Kolkata Tier 2 @ ALICE

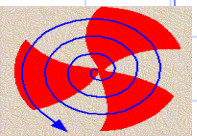
Who We Are

EHEP&AG → Experimental High Energy Physics and Application Group,
VECC → Variable Energy Cyclotron Centre, Kolkata, West Bengal
DAE → Department of Atomic Energy. Govt of India.

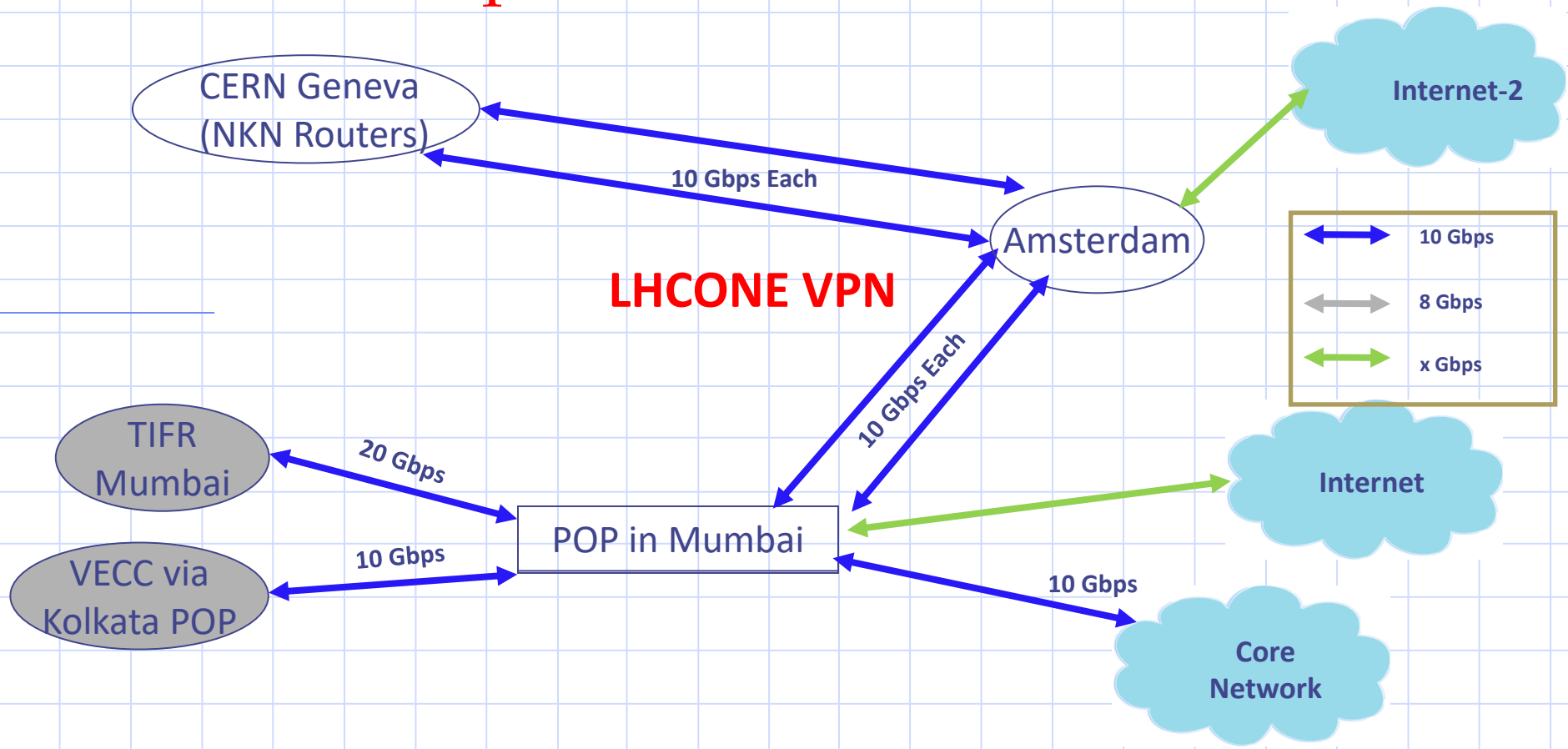
Tier-2 Site for the WLCG (World Wide Computing Grid)
Kolkata Tier-2 For ALICE GRID
GOCDB Name:- IN-DAE-VECC-02

Team:-
Dr. Subhasis Chattopadhyay : (Retired in this January)
Dr. Arup Bandyopadhyay (Heading the Group)

Vikas Singhal
Prasun Singh Roy + team of two contractual staff (changing)

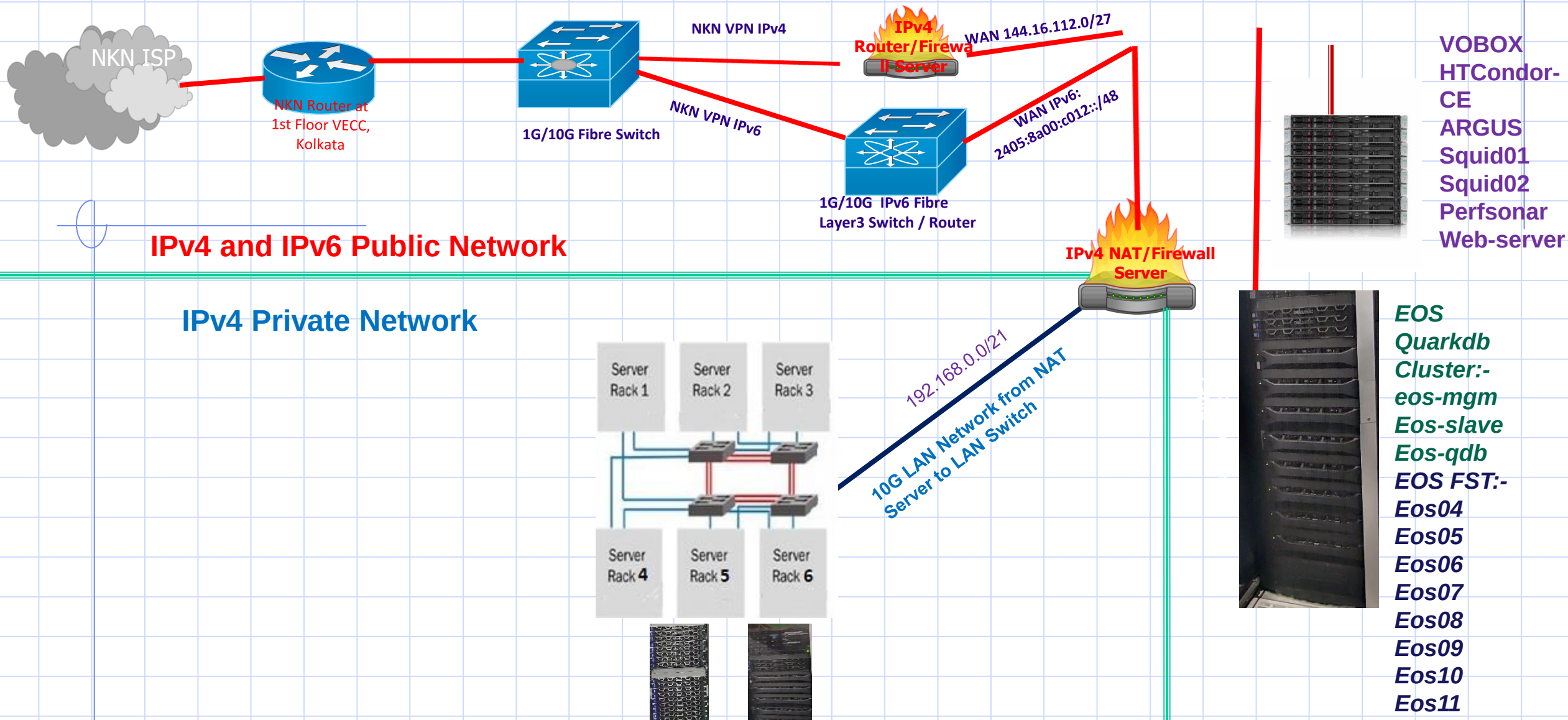


10 Gbps NKN WAN Network



- 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.

NKN Router to Grid Computing Facility



Backend Components and Computing Hardware

- 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

Kolkata Tier-2 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.

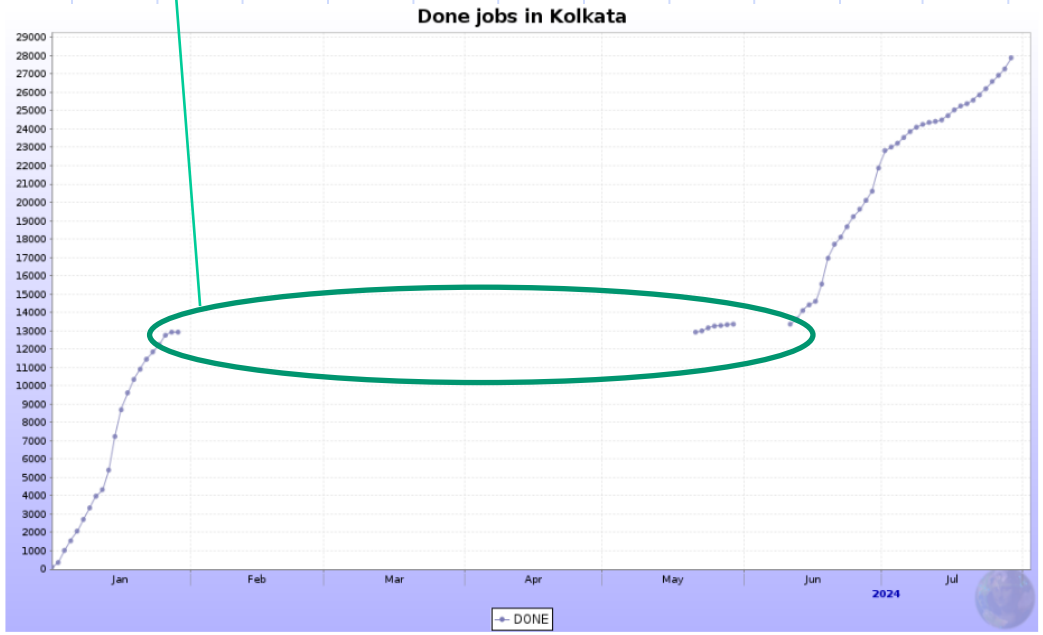
RAM 128 GB DDR4.

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

Status of Kolkata Tier-2 during the 2024

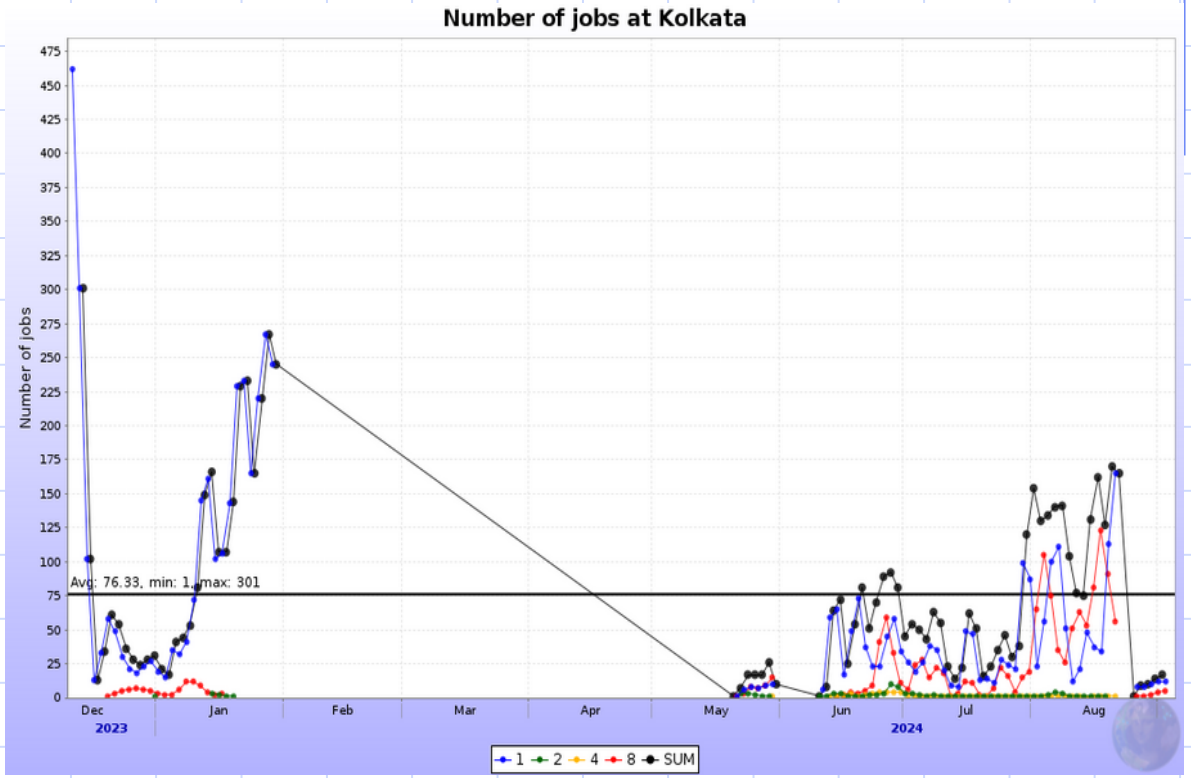
Switched to 8 Core jobs,
8-core jobs Configuration trouble shooting,

Major cooling Infrastructure Issues,
ERROR_E



Done jobs in Kolkata

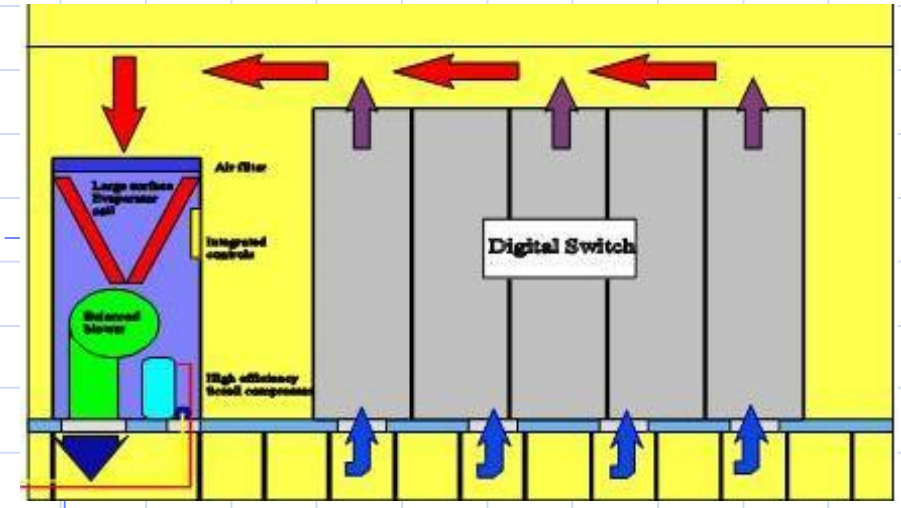
Series	Last value	Min	Avg	Max
1. DONE	27883	110	15959	27883
Total	27883		15959	



28K, 8 core ALICE Jobs successfully completed during January to July:-
~ 2,24,000 cpu cores utilized. Average job duration 10 hrs)

Recap: 13 years ago Implemented an Efficient Cooling Solution

- Hot and Cool Air is separated using Cold Air Containment which is least accessible Area.
- Temperature gradient between Cold and Hot zone is 5°C.



- Power usage effectiveness (PUE)
  - =Total Facility Power/ IT Equipment Power
  - = 1200Units / 816Unit per Day
  - = 1.47
- The same has been published in the DAE Symposium.
- This was the best possible solution at that time.
- It provided to 6 Computing Racks and all are full now.

ROI at ALICE Tier-2 @ Kolkata

Only ₹ 2*/ job

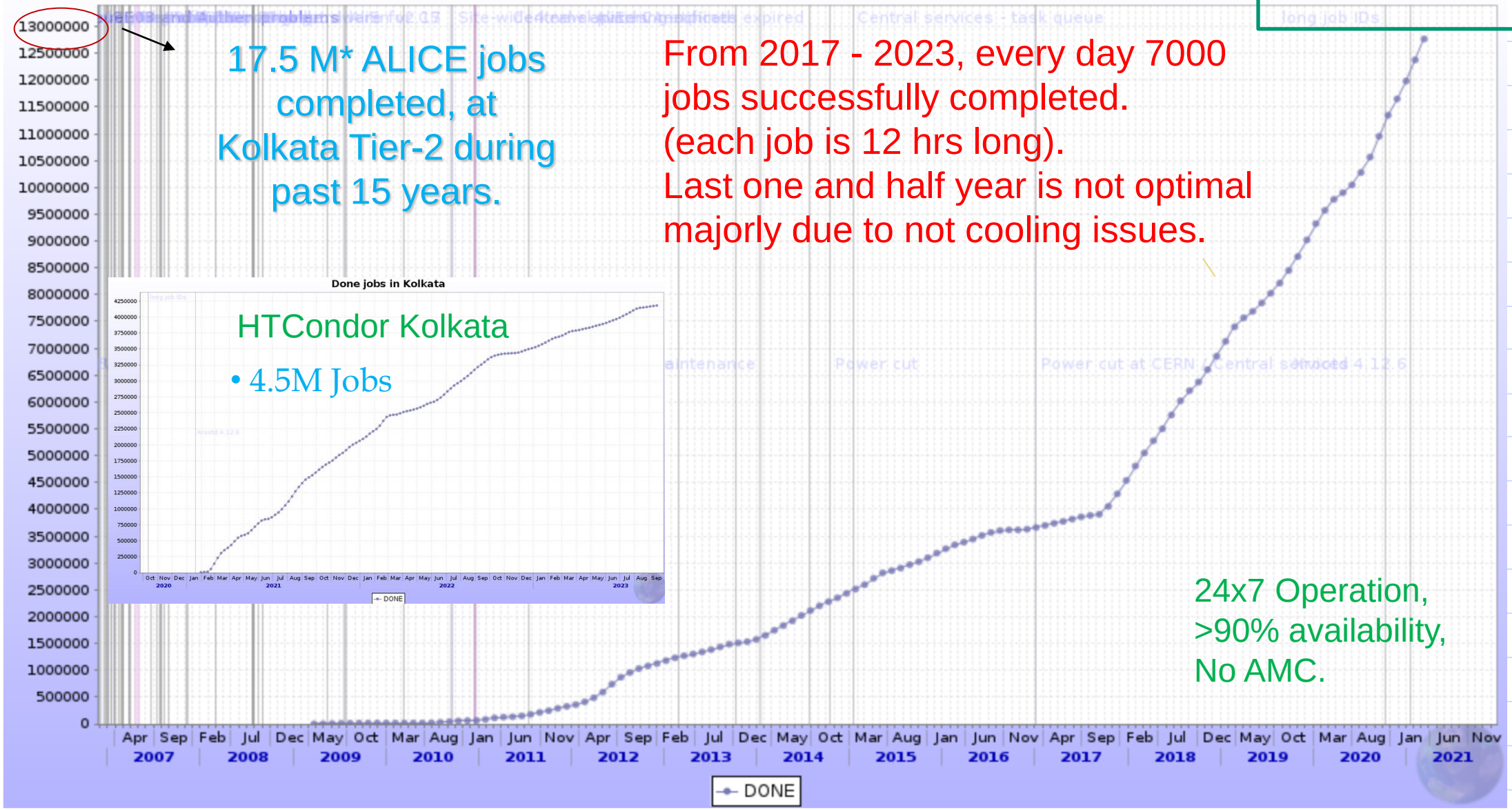
17.5 M* ALICE jobs completed, at Kolkata Tier-2 during past 15 years.

From 2017 - 2023, every day 7000 jobs successfully completed.
(each job is 12 hrs long).
Last one and half year is not optimal majorly due to not cooling issues.

HTCondor Kolkata

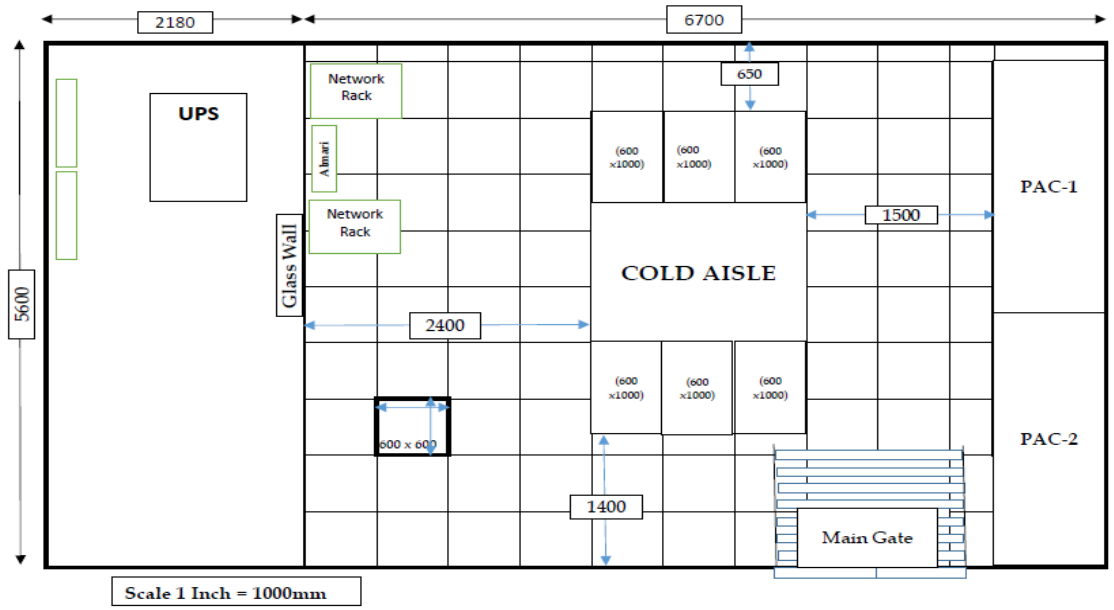
- 4.5M Jobs

24x7 Operation,
>90% availability,
No AMC.



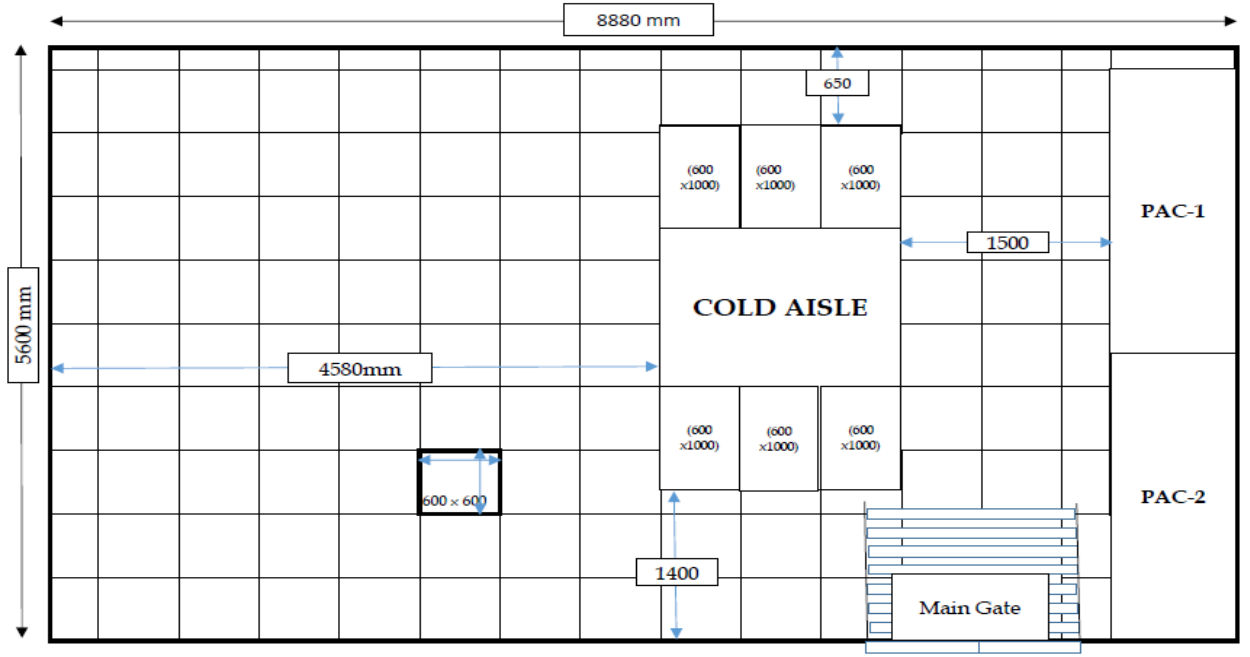
* Since 2008, for only computing servers ~ ₹ 3.5 Cr. Infrastructure, Manpower, Space, Storage, Cooling and electricity costs are etc.

Rearranging the GRID Computing Facility, VECC

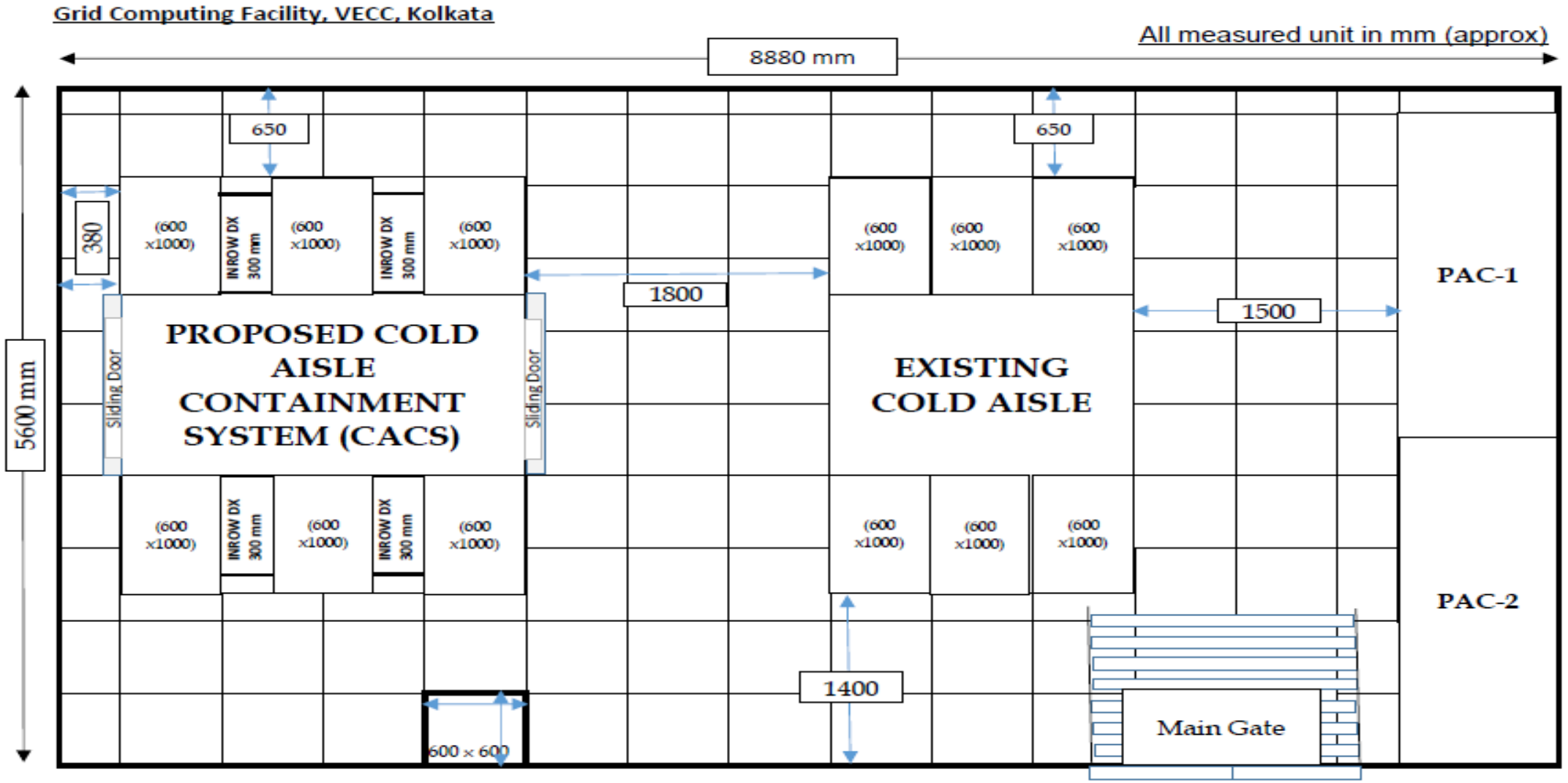


- Did not get more physical space, therefore re-arranging the facility.
- Efficiently need to utilize remaining space in the Room.
- New solution for at-least an another decade.
- UPS room is renovated and modified.

- Started to removing of UPS and other passive components.
- An small UPS room is renovated and modified.



Proposed Layout for 100kW of InRow cooling Solution



An Indent has been initiated and Internal Technical Committee evaluation completed.

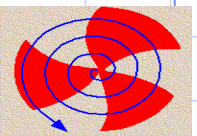
Upgradation from CC7 to AL9 and HTCondor Middleware and Packages

- Migrated Entire Computing Element to Alma Linux 9
- Computing Element: HTCondor-CE version v23.0.14
  - (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)
- VOBOX – wlcg-voms, vobox (htcvobox.tier2-kol.res.in)

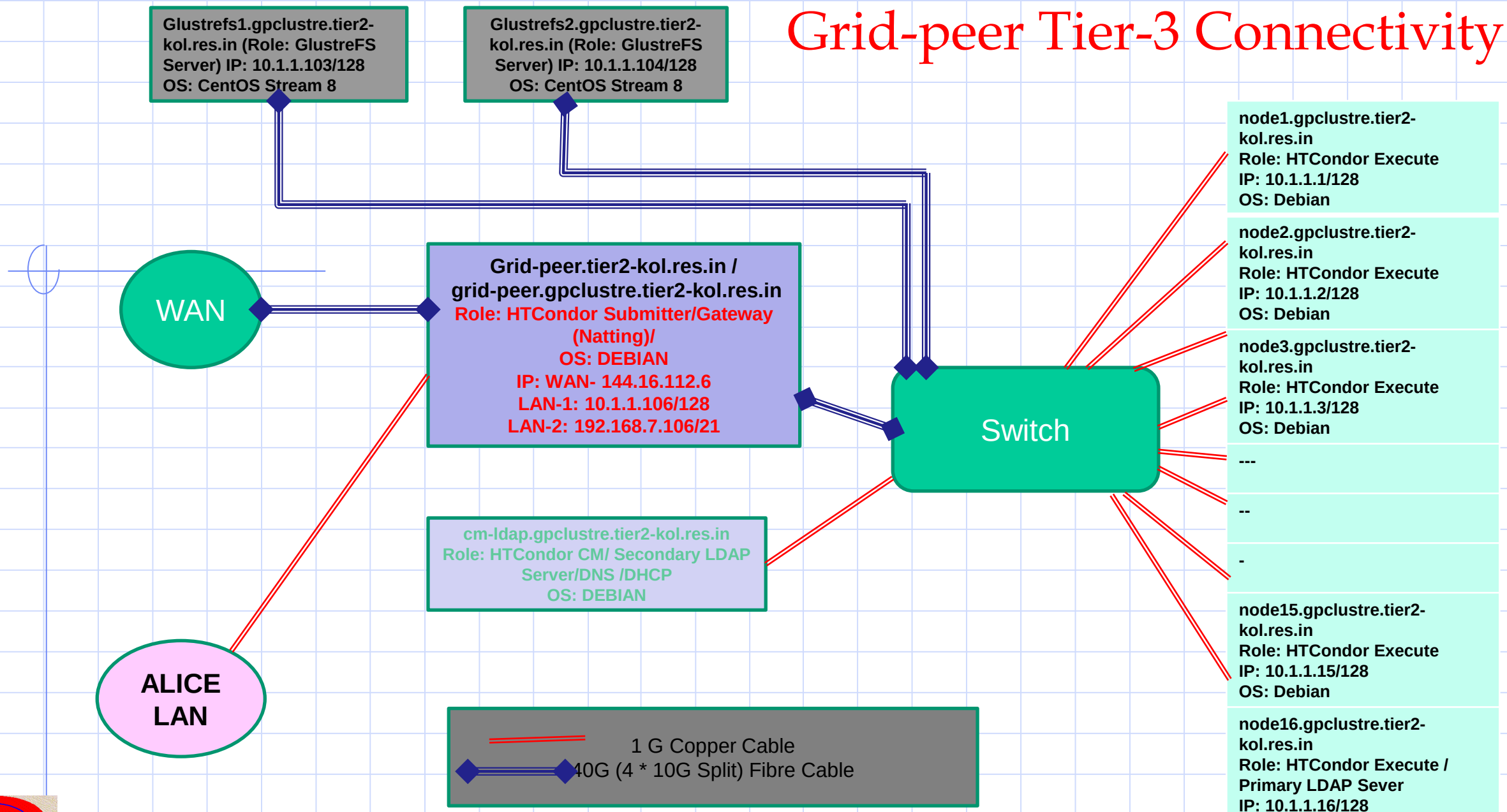
- Thanks: Maarten Litmaath helping at each level.
- Discussing with HTCondor team for domain name related issue.
- EOS will be upgraded after CE.

Upgrade Plans of Storage Element (EOS) at Kolkata Tier2

- Cleaning and removing of Dark Files with help of ALICE EOS team,
  - Will resolve storage number discrepancy
  - correct the faulty replica using EOS tools.
- OS Upgrade from Centos 7.x to ALMA 9.x. for the EOS
  - 8 disk servers and 3 quarkdb + 2 management servers
- Upgrade EOS v4 to v5.
  - On EOS v4, no option to take backup of quakdb data,
  - One by one will upgrade quarkdb severs.



Grid-peer Tier-3 Connectivity



Grid-Peer Tier3 Cluster Status

- 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-ldap: 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:

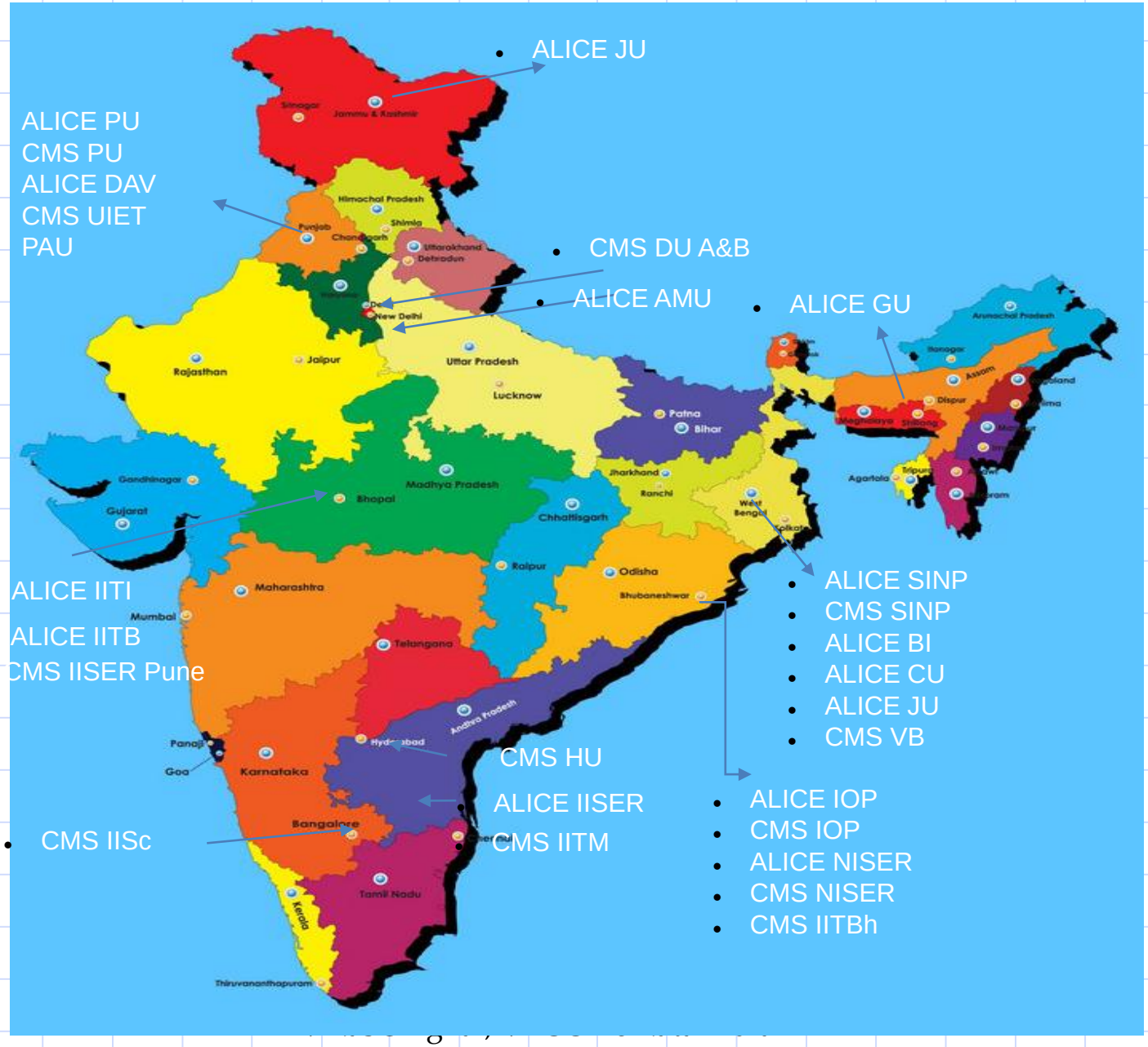
➢ Glusterfs Storage: 129 TB Usable Space. (Replica-2 Type)

- 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

The GRID India project and Collaborating Institutes

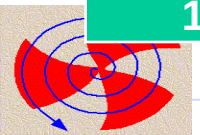


PI and Co-PI for each ALICE/STAR Institutes for the GRID India

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	Ranbir Singh, Bedanga Das Mohanti
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

PI and Co-PI for each CMS Institutes for the GRID India

List of CMS Indian Collaborating Institutes and Contact Persons details		
S. No.	Institution	PI/Contact Person
1	TIFR	Kajari Mazumdar, Manoranjan Guchait, 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



The GRID India Monthly Meetings

S. No.	Date	Link	Meeting Agenda
1	09/11/2023	https://indico.cern.ch/event/1345690/	7th ATCF Update
2	07/12/2023	https://indico.cern.ch/event/1354604/	The NKN: Past Present Future,
3	04/01/2024	https://indico.cern.ch/event/1361684/	Experience of HSF-India HEP Software Workshop at NISER – Bhubaneswar, The Grid India Project Status
4	22/02/2024	https://indico.cern.ch/event/1386015/	Input for Joint CERN India Liaison Committee Meeting,
5	25/04/2024	https://indico.cern.ch/event/1409639/	DST Format DPR for each DST group, Project completion Report for the project 2014-2020
6	30/05/2024	https://indico.cern.ch/event/1421682/	Update of HSF School at Delhi University TIFR Tier-2 Updates and Monthly Report Kolkata Tier-2 Monthly Update
7	25/07/2024	https://indico.cern.ch/event/1441091/	The Grid India Project Status, DST Format DPR for each DST group, Input and discussion for 10th India-CERN Task Force meeting
8	30/08/2024	https://indico.cern.ch/event/1450481/	The GRID India Project Status, GPU Computing and outlook.

"Scientific Computing Workshop for High Energy Physics and Tomography"

during December 16-20, 2024 at VECC, Kolkata

https://indico.cern.ch/event/1422314/

Thank You

Present Status of ALICE Kolkata Tier2

```
[root@eos-mgm ~]# eos -b
EOS Console [root://localhost] |/eos/alicekolkata/grid/> 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	156.72 TB	off	on	1	on	80	0	off	1	0	on

USED

Name	Status	Size	Used	Free	Usage	No of files	Type	ADD test
ALICE::Kolkata::EOS2	OK	1.124 PB	50.35%	571.4 TB	579.6 TB	12.51 M	FILE	OK

8. Currently, Kolkata EOS has filled 1.11 PB out of 1.27 PB (almost 100%) in eos CLI. But on ALICE Monitoring webpage it's show 579.6 TB used and 571.4 TB free (around 51% Free Space).

9. The differences between these two output are due to corruption of replica (RAIN-6) for those faulty files. There are too many dark files. However we had removed many corrupted file which has shown in "CRAWLER" section under "SE Information" of ALICE Monalisa WebPage (http://alimonitor.cern.ch/crawlerPFNSamples), but still difference.

We contacted with Costin at ALICE about this incident and waiting for reply.

Resolved a few GGUS Tickets for Kolkata Tier2

Ticket-id: 165624: New VOMS i.e. wlcg-iam-lsc-alice-2.0.0 configuration for LHC experiments (IN-DAE-VECC-02).

Ticket-ID: 165772: New TOKEN configuration for LHC experiments (IN-DAE-VECC-02).

Ticket-ID: 163984 : Installation of HTCondor 10 and HTCondorCE and the migration from voms-based authentication with X509 certificates to AAI tokens for accessing the HTCondorCE endpoints.

SSL Token authentication, enable SSL authz on HTCondor-CE endpoint