



ALICE

Kolkata Tier II @ ALICE and Status



Site Name :-
 Tier-2 Site for the WLCG
 (World Wide Computing Grid)
 GOCDB Name:- IN-DAE-VECC-02
 VO :- ALICE
 Group:- EHEPAG
 Unit:- VECC
 City:- KOLKATA
 Country :- INDIA

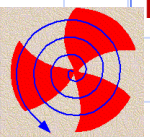
Kolkata,
 The capital of West Bengal
 Calcutta,
 Located in eastern India,
 known as the "City of Joy".
 Mother Teresa, Rabindranath
 Tagore, Satyajit Ray, J C
 Bose, and S N Bose



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

Team:-
 Subhasis Chattopadhyay
 Vikas Singhal
 Prasun Singh Roy

T. K. Samanta and S. K. Pal
 helped in establishing the centre
 in the initial years.





ALICE Tier1-Tier2 Meetings

R

Me eti ng	Period	Year	Institute, Place	Link
1	26-27 May	2009	CERN, Switzerland	http://indico.cern.ch/event/58444/
2	24-26 Jan	2012	KIT, Germany	https://indico.cern.ch/event/157585/
3	4-6 June	2013	CC-IN2P3, France	https://indico.in2p3.fr/event/8114/
4	3-7 March	2014	Tsukuba, Japan	http://indico.cern.ch/event/274974/
5	23-25 Feb	2015	INFN, Torino, Italy	https://indico.cern.ch/event/354209/
6	18-20 April	2016	Bergen, Norway	https://indico.cern.ch/event/485835/
7	3-5 May	2017	Strasbourg, France	https://indico.cern.ch/event/595536/



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Evolution of Grid Computing Facility at VECC (Overview)

2002

- 2 Desktop Machine
- 512MB HD in Desktop Machine
- 128Kbps network shared link



2003

- 2 Tower Like Servers
- 40GB as DAS
- 512Kbps Network



2004

- 9 HP 1U Servers
- 400GB in HP MSA 500
- 2Mbps Dedicated Link



2009

- 8 Quad Core HP Blades
- 25 TB i-SCSI storage
- 100Mbps from VSNL (ERNET)



2008

- 40 Dual Core HP Blades
- 108TB HP EVA SAN storage
- 30Mbps WAN from Reliance



2006

- 17 Wipro 1U Servers Single Core
- 2TB Wipro NAS storage
- 4Mbps WAN Network from Bharti



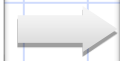
2010 - 2012

- 32 Dual Processor Blades
- 200TB IBM DS 5100 storage
- 300 Mbps WAN from NKN
- Cold aisle cooling solution
- Efficient cooling (1.47 PUE)



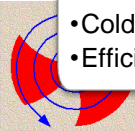
2012 -2015

- GPU Computing with Tesla 2075
- 1Gbps NKN WAN under LHCONE
- 148 TB of disk based storage
- Low cost storage solution based on EOS RAIN-6 concept.



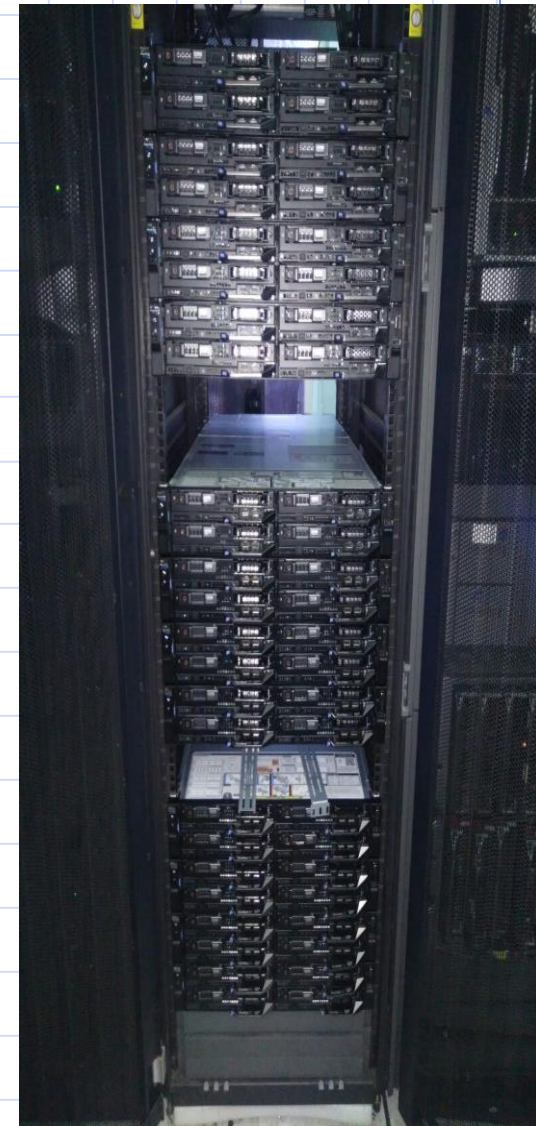
2017-2018

- Xeon-phi co-processor for computing
- 48 (2*14 Core) Dell Dense servers
- 51TF cluster in TopSuperComputers
- 10Gbps WAN network from NKN
- 8 Million ALICE Jobs completed.



Commissioned 2688 HT cores of Computing Resources

- 12 DELL PowerEdge FX2 Enclosures.
- Each contain 4 DELL PowerEdge FC630 servers.
- Each server configuration:-
 - 2 Nos of Intel Xeon E5-2680 v4 2.4 GHz
with 14 cores
 - 8 * 16 GB RDIMM, 2400MT/s
 - 960 GB of SSD harddisk.
 - 2 * 10 Gigabit network cards.
- Total cores $48*2*14*2=2688$ (HT)
- Scientific Linux CERN 6.8 installed
- 10G network connected.
- Approx cost of the equipment = \$ 300,000.





Kolkata Tier-2 cluster in TopSuperComputers India List

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Listed in Top Super Computers India

<http://topsc.cdacb.in/jsps/feb2018/index.html>

<http://topsc.cdacb.in/jsps/july2018/index.html>

<http://topsc.cdacb.in/jsps/jan2019/index.html>

HPL Benchmarking performance

Theoretical Peak Performance

$R_{peak} = 2.4 * 28 * 16$ Gigaflop
= 1075.2 Gigaflop
= 1.0752 Teraflop (Single Server)

R_{peak} for cluster = $1.0752 * 48$ Tflops
= 51.6096 Tflops

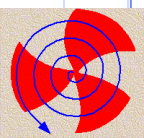
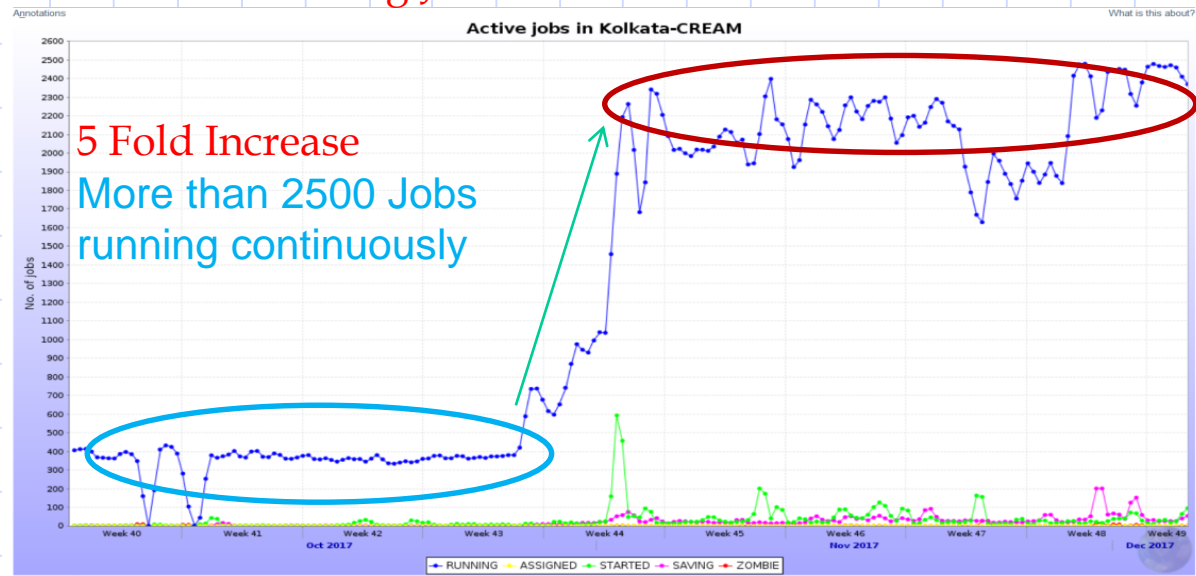
Linpack Benchmark performance

$R_{max} = 4.30471e+04$ Gflops
= 43.0471 Tflops.

Top Super Computers in India is list of the most powerful supercomputers in India and it is maintained by C-DAC Bangalore. Earlier it was maintained by IISc Bangalore since its inception in 2009.

Kolkata Tier-2 Cluster maintained its position in the list published in July 2018 also and one down in Jan 2019 .

Running Jobs at Monalisa Oct - Nov 17





ALICE Job completed @Kolkata

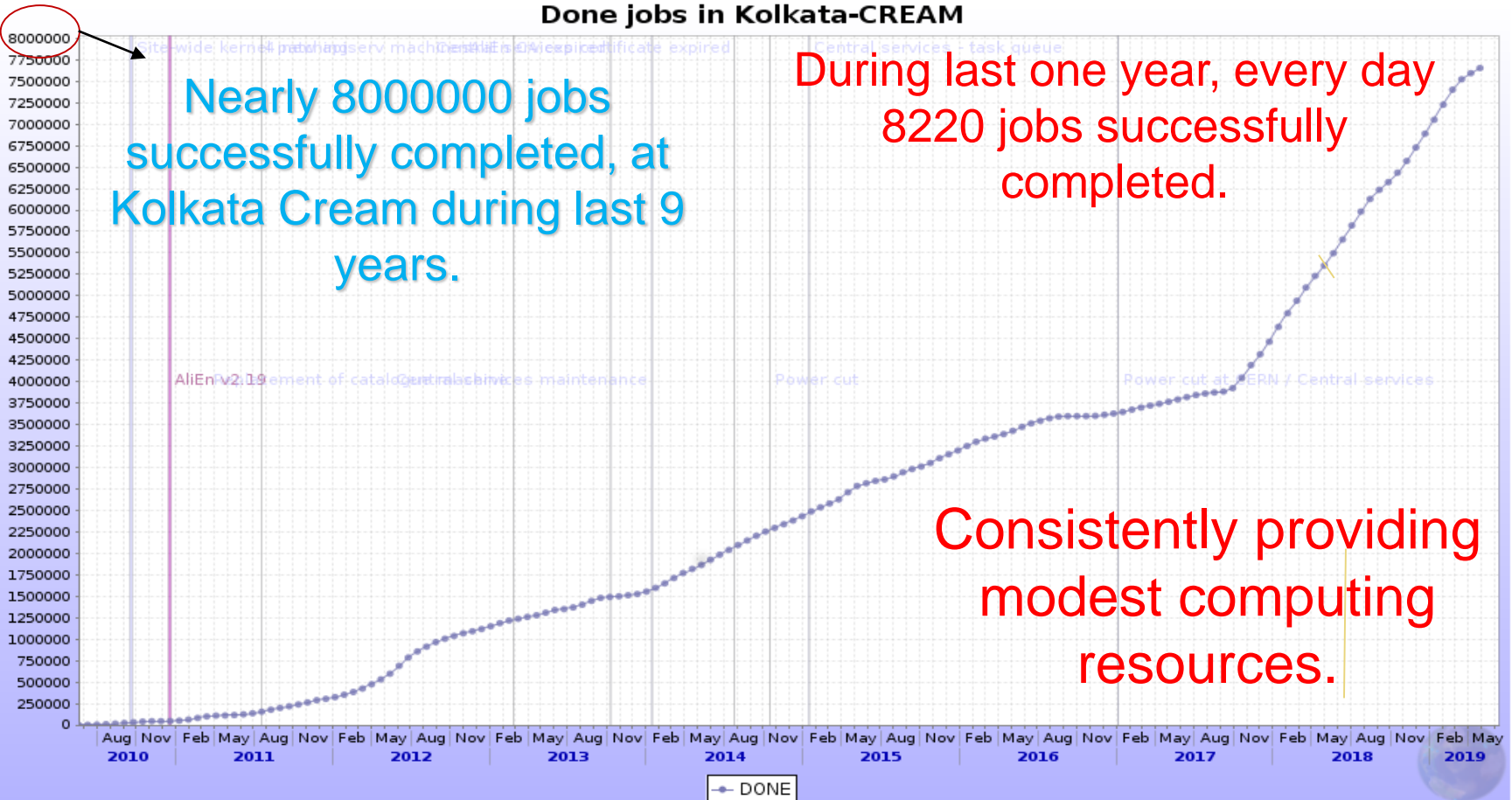
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Time selection: last 9 years or « 2010-05-14 05:00 - 2019-05-14 05:00 »

Statistics

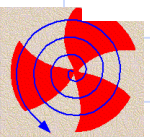
What is

Done jobs in Kolkata-CREAM



No AMC for any server.
Maintaining In-house only

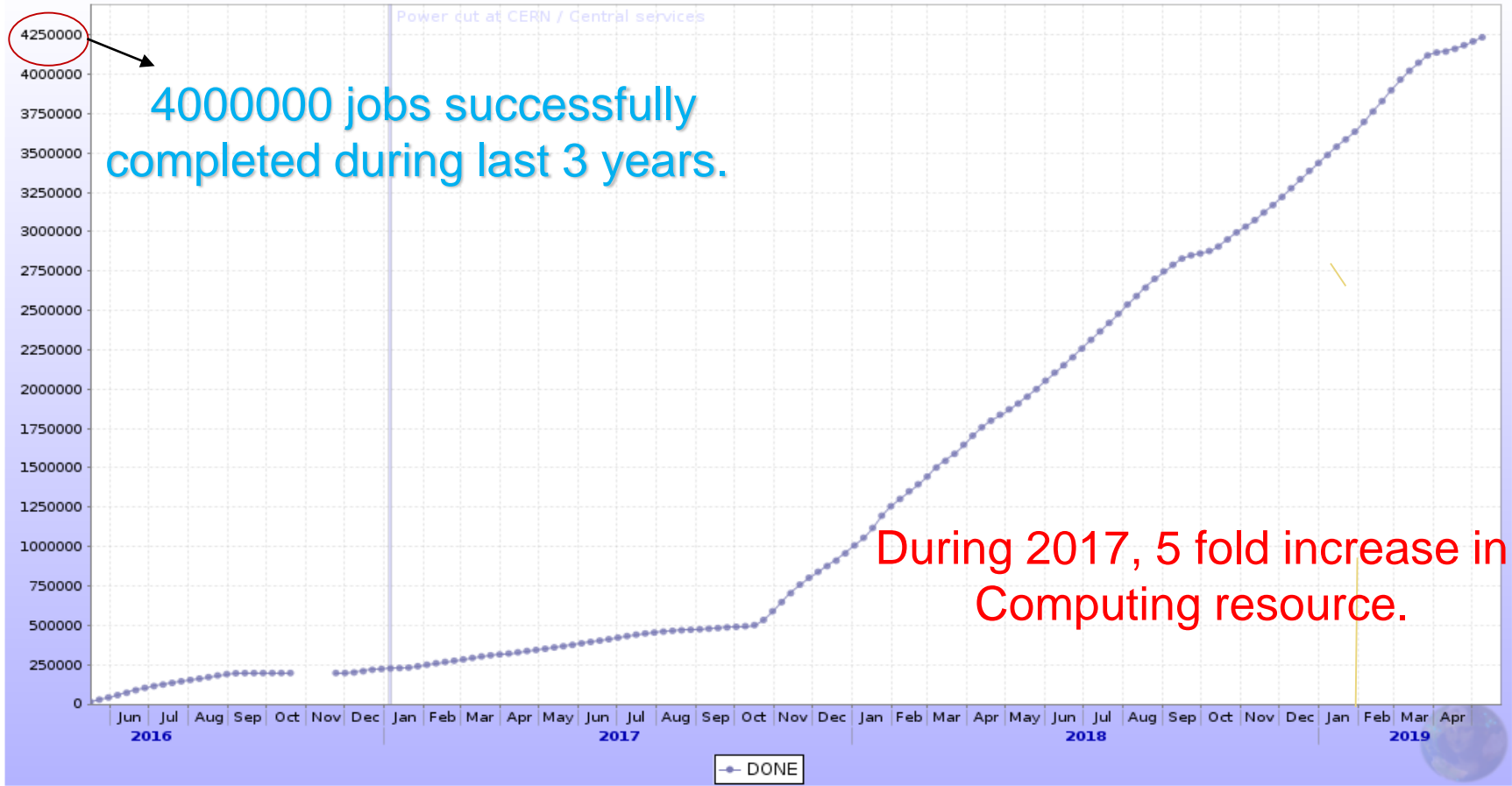
Done jobs in Kolkata-CREAM					
	Series	Last value	Min	Avg	Max
1.	DONE	7654486	309	2543570	7654486
Total		7654486		2543570	





ALICE Job completed @Kolkata since 2016 Meeting

Done jobs in Kolkata-CREAM



Done jobs in Kolkata-CREAM					
	Series	Last value	Min	Avg	Max
1.	DONE	4234801	13593	1439375	4234801
Total		4234801		1439375	





Kolkata Tier-2 Storage Evolution SAN Storage

Started with SAN Based Storage system

Procured HP EVA 6100 in 2008

2 Racks

Total 200 Spindles of 500GB each

Total raw capacity 100 TB usable capacity 68 TB only.

Configured as ALICE::Kolkata::SE

Procured IBM DS5100 in 2011

1 Racks

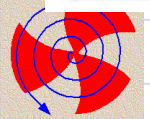
Total 96 Spindles of 2TB each

Total raw capacity 192 TB usable capacity 152 TB only.

Added under ALICE::Kolkata::SE

Name	Status	Size	Used	Free	Usage	No of files	Type	ADD test
ALICE::Kolkata::SE	OK	223.2 TB	24.36%	168.8 TB	54.36 TB	1.722 M	FILE	OK

Monalisa snapshot during 2012 showing Kolkata::SE



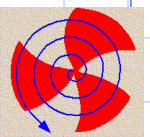


Kolkata Tier-2 towards Disk based Storage

Moving towards Disk Based storage configured using EOS.

Procured in March 2017

Name of Instance:	ALICE::Kolkata::EOS
No. of Disk Server:	3 Nos.
Total Physical Space	6 U
Each Disk Capacity:	4TB
Nos. of Disk in each disk server:	12
H/W RAID type:	0 (Zero)
OS:	Scientific Linux 6
EOS version:	EOS AQUAMARINE (0.3.256)
RAIN type (Redundant Array of Independent nodes) :	RAIN6
RAW Space:	144 TB.
No. of Management Server:	1
Used as prototype concept.	





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Procured more disk servers for EOS

Disk Server Hardware (Procured during Nov-Dec 2018)

7 nos. of Dell PowerEdge R730XD servers. Each server contains:-

16 * 10TB NLSAS HDD and 2*480GB SSD.

4 * 10GB Ethernet (Fibre).

8 * 16 = 128GB DDR4 RAM.

2 * Intel Xeon 10 core Processors.

RAID: All server are configure with 2 types of RAID:-

- i. RAID-0 in 16 nos 10TB HDD.
- ii. RAID-1 in 2 nos 480 SSD GB HDD.

Power Supply 2 * 750 Watt

Size : 2U Rack Mount each.

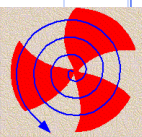
Hardware for Management Server

2 nos. of 1U Rack Mount Servers. Both server contain:-

RAM size 128GB and 64GB

Disk size 980GB SSD and 1.2TB SAS HDD

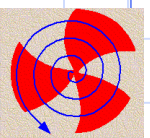
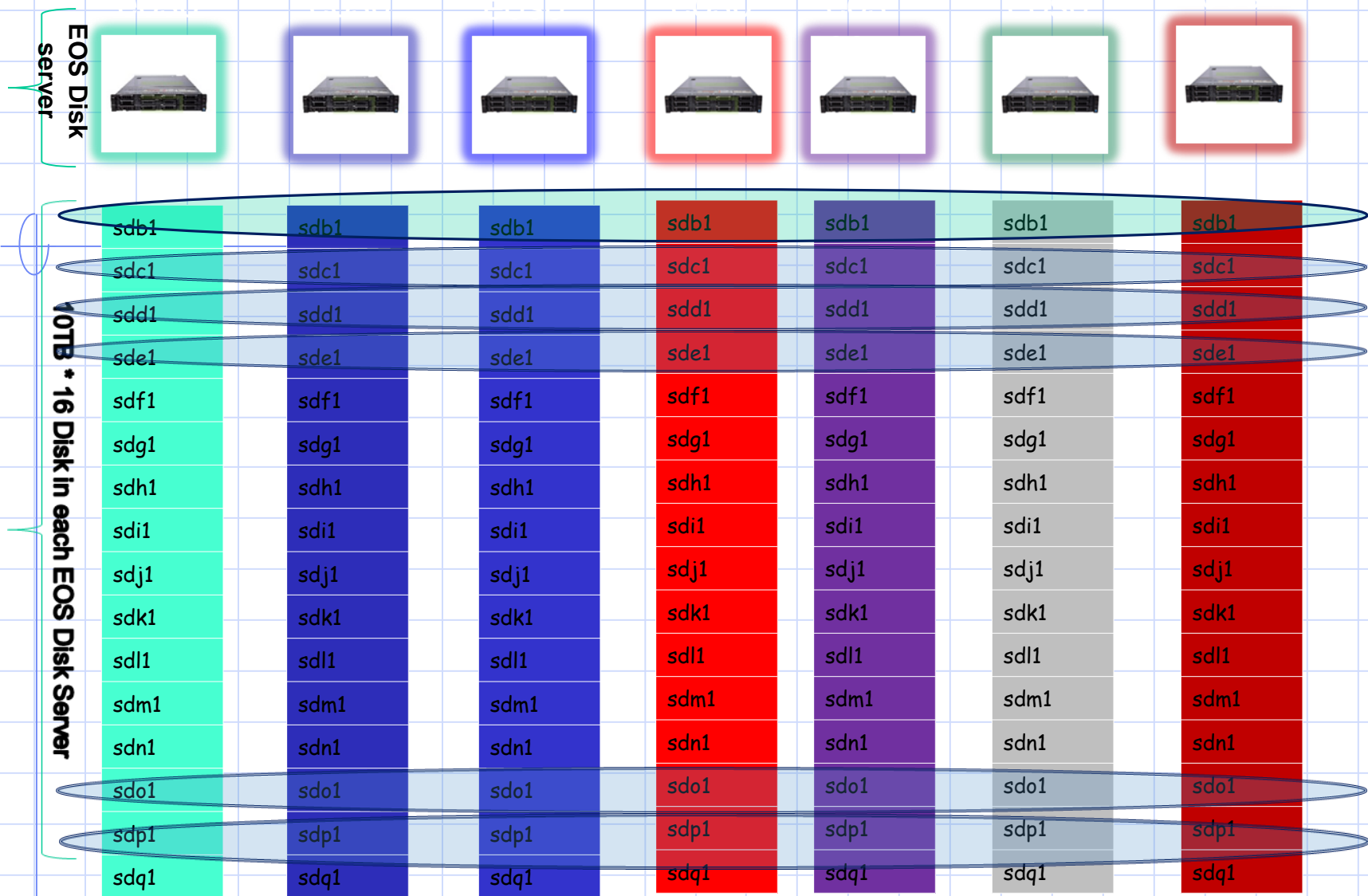
Processors : 2 * Intel Xeon Processor





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Disk Grouping to make RAIN6





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One Group Under RAIN-6

We made 16 disk group with 7 nos. of 10TB HDD from 7 disk server. Example:

group name – default.0

Disk Server name:



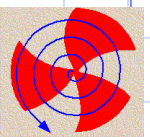
Drive mount point name:-



Screenshot of 16 disk group in ALICE::Kolkata::EOS2:-

```
[root@eos-mgm ~]# eos -b group ls
```

type	name	status	N(fs)	dev(filled)	avg(filled)	sig(filled)	balancing	bal-shd	drain-shd
groupview	default.0	on	7	1.67	19.03	0.79	idle	0	0
groupview	default.1	on	7	1.66	14.59	0.76	idle	0	0
groupview	default.10	on	7	1.03	13.19	0.48	idle	0	0
groupview	default.11	on	7	1.14	16.02	0.55	idle	0	0
groupview	default.12	on	7	1.05	16.82	0.49	idle	0	0
groupview	default.13	on	7	1.72	14.51	0.79	idle	0	0
groupview	default.14	on	7	1.15	13.36	0.52	idle	0	0
groupview	default.15	on	7	1.11	12.82	0.51	idle	0	0
groupview	default.2	on	7	1.18	18.30	0.56	idle	0	0
groupview	default.3	on	7	1.06	13.56	0.53	idle	0	0
groupview	default.4	on	7	0.94	13.46	0.44	idle	0	0
groupview	default.5	on	7	1.20	12.93	0.53	idle	0	0
groupview	default.6	on	7	1.24	17.84	0.57	idle	0	0
groupview	default.7	on	7	1.32	13.11	0.58	idle	0	0
groupview	default.8	on	7	1.07	13.06	0.50	idle	0	0
groupview	default.9	on	7	1.12	13.00	0.53	idle	0	0





Configuration of Kolkata::EOS2

MGM: Manager or management. two types i.e. "Master" and "Slave".

FST: Disk server.

Current EOS version: CITRINE (4.4.23) with XROOTD version 4.9.1.

Configuration file "eos" and "eos_env" for MGM and FST.

Alias hostname in DNS: Point to MASTER and SLAVE eos.

Alias name: eoskolkata.tier2-kol.res.in->

(Slave). eos-mgm.tier2-kol.res.in (Master) and eos-slave.tier2-kol.res.in

Common installation procedure of MGM and FST:-

OS: CentOS7 (7.5 in our case) in all MGM and disk servers (FST) SSD drive.

Mount Point: All the 16 nos. of 10TB disk are mounted individually mount point i.e. xdata0 to xdata15 in each fst.

Made separate "/var" mount point in MGM and FST. Size of "/var" in MGM is greater than 500GB will be use to store namespace, which contain a information of files and directories inside eosmain.

Disable selinux.[cat /etc/selinux/config].

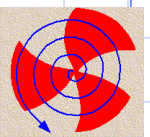
Enable ntp and ntpd service is running.[systemctl start ntpd; systemctl enable ntpd; ntpq -p, date -R].

SSH password free between MGM and FST.

Disable and stop firewalld, i.e.:-

- systemctl stop firewalld
- systemctl disable firewalld

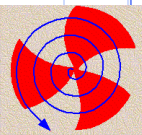
Install EPEL repo and add a line "--exclude=xrootd* libmicrohttpd*" for every section in epel repo and





Performance Evaluation of Disk based server

- Started finding out performance of such disk server. Needed for new procurement.
- Such server from any OEM comes with RAID+Host Bus Expander Card.
- No OEM have more than 8 channels of max 12 Gbps speed per RAID Cards. Will this sufficient?
- Is provided “RAID + Expander card” limits on the performance? (Bottleneck may be PCIe3.0)
- Try to gather throughput or IOPS. Simple Available tools:-
 - xdd
 - dd
 - rsync (Running multiple rsync in parallel on all the disks)
 - IOZone
 - IOR
- Per Disk 7.2K RPM NLSAS speed is approx 200-300MBps
https://www.cloudbyte.com/wp-content/uploads/Whitepaper_CloudByte_Measuring-Storage-Performance.pdf





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Playing with different tools

volume	write rate
vol9	31.3MB/s
vol10	31.1MB/s
vol11	31.2MB/s
vol12	31.1MB/s
vol13	32.2MB/s
vol14	31.2MB/s
vol15	32.1MB/s
vol16	31.3MB/s

dc 100g

volume	file size	copy rate
vol1	104.88gb	107.96 Mbyte/sec
vol2	104.88gb	108.07 Mbyte/sec
vol3	104.88gb	108.29 Mbyte/sec
vol4	104.88gb	108.41Mbyte/sec
vol5	104.88gb	108.52Mbyte/sec
vol6	104.88gb	108.63Mbyte/sec
vol7	104.88gb	108.63Mbyte/sec
vol8	104.88gb	108.74Mbyte/sec
vol9	104.88gb	108.86Mbyte/sec
vol10	104.88gb	108.97Mbyte/sec
vol11	104.88gb	109.08Mbyte/sec
vol12	104.88gb	109.08Mbyte/sec
vol13	104.88gb	109.20Mbyte/sec
vol14	104.88gb	109.31Mbyte/sec
vol15	104.88gb	109.42Mbyte/sec
vol16	104.88gb	109.54Mbyte/sec

	OUTPUT RATE(write)	OUTPUT RATE(read)
RAID0 (1*10 TB)	326.146 mb	250 mb
RAID5(7*10 TB)	1787.418 mb	1310 mb
RAID6(8*10 TB)	1784.587 mb	1321 mb

rsync in parallel or simultaneously

```
xdd.linux -op write -targets 1 /dev/sdb -mbytes 5000 -blocksize 1048576 -dio
```





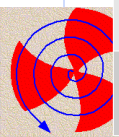
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Result for IOZone with multiple thread

- Initially run with default values of File Size and Block size → could not understand
- Increased file size using -g, it should be 3 times of RAM on the machine.
- Command used::

`./ionone -s 512000000 -r 4096 -i 0 -i 1 -t 1 -F /root/vol1/testiozone`

	RAID Controller	Avg throughput per process(writers)	Avg throughput per process(rewriters)	Avg throughput per process(readers)	Avg throughput per process(re-readers)
Eos with 12 HDD KB thread =1 mount point =12	PERC H710P Mini(Embedded)	110652.85 KB/sec	84256.88 KB/sec	126043.89 KB/sec	136674.09 KB/sec
Eos with 12 HDD thread=12 mount point =12	PERC H710P Mini(Embedded)	159149.85 KB/sec	164990.63 KB/sec	164627.31 KB/sec	166349.62 KB/sec
Eos with 16 HDD thread =1 mount point =16	PERC H730P Mini(Embedded)	243568.16 KB/sec	230368.39 KB/sec	241631.95 KB/sec	244617.86 KB/sec
Eos with 16 HDD thread=16 mount point =16	PERC H730P Mini(Embedded)	137305.10 KB/sec	137523.73 KB/sec	220540.04 KB/sec	222027.89 KB/sec
Eos with 16 HDD thread =7 mount point =7	PERC H730P Mini(Embedded)	223869.92 KB/sec	229151.56 KB/sec	235014.60 KB/sec	234988.96 KB/sec
Eos with 16 HDD thread =1 mount point =7	PERC H730P Mini(Embedded)	190517.33 KB/sec	188936.16 KB/sec	182141.70 KB/sec	182597.25 KB/sec
Eos with 16 HDD thread =1 mount point =1	PERC H730P Mini(Embedded)	198293.03 KB/sec	197595.88 KB/sec	190645.17 KB/sec	190964.84 KB/sec

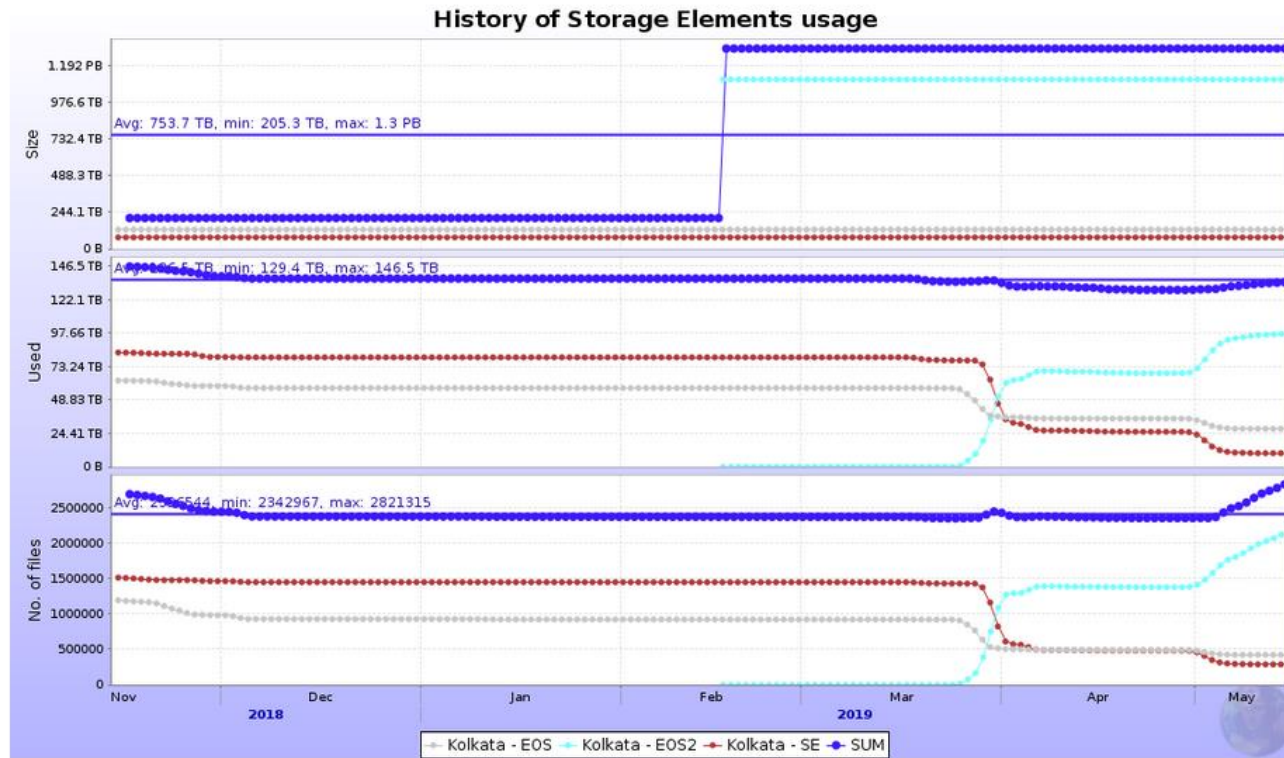




Overview of present Kolkata Tier-2 Storage

Annotations

What is this about

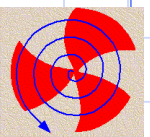


Statistics

Size				
Series	Last value	Min	Avg	Max
1. Kolkata - EOS	128.9 TB	128.9 TB	128.9 TB	128.9 TB
2. Kolkata - EOS2	1.1 PB	1.1 PB	1.1 PB	1.1 PB
3. Kolkata - SE	76.39 TB	76.39 TB	76.39 TB	76.39 TB
Total	1.3 PB		1.3 PB	

Used				
Series	Last value	Min	Avg	Max
1. Kolkata - EOS	27.76 TB	27.76 TB	51.47 TB	63.28 TB
2. Kolkata - EOS2	97.34 TB	0 B	40.21 TB	97.66 TB
3. Kolkata - SE	9.996 TB	9.996 TB	65.5 TB	83.6 TB
Total	135.1 TB		157.2 TB	

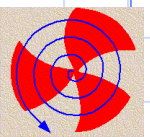
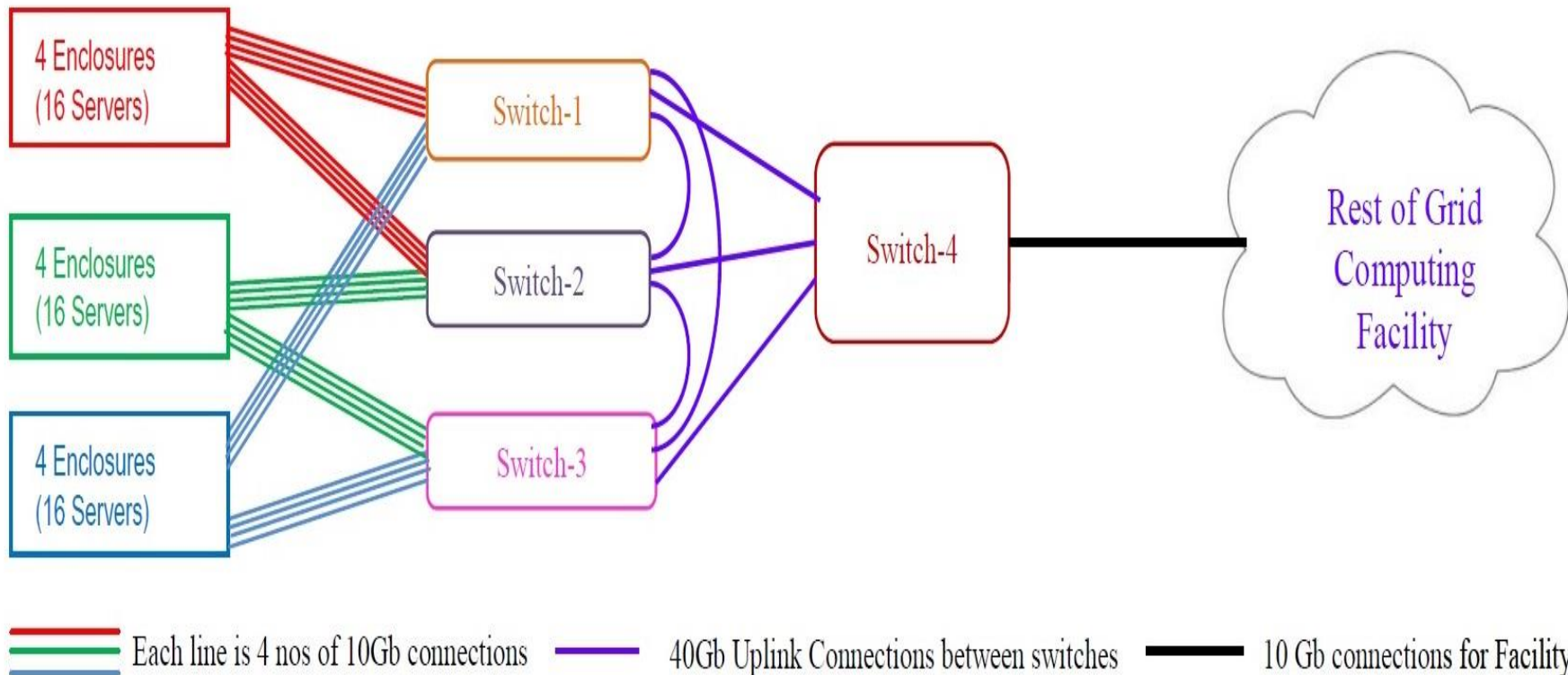
Number of files				
Series	Last value	Min	Avg	Max
1. Kolkata - EOS	421713	421676	817631	1198994
2. Kolkata - EOS2	2133774	0	805580	2143592
3. Kolkata - SE	286448	286448	1191433	1508450
Total	2841937		2814645	





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Logical Network Connectivity



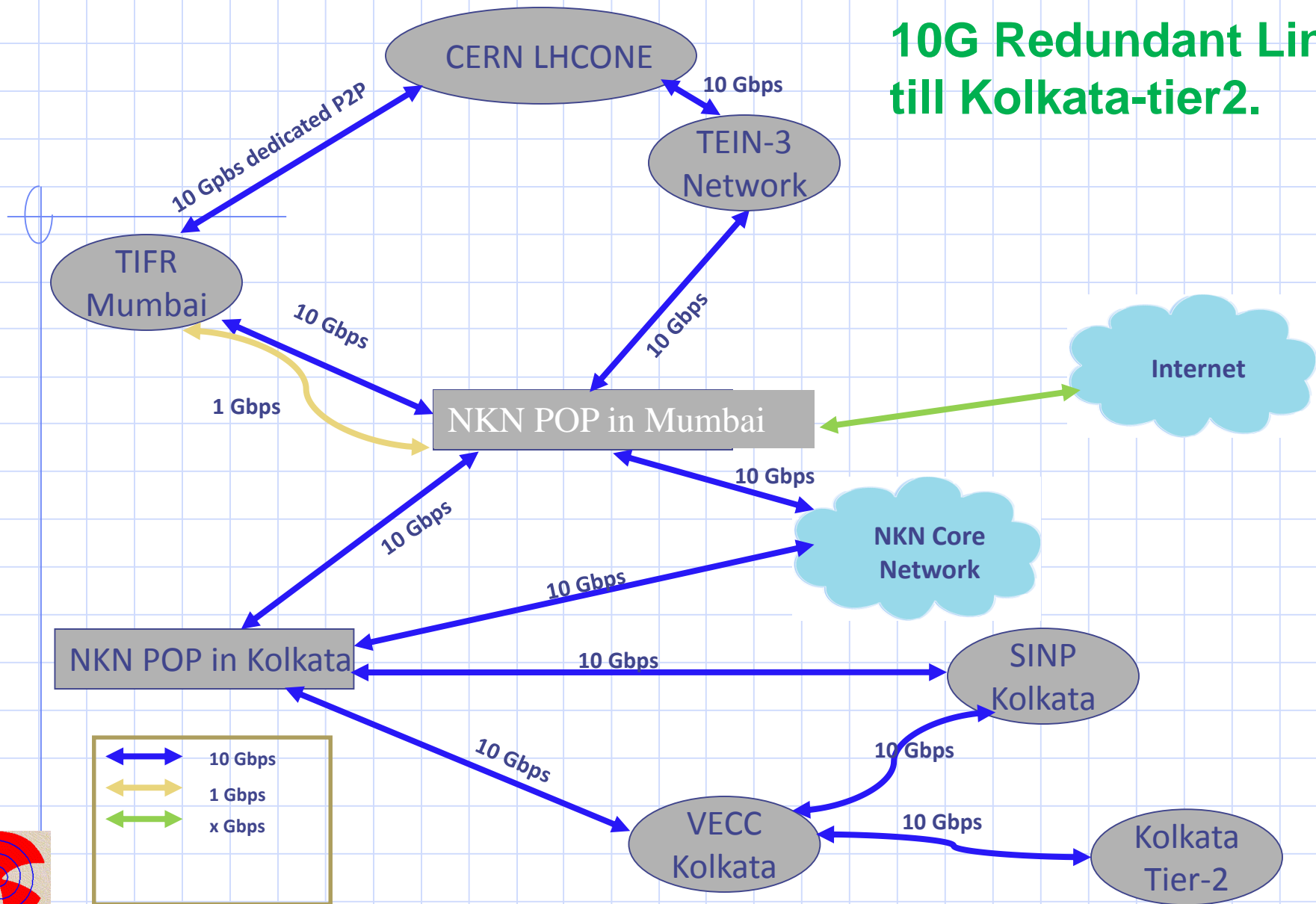


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KOLKATA Tier-2@Alice Grid

Physical Network Connectivity from CERN -- Kolkata, India

10G Redundant Link till Kolkata-tier2.





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IPv6 Configuration and Implementation

Kolkata Tier-2 Domain Name: tier2-kol.res.in
From ERNET

IPv4 Range :- 144.16.112.0/32
From ERNET

NKN providing network.

Tried few options such that same AS for LHC ONE announcement

NKN Provided IPv6 Segment.
2405:8a00:c012/48
IPv6 also part of LHCONE.

DNS Host name

kol.res.in
kol.res.in

144.16.112.3
144.16.112.4

IPv4

2405:8a00:c012::a:3
2405:8a00:c012::a:4

IPv6 naamak.tier2-

suchak.tier2-

Services Host name

kol.res.in
kol.res.in

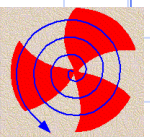
144.16.112.13
144.16.112.12

IPv4

2405:8a00:c012::a:13
2405:8a00:c012::a:12

IPv6 grid01.tier2-

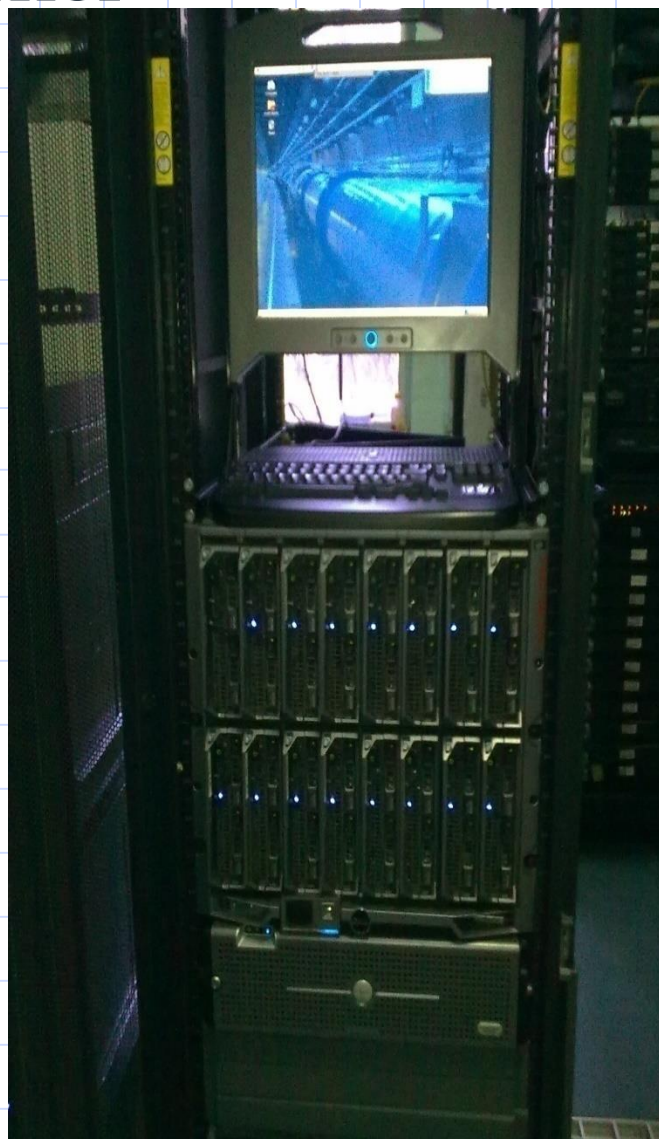
gridce02.tier2-



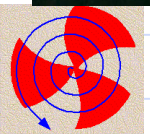


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Grid-Peer Tier-3 Cluster Status



- More Load on the CLUSTER as CBM user also utilizing the cluster
- 8 Numbers of HP BL675G7 Blade servers each with 4 * AMD Opteron Processor 6380(16 Core)
- 3 Number of Dell M610 Blade servers each with 2 * Intel Quad Core E5530 Xeon 2.4GHz CPU 8MB cache and 16GB RAM.
- 6 out of 8 HP blade servers are dedicated for non-interactive nodes and rest is being used for CBM work.
- 3 Dell blade servers are being used as interactive node.
- Extensively used by VECC users and PMD Collaborators, completed more than 35000 jobs successfully in last 3 months.
- 75 TB storage, almost filled up.
- 75 + active users (across India.)
- 45 + active users (in VECC.)
- Tape based backup of Tier-3 storage performed twice in a month.

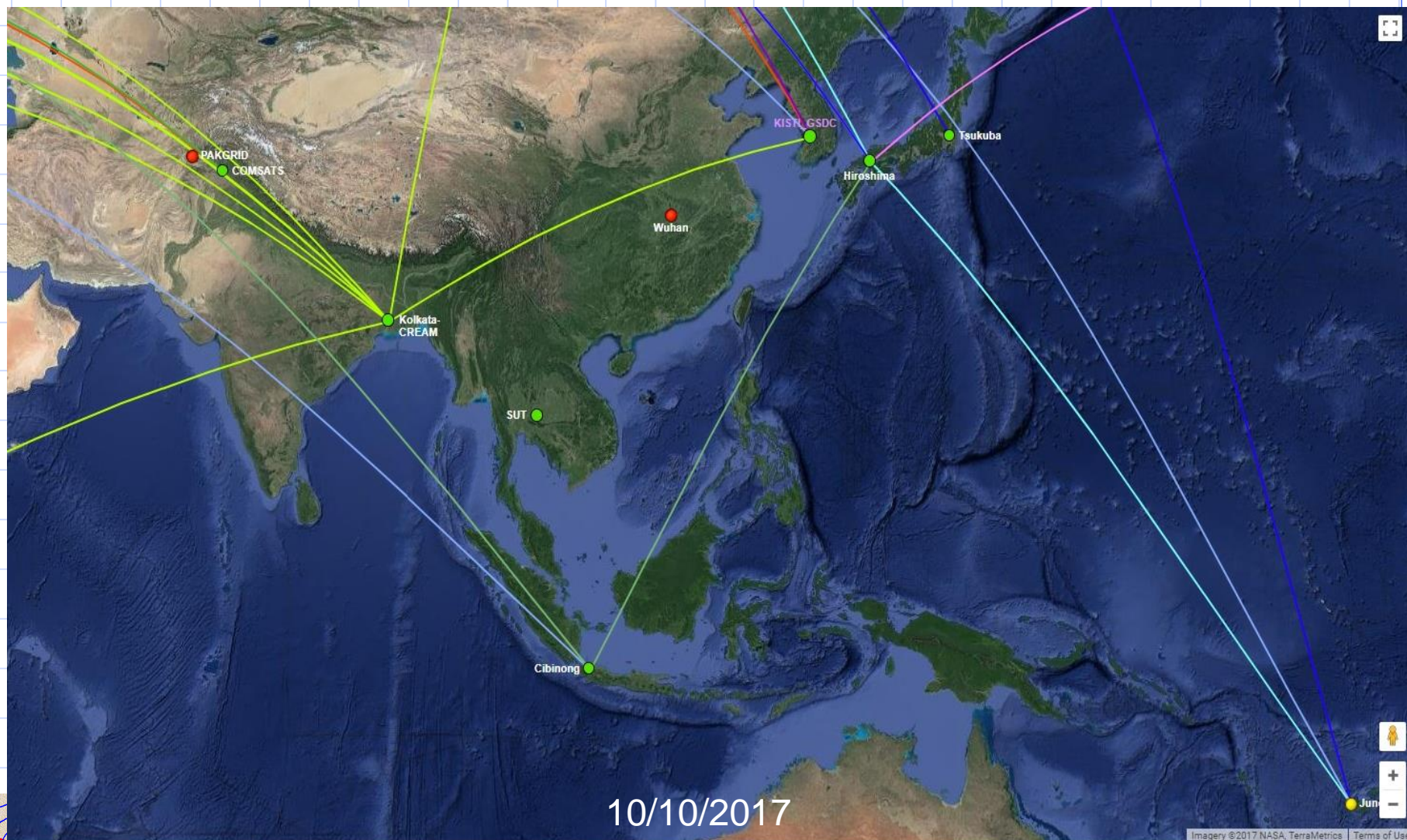




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Connectivity between Asian Tiers

From last 4 years started Networking between ASIAN Sites.
Initiative by ATCF. Connectivity increasing day by day.

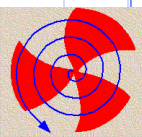


10/10/2017



Future Road Map

- Started Market survey for procurement of 1.5 PB of disk based storage servers.
 - Similar as present one:- 7 Nos of 18*12 TB NLSAS disk servers.
- Will procure approx. 15 K HEP Spec 2006 computing servers during 2019.
- Budget available till March 2020. For future budget need to fight (as NO PMD).
- Will procure more disk based storage.
- Is Cloud Computing be explored, if Yes, any rule regulation.
- Is accelerator or GPU Computing be used.
- Can AMD or Power processors be purchased? AMD has new 32 core processors.
If Yes, any HEP spec number for the same?

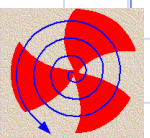




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Queries and Questions

- How to rebuild a failed disk under RAIN-6 configuration? (Still not clear, Any automatized procedure.)
- Can have Hot Spare disk concept under EOS?
- How to optimize EOS to utilize parallel read, write on different Groups.
- How to add new disk servers under existing EOS? (Can expand the group.)
- Graphical Monitoring of EOS will help for optimizing and debugging.
- UMD-4 time line? How to create gridmap? Compilation of Argus etc.
- Which middleware configuration tool and batch scheduler supported?



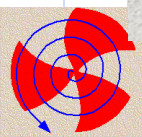


ALICE

KOLKATA Tier-2@Alice Grid



Thank You
Group Photo of Bergen Meeting
Latchezar was behind the camera.

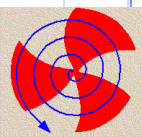


Vikas Singh, IITC,
INDIA



ALICE

BackUp Slides

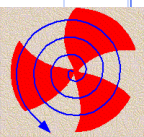




ALICE

Expanding of Kolkata Tier2 EOS

- ❖ Name of Instance: ALICE::Kolkata::EOS2
- ❖ Space: 1.1PB.
- ❖ 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



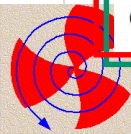


ALICE

KOLKATA Tier-2@Alice Grid

EOS Storage Solution

disk based, low latency storage solution based on RAIN-6

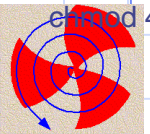




ALICE

Installation of MGM -Master (See more Prasun Slides)

```
yum install -y openssl
systemctl list-unit-files | grep puppet (if puppet found, remove it)
mkdir -p /etc/grid-security/daemon
hostname -f
openssl req -new -x509 -days 3650 -nodes -out /etc/grid-security/hostcert.pem -keyout /etc/grid-security/hostkey.pem (Dummy Certificate)
openssl x509 -in /etc/grid-security/hostcert.pem -text
openssl x509 -in /etc/grid-security/hostcert.pem -serial -dates -noout
diff -qs <(openssl rsa -in /etc/grid-security/hostkey.pem -pubout) <(openssl x509 -in /etc/grid-security/hostcert.pem -pubkey -noout)
cp /etc/grid-security/hostcert.pem /etc/grid-security/daemon/hostcert.pem; cp /etc/grid-security/hostkey.pem /etc/grid-
security/daemon/hostkey.pem
ls -ltr /etc/grid-security/
ls -ltr /etc/grid-security/daemon/
chown -R daemon:daemon /etc/grid-security/daemon
ls -ltr /etc/grid-security/*.pem
chmod 400 /etc/grid-security/hostkey.pem
chmod 600 /etc/grid-security/hostcert.pem
***** Install EGI-trustanchors.repo under /etc/yum.repos.d for ca certificate *****
wget http://repository.egi.eu/sw/production/cas/1/current/repo-files/EGI-trustanchors.repo -O /etc/yum.repos.d/EGI-trustanchors.repo
yum install -y ca-policy-egi-core
ls -ltr /etc/grid-security/certificates/nginx-bundle.pem
ls -ltr /etc/grid-security/certificates/
cat /etc/grid-security/certificates/*.pem > /etc/grid-security/certificates/nginx-bundle.pem
ls -ltr /etc/grid-security/certificates/nginx-bundle.pem
***** Install XROOTD.repo under /etc/yum.repos.d for xrootd packages *****
wget http://xrootd.org/binaries/xrootd-stable-slc$flavour.repo -O /etc/yum.repos.d/xrootd.repo
***** Install eos.repo under /etc/yum.repos.d for eos packages
wget https://raw.githubusercontent.com/cern-eos/eos/master/utills/eos-el7.repo -O /etc/yum.repos.d/eos.repo
rpm --import http://storage-ci.web.cern.ch/storage-ci/storageci.key
yum install eos-server eos-client eos-nginx eos-fuse eos-test eos-apmon eos-cleanup jemalloc nscd xrootd-alicetokenacc
yes | xrdssadmin -k eos -u daemon -g daemon add /etc/eos.keytab
chown daemon:daemon /etc/eos.keytab
chmod 400 /etc/eos.keytab
```





ALICE

Installation of MGM -Slave (See more Prasun Slides)

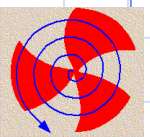
```
yum install -y openssl
systemctl list-unit-files | grep puppet (if puppet found, remove it)

Make password free

mkdir -p /etc/grid-security/daemon
hostname -f (eos-slave.tier2-kol.res.in)

Copy host certificate of MGM-Master i.e. eos-mgm and paste into /etc/grid-security/ of eos-slave i.e.
    scp -rv eos-mgm:/etc/grid-security/host*.pem /etc/grid-security/
openssl x509 -in /etc/grid-security/hostcert.pem -text
openssl x509 -in /etc/grid-security/hostcert.pem -serial -dates -noout
diff -qs <(openssl rsa -in /etc/grid-security/hostkey.pem -pubout) <(openssl x509 -in /etc/grid-security/hostcert.pem -pubkey -noout)
cp /etc/grid-security/hostcert.pem /etc/grid-security/daemon/hostcert.pem; cp /etc/grid-security/hostkey.pem /etc/grid-
security/daemon/hostkey.pem

ls -ltr /etc/grid-security/
ls -ltr /etc/grid-security/daemon/
chown -R daemon:daemon /etc/grid-security/daemon
ls -ltr /etc/grid-security/*.pem
chmod 400 /etc/grid-security/hostkey.pem
chmod 600 /etc/grid-security/hostcert.pem
***** Install EGI-trustanchors.repo under /etc/yum.repos.d for ca certificate *****
wget http://repository.egi.eu/sw/production/cas/1/current/repo-files/EGI-trustanchors.repo -O /etc/yum.repos.d/EGI-trustanchors.repo
yum install -y ca-policy-egi-core
```





ALICE

Namespace synchronisation between Master and Slave MGM

After successful installation of eos, we check the namespace sync in both mgm i.e.:-

```
#eos -b ns
```

Output of above command is show only one hostname as RW-Master in Replication section. It means there has no replication between master and slave. So, we first start the replication between master and slave by eossync. We run below eossync command in both mgm i.e.:-

- `systemctl start eossync`
- `systemctl start eossync@*`
- `systemctl status eossync@*`

After start eossync, again check namespace i.e. `eos -b ns`. If eossync is successful, the output is like to below:-

➤ **In eos-mgm:-**

```
# -----  
ALL   Replication          mode=master-rw state=master-rw master=eos-mgm.tier2-kol.res.in configdir=/var/eos/config/eos-mgm.tier2-  
kol.res.in/ config=default mgm:eos-slave.tier2-kol.res.in=ok mgm:mode=slave-ro mq:eos-slave.tier2-kol.res.in:1097=ok  
# -----  
ALL   File Changelog Size    1.03 GB  
ALL   Dir  Changelog Size    515.61 MB
```

➤ **In eos-slave:-**

```
ALL   Replication          mode=slave-ro state=slave-ro master=eos-mgm.tier2-kol.res.in configdir=/var/eos/config/eos-mgm.tier2-  
kol.res.in/ config=default mgm:eos-mgm.tier2-kol.res.in=ok mgm:mode=master-rw mq:eos-mgm.tier2-kol.res.in:1097=ok  
ALL   Namespace Latency Files      0  
ALL   Namespace Latency Directories 0  
ALL   Namespace Pending Updates    0  
# -----  
ALL   File Changelog Size    1.04 GB  
ALL   Dir  Changelog Size    525.66 MB
```

