

GRID India and Kolkata Tier II

Talk Outline

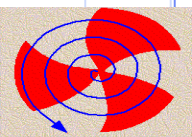
- NKN Connectivity,
- Internal Connectivity,
- Backend Component,
- Middleware and Packages,
- Kolkata Tier-2 status,
- Kolkata::EOS status,
- GRID-India Project,
- Involving Tier-3s,
- Future Outlook

Kolkata Site Details

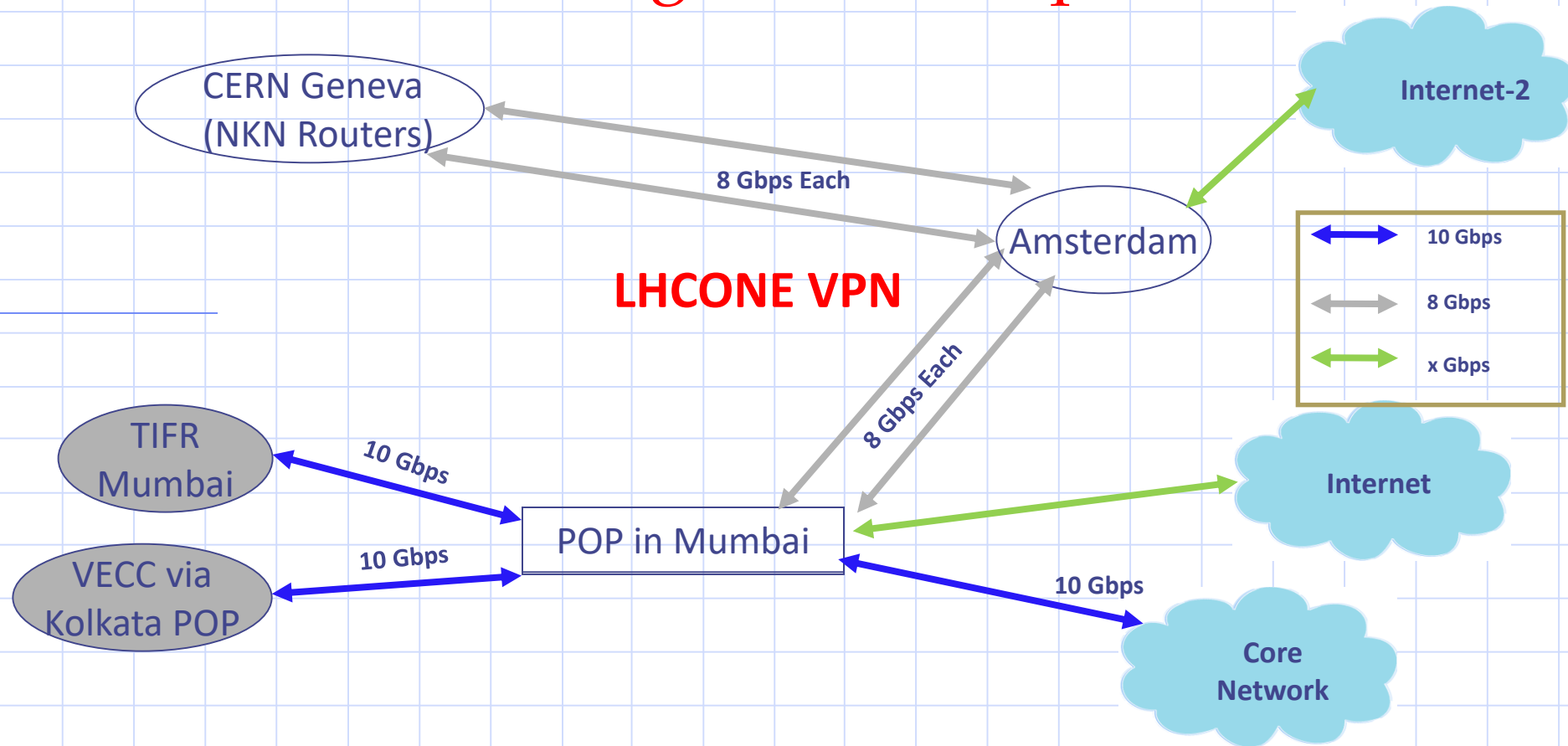
VECC → Variable Energy Cyclotron Centre,
DAE → Department of Atomic Energy. Govt of India.

Tier-2 Site for the WLCG (World Wide Computing Grid)
Kolkata Tier-2 For ALICE GRID
GOADB Name:- IN-DAE-VECC-02

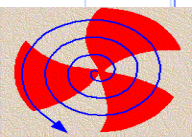
Team:-
Subhasis Chattopadhyay : Mentor
Vikas Singhal
Prasun Singh Roy
+ 2 contractual staff (changing)



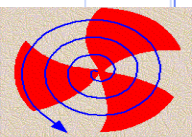
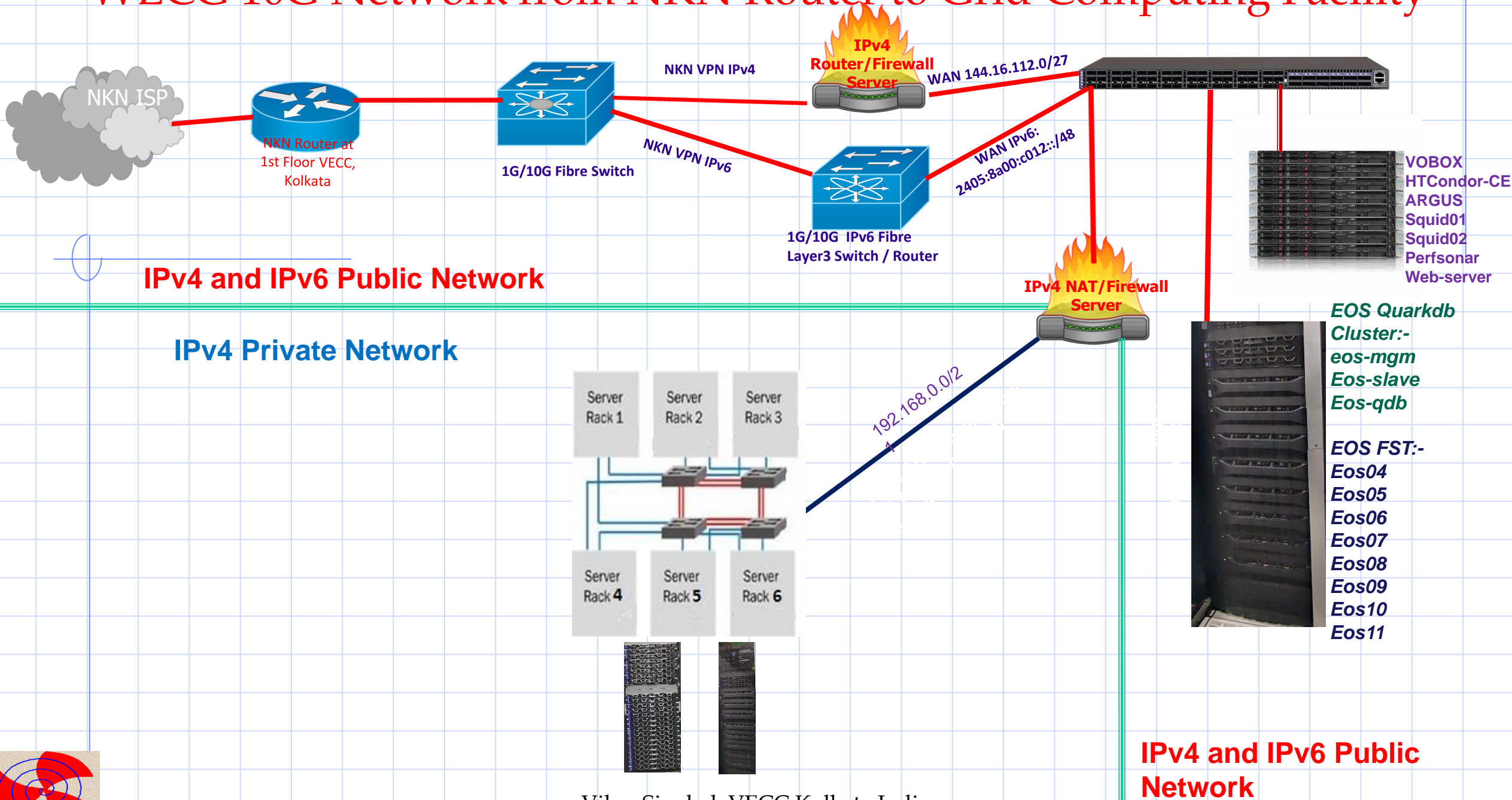
Networking and Participation



- NKN Routers are hosted at CERN Geneva,
- Collaborative project under NKN-2 (End to End 100Gbps).
- May involve Networking Project in collaboration with CERN IT.



WLCG 10G Network from NKN Router to Grid Computing Facility



Backend Component / Essential Packages for a Grid Site

- Domain name:-
 - Public : tier2-kol.res.in (ISP: ERNET)
 - Private: internal.tier2-kol.res.in
- IP Range:-
 - IPv4 Range: 144.16.112.0/27 (ISP: ERNET)
 - IPv6 Range: 2405:8a00:c012::/48 (ISP: NKN)
- DNS:
 - Public: naamak.tier2-kol.res.in; suchak.tier2-kol.res.in
 - Private: installer.internal.tier2-kol.res.in
- Local Resources:
 - Batch system : HTCondor 9.0.16 (Local Lan)
 - a. Submitter: Kolkata-condor-ce.tier2-kol.res.in
 - b. Central Manager:
condor-cm.internal.tier2-kol.res.in
 - Storage: EOS Citrine version 4.102
- Networking : 10Gbps LAN and WAN over Fibre

Worker-Nodes:-

Total No. of Worker-nodes: 64

Total No. of Threads: 3456

No. of Core: 1728

Two types of Processors

Processor Used: 14 Core Intel(R) Xeon(R) CPU E5-2680 v4 @ 2.40GHz

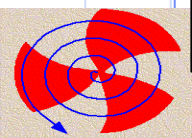
RAM 128 GB DDR4.

HDD Type : SSD (980GB)

12 Core Intel(R) Xeon(R) Silver 4214 CPU @ 2.20GHz.

RAM 128 GB DDR4.

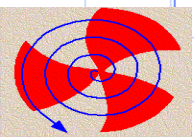
SAS 12G SFF 4 X 600 GB with RAID5 and one hot spare.



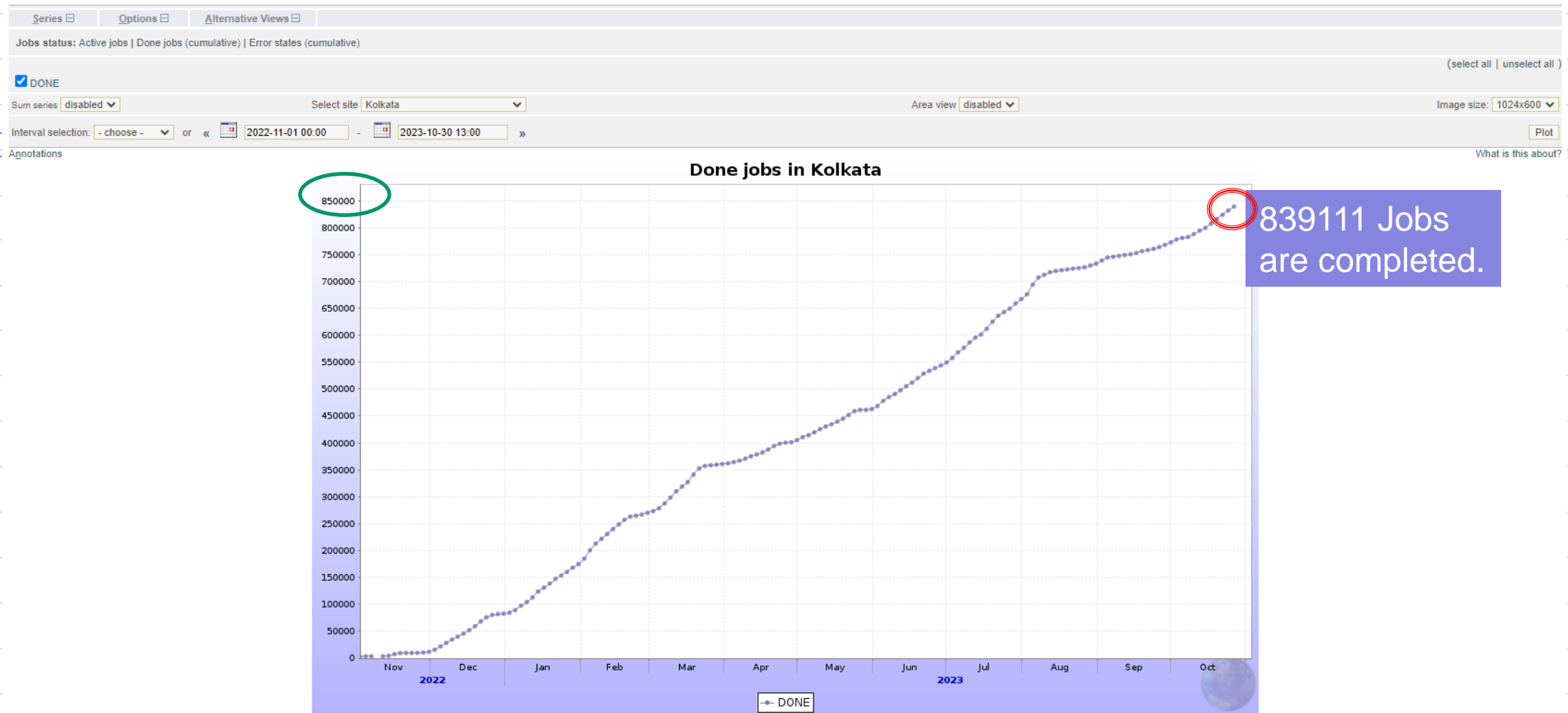
Middleware and Packages

➤ Grid Services:-

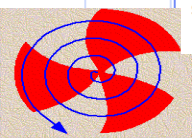
- ❑ Computing Element: HTCondor-CE v5.1.3 (kolkata-condor-ce.tier2-kol.res.in)
- ❑ Accounting :
 - APEL-Parser – v1.9.1 (kolkata-condor-ce.tier2-kol.res.in)
 - APEL- Client – v1.9.1 (argus.tier2-kol.res.in)
- ❑ BDII – v5.2.26 (argus.tier2-kol.res.in)
- ❑ ARGUS – v1.7.0 (argus.tier2-kol.res.in)
- ❑ VOBOX – wlcg-voms, vobox (htcvobox.tier2-kol.res.in)
- ❑ Xrootd-Redirector: eos-mgm.tier2-kol.res.in and eos-slave.tier2-kol.res.in



ALICE Jobs @ Kolkata Completed during the last year



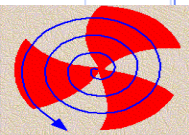
Done jobs in Kolkata



KOLKATA::EOS2 File Crawler Error Solution

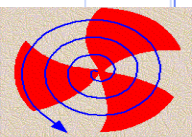
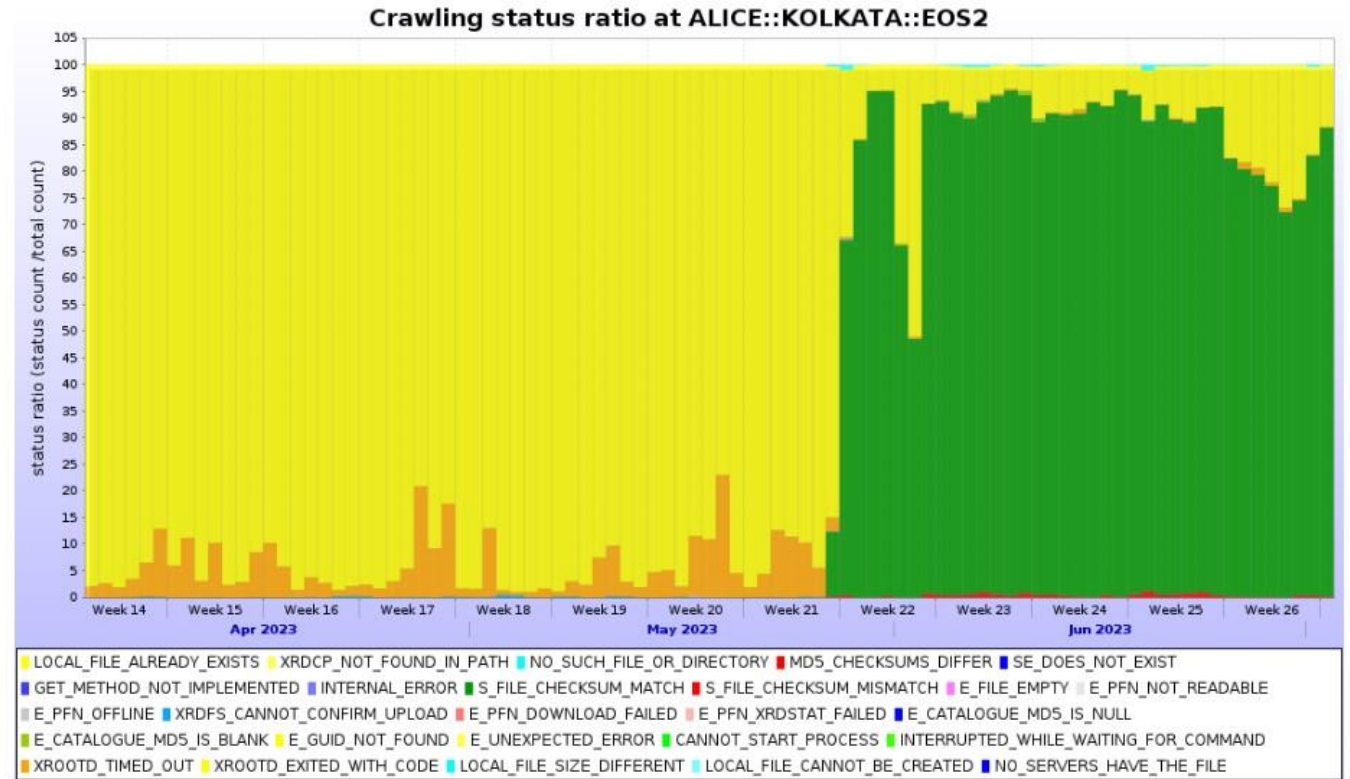
- ALICE file crawler system determines the health and performance of the ALICE Storage Elements.
- Kolkata::EOS2 were failing tests.
- Local LAN traffic between SE and WNs via private IPs.
- Added static route between Public and Private IP of EOS servers on the WNs.

```
[root@htc-wn012 ~]# cat
/etc/sysconfig/network-scripts/route-p2p1
144.16.112.10/32 via 192.168.1.10
144.16.112.14/32 via 192.168.1.14
144.16.112.18/32 via 192.168.1.18
144.16.112.19/32 via 192.168.1.19
144.16.112.20/32 via 192.168.1.20
144.16.112.21/32 via 192.168.1.21
144.16.112.22/32 via 192.168.1.22
144.16.112.23/32 via 192.168.1.23
144.16.112.24/32 via 192.168.1.24
144.16.112.25/32 via 192.168.1.25
144.16.112.15/32 via 192.168.1.15
[root@htc-wn012 ~]#
```



Expanding of Kolkata Tier2 EOS

- ❖ Name of Instance: ALICE::Kolkata::EOS2
- ❖ Space: 1.1PB -> 1.28 PB
- ❖ No. of Management Server: 2
- ❖ No. of Disk Server: 7Nos.
- ❖ Each Disk Capacity in Disk Server: 10TB
- ❖ Hard Disk Type: NLSAS
- ❖ Nos. of Disk in each disk server: 16
- ❖ H/W RAID type: 0 (Zero)
- ❖ OS: CentOS 7.x
- ❖ EOS version: EOS CITRINE (4.4.23)
- ❖ RAIN type (Redundant Array of Independent nodes) : RAIN6
- ❖ Added one more similar Hardware box for balancing during one node down.
- ❖ We will add more similar nodes.



Kolkata EOS Status

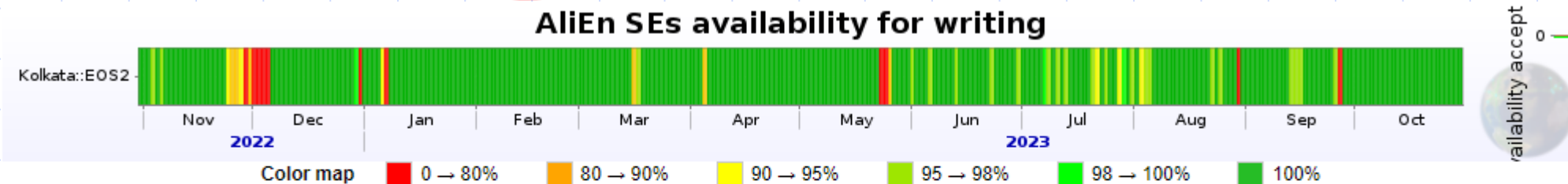
EOS Storage Usage upto 30th October 2023 as per MonaLisa Website: - 580.1 TB

Storages status	Name	Status	Size	Used	Free	Usage	No of files	Type	ADD test
	ALICE::Kolkata::EOS2	OK	1.115 PB	50.8%	561.9 TB	580.1 TB	12.81 M	FILE	OK

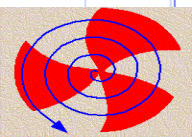
EOS Storage Usage upto 30th October 2023 as per EOS CLI command – 1.26 PB

```
root@eos-mgm ~]# eos -b space ls
```

type	name	groupsize	groupmod	N(fs)	N(fs-rw)	sum(usedbytes)	sum(capacity)	capacity(rw)	nom.capacity	sched.capacity	quota	balancing	threshold	converter	ntx					
active	wfe	ntx	active	intergroup																
spaceview	default	8	24	128	128	1.11 PB	1.27 PB	1.26 PB	0 B	153.72 TB	off	on	1	on	80	0	off	1	0	on

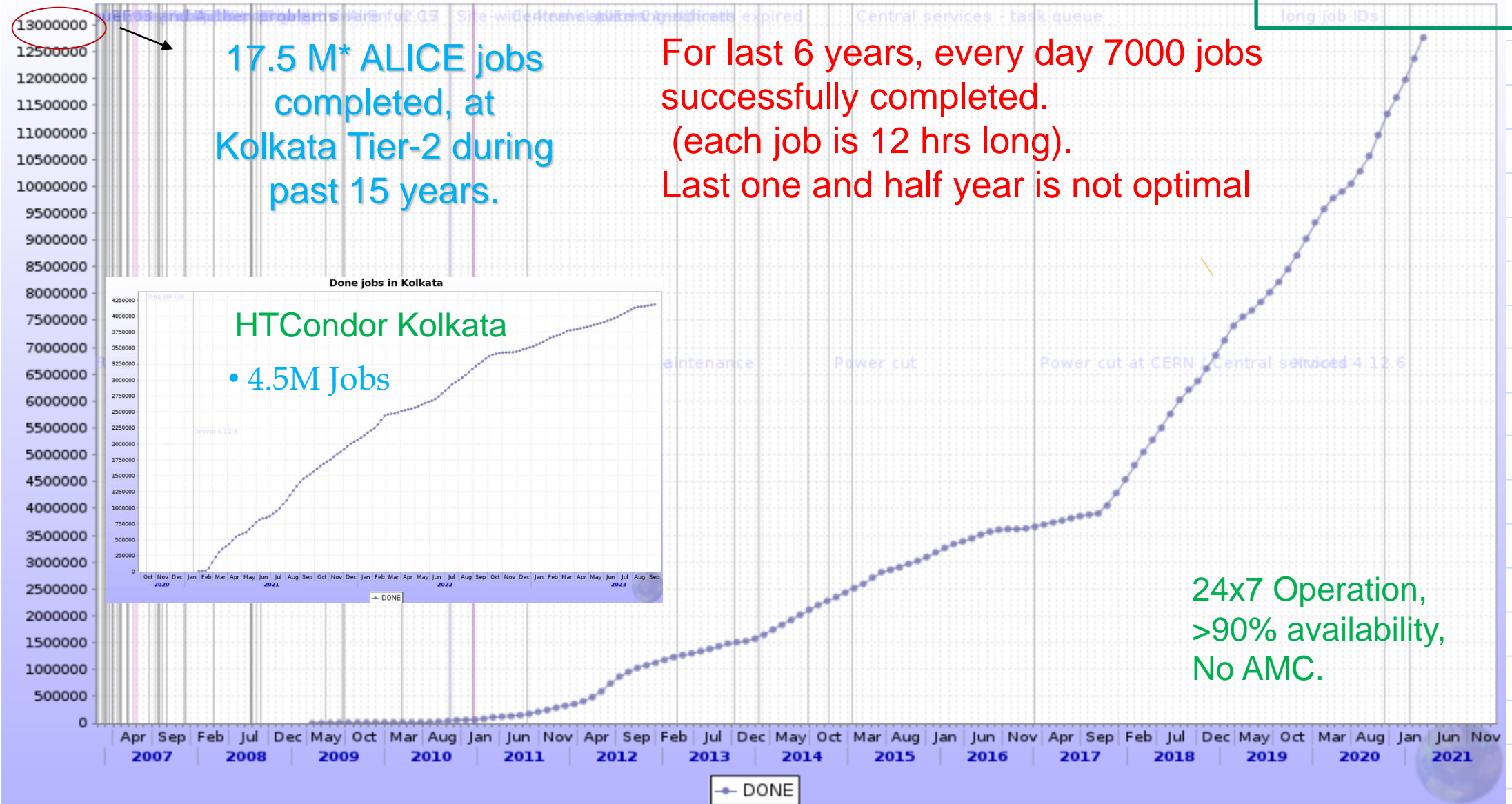


Statistics						
Link name	Data		Individual results of writing tests			Overall
	Starts	Ends	Successful	Failed	Success ratio	Availability
Kolkata::EOS2	30 Oct 2022 14:15	30 Oct 2023 14:24	8504	268	96.94%	97%



ROI at ALICE Tier-2 @ Kolkata

Only ₹ 2/ job



- Since 2008, for only computing ~ ₹ 3.5 Cr. For Storage, Cooling and electricity etc ~ ₹ 3.5 Cr.

Grid-Peer Tier3 Cluster Status



Grid-Peer Head Node
CM-Idap

Interactive Nodes

Non-interactive Nodes

Storage

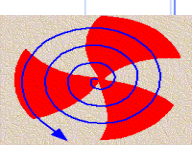
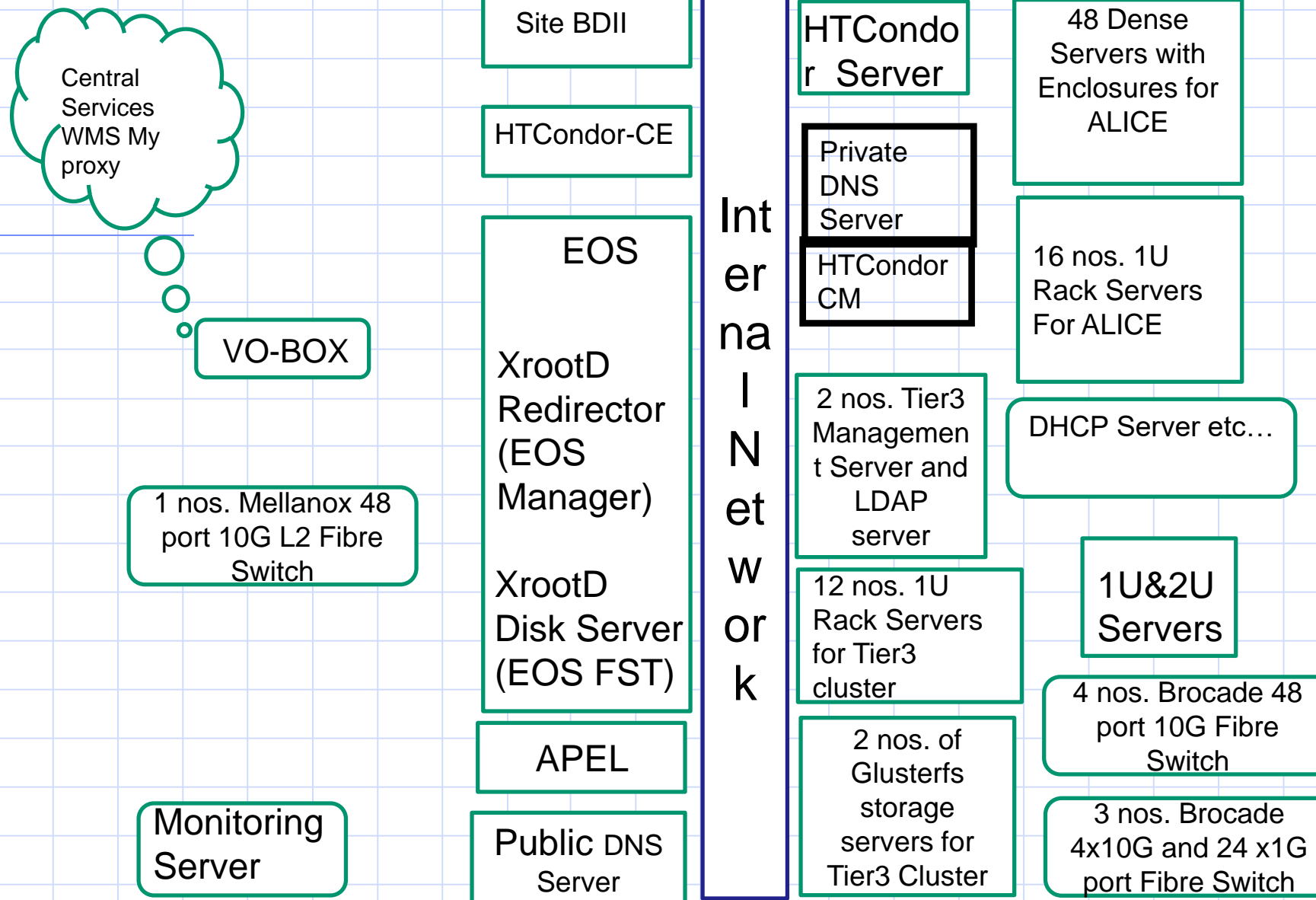
- Total 624 Threads (48 Threads/server).
- Extensively used by VECC users and ALICE INDIA/CBM INDIA Collaborators. 75+ active users (across India)
- Grid-Peer: Head Node/ HTCondor Submitter.
- CM-Idap: Ldap Authentication Server + HT Condor CM
- Interactive Nodes (Grid-peer) : 4 Nos. @48 threads & 128GB RAM.
- Non-interactive Nodes(HT-Condor Execute Nodes):
 - 9 Nos. @48 threads & 128GB RAM.
- Network Connected : 10G Fibre.
- OS debian 11.3 (64bit).
- Two factor authentication Login
 - (1-Key-Based Authentication, 2-PasswordAuthentication,).
- Access to Grid-Peer Head-Node by using LAN & WAN(IPv4).
- gcc version 10.2.1 20210110 & condor version 9.12.0-1.1

Storage:

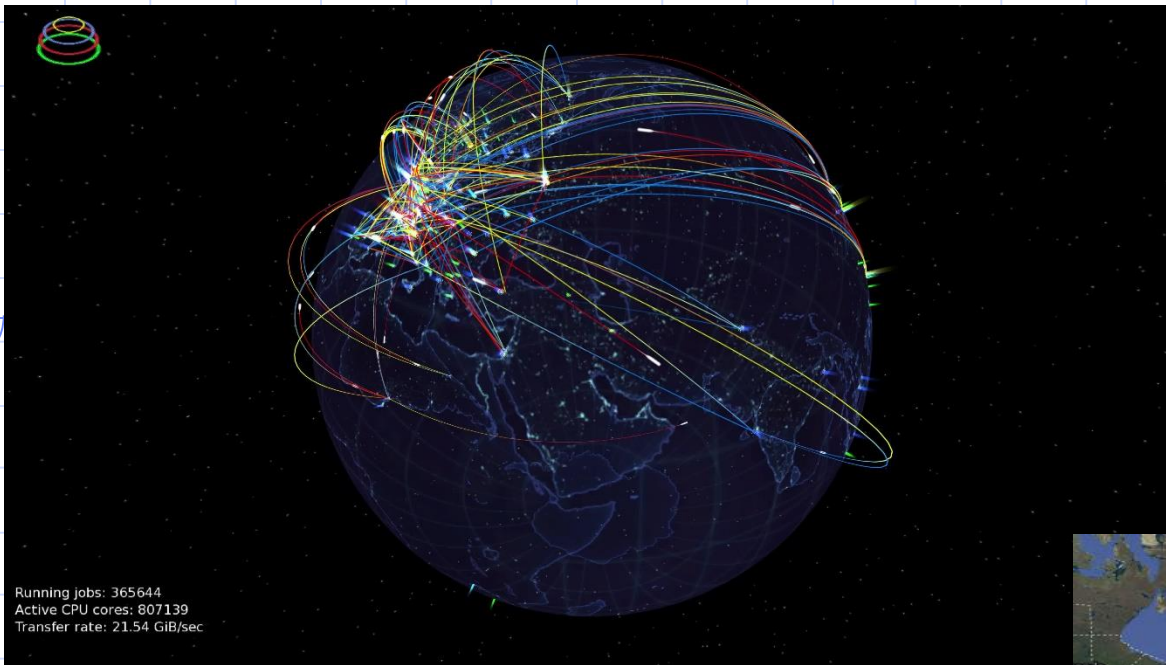
- Glusterfs Storage: 129 TB Usable Space. (Replica-2 Type)
- Total space 216TB (18Hard disk) 15 hard disk usable and 3 Global hot spare and Configuring RAID 5
- Glusterfs Storage are installed with Centos Stream 8.
- Users home directory of interactive nodes are mounted by NFS through Glusterfs storages.

Monitoring under development

Kolkata Site Components

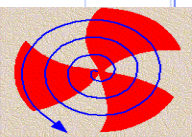
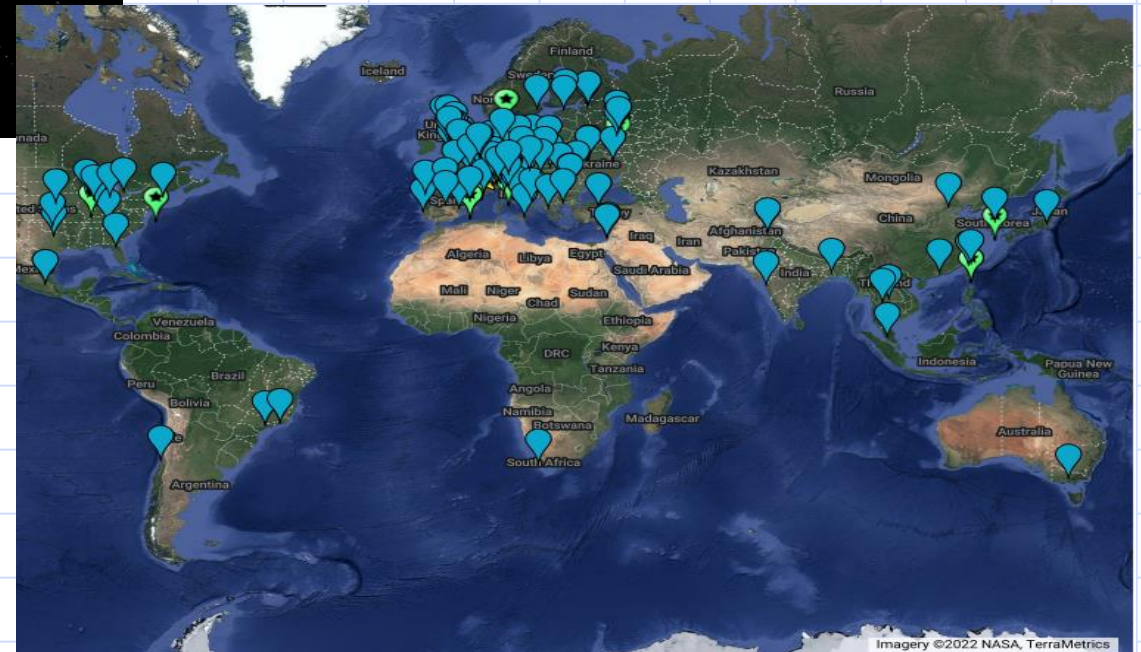


India @ WLCG



- Two Tier-2s
 - VECC Kolkata for ALICE
 - TIFR Mumbai for CMS
 - Software Work

- ✓ Active for 2 decades,
- ✓ Resources as per M&O-A share,
- ✓ Network from NKN (MOU between DAE & NKN)



Software Development @ BARC

DAE-CERN Protocol agreement on Grid computing for software development for WLCG.

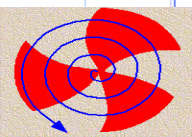
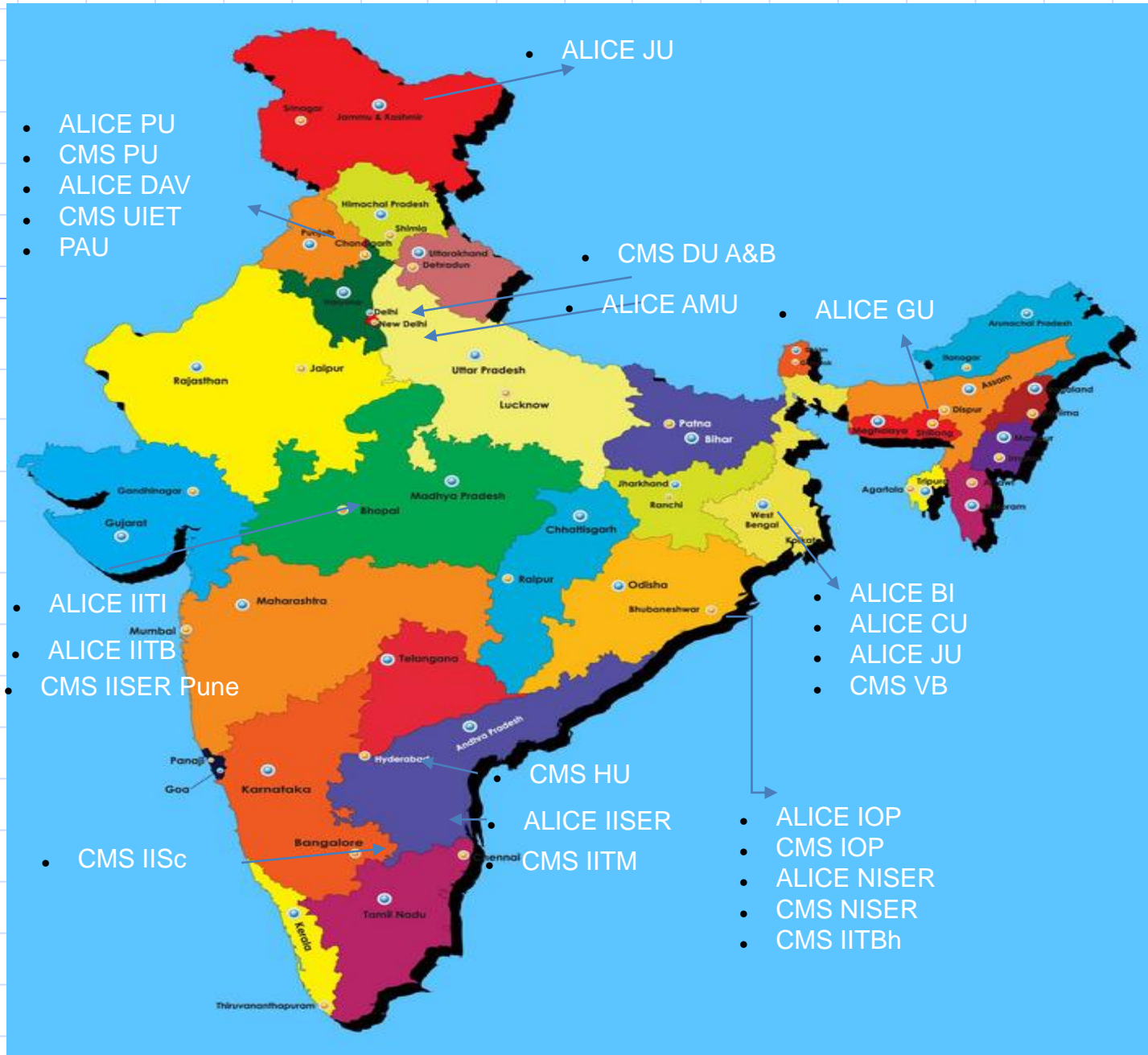
- More than 11M CHF in-kind contribution,
- More than a decade of active software development (2003 -2012),
- Contribution of 1000 Person-months,

DAE developed software is deployed at WLCG, CERN

- **GRIDVIEW :**
A Grid Monitoring and Visualization Tool for LCG
- **SHIVA:** Problem Tracking System,
- Co-relation Engine, Fabric management,
- Quattor toolkit enhancements,
- ALICE VOBOX Monitoring,
- Enhancements for Cloud Management at CERN
- TIFR is participating in CMS software.



India Tier-3 and Plans



Contact persons for ALICE/STAR India Institutes

List of ALICE Indian Collaborating Institutes and PIs details

S.N	Institute	PI/Contact person
1	Variable Energy Cyclotron Centre	Vikas Singhal, Sanjib Muhuri
2	Institute of Physics	Pradip Kumar Sahu, Gautam Tripathy
3	National Institute of Science Education and Research	Bedanga Das Mohanti, Ranbir Singh
4	Punjab University	Lokesh Kumar, M. M. Agrawal
5	Jammu University	Anju Bhasin, Anik Gupta
6	Gauhati University	Buddhadeb Bhattacharjee, Subhankar Roy
7	Aligarh Muslim University, Aligarh	Shakeel Ahmad, Mohd Mohsin Khan
8	Bose Institute, Kolkata	Supriya Das, Sidharth Prasad
9	IIT-Bombay	Basanta Kumar Nandi, Sadhana Das
10	IIT-Indore, Indore	Raghunath Sahoo, Abhishek Srivastava
11	University of Calcutta, Kolkata	Amlan Chakrabarti, Soumya Sen
12	Jadavpur University, Jadavpur	Mitali Mondal, Argha Deb
13	DAV College, Chandigarh	Navneet Kumar Pruthi, Prashanti Shrivastava
14	IISER Tirupati	Chitrasen Jena, Arunima Banerjee

Contact persons for CMS India Institutes

List of CMS Indian Collaborating Institutes and Contact Persons details

S. No.	Institution	PI/Contact Person
1	TIFR	Kajari Mazumdar, Gobinda Majumder
2	IOP	Aruna Nayak, Debottam Das
3	NISER	Sanjay Swain, Prolay Mal
4	Panjab University	Vipin Bhatnagar, Sushil Singh Chauhan
5	UIET, PU	Sunil Bansal, Suresh Kumar Bansal
6	Panjab Agricultural University	Nitish Dhingra, Mehra Singh Sidhu
7	DU-A & B	Ashutosh Bhardwaj, Ashok Kumar, Brajesh Choudhary, Kirti Ranjan
8	University of Hyderabad	Bhawna Gomber, Nekuri Naveen
9	IISER-Pune	Seema Sharma, Sourabh Dube
10	IIT-Madras	Prafulla Kumar Behera, Prabhat Pujahari
11	IISc	Jyothsna Komaragiri, Sudhir Kumar Vempati
12	IIT-Bhubaneswar	Seema Bahinipati, Barathram Ramkumar

GRID Monthly Meeting and Status

S. No.	Date	Link	Meeting Agenda
1	05/01/2023	https://indico.cern.ch/event/1234841/	Kolkata Tier-2 Details, AOB
2	02/03/2023	https://indico.cern.ch/event/1249345/	TIFR Tier-2 Details, Last meeting queries and Answers
3	06/04/2023	https://indico.cern.ch/event/1274050/	Grid India Project Reports Disk Based Storage Discussion
4	11/05/2023	https://indico.cern.ch/event/1285315/	Grid India Project Reports, Disk Based Storage Servers At EOS Kolkata
5	06/07/2023	https://indico.cern.ch/event/1304370/	Grid India Project Status, EOS Kolkata and MonaLisa File Crawler, Future Outlook and Plan
6	03/08/2023	https://indico.cern.ch/event/1313159/	TIFR Tier-2 Storage Migration, HSF Details, Grid India Project Status,
7	06/09/2023	https://indico.cern.ch/event/1322307/	TIFR Tier-2 Storage and migration from DPM to Dcache. Expedite the Grid India Project
8	05/10/2023	https://indico.cern.ch/event/1333606/	The GRID India Project Status. Problem statement and outlook.

Thank You



DURGA POOJA Festival at Kolkata India.

Vikas Singhal, VECC Kolkata India

