

Status Report on KISTI's Computing Activities

Oct. 28, 2024

KISTI Global Science experimental Data hub Center
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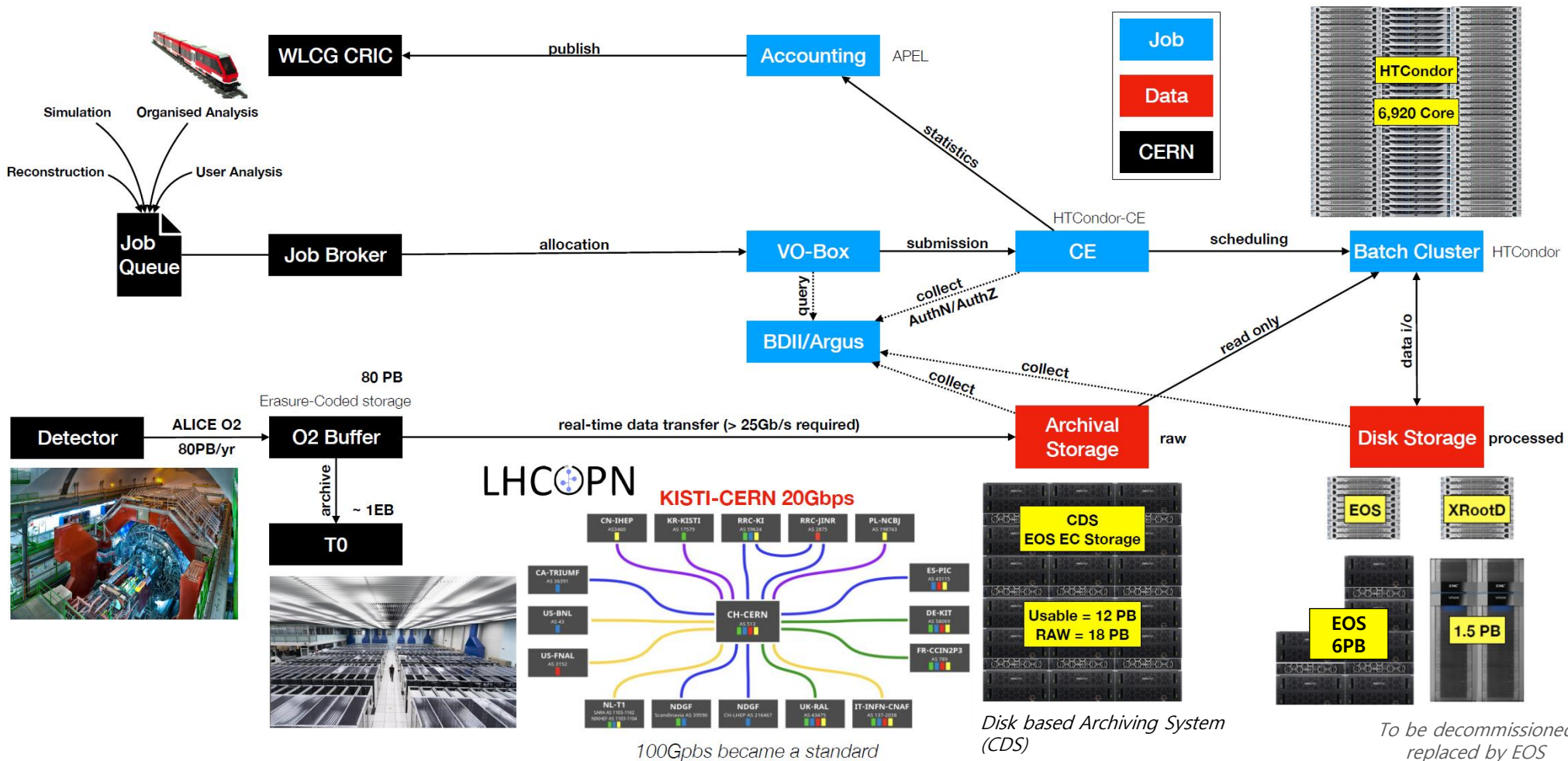
CONTENTS

- 01 WLCG Tier-1
- 02 WLCG Tier-2
- 03 Pledges and Asia Tier Center Forum
- 04 Conclusions



WLCG Tier-1

7,000 Job slots, 20PB Storage, 20Gbps dedicated link for OPN



KISTI Tier-1 has been providing reliable and stable service

○ 1% Contribution to Total(T0+T1+T2) ALICE Computing

○ Current CPU commitment: 63kHS23 ↑

50 node x 32 core, 334 HS23/node

27 node X 32 core, 356 HS23/node

25 node X 40 core, 472 HS23/node

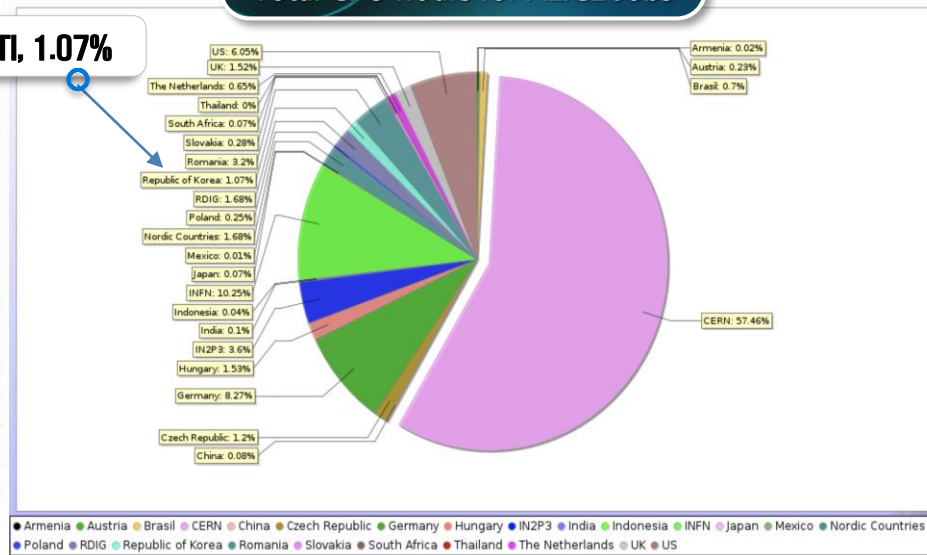
20 node X 160 core, 2196 HS23/node

= Max 6,664 concurrent jobs

○ 2024 pledge: 63kHS23, 2025 pledge: 69kHS23

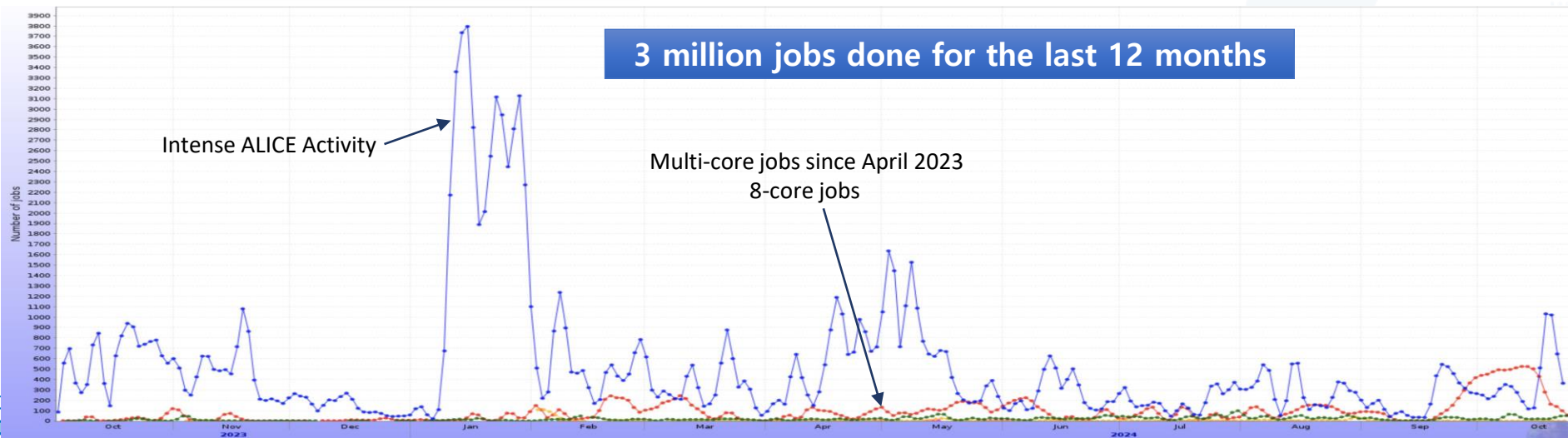
KISTI, 1.07%

Total CPU hours for ALICE Jobs



Active Jobs in KISTI_GSDC

3 million jobs done for the last 12 months



DISK (7,500 TB) / CDS-Tapeless Archiving (12,000 TB)

DISK (SE2) ○ XRootD based data handling (1,500 TB)
- 1 redirector + 5 storage nodes

Usage 750 TB, 51%

Read Availability 98.95%

Write Availability 98.99%

DISK (EOS) ○ EOS based data handling (6,000 TB)
- 2 MGMs (duplexing) + 5 FSTs (storage nodes)

Usage 2,779 TB, 46%

Read Availability 97.92%

Write Availability 99.34%

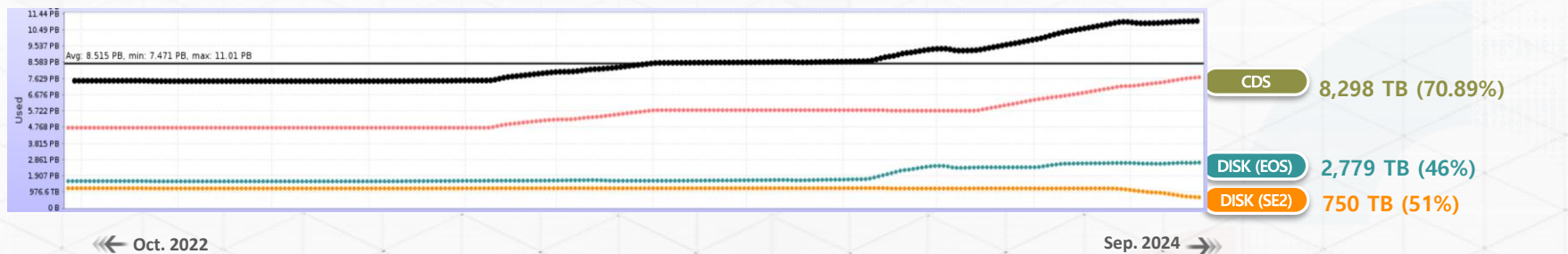
CDS ○ EOS based Custodial Disk Storage (12,000 TB)
- 3 MGMs (HA) + 18 FSTs (12+4 RAIN, 2 spares)

Usage 8,398 TB, 70.89%

Read Availability 98.37%

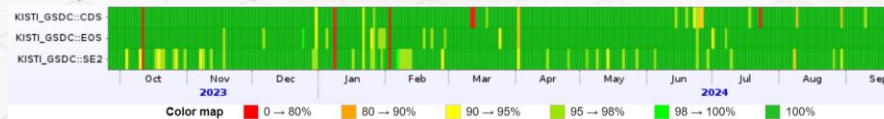
Write Availability 98.84%

Storage status for last 12 months



Disk Reading

Disk Writing



Link name	Data		Individual results of reading tests			Overall	
	Starts	Ends	Successful	Failed	Success ratio	Availability	
	KISTI_GSDC::CDS	25 Sep 2023 08:45	24 Sep 2024 09:04	8688	148	98.33%	98.37%
KISTI_GSDC::EOS	25 Sep 2023 09:00	24 Sep 2024 09:19	8587	191	97.82%	97.92%	
KISTI_GSDC::SE2	25 Sep 2023 08:55	24 Sep 2024 09:14	8704	95	98.92%	98.95%	

Link name	Data		Individual results of writing tests			Overall	
	Starts	Ends	Successful	Failed	Success ratio	Availability	
	KISTI_GSDC::CDS	25 Sep 2023 08:45	24 Sep 2024 09:04	8738	103	98.83%	98.84%
KISTI_GSDC::EOS	25 Sep 2023 09:00	24 Sep 2024 09:19	8719	59	99.33%	99.34%	
KISTI_GSDC::SE2	25 Sep 2023 08:54	24 Sep 2024 09:13	8708	92	98.95%	98.99%	

Keeping top most quality of services

	Reliability		Availability	
	Overall in 2023	~Sep. 2024	Overall in 2023	~Sep. 2024
ALICE	97.3%	98.9%	97.3%	98.9%

Monthly target of WLCG : 97%

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

Monthly Availability/ Reliability (%)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Reliability	98	95*	97	97	97	100	99	100	98	100	99	99
Availability	98	95*	97	97	97	100	99	100	98	100	99	99

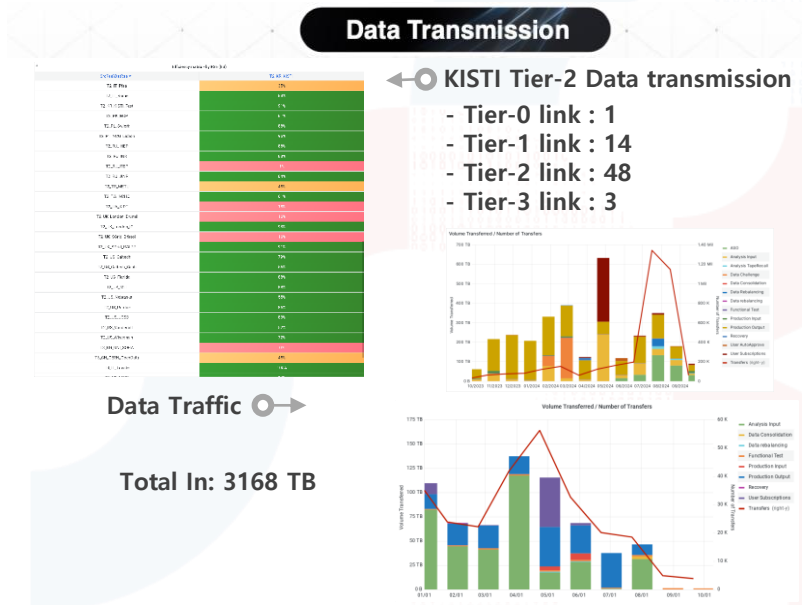
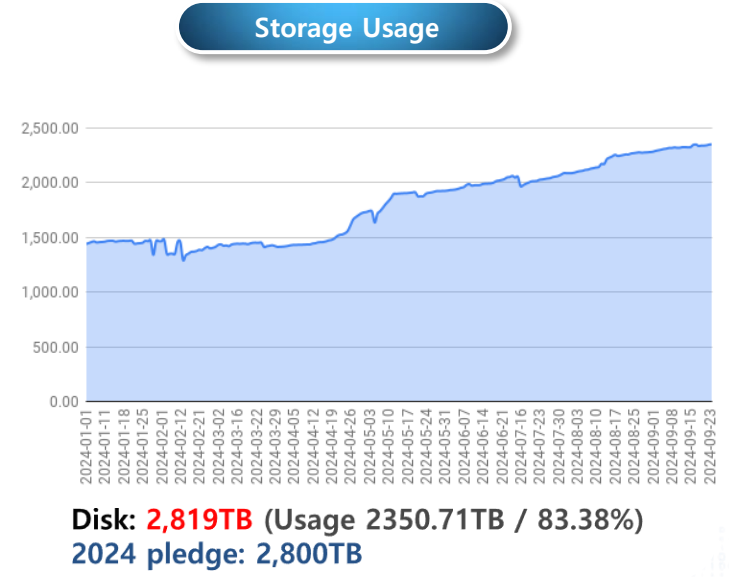
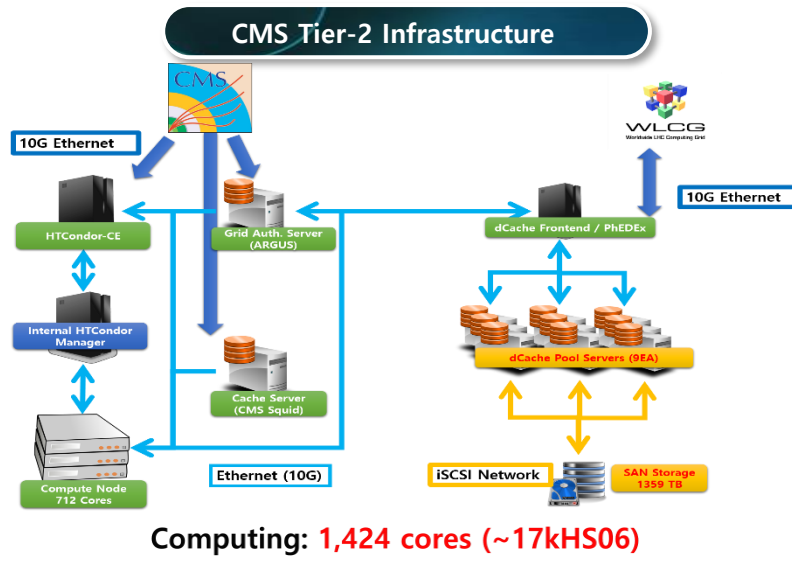
- $Reliability = \frac{T_{up}}{T_{up} + (T_{DOWN} - T_{SCHEDDOWN})}$

- $Availability = \frac{T_{up}}{T_{up} + T_{DOWN}}$

- Network Issue: Misconfiguration on LHCOPN backup link has affected the site availability
- Close collaboration with the KREONet service team to address the issue



WLCG Tier-2



WLCG Tier-2 Service Availability / Reliability

서비스	Reliability		Availability	
	Overall in 2023	~Sep. 2024	Overall in 2023	~Sep. 2024
ALICE	97.9%	97.9%	97.8%	97.8%

Monthly target of WLCG : 95%

Site	Availability ↓	Reliability
T2_CH_CERN	99.60%	99.60%
T2_DE_RWTH	99.19%	99.20%
T2_IT_Legnaro	98.91%	98.91%
T2_HU_Budapest	98.91%	98.91%
T2_FL_HIP	98.65%	98.85%
T2_US_Wisconsin	98.33%	98.33%
T2_RU_JINR	98.18%	98.19%
T2_UK_London_JC	98.11%	98.12%
T2_AT_Vienna	97.99%	98.01%
T2_US_Purdue	97.83%	97.83%
T2_KR_KISTI	97.78%	97.85%
T2_CN_Beijing	97.54%	99.08%
T2_PT_NCG_Lisbon	97.11%	97.11%
T2_RU_IHEP	96.53%	96.55%
T2_DE_DESY	96.49%	97.02%
T2_PL_Cyfronet	96.45%	96.45%
T2_US_Caltech	96.05%	96.05%
T2_RU_JINR	96.01%	96.07%
T2_ES_CIEMAT	95.82%	96.29%
T2_UK_SGrid_RALPP	95.79%	96.60%
T2_BE_IHHE	95.52%	99.19%
T2_UK_London_Brunel	95.09%	95.09%
T2_FR_IPHC	94.90%	95.07%
T2_PL_Swierk	94.74%	95.19%
T2_US_MIT	94.73%	94.73%
T2_US_Nebraska	94.69%	94.69%
T2_CH_CSCS	94.54%	95.87%
T2_US_UCSD	94.38%	94.38%
T2_US_Florida	94.21%	94.69%
T2_BR_SPRACE	94.13%	94.13%
T2_RU_ITEP	93.20%	93.35%
T2_US_Vanderbilt	92.02%	92.02%
T2_IT_Bari	91.90%	91.90%
T2_EE_Estonia	91.08%	92.72%
T2_UA_KIPT	88.92%	97.23%
T2_BE_UCL	88.66%	90.95%
T2_ES_IFCA	87.33%	87.33%
T2_FR_ORIF	86.90%	87.00%
T2_BR_UERJ	82.79%	82.79%
T2_TW_NCHC	81.69%	81.69%
T2_IT_Pisa	81.15%	82.12%
T2_IT_Rome	70.32%	73.26%
T2_IN_TIFR	58.86%	63.17%
T2_LB_HPC4L	50.96%	50.96%
T2_UK_SGrid_Bristol	22.97%	70.59%
T2_TR_METU	21.67%	28.41%
T2_PK_NCP	0.12%	0.60%

Tier-1/2 pledges & Asia Tier Center Forum

Tier-1 pledge: 10% Contribution to ALICE Tier-1 Computing

	ALICE Tier-1 Resources (C-RSG Recomm.)		KISTI Tier-1 requirements (10% contribution)		KISTI Tier-1 Pledges	
	2024	2025	2024	2025	2024 (installed)	2025 (planned)
CPU	630kHS23	690kHS23	63kHS23	69kHS23	63kHS23 (6,664cores)	72kHS23 (6,920cores)
Disk	71.5PB	79PB	7.15PB	7.9PB	7.5PB	8PB
Tape	107PB	123PB	10.7 PB	12.3 PB	12PB	12PB

○ KISTI Tier-1 Pledges for 2025

- (Pledges) CPU: 72kHS23, Disk: 8PB, Tape: 12PB
- (CPU) Old workers of the current CPUs will be phased out as their warranty ended, replaced by New worker nodes
- (Disk) 1.5PB of Disks(Xrootd) will be decommissioned and 2PB of Disks(EOS) will be added in 2025

Tier-2 pledge

	CMS Tier-2 Resources (C-RSG Recomm.)		KISTI Tier-2 Pledges		
	2024	2025	2024 (installed)	2024 (planned)	2025 (planned)
CPU	1,600kHS23	1,900kHS23	17kHS23 (1,424cores) (1.1%)	24kHS23 (2,664cores) (1.5%)	45kHS23 (4,500cores) (2.4%)
Disk	149PB	175PB	2.8PB (1.88%)	2.8PB (1.88%)	3.5PB (2.0%)

○ KISTI Tier-2 Pledges for 2025

- (Pledges) CPU: 45kHS23, Disk: 3.5PB
- (CPU) New workers to be deployed in 2025
- Meet the pledge target of Korean researcher ratio 2.4%
- (Disk) 1PB of Disks added early this year (1.8PB -> 2.8PB)
- Disk pledge target: 2% of CMS Tier-2 requirements
- Incremental strategy due to budget limit

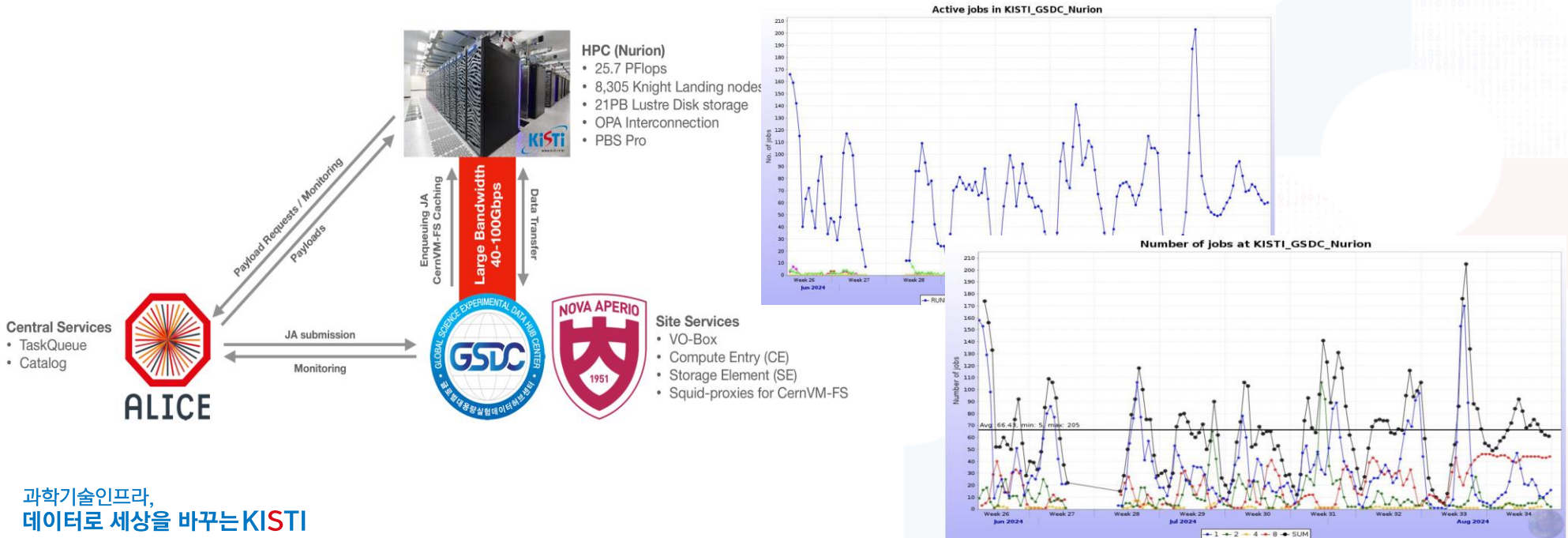
KISTI (Korea Institute of Science and Technology Information)

- Government-funded research institute founded in 1961 for national information services and Supercomputing
- National Supercomputing Center
 - Nurion (Cray CS500 system): 25.7 PFlops, ranked 11th of Top500 (2018) ⇒ 46th (Nov 2022)
 - * New HPC System will be deployed in 2025, 600PFlops (Top 10 ranking target)
 - Neuron - GPU system, 1.24 PFlops
 - KREONet/KREONet2 - National/International R&E network



KISTI HPC testbed for ALICE experiment

- Collaboration with KISTI Nurion Team & CBNU (a member of KoALICE)



Governance to solve common issues and troubles faced by Asian Tier centers

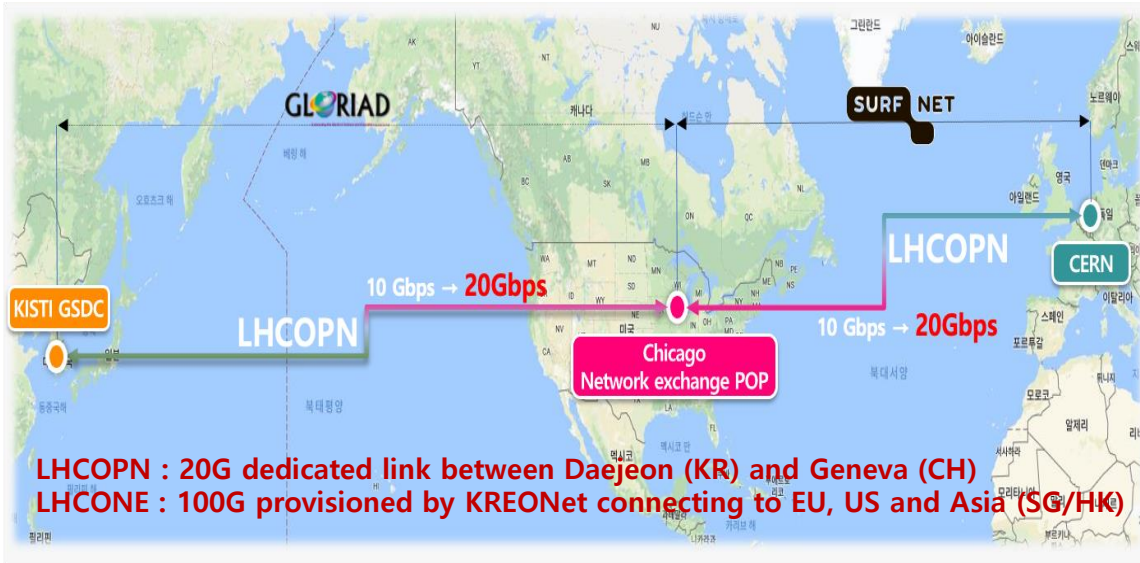
The 8th Asian Tier Center Forum

Sep 2 – 4, 2024
TIFR

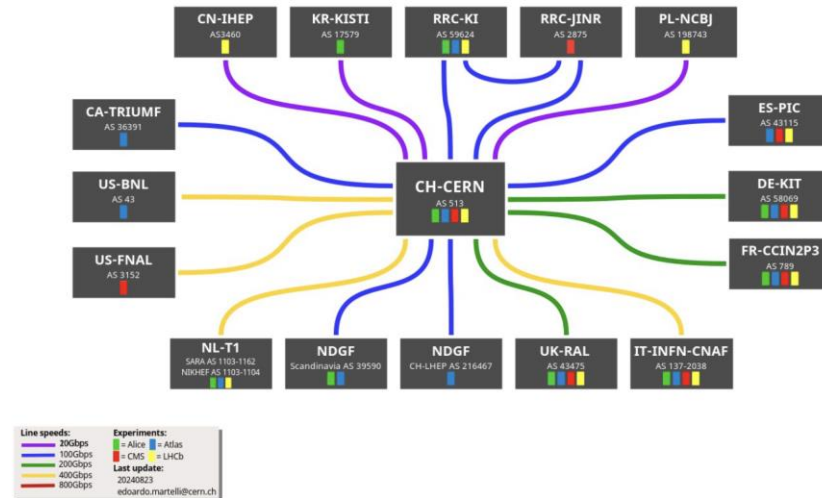
- **TIFR(Tata institute of Fundamental Research) / Mumbai, India**
 - co-hosted by TIFR, KISTI GSDC
 - 2-4 September 2024
- **50 registered participants** (15 institutes from 8 nations)
 - CERN, ASGC(TW), BRIN(ID), IHEP(CN), ICEPP(JP), KEK(JP), KISTI(KR), Rajamangala U.(TH), SUT(TH), TIFR, VECC(IN)
- Status and updates on Asian sites(8 sites), Experiments(ALICE, CMS, BelleII, Dune), Network(LHCOPN/ONE, Kreonet, NKN), HTCondor workshop and Special colloquium for Computing in HEP
- Discussions on ideas or ways to support each individual site and collective activities in Asia
 - Developing support models towards a strong collaboration in the region to cope with challenges
- **It provides a place where the Asian sites can share and discuss any issues to resolve in a collective way**



KISTI ↔ CERN LHCOPN 20Gbps

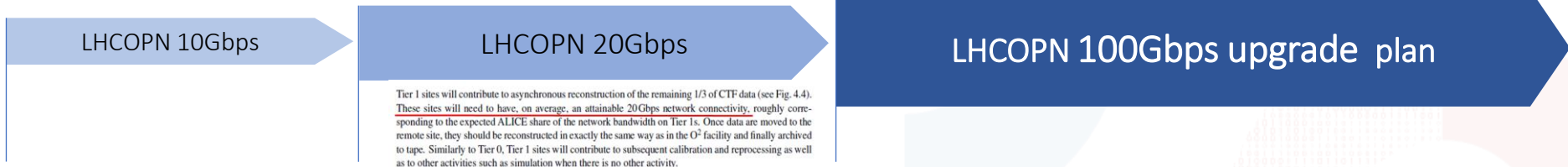


LHCOPN



❖ Most Tier-1: Dedicated Data network with over 100Gbps +100Gbps network became a standard

📍 USA, Netherland, Italy: 400Gbps / Germany, UK, France: 200Gbps / Spain, Canada: 100Gbps
Only Korea: 20Gbps except for the New Tier-1 sites



Tier 1 sites will contribute to asynchronous reconstruction of the remaining 1/3 of CTF data (see Fig. 4.4). These sites will need to have, on average, an attainable 20Gbps network connectivity, roughly corresponding to the expected ALICE share of the network bandwidth on Tier 1s. Once data are moved to the remote site, they should be reconstructed in exactly the same way as in the O² facility and finally archived to tape. Similarly to Tier 0, Tier 1 sites will contribute to subsequent calibration and reprocessing as well as to other activities such as simulation when there is no other activity.

- KISTI-GSDC is a datacenter for data-intensive fundamental research by providing necessary computing power, storage and services
- KISTI Tier-1 for ALICE is running **stable and fully functional**, providing high quality of services.
 - New and powerful machines were deployed to meet CPU and Storage pledges
 - Tier-1 pledges have contributed about 10% of all ALICE Tier-1 requirements.
- Tier-2 for CMS have been **operating without critical issues**
 - Tier-2 computing pledges will be expanded to reach the target (2.4% of all CMS Tier-2 resources).
- KISTI HPC Project has conducted in collaboration with a KoALICE member and KISTI Nurion Team
- **Experience and knowledge from operating WLCG Tier-1 and 2** has been transferred to **support domestic research area** and has helped to improve research activities.

과학기술인프라, 데이터로
세상을 바꾸는 **KiSTi**

Thank You

