

# Status Report on KISTI's Computing Activities

**Global Science experimental  
Data hub Center**

October 29, 2018  
Seo-Young Noh



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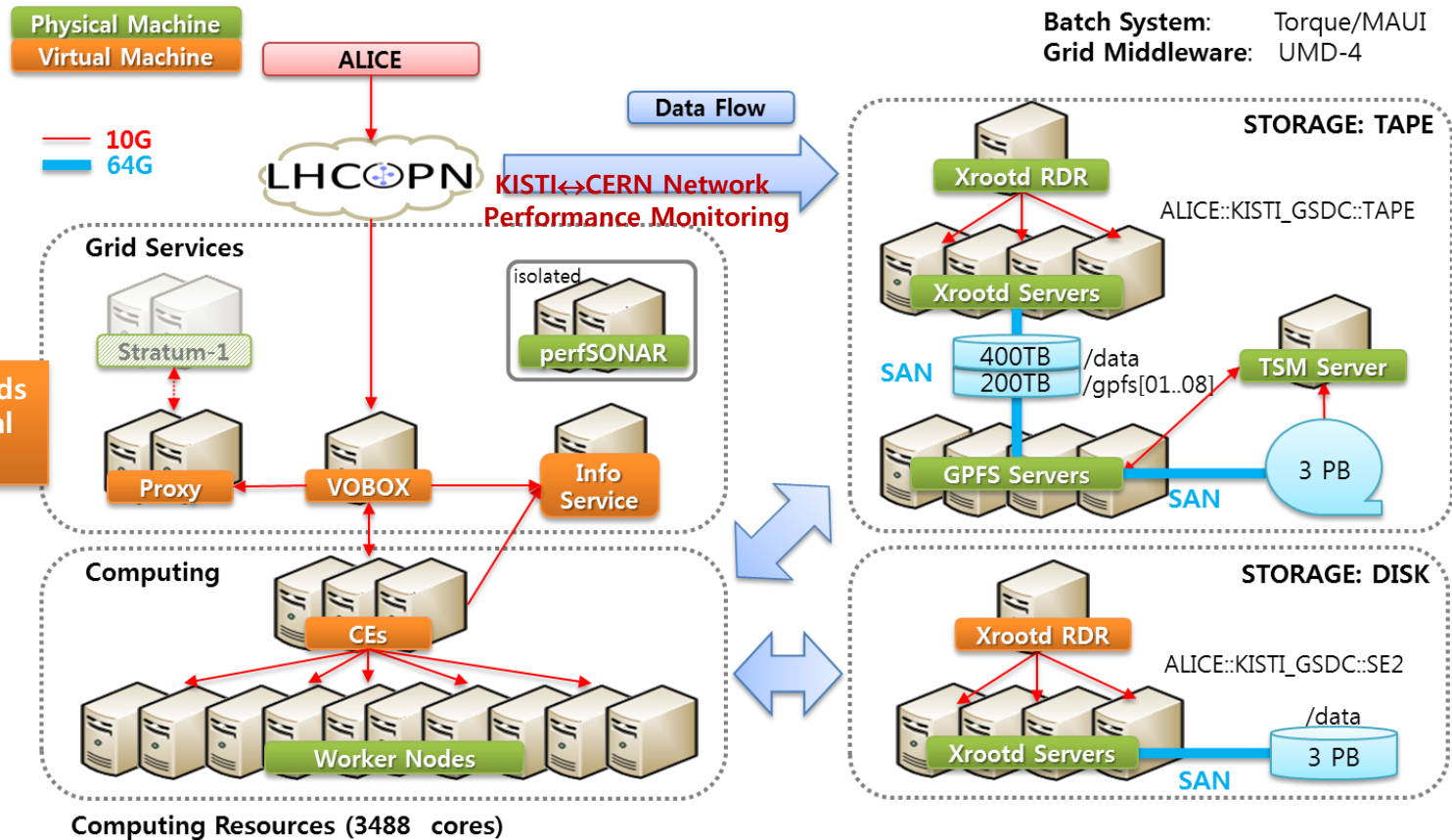
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# WLCG Tier-1 Status

# WLCG Tier-1 Infrastructure

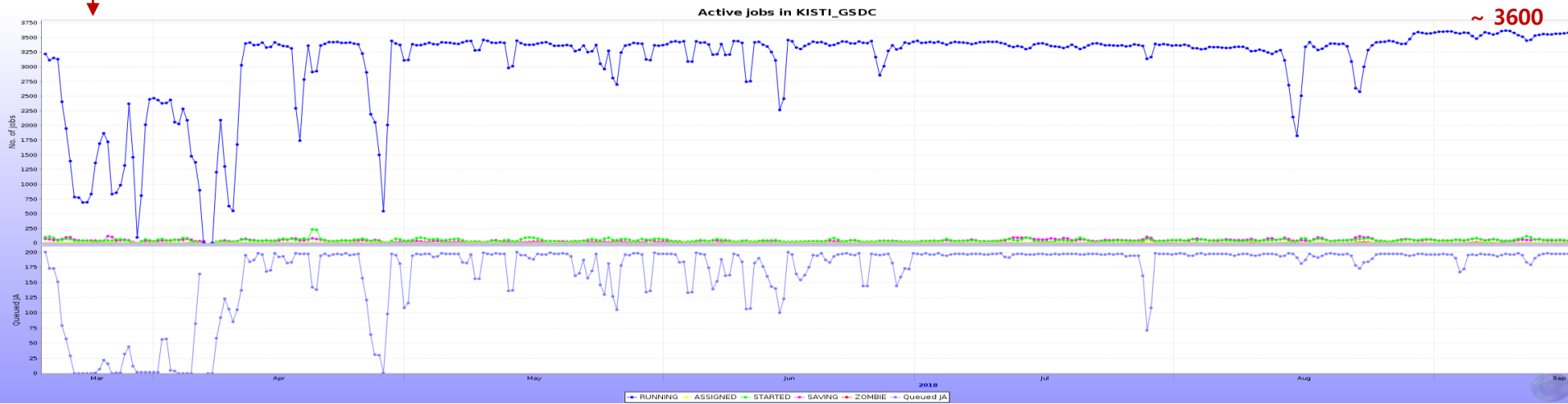
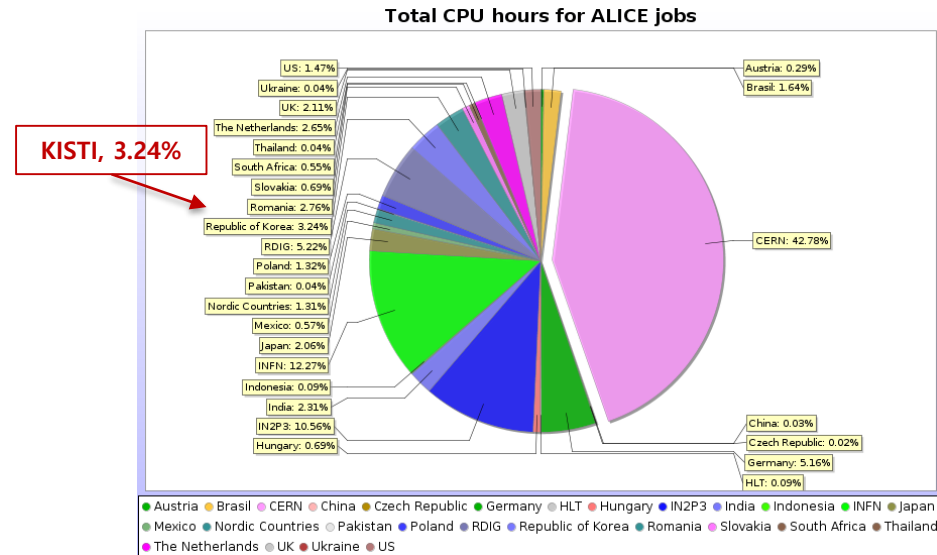
## 3,680 Job slots, 6PB Storage, 10Gbps fully connected Services



# Computing Jobs

**KISTI Tier-1 has been providing reliable and stable service**

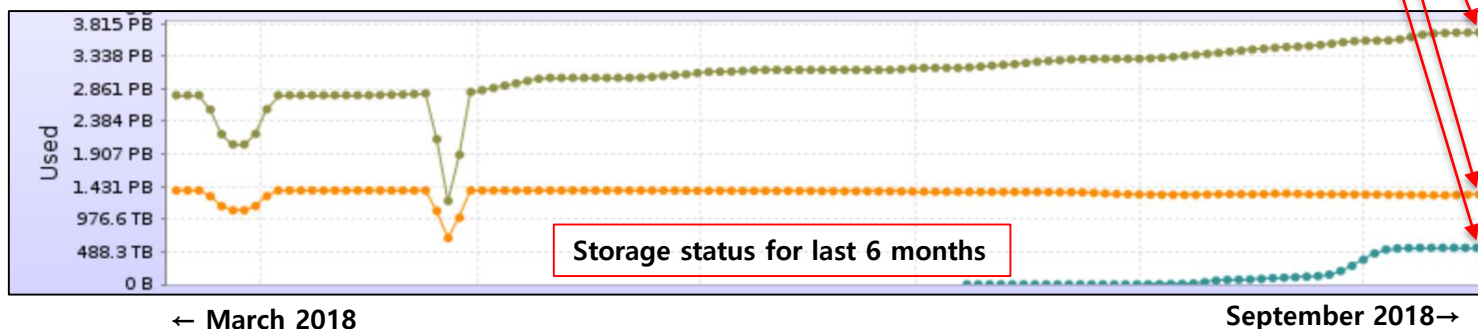
**Max 3,680 concurrent jobs**  
 (52 nodes x 32 cores, 334 HS06/node)  
 (38 nodes x 32 cores, 356 HS06/node)  
 (20 nodes x 40 cores, 472 HS06/node)  
 ~ 41 kHS06  
 Meet the pledge of 2018 (>41kHS06)



**More than 3.1 million jobs during last 6 months**

# Storage(Disk)

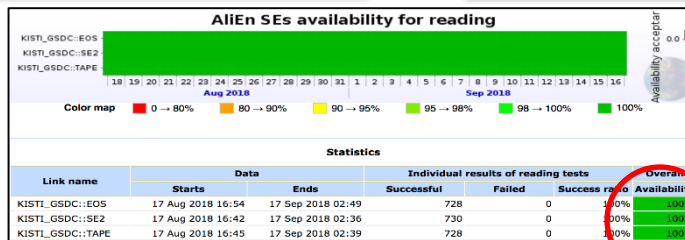
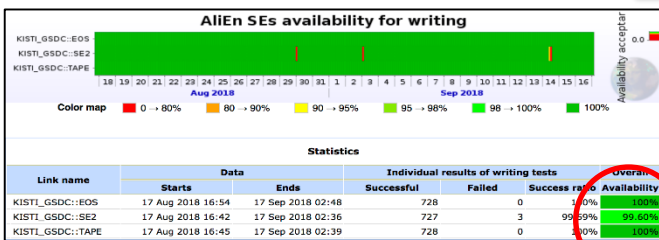
- 3000TB (1.5 PB added in May)
  - ➔ XRootD based data handling (1 redirector + 5 storage nodes)
  - ➔ EOS based data handling (new, setup in July) (2 MGMs + 5 FSTs)



Disk storage elements																						
KISTI				Catalogue statistics				Storage-provided information				Functional tests		Last day add tests		Demotion						
SE Name	AliEn SE	AliEn name	Size	Used	Free	Usage	No. of files	Type	Size	Used	Free	Usage	Version	EOS Version	add	get	rm	3rd	Last OK add	Successful	Failed	factor
1. KISTI_GSDC - EOS	ALICE::KISTI_GSDC::EOS		1.5 PB	548 TB	988 TB	35.68%	2,425,466	FILE	1.465 PB	549.4 TB	950.6 TB	36.63%	> rootd v4.8.3						14.09.2018 09:48	24	0	0
2. KISTI_GSDC - SE2	ALICE::KISTI_GSDC::SE2		1.446 PB	1.311 PB	138.5 TB	90.64%	21,235,354	FILE	1.446 PB	1.36 PB	88.31 TB	94.04%	> rootd v4.3.0						14.09.2018 10:36	24	0	0
<b>Total</b>			<b>2.946 PB</b>	<b>1.846 PB</b>	<b>1.1 PB</b>		<b>3,660,820</b>		<b>2.911 PB</b>	<b>1.897 PB</b>	<b>1.015 PB</b>				<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>				

Disk Usage 90.6%/35.7%

Real Usage 94%/36.6%

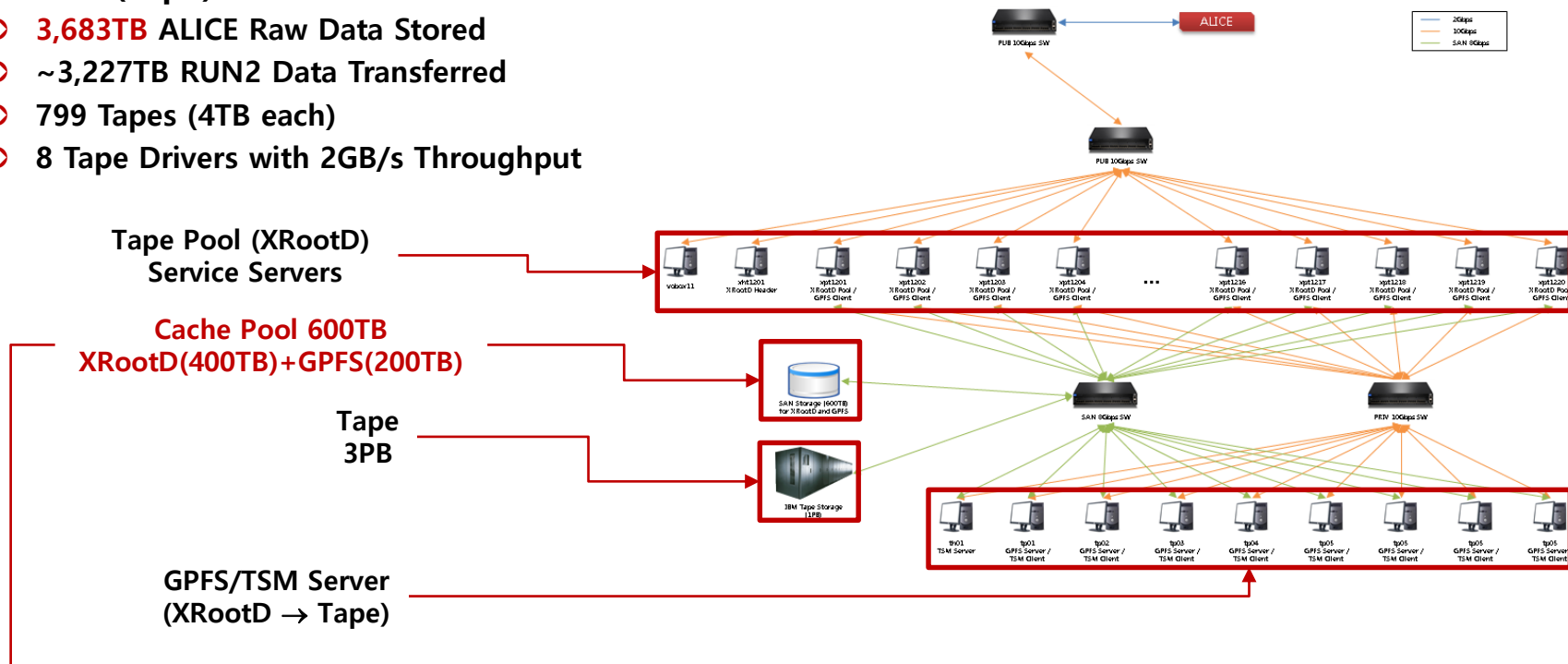


> 99% availability for read/write in disk  
= 100% availability in tape

# Storage (Tape)

## 3000TB (Tape)

- ➔ 3,683TB ALICE Raw Data Stored
- ➔ ~3,227TB RUN2 Data Transferred
- ➔ 799 Tapes (4TB each)
- ➔ 8 Tape Drivers with 2GB/s Throughput



Tape storage elements

KISTI																							
SE Name	AliEn SE	AliEn name	Size	Used	Free	Usage	No. of files	Type	Size	Used	Free	Usage	Version	EOS Version	Functional tests				Last day add tests		Demotion		
			Catalogue statistics				Storage-provided information																
1.	KISTI_GSDC - TAPE	ALICE::KISTI_GSDC::TAPE	387.2 TB	3.683 PB	-	974%	2,798,196	FILE	384.6 TB	353.3 TB	31.35 TB	91.85%	Xrootd v4.4.1			add	get	rm	3rd	Last OK add	Successful	Failed	factor
Total			387.2 TB	3.683 PB	0		2,798,196		384.6 TB	353.3 TB	31.35 TB					1	1	1	1	14.09.2018 10:39	24	0	

Using Disk-based Cache to speed up the read/write from tape system

# Site Availability/ Reliability

## Keeping top most quality of services

- ➔ Monthly target is 97% in WLCG
- ➔ Right on the track for stable and reliable service

$$Reliability = \frac{T_{UP}}{T_{UP} + (T_{DOWN} - T_{SCHED\_DOWN})}$$

$$Availability = \frac{T_{UP}}{T_{UP} + T_{DOWN}}$$

### ■ Summary

	Reliability		Availability	
	Overall in 2018	Last 6 months	Overall in 2018	Last 6 months
ALICE	99.4 %	<b>99.8 %</b>	98.9 %	<b>98.8 %</b>

### ■ Monthly Availability/ Reliability (%)

Month	March	April	May	June	July	August
Reliability	100	100	100	99	100	100
Availability	100	<b>93<sup>1)</sup></b>	100	100	100	100

1) Power shortage for 48 hours due to scheduled Power Transformer Replacement

Participating in WLCG operation meeting every week,  
closely collaborating with WLCG members



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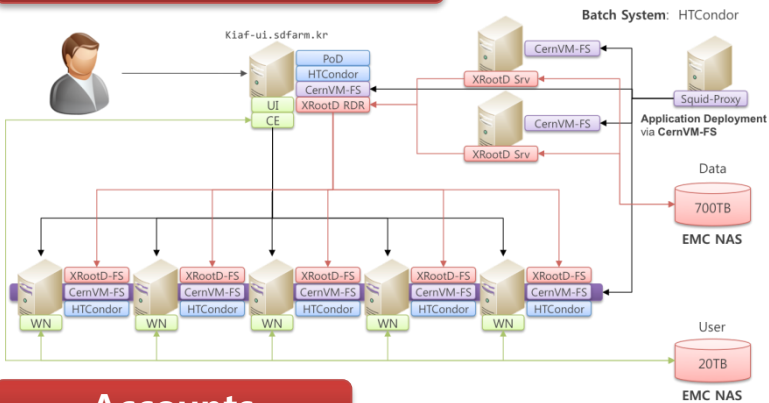
**KiAF, CMS T3@KISTI**

# ALICE Tier-3 (KIAF)

## Dedicated to Korean ALICE community

- ➔ 200 cores, 700TB
- ➔ Upgraded in Mar. 2018
- ➔ CVMFS, XRootD, HTCondor
- ➔ Bi-weekly user meeting (vidyo)

## System Configuration



## Accounts

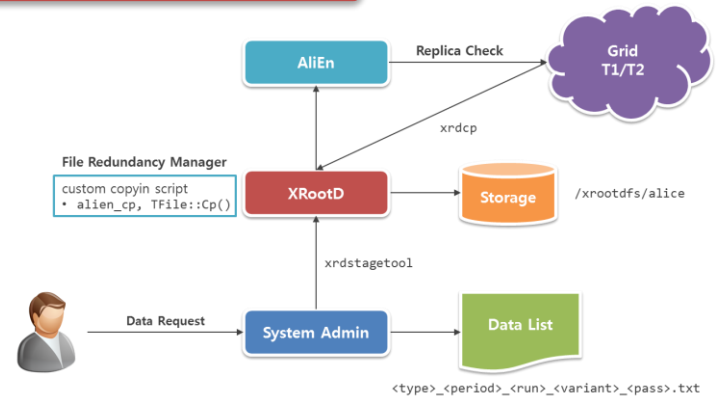
Univ.	Inha	Pusan	Yonsei	GWNU	Total
#	12	6	7	1	26

## Jobs Processed

2014	2015	2016	2017	2018
101*	3,703	117,432**	1,973,872	303,075

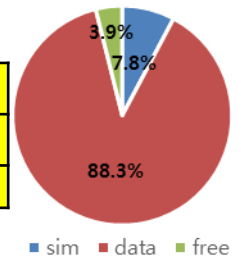
\* Jobs have been sharply increased after renewal

## Data Transmission

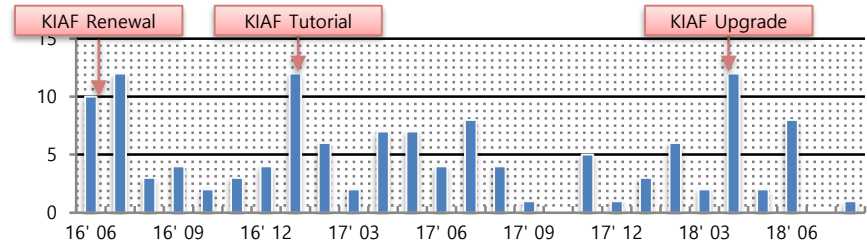


## Disk Usage(TB)

	Total	Used	Free	Usage
Data	700	672.7	27.3	96.1%
User	20	13.7	6.3	68.5%



## Technical Supports

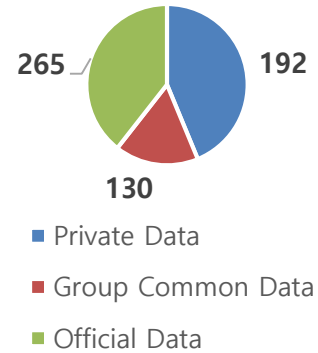
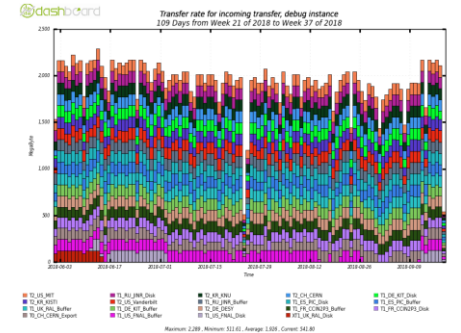
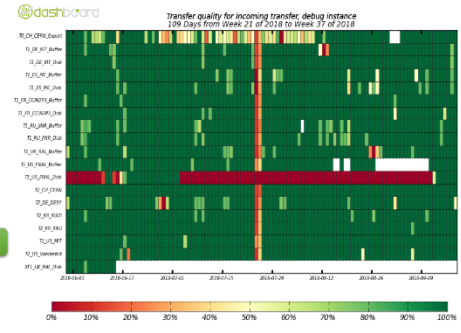
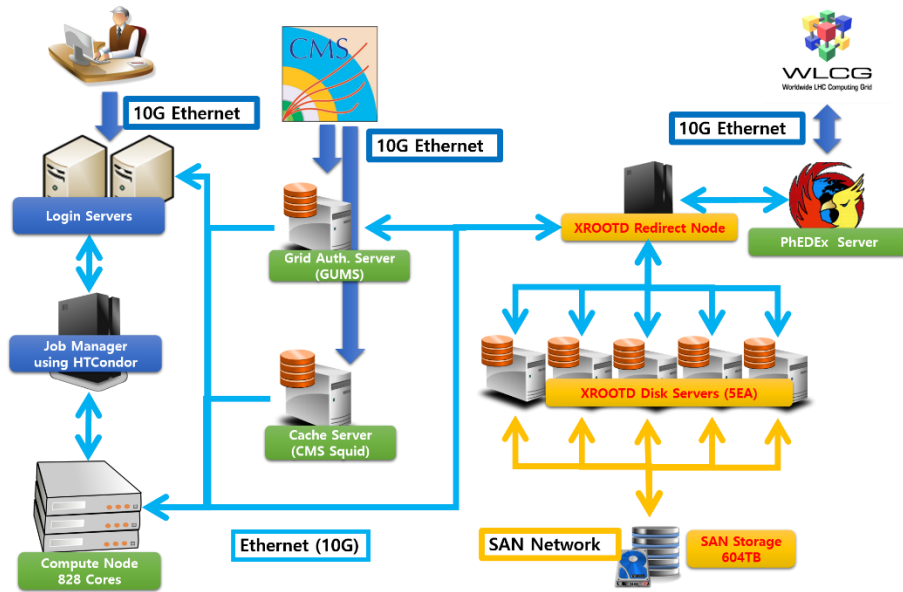


# CMS Tier-3

828 Cores + 604TB

Data Transfer Links

Linked to all Tier-1s and some Tier-2s bidirectional way



Storage Usage

Size	Used	Avail	Use%	Mounted on
20T	18T	2.9T	86%	/cms
604T	590T	15T	98%	/xrootd

Accounts

Univ.	KNU	KU	SNU	SKKU	UOS	KHU	Hanyang	JNU	Sejong	Total
accounts	13	10	18	9	20	1	6	6	1	84

Jobs completed

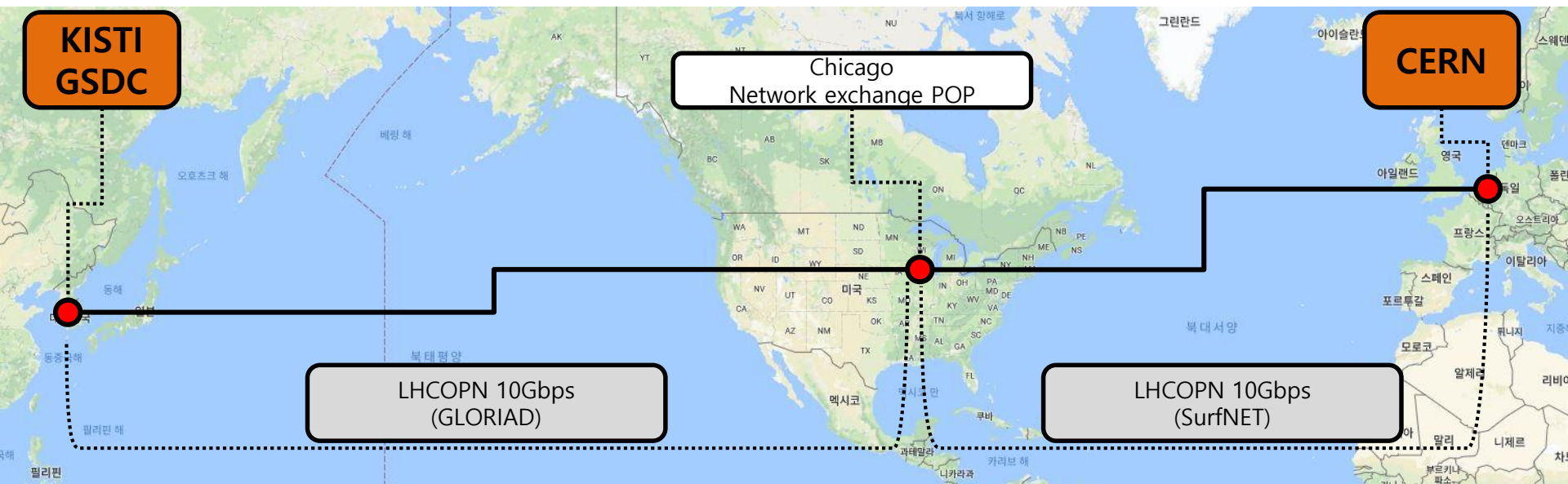
	Mon.	Dec. '17	Jan. '18	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
Jobs		537,126	188,571	276,279	504,628	713,501	405,902	511,704	401,675	398,645

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# Network & New CMS Tier-2

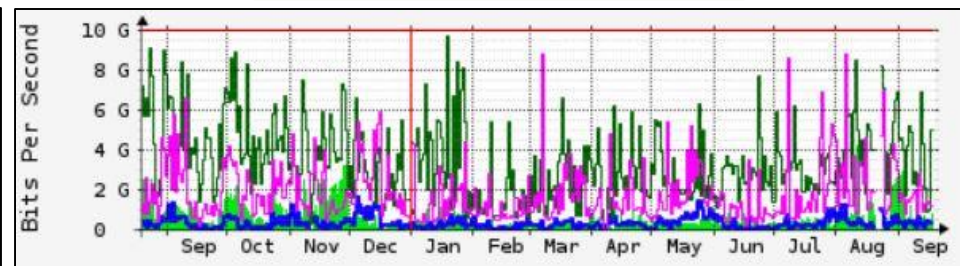
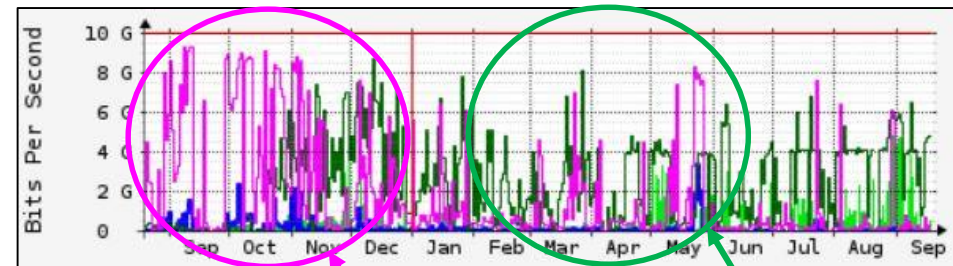
# KISTI-CERN LHCOPN

KISTI↔CERN 10Gbps dedicated network is working fine



MAIN(LHCOPN)

BACKUP(GLORIAD)



Data Transferred from CERN    Data Transferred from KISTI

# 4<sup>th</sup> Asia Tier Center Forum

## Steering wheel to solve common issues and troubles faced by Asia Tier centers



### ■ Suranaree University of Technology @ Thailand

- ➔ November 21-22
- ➔ Asia Network Connectivity Update – Fast Data Network
- ➔ Possibility on Distributed Storage & Common Tier-1

### ■ Confirmed Participants

- ➔ 12 institutes from Japan, China, Thailand, Indonesia, India, Pakistan, Korea
- ➔ Experts from CERN WLCG, NeIC, NRENs



- 24 participants from 10 sites (ASGC, COMSATS, Hiroshima, Tsukuba, Wuhan, SUT, LIPI, Kolkata, TIFR, KISTI), TEIN\*CC, KREONet, ESnet and CERN



- 20 participants from 7 sites (\*COMSATS, Hiroshima, \*Wuhan, NECTEC, SUT, LIPI, KISTI), \*TEIN\*CC, KREONet, ThaiREN, UniNET, GÉANT and CERN

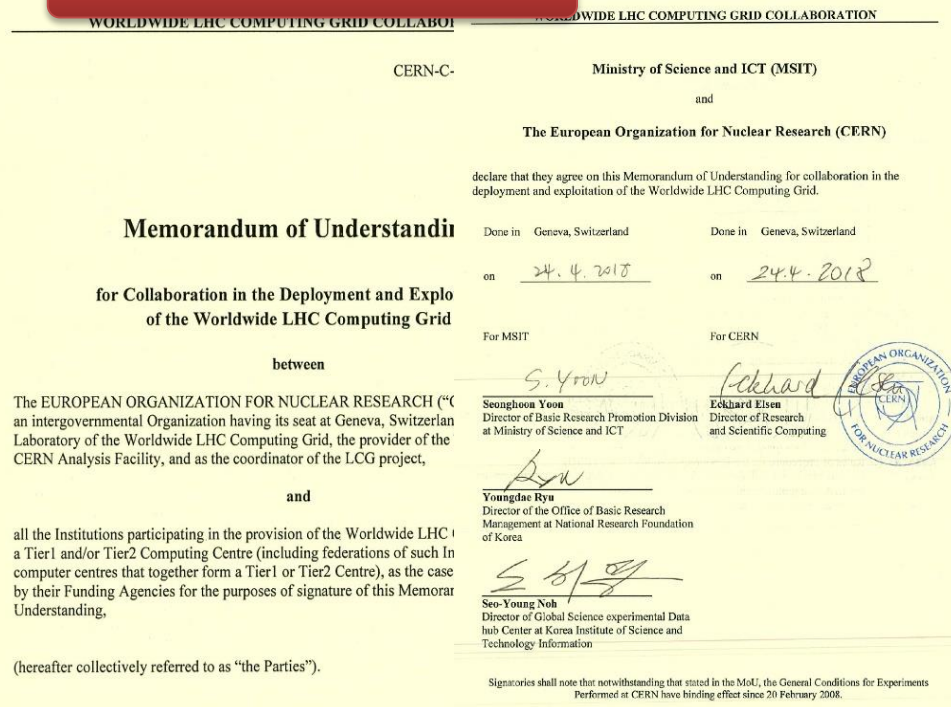


- 30 Participants from 13 sites (ASGC, COMSATS, Hiroshima, IHEP, KISTI, \*Kolkata, LIPI, Malaya, SUT, TIFR, Tokyo, Tsukuba, \*Wuhan), ESnet, KREONet, MYREN, SINET, TransPAC, TEIN\*CC and CERN

# CMS Tier-2 MOU

## MOU has been signed at April CKC meeting@CERN

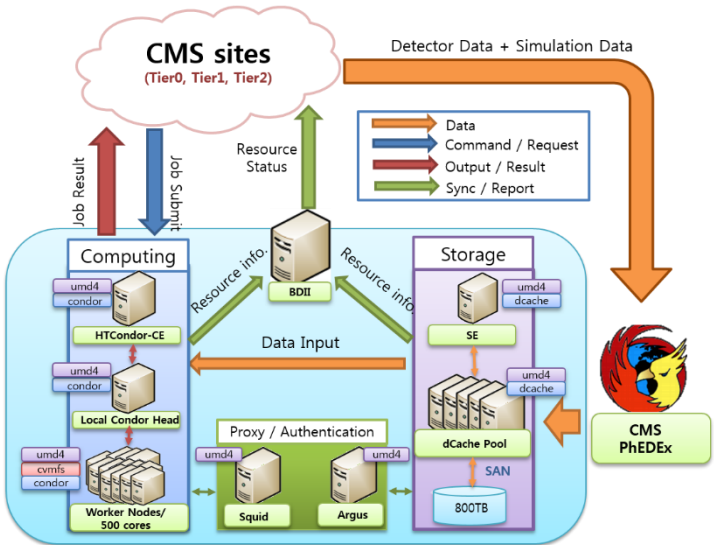
### CMS Tier-2 WLCG MoU



Responsible for **more than 95% reliable service quality** and **fast service recovery** within reasonable time  
(2 hours during office time and 72 hours during non office time)

# CMS Tier-2 Service Status

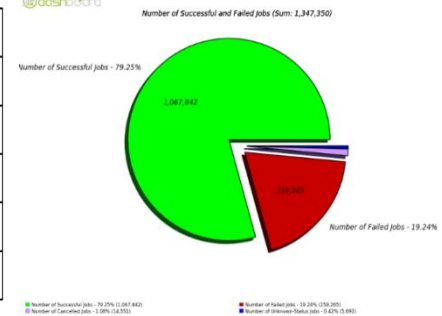
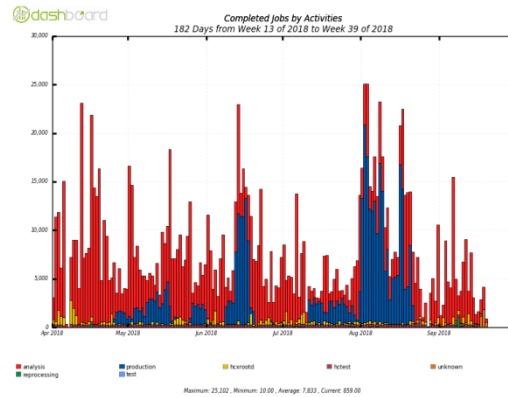
## Configuration



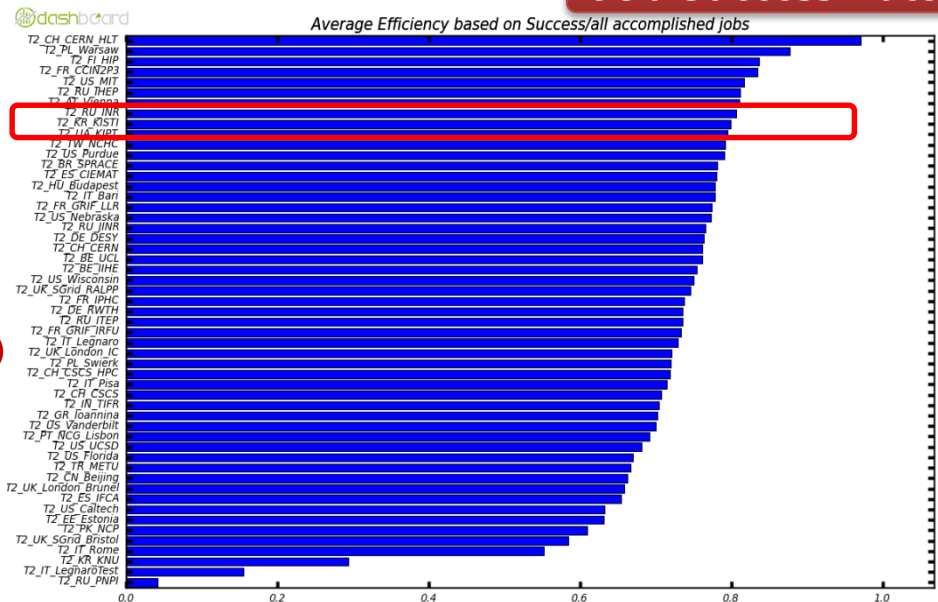
**500 core, 800TB**

- ➔ Stable service
- ➔ 1,067,851 job completed during 18.04~'18.09.19. (79.25% Success rate)
- ➔ Data transmission using PHEEx
  - Commissioned to T0(2), T1(15), T2(44), T3(1)

## Job Activities



## Job Success Rate





# CMS Tier-2 Monitoring

## CMS Tier-2 Report

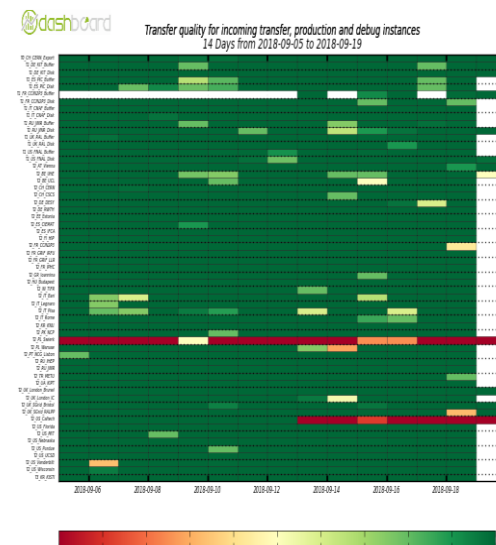
T2_KR_KISTI																						
LifeStatus:	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓																					
Site Readiness:	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	n/a	n/a	n/a				
Maintenance:	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up					
HammerCloud:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	n/a					
SAM Availability:	98%	100%	98%	98%	98%	99%	98%	98%	98%	98%	98%	98%	98%	98%	100%	100%	100%					
Good T2 links from T1s:	14/14	14/14	14/14	14/14	15/15	14/14	14/14	14/14	14/14	14/14	14/14	14/14	14/14	14/14	13/13	15/15	15/15					
Good T2 links to T1s:	14/14	14/14	14/14	14/14	13/14	14/15	14/14	14/14	14/14	14/14	15/15	15/15	14/14	14/14	15/15	15/15	14/14					
Active T2 links from T1s:	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14					
Active T2 links to T1s:	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14					
	28	29	30	31	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
	Aug				Sep																	

## Service Quality

Federation	Availability	Reliability
HU-HGCC-T2	100%	100%
BR-SP-SPRACE	99%	99%
FR-GRIF	99%	99%
FR-IN2P3-CC-T2	99%	100%
T2_US_MIT	99%	99%
T2_US_Nebraska	99%	99%
T2_US_Purdue	99%	99%
T2_US_UCSD	99%	99%
T2_US_Wisconsin	99%	99%
UA-Tier2-Federation	99%	100%
UK-London-Tier2	99%	99%
CERN-PROD	98%	99%
DE-DESY-RWTH-CMS-T2	98%	98%
T2_US_Florida	98%	98%
PK-CMS-T2	97%	97%
PT-LIP-LCG-Tier2	97%	97%
GR-Ioannina-HEP	96%	96%
KR-KISTI-GSDC-02	96%	98%

Federation	Availability	Reliability
T2_US_Caltech	96%	96%
BE-TIER2	95%	97%
EE-NICPB	95%	96%
ES-CMS-T2	95%	98%
FR-IN2P3-IPHC	94%	94%
IT-INFN-T2	94%	95%
FI-HIP-T2	93%	93%
CN-IHEP	92%	99%
TW-CMS-T2	89%	91%
UK-SouthGrid	89%	90%
CH-CHIPP-CSCS	88%	88%
IN-INDIACMS-TIFR	88%	88%
TR-Tier2-federation	81%	83%
RU-RDIG	79%	80%
PL-TIER2-WLCG	69%	93%
AT-HEPHY-VIENNA-UIBK	54%	77%
T2-LATINAMERICA	N/A	N/A
TH-Tier2	N/A	N/A

## Data transmission links



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# Conclusions

# Movement to a new place

## New Supercomputing Building



## 1<sup>st</sup> Computing Room



25.7PFlops and 20PB ranked 11th in Top 500

## 2<sup>nd</sup> Computing Room



- ➔ All GSDC's computing resources will be moved to 2<sup>nd</sup> computing room in the new building
- ➔ Some ALICE data is unique, so such data will be replicated in a backup safely, then move to the new space
- ➔ Better environment for new computing resources including tape system which was limited due to space restriction

# Summary

- KISTI Tier-1 is **running stable and fully functional**, providing high quality of services for ALICE. **Disk storage has been increased to 3PB in May.**
- **New CMS Tier-2** is working properly, satisfying the quality of service (reliability and availability). Job completion rate is ranked high and service quality is ranked in middle among the other Tier-2s
- **10Gbps network link** between KISTI and CERN is working good. No significant service interruption in data transmission.
- **4<sup>th</sup> Asia Tier Center Forum** will be held at SUT in November. The forum has **focused on the network connectives in Asian Tiers** and there was good achievement. Through this forum, we will collaborate together to resolve common issues in Asian community.
- **GSCD computing resources will be move to the new building soon.** We are seriously considering data safety. New space will help us to provide better service.

**Thank you**