon(R) CPU X5670 @ 2.93GHz
  24 GB RAM.
  Number of Physical CPU's = 50
  Number of Logical Cores =300

Total Number of Physical CPU's = 106
Total Number of Logical Cores =524
HEPSPEC06 = 6365
KSI2K= 1591

Hardware Specification (Disk)

- 10 Transtec NAS4324M-A, Intel Xeon E5520 -2x2.26 GHz, 12 GB RAM, 24 SATA Drives provides 23 TB of RAW storage.
- 2 Storage Elements (DPM)
  - pcncp22.ncp.edu.pk
    15 TB
  - pcncp23.ncp.edu.pk
    48 TB
  - pcncp26.ncp.edu.pk
    Xrootd (storage for Alice VO)
    6 TB

Total online storage = 69.8 TB

Additional 110 TB of storage will be available soon.

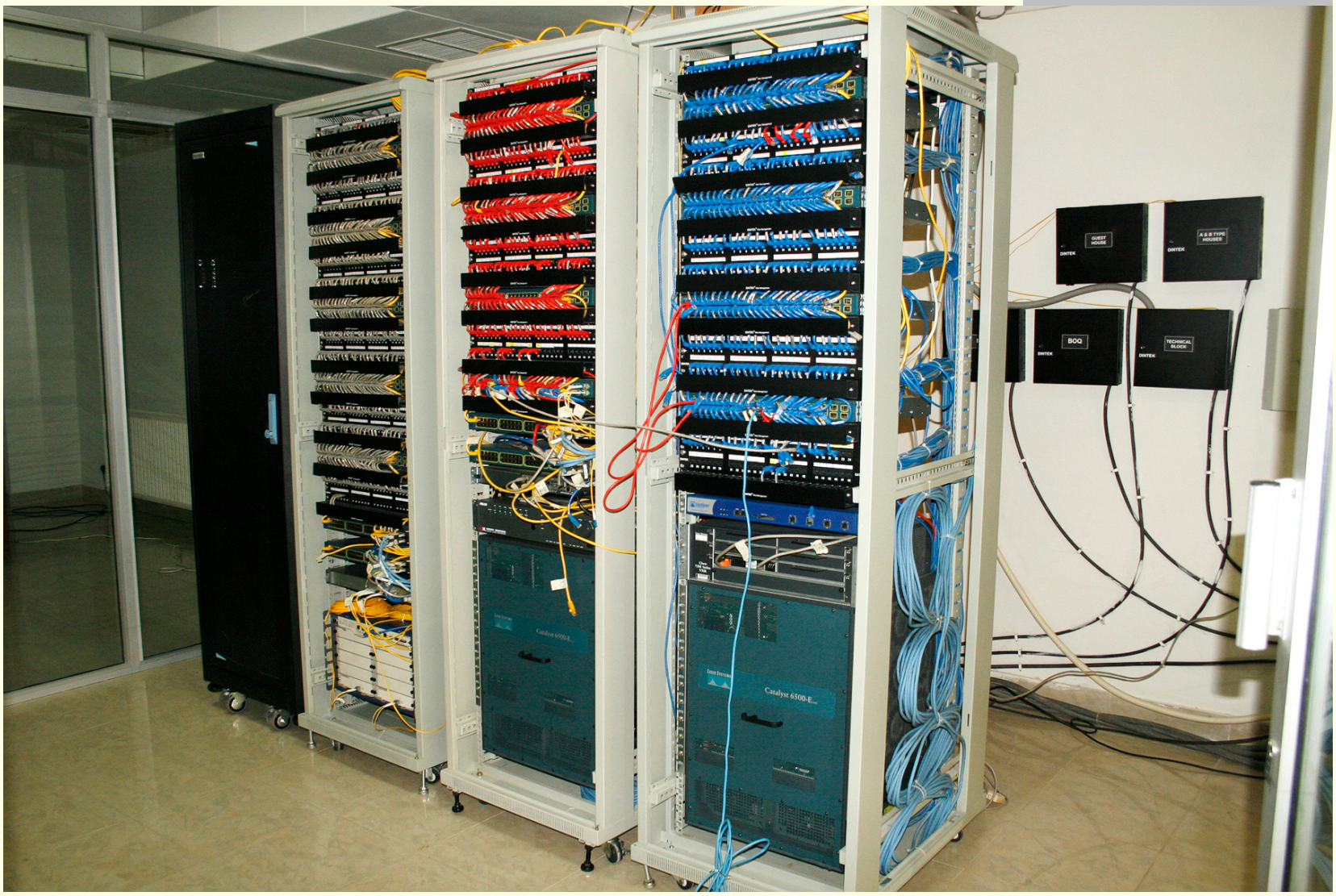
Network

- NCP-LCG2 site is connected with 155Mbps R&D link connected with TEIN3,GEANT2, and Internet2 as provided by PERN-2 (Pakistan Educational Research Network).

- Utilization of PERN-2 Links (In 2010-2011)
- **Total Download = 60 TB**
- **Total Upload =13.5 TB**

WLCG @ NCP

WLCG @ NCP


Catalyst 6500-E
GUEST HOUSE
A & B TYPE HOUSES
BOQ
TECHNICAL BLOCK
DINTEK

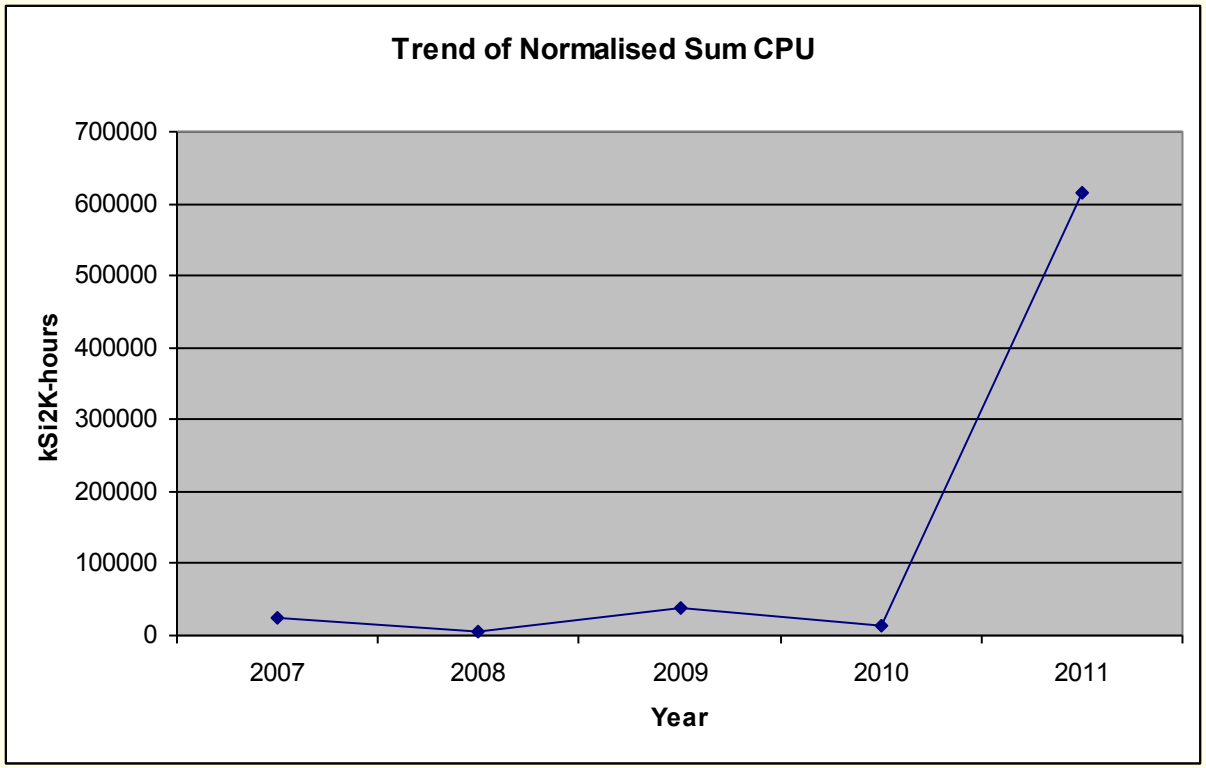
Normalised Sum CPU

Statistics

Year*	kSI2K-hours	HEPSPEC06
2007	24306	97224
2008	5381	21524
2009	39452	157808
2010	14226	56904
2011	629579	2518316
Total	712944	2851776

*** On March of respective year**

Normalised Sum CPU



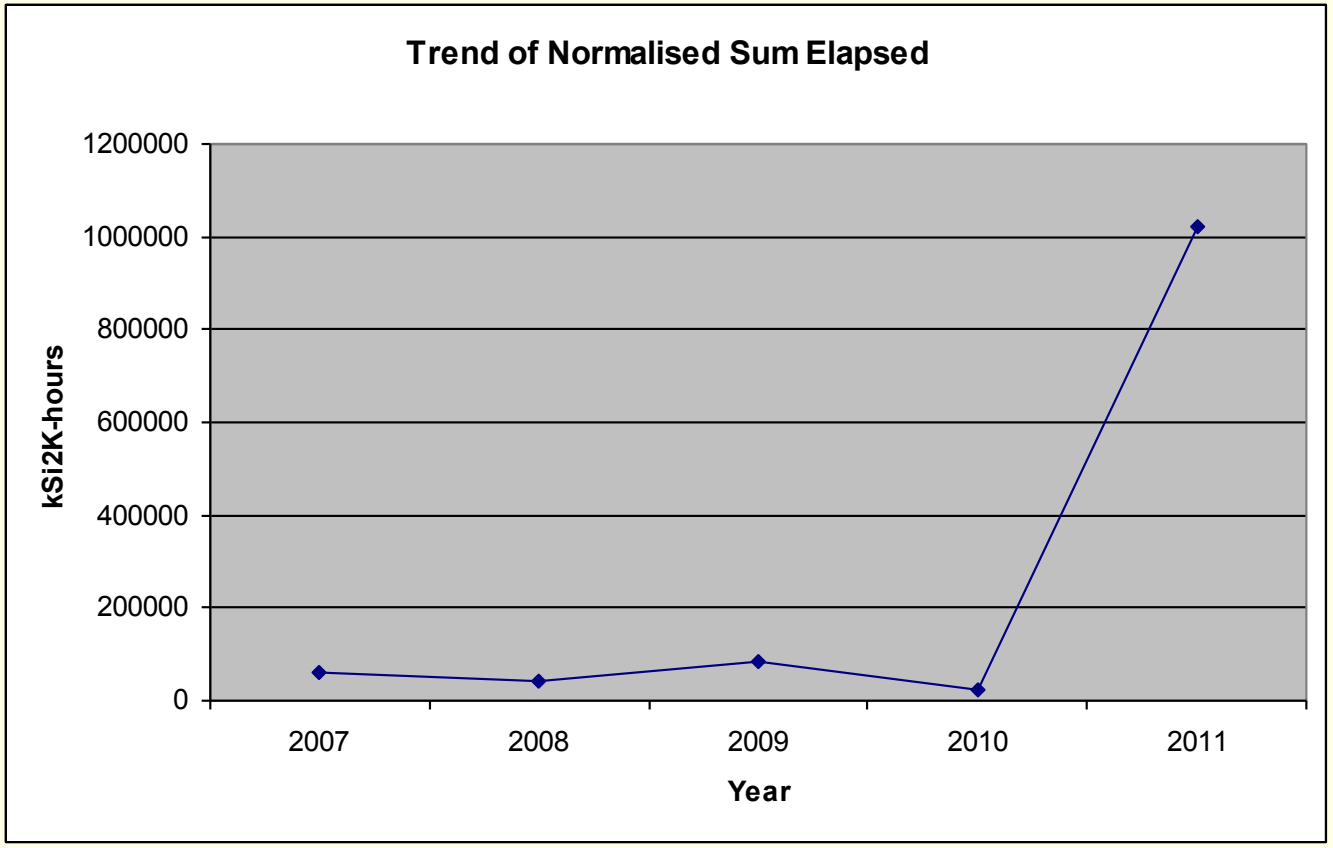
Normalised Sum Elapsed

Statistics

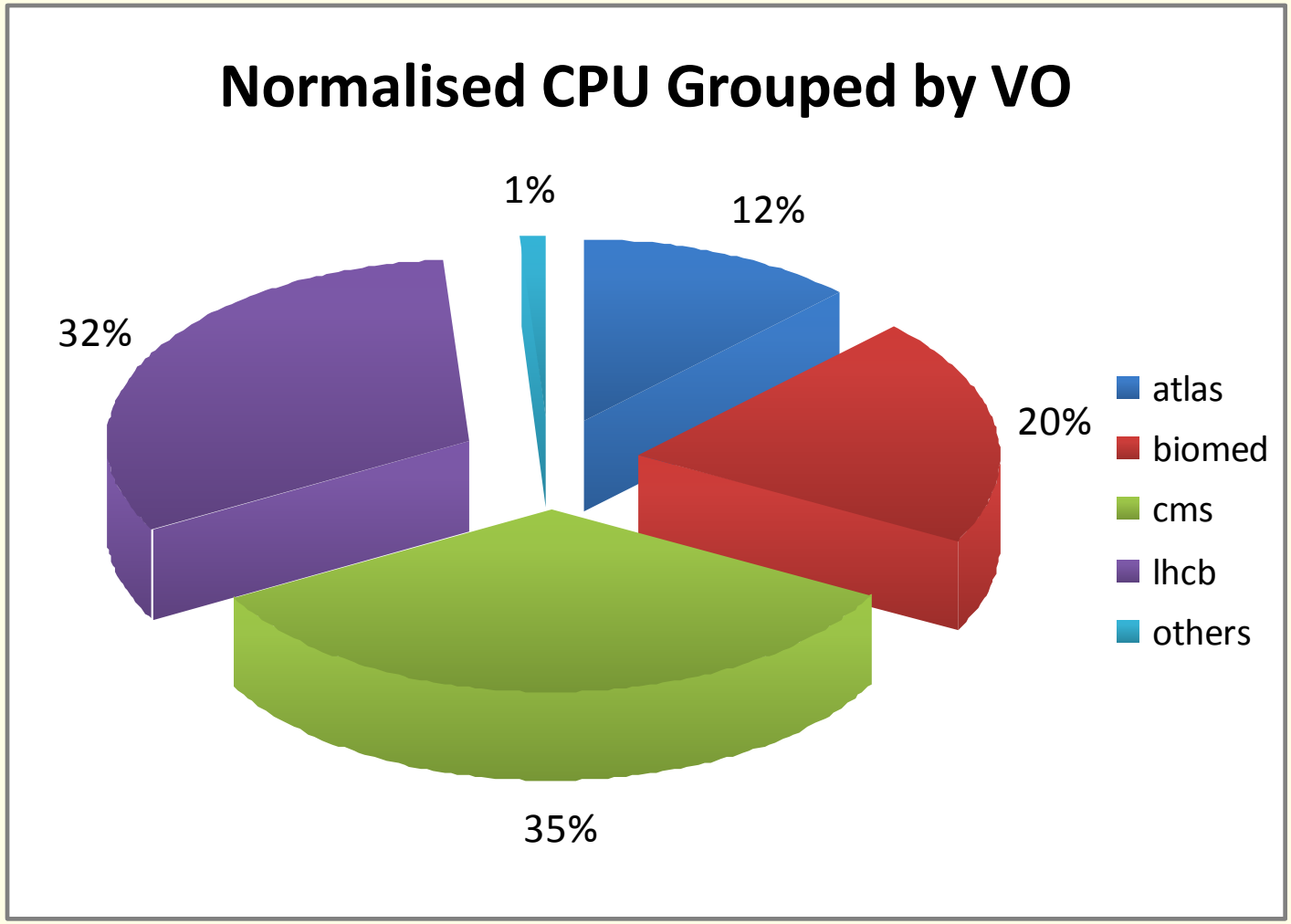
Year *	kSI2K-hours	HEPSPEC06
2007	62122	248488
2008	42279	189116
2009	84608	338432
2010	24655	98620
2011	1019679	4078716
Total	1233343	4933372

*** On March of respective year**

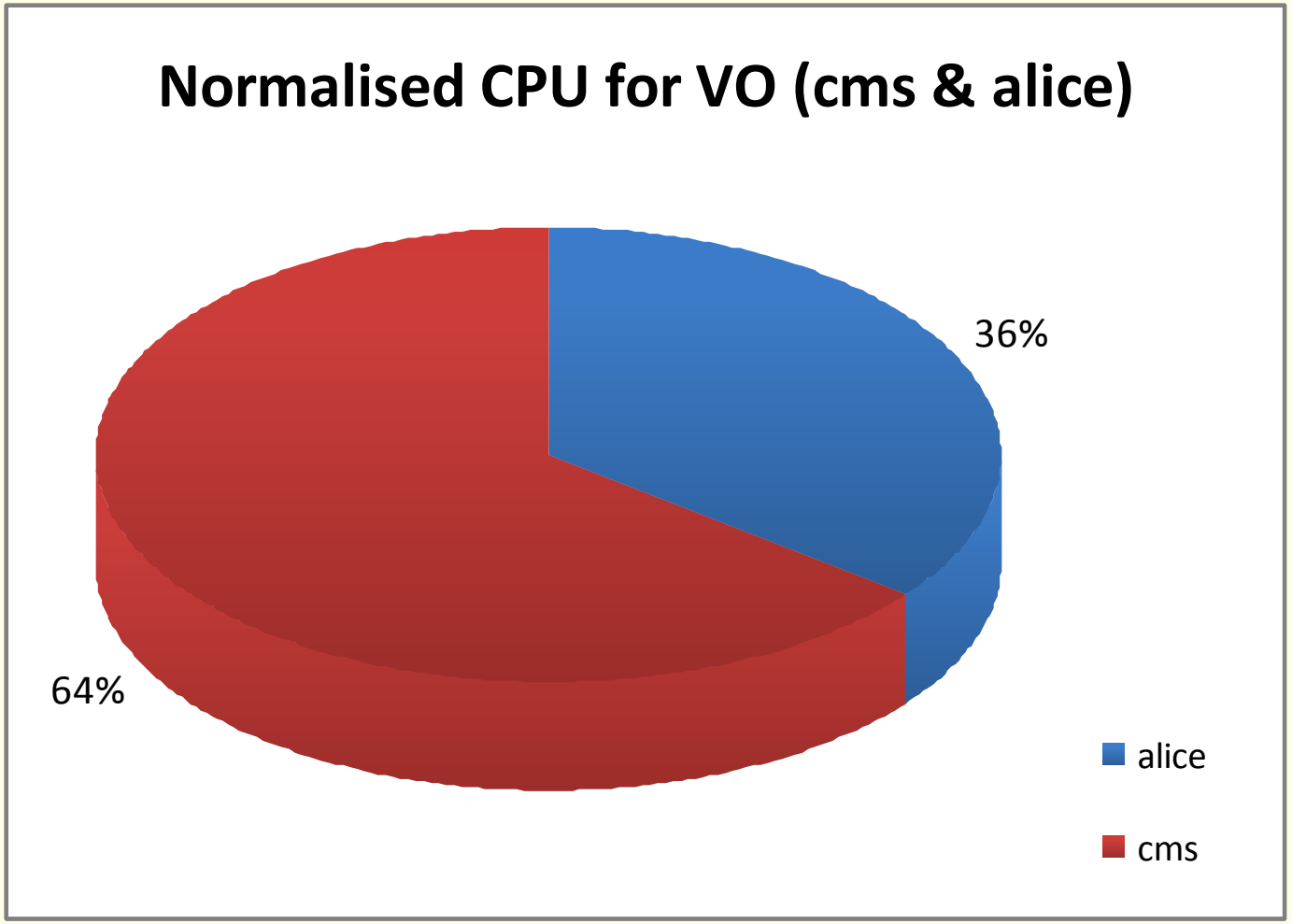
Normalised Sum Elapsed



Contribution to different VO's
March 2006-March 2010



Contribution to CMS & ALICE April 2010-March 2011



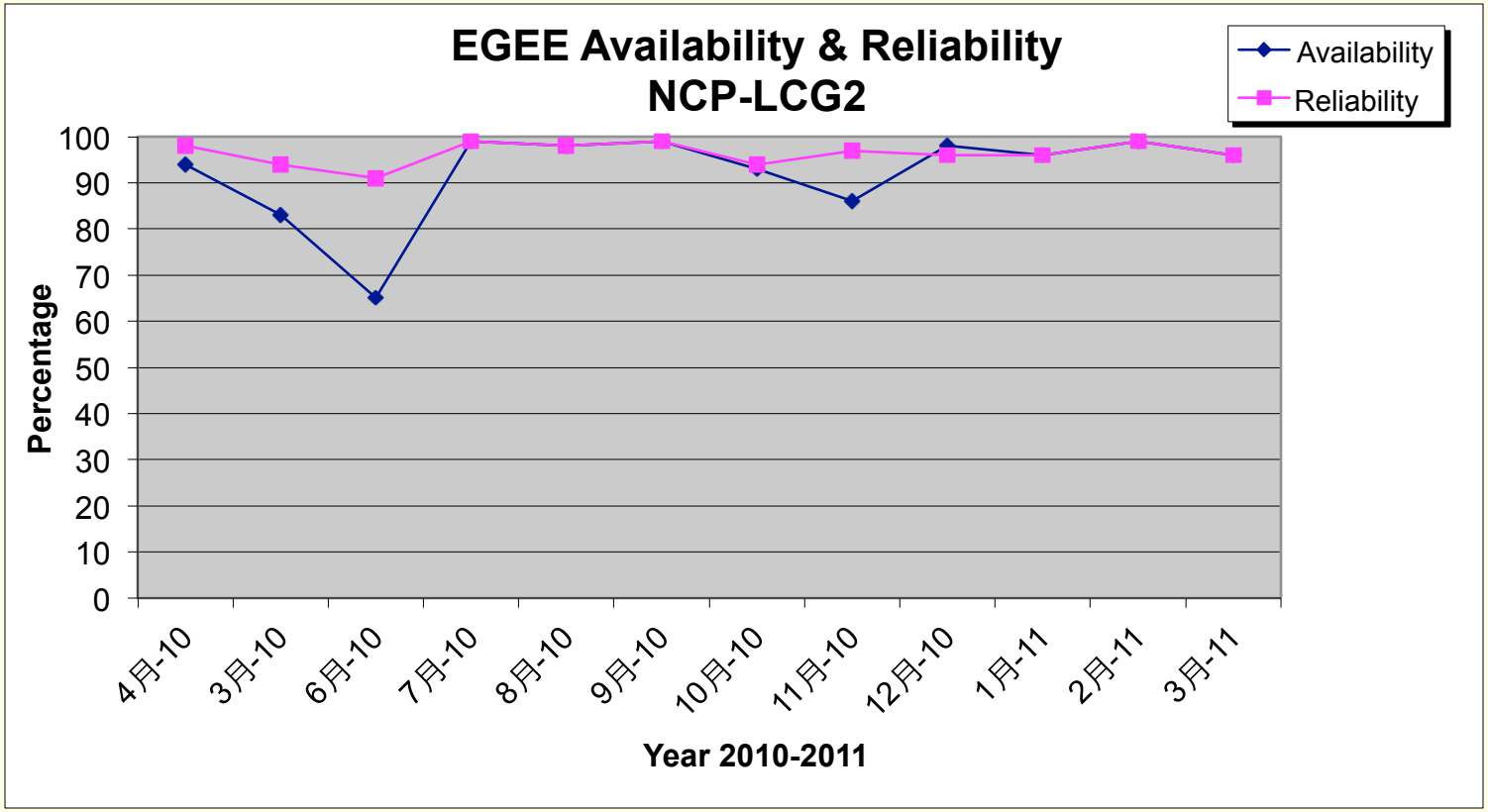
EGEE Statistics:

Site Availability and Reliability for year 2007-2010

Month	2007	2008	2009	2010
January	N-A	22,29	89,91	48,48
February	N-A	37,41	73,89	85,85
March	N-A	63,82	85,90	66,73
April	N-A	50,65	72,82	94,98
May	N-A	51,56	34,60	83,94
June	44,66	78,83	94,94	65,91
July	52,61	88,91	61,97	99,99
August	00,01	95,96	98,100	98,98
September	00,00	25,60	95,96	99,99
October	00,00	61,87	96,96	93,94
November	12,23	76,89	99,99	86,97
December	45,51	92,93	49,49	89,96

EGEE Statistics:

Site Availability and Reliability from March 2010-March 2011



PhEDEx

- PhEDEx was successfully deployed at NCP in February 2009, with limited network connectivity of 10 Mbps.
- Initially we have downloaded the a dataset of JobRobot and few datasets for analysis purpose.
- Till now we have three commissioned links with following Tier1.
  - T1_CH_CERN
  - T1_TW_ASGC
  - T1_US_FNAL
- Testing with remaining Tier1 is in progress.

PhEDEx Cumulative Transfers Statistics

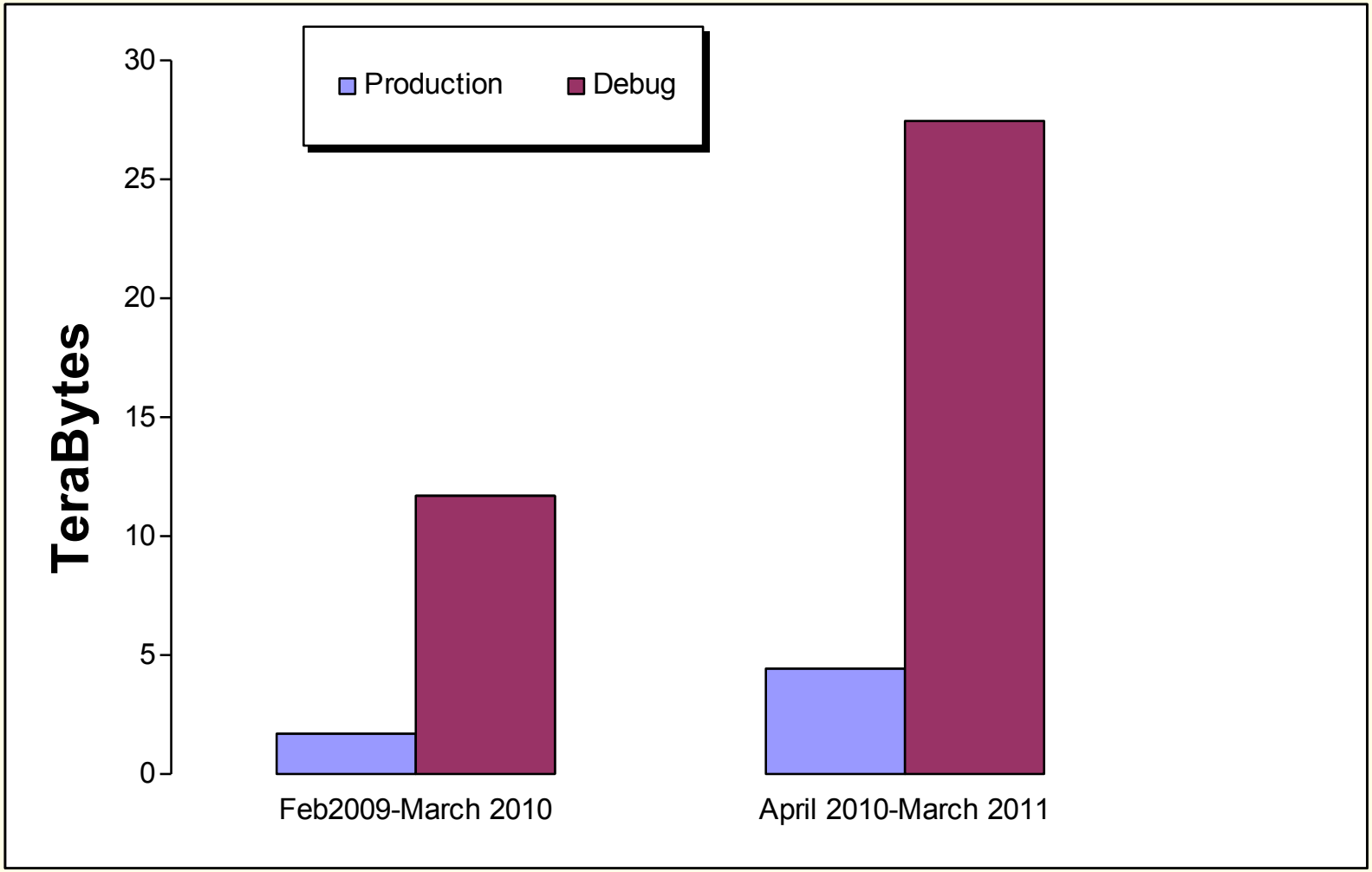
April 2010-March 2011

- **4.48** TB (Production)
- **27.47** TB (Debug)

February 2009-March 2010

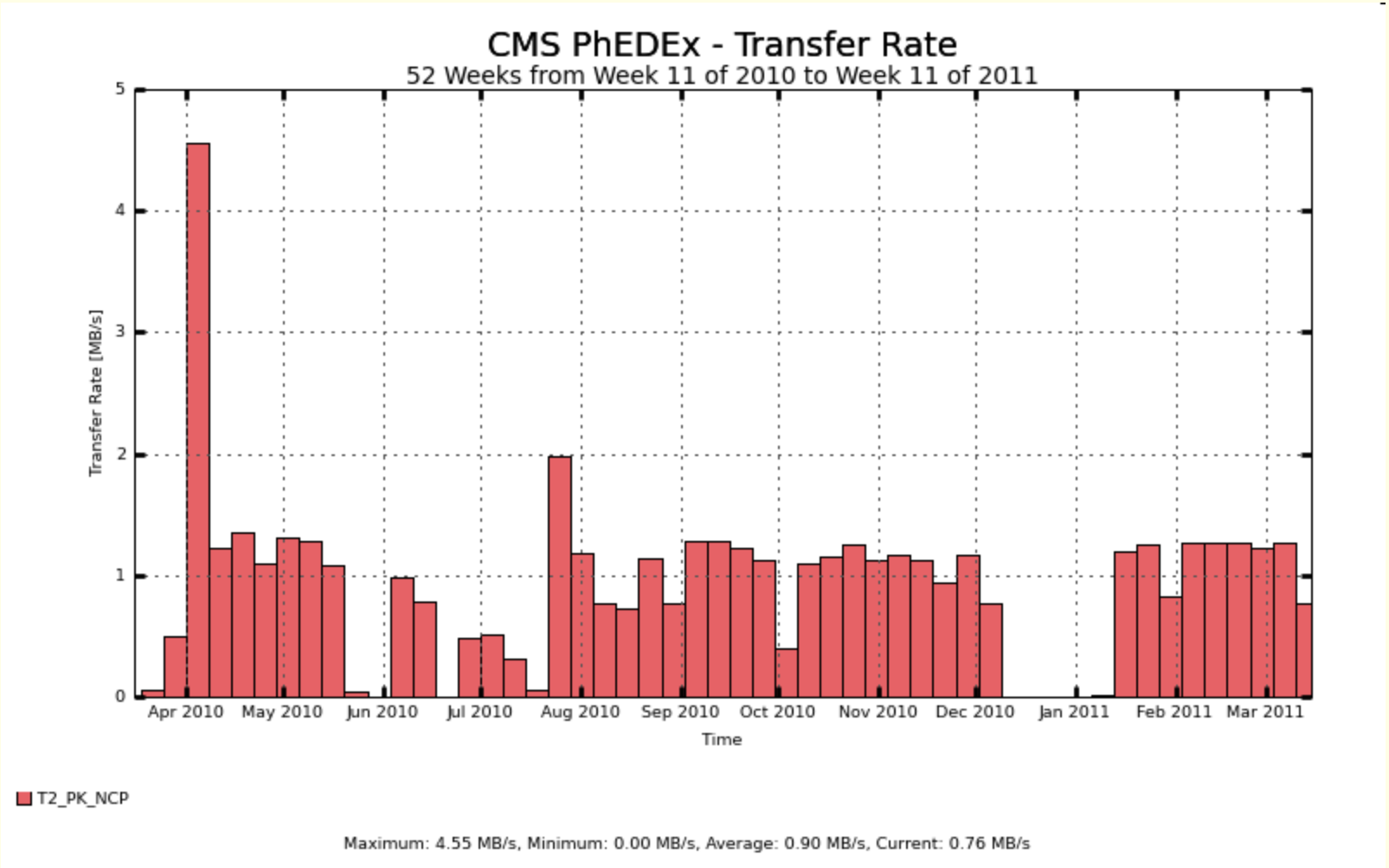
- **1.68** TB (Production)
- **11.66** TB (Debug)

PhEDEx Transfer Statistics (Graphical Representation)

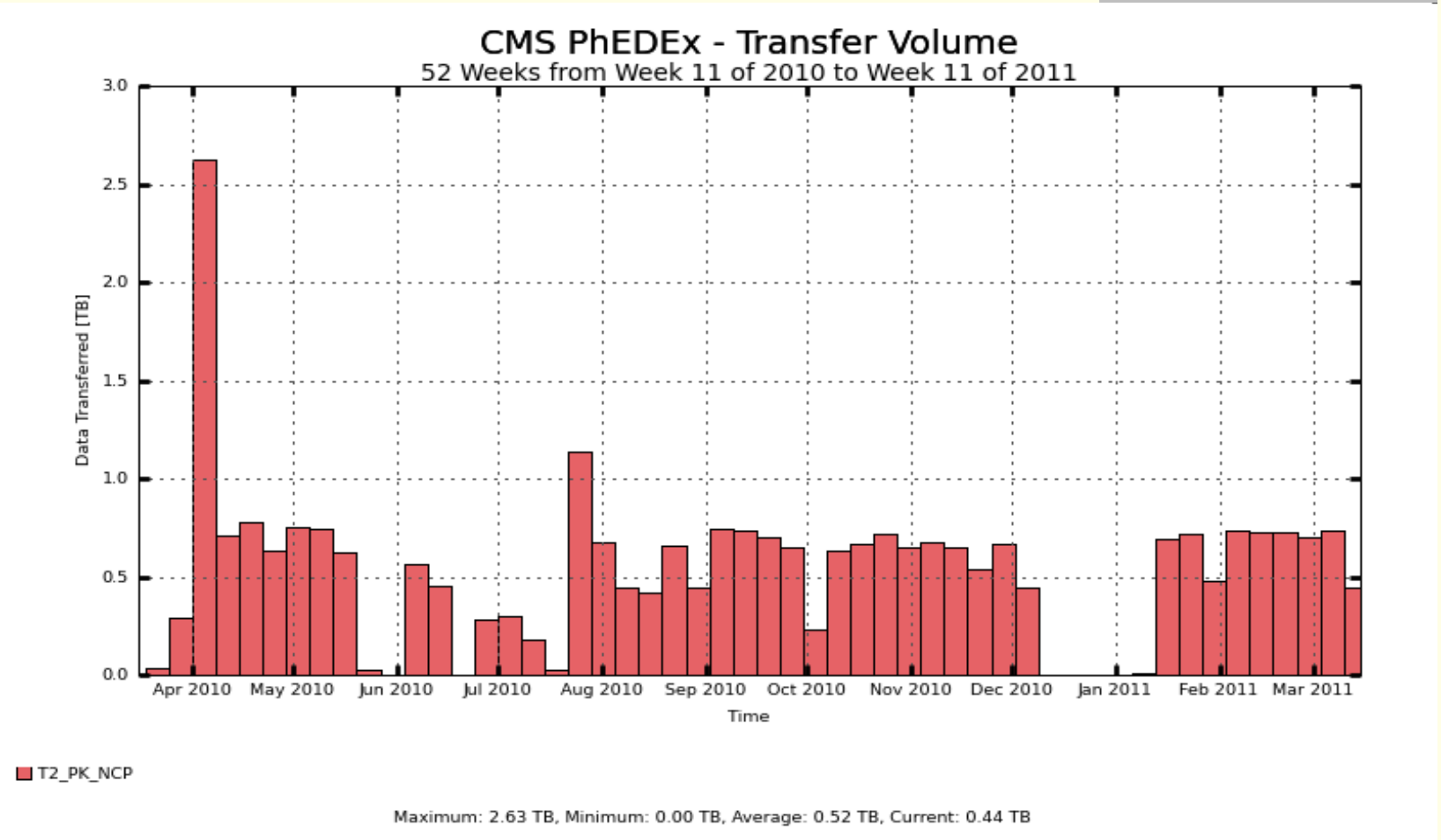


PhEDEx-Transfer Rate (Debug instance)

April 2010-March 2011



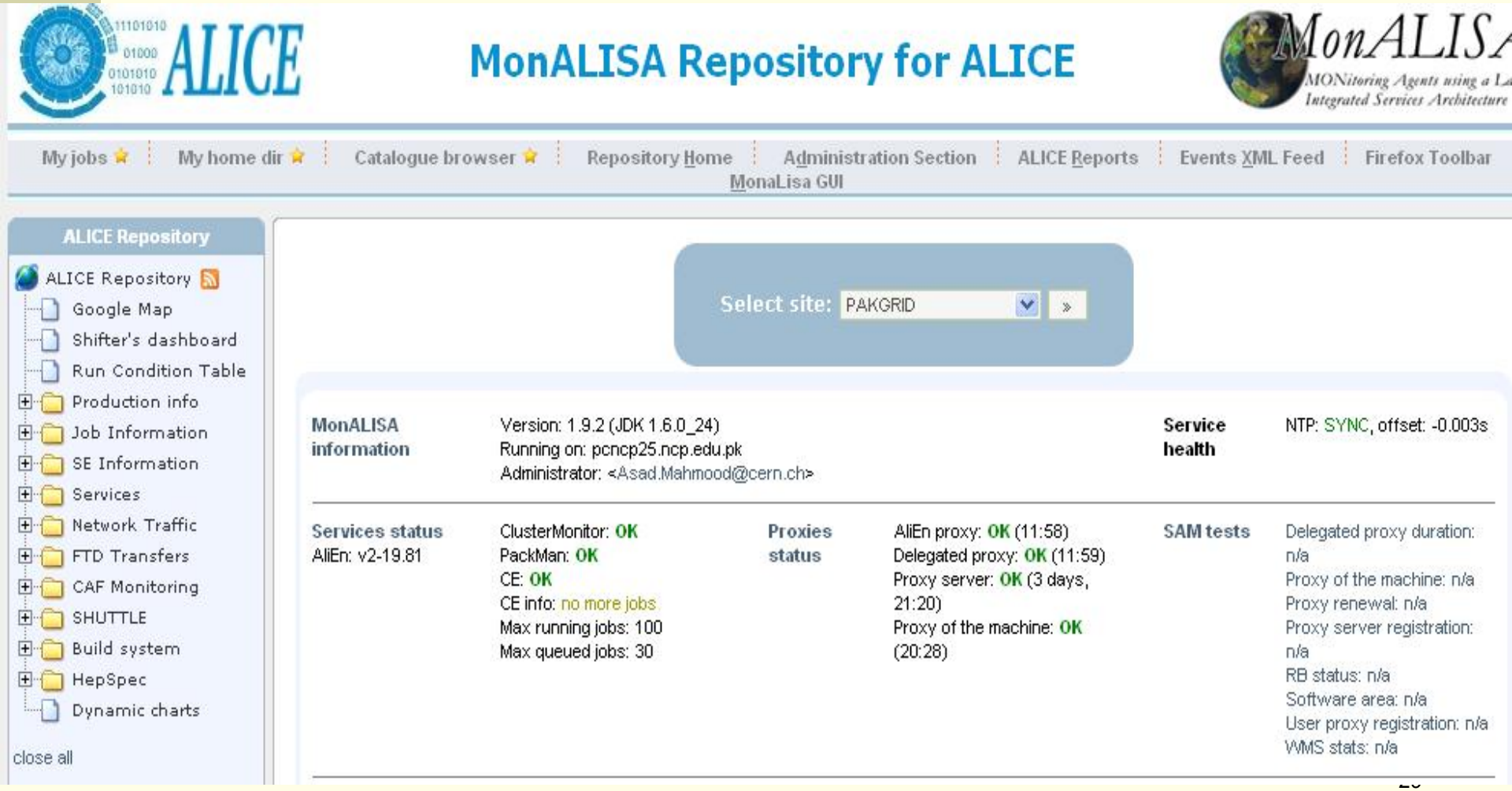
PhEDEx-Transfer Volume (Debug instance)
April 2010-March 2011



VoBox for Alice

- Deployed VOBox for Alice on pcncp25.ncp.edu.pk
- The VOBOX is the entry door of ALICE to the WLCG environment
- It is fundamental and mandatory to enter the ALICE production
- The 1st service to provide for any new site
- It is a critical service
- At the T0 it must be recovered before 2h
- For any other Tx site, the VOBOX interruption means the production interruption

ALICE Monitoring



Alice offline Environment

ALICE offline framework (AliRoot) is deployed, which provides an analysis platform for

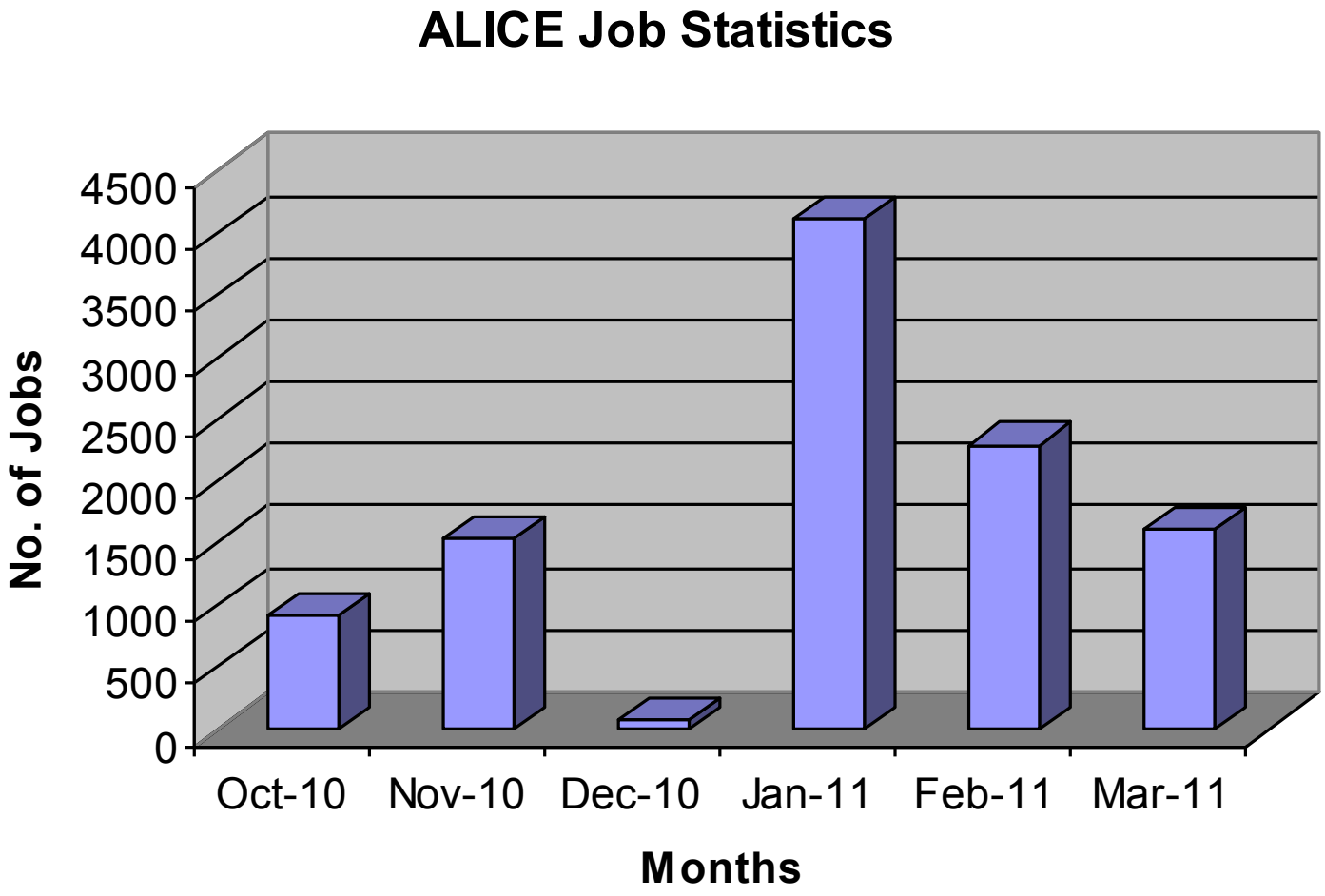
- Event generation
- Particle transport
- Generation of digits
- Event merging
- Reconstruction
- Particle identification
- Generation of event summary data

Alice offline Environment (contd.)

Following tools for ALICE offline environment is also deployed

- Pyhtia
- GEANT-3
- GEANT-4
- FLUKA
- AliRoot

Alice Job Statistics



ManPower at NCP-LCG2

- 2 Grid Operations Manager (Full time)
- 2 Network Administrators (Part time)
- 1 System Administrator (Part time)

Common challenges

- Network Connectivity
  - Higher Education Commission of Pakistan has provided 155 Mbps to NCP at no cost.
  - Network disruptions at service provider's level due to various reasons.
- Electric Power
  - Pakistan hassled dreadfully by the severe power-shortage in recent times.
  - Extensive load-shedding harmfully impacted the battery backups for power generation

Summary

- NCP-LCG2 node is supporting to CMS experiments in computing.
- Despite all of the challenges, the average availability and reliability of Grid Nodes is above 90 %.
- Storage and Network Resources will be enhanced soon.

Questions

THANKS