KISTI Status Report

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for KISTI-GSDC Team

Introduction

KISTI

Korea Institute of Science and Technology Information

- Government-funded research institute founded in 1962 for **National Information Service and Supercomputing**

- **National Supercomputing Center**

  - Tachyon II system (~307.4 TFlops at peak), ranked 14th of Top500 (2009)

  - **New system coming this year (~18 PFlops at peak)**

  - **KREONet** - National R&E network

Map of South Korea

ICN
Seoul
2h by car
We are here!
Daejeon
Jeju Island
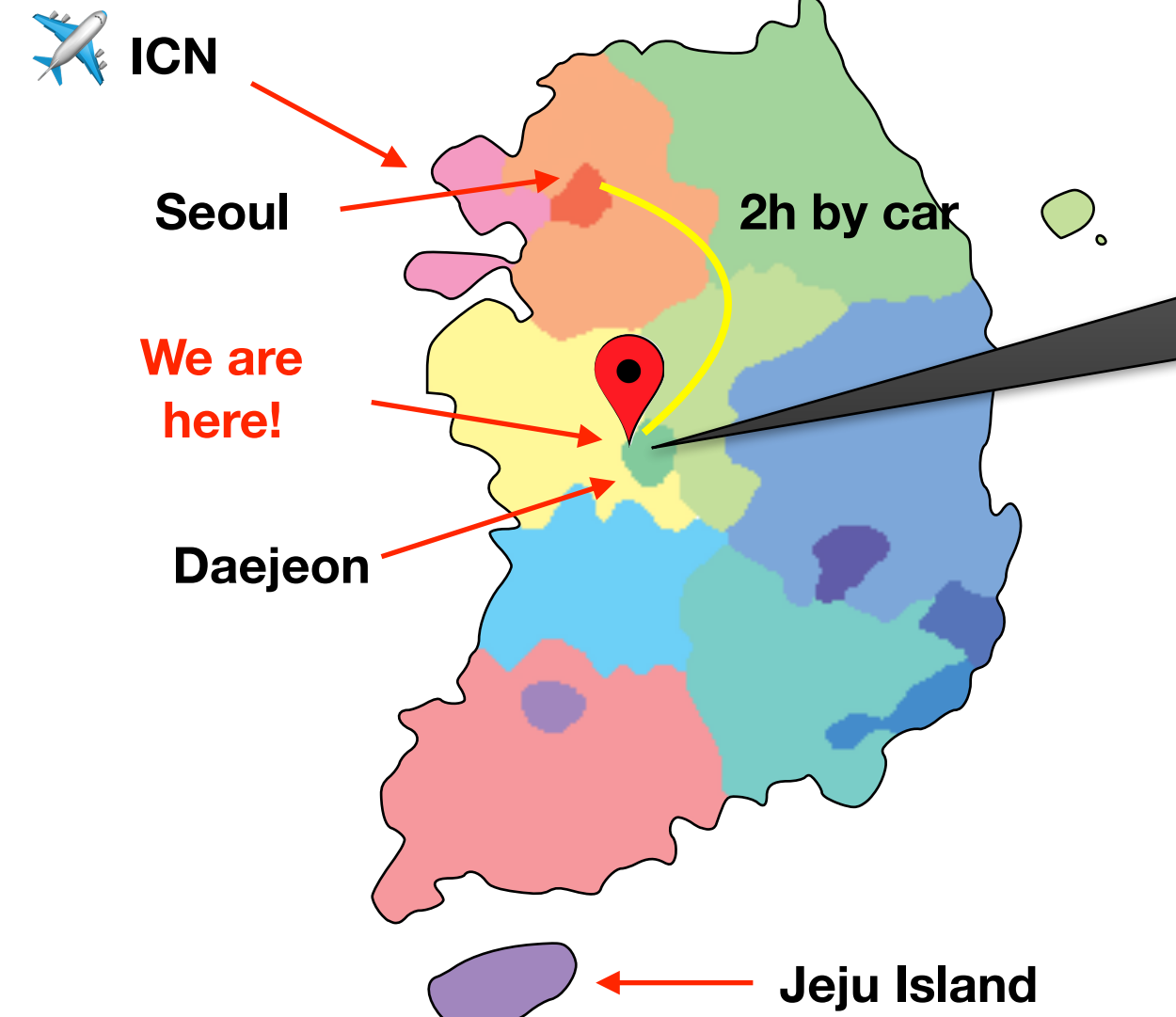
Daedeok R&D Innopolis

Rare Isotope Accelerator (Under construction)

30 **Government Research Institute**
11 **Public Research Institutes**
29 **Non-profit Organizations**
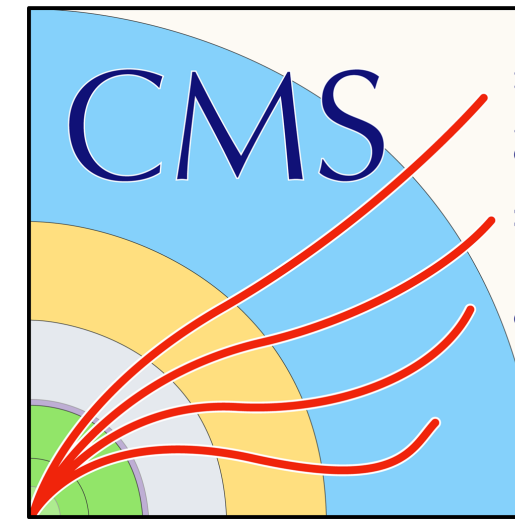**7** **Universities**

Tachyon II

KREONET

GSDC

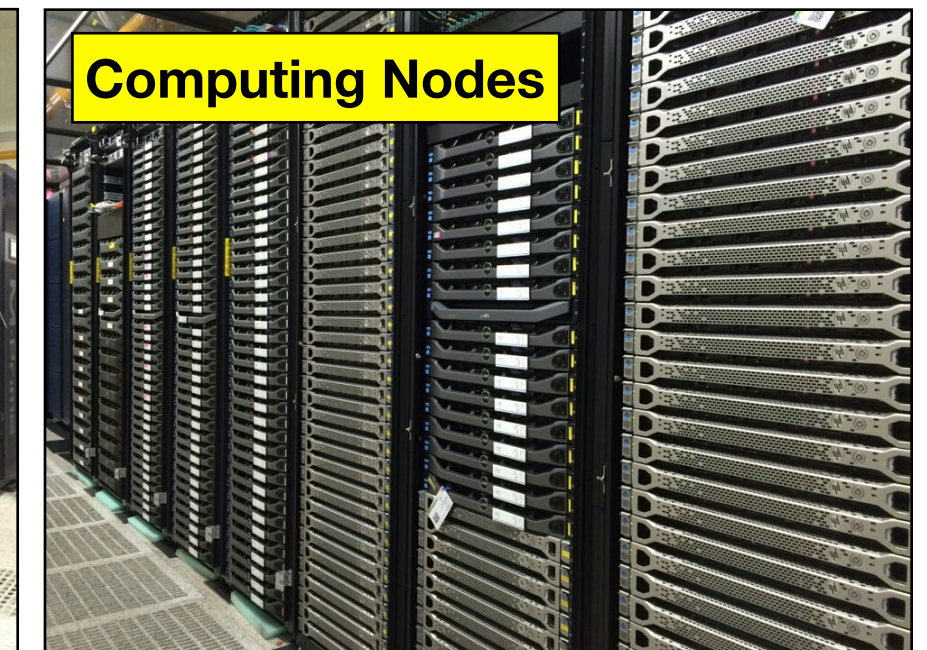**Global Science experimental Data hub Center**

- Government-funded project, started in 2009 to **promote Korean fundamental research through providing computing power and data storage**

- **Datacenter for data-intensive fundamental research**

  - 14 staff: system administration, experiment support, external-relation, management and planning

Disk Storage

Tape System

Computing Nodes

Experiment Support

Heavy-Ion Physics
WLCG Tier-1
(CPU) 3,500 cores / (DISK) 1,500 TB / (TAPE) 3,000 TB
Tier-3 (KIAF) : (CPU) 200 cores / (DISK) 300 TB

Elementary Particle Physics
Tier-3 : (CPU) 1,000 cores / (DISK) 600 TB
WLCG Tier-2 (2017)
(CPU) 1,000 cores / (DISK) 800 TB

Astrophysics
LDG Tier-3
(CPU) 800 cores / (DISK) 600 TB
LDG Tier-2 (TBD)

Medical Science
(CPU) 360 cores / (DISK) 600 TB

Elementary Particle Physics
B2G Tier-2
(CPU) 300 cores / (DISK) 100 TB

Neutrino Physics
RAW data storage
(CPU) 360 cores / (DISK) 700 TB

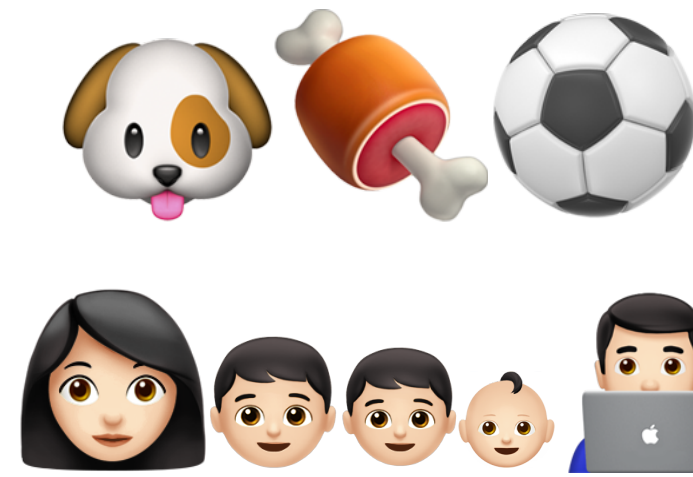Structural Biology (TEM)
(CPU) 300 cores / (DISK) 500 TB
Trial Service

3-4 more domestic experiments under preparation
e.g. volcanic hazard mitigation, brain research, disease control, etc.

5

WLCG Tier-1 Status

WLCG Tier-1 Requirements

Resources

Network
LHCOPN - Provide **a dedicated optical connection to CERN with (currently) 10Gb/s** for T0-T1 and T1-T1 traffic + backup
- LHCONE - Provide **a practical solution for T1-T2 traffic** (to be discussed with experiment)

Pledges
CPU & DISK - Provide typically **10% of global total T1 requirement of experiment** (absolute **minimum 5%** approved by C-RRB)
- TAPE - Provide **sufficient capacity to store its share of raw data of experiment** and **demonstrate the capability of accepting a copy of raw data**

Services

- Should **integrate with WLCG monitoring framework**
- Availability/Reliability : **>99% during data-taking, >97% at minimum** (based on WLCG MoU)
  - **On-call support** required for key services
- Should **interface with WLCG accounting services**
- Should **support a number of T2 sites**
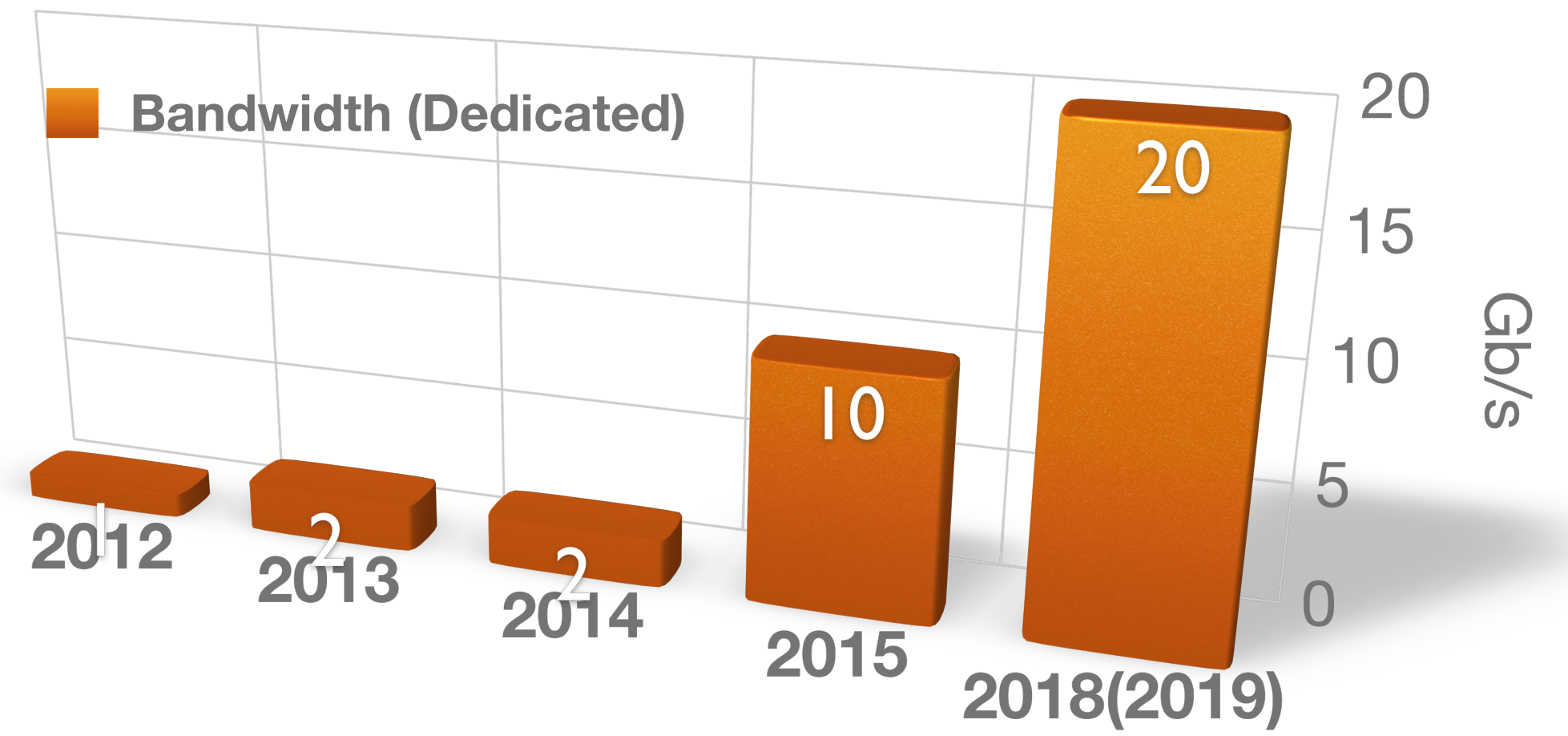 - Technical support and acting as a data source according to the computing model of experiment

LHCOPN

T0-T1 and **T1-T1** Network
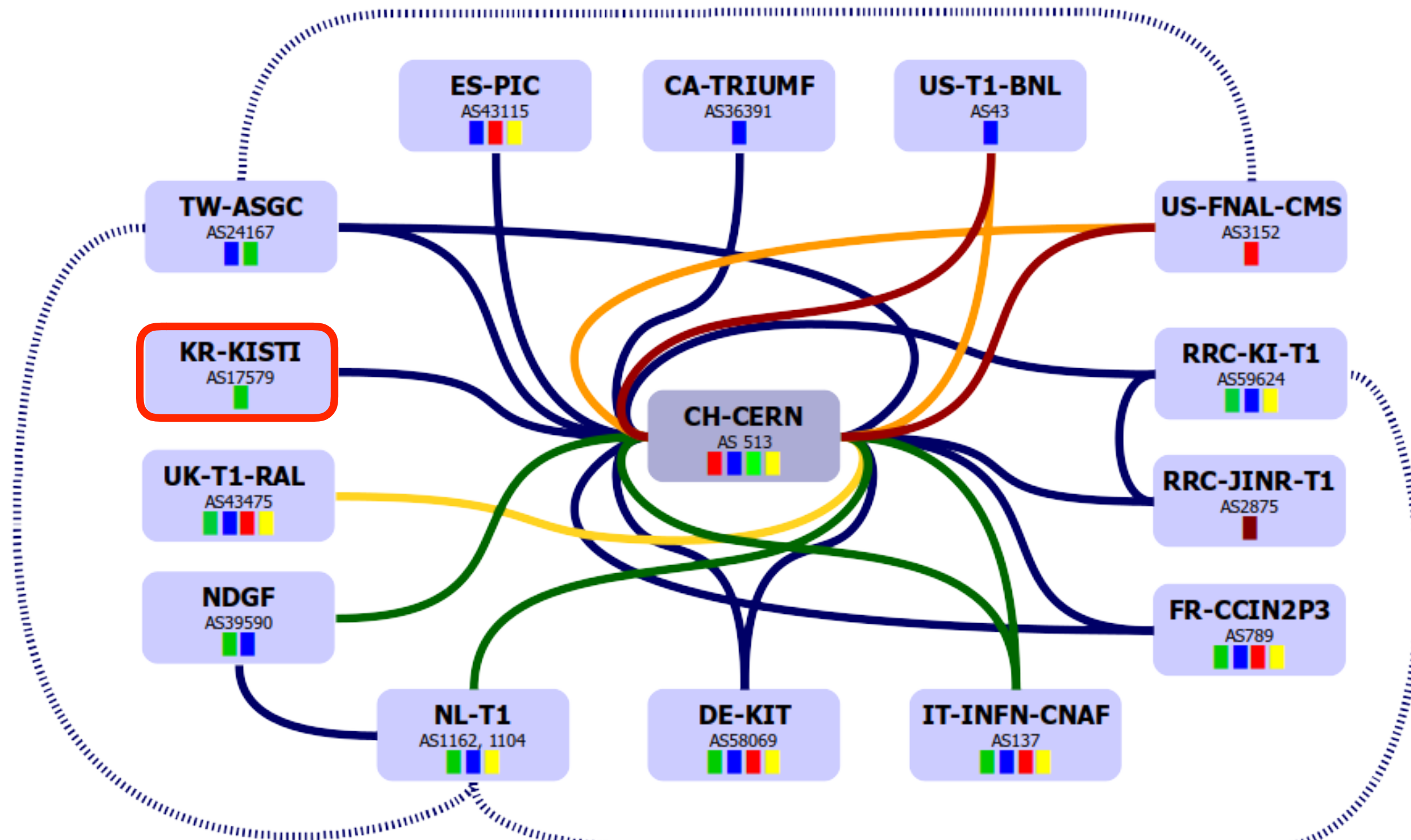
10Gb/s upgrade plan submitted to WLCG in Nov 2013
However, budget eventually secured in 2015 after the global cut (~10%) in 2014
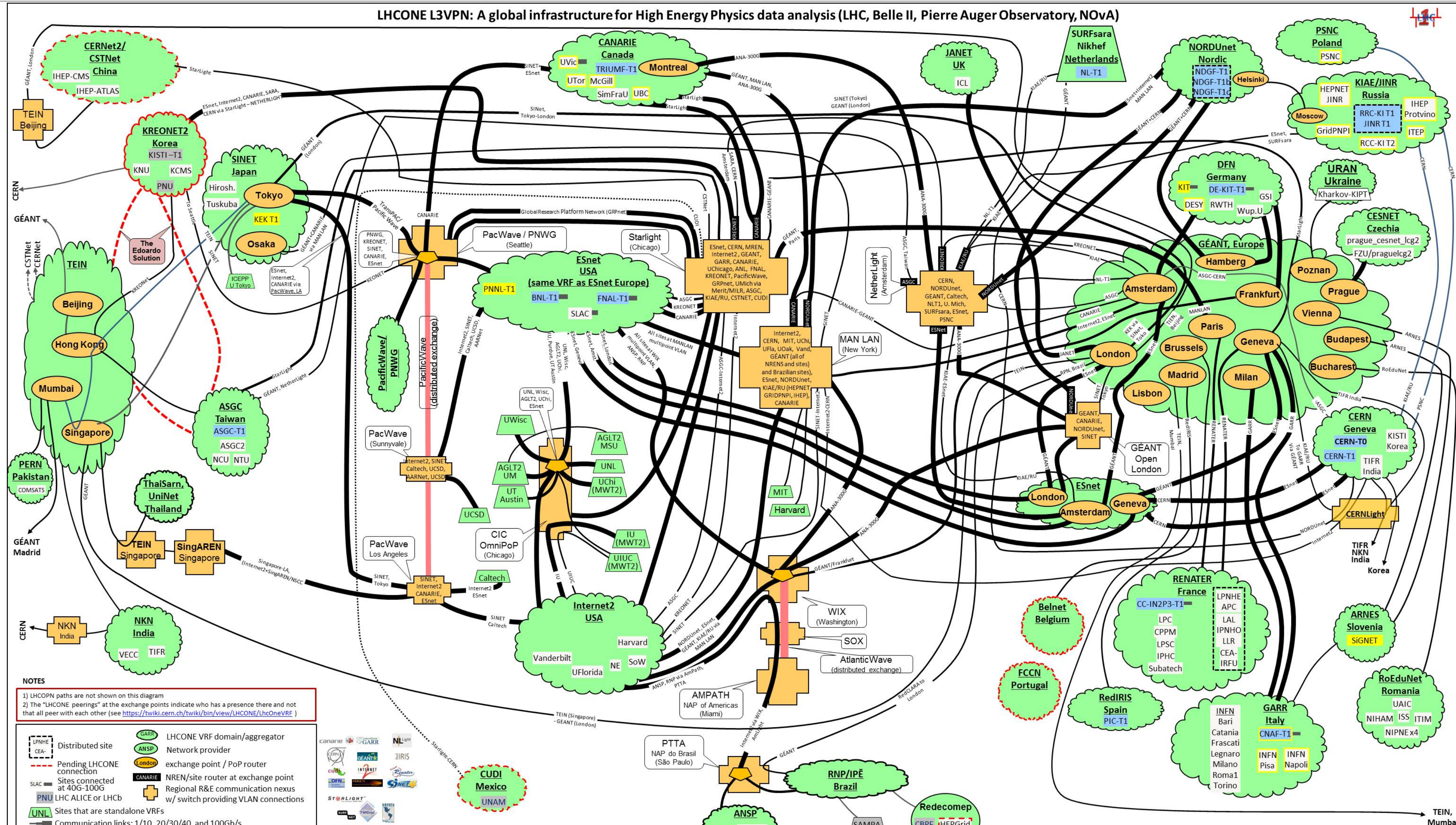
10Gb/s bandwidth upgrade timely done in April 2015 just before the start of LHC RUN2 data-taking
Upgrade of OPN bandwidth is under consideration together with new design on system architecture

LHCONE

T1-T2 and T2-T2 Network

LHCONE Map (v3.4)
William Johnston, ESNET

LHCONE L3VPN: A global infrastructure for High Energy Physics data analysis (LHC, Belle II, Pierre Auger Observatory, NOvA)
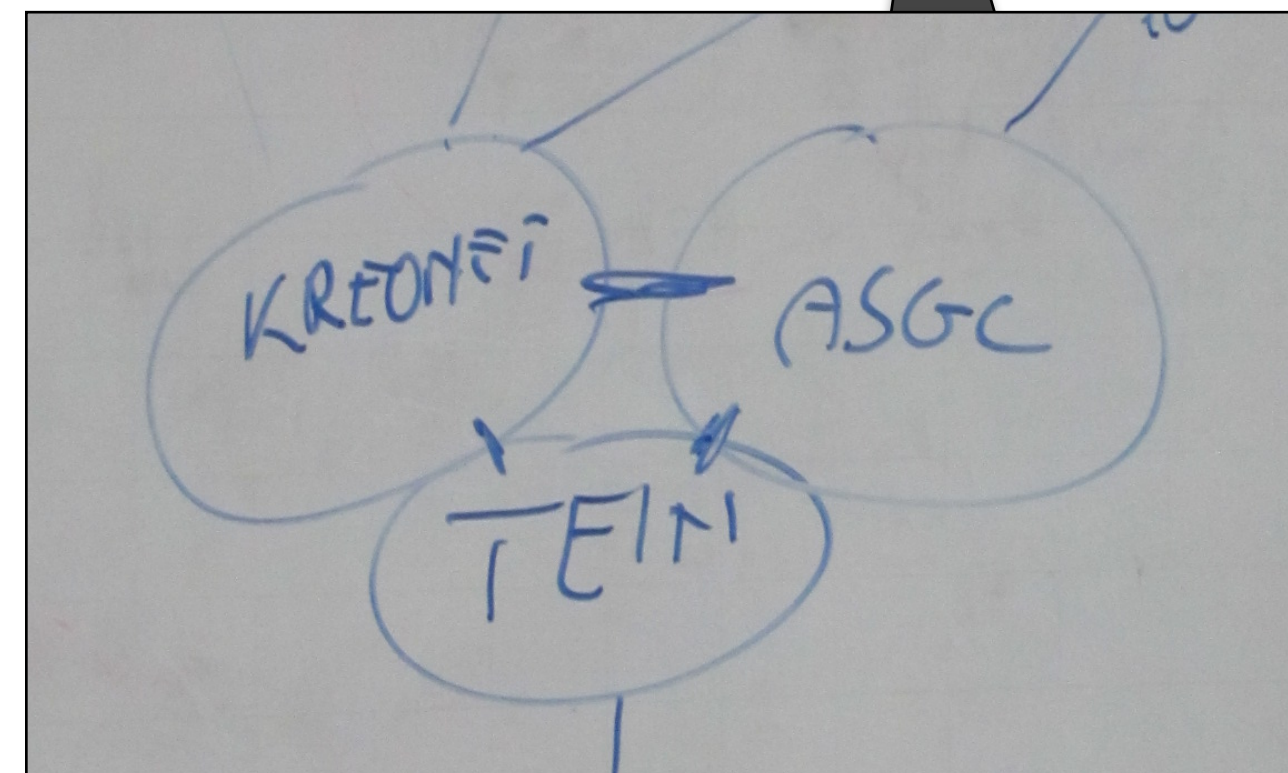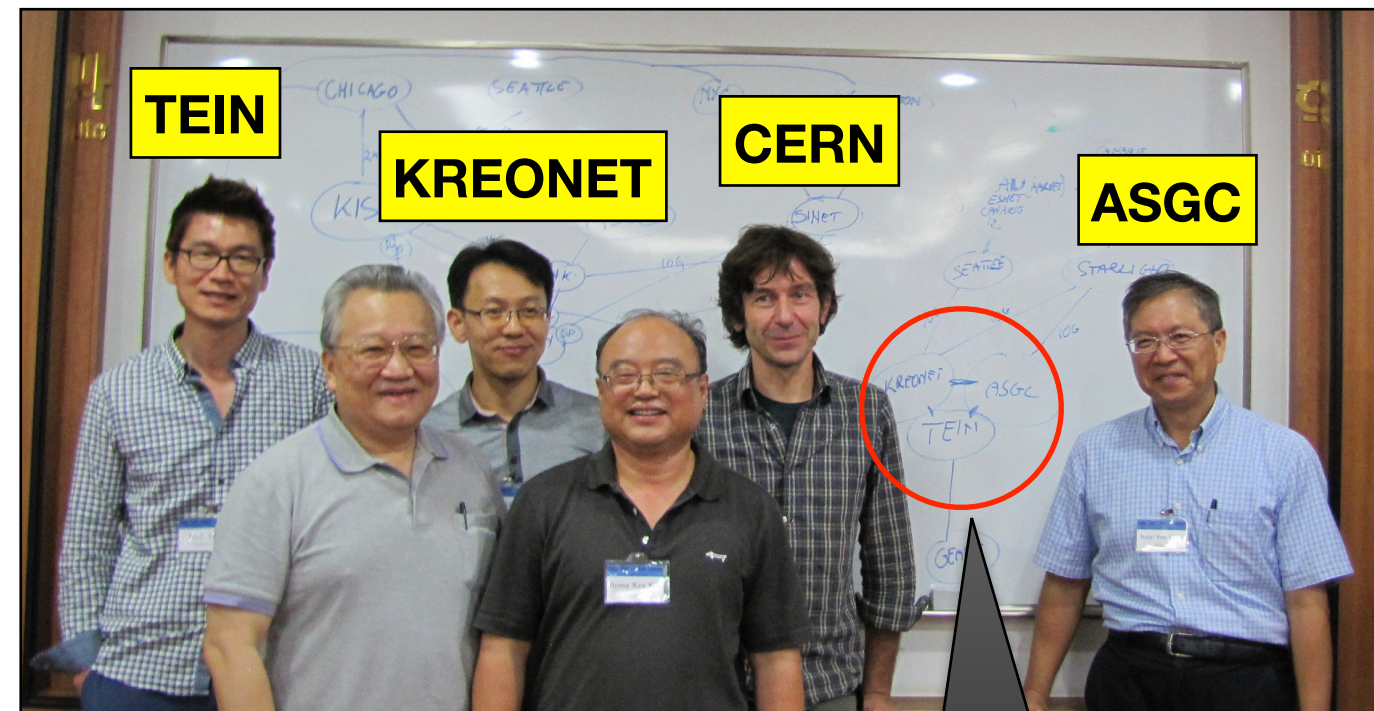
9

LHCONE in Asia
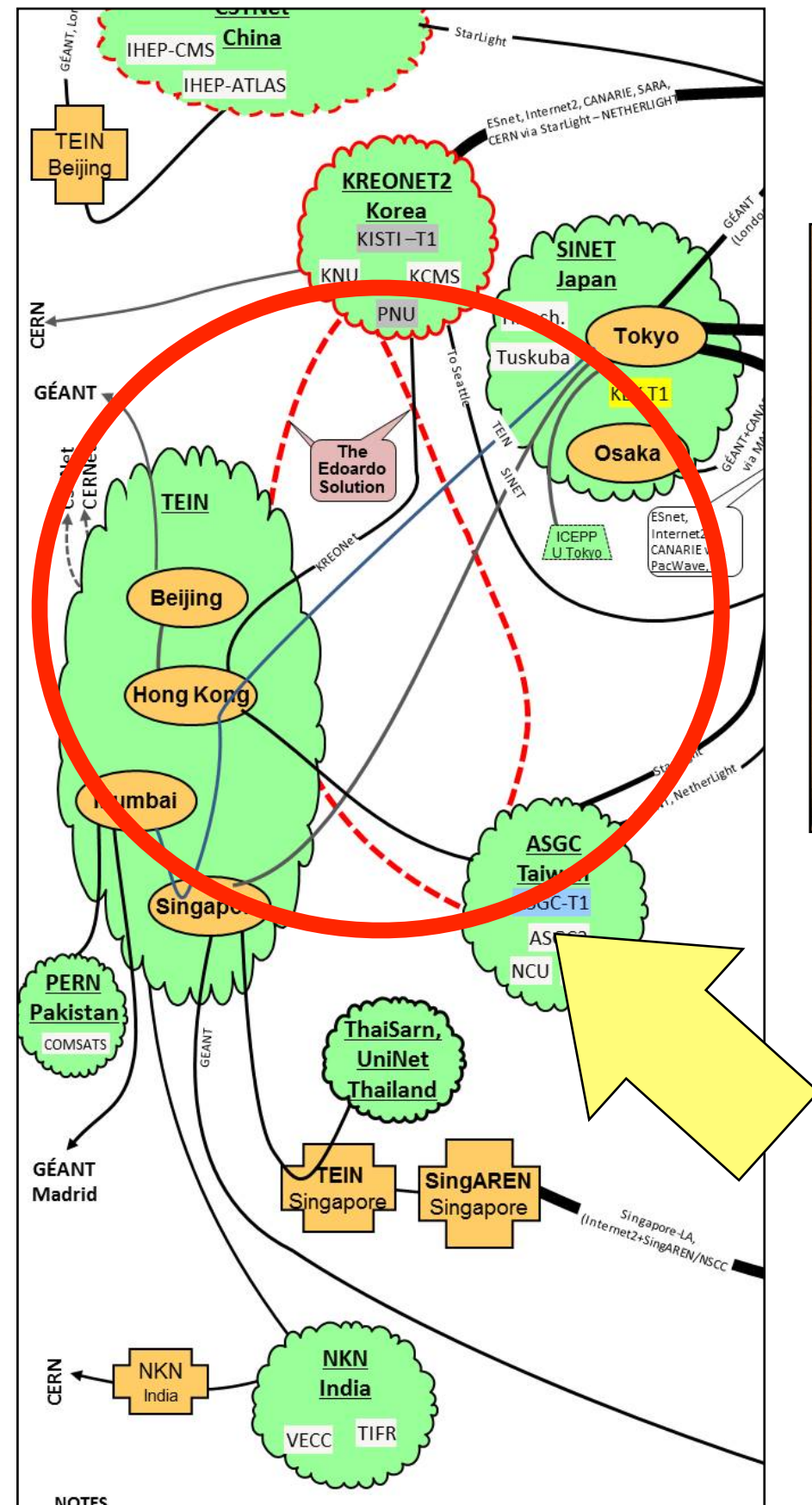
A part of LHCONE Map (v3.4)
William Johnston, ESNET

"Edoardo Solution"
Derived @ 1st ATCF

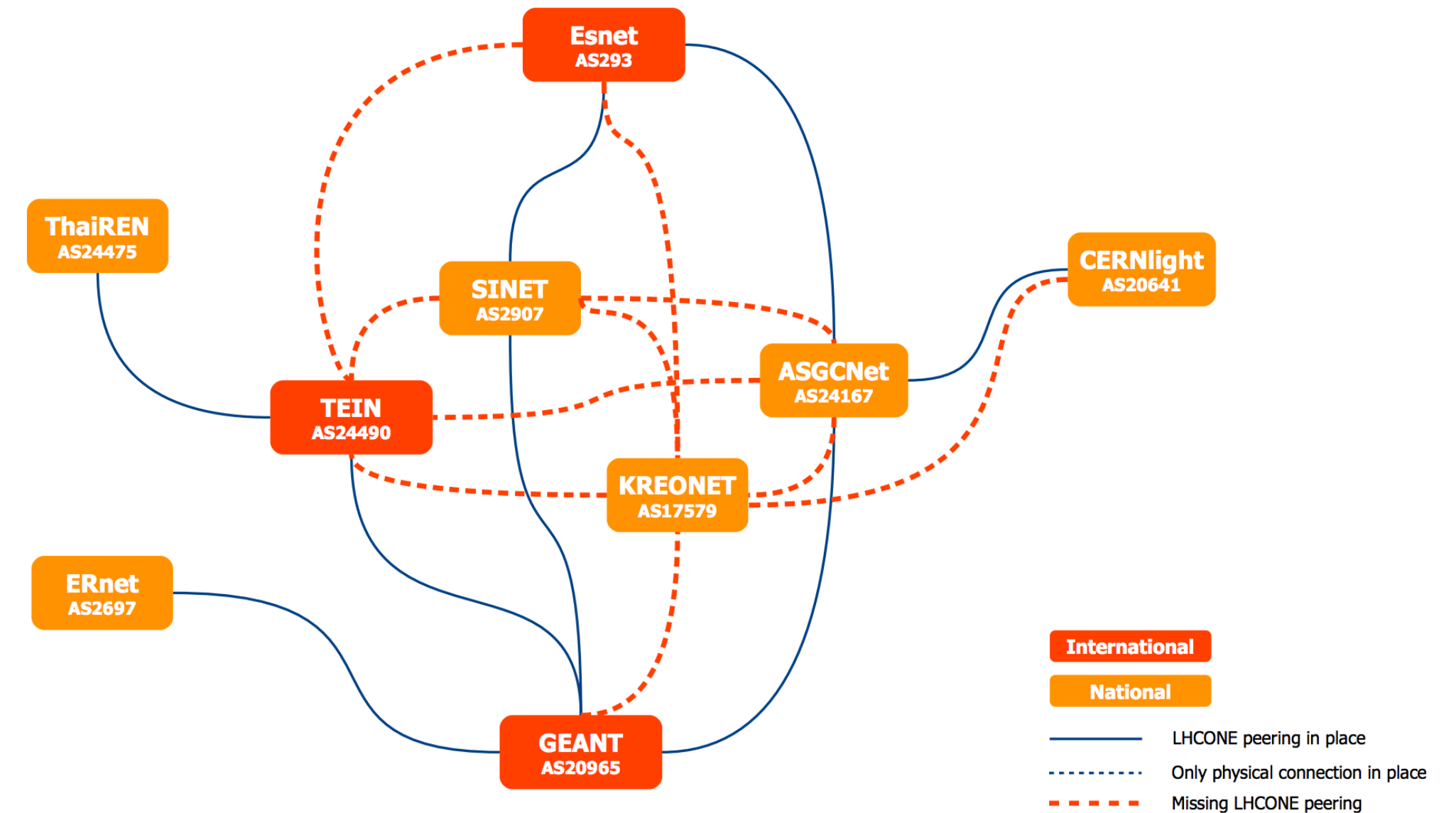TEIN KREONET CERN ASGC

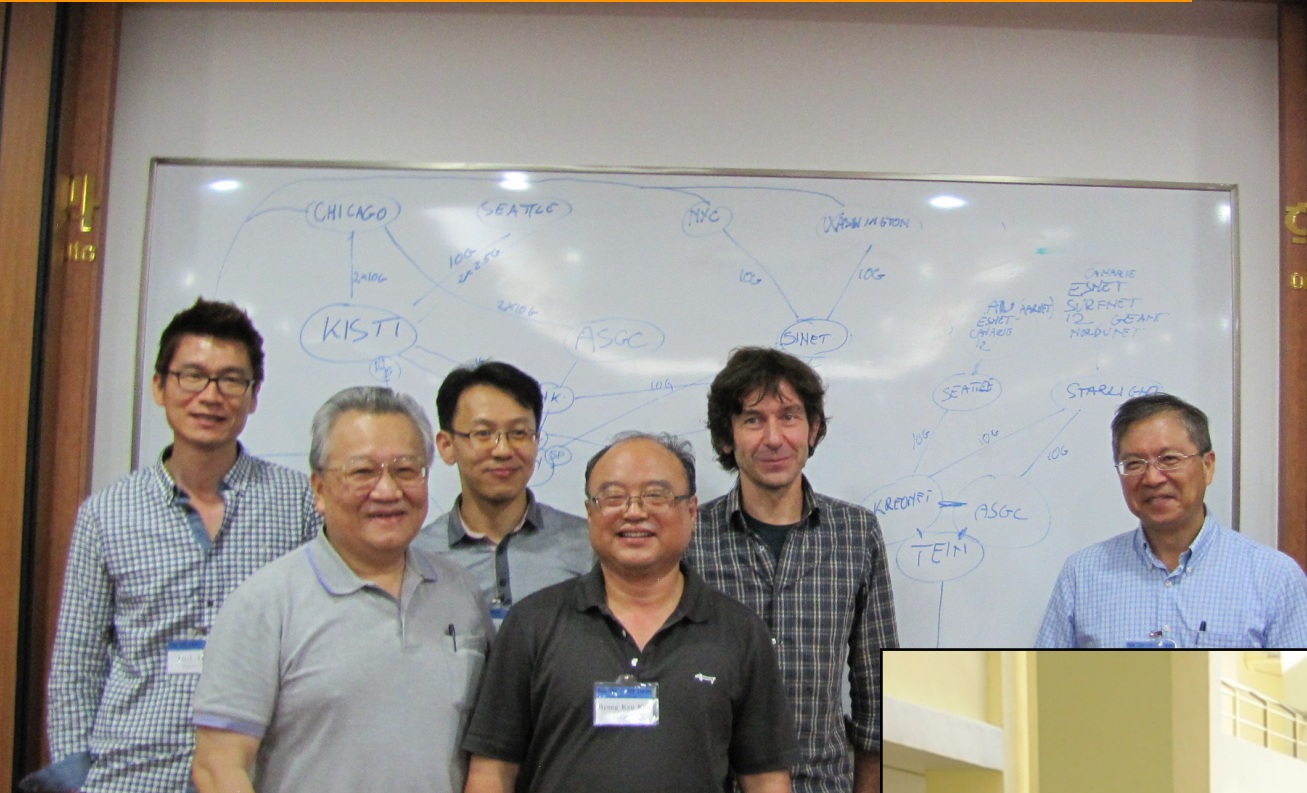Interconnection of VRFs

Missing connections

LHCONE Update @ 2nd ATCF
Edoardo Martelli, CERN

A long journey is expected for consolidation of network environment in Asia

Asia Tier Center Forum

1st ATCF @ KISTI, Sep 2015

- Started to discuss how the connectivity among Asian sites can be improved practically
- Participation of Asian sites as well as Network experts from CERN, ESnet, GÉANT, TEIN, KREONet

2nd ATCF @ SUT, Nov 2016

3rd ATCF @ KISTI, 11 Oct - 13 Oct 2017

- Trying to build a membership among Asian sites for grid computing
- Letter of Agreement is being prepared
- Expecting consolidated cooperations upon not only networks but also common issues
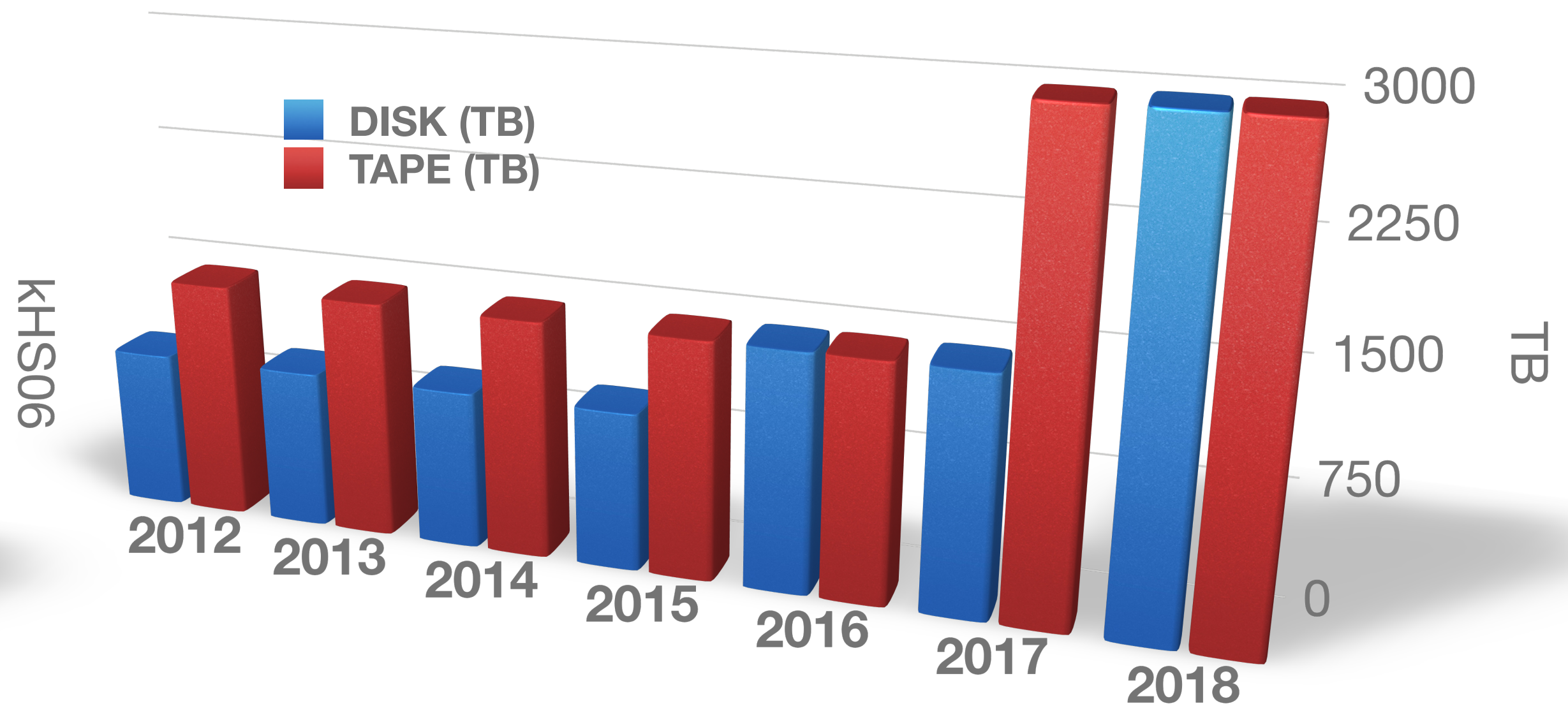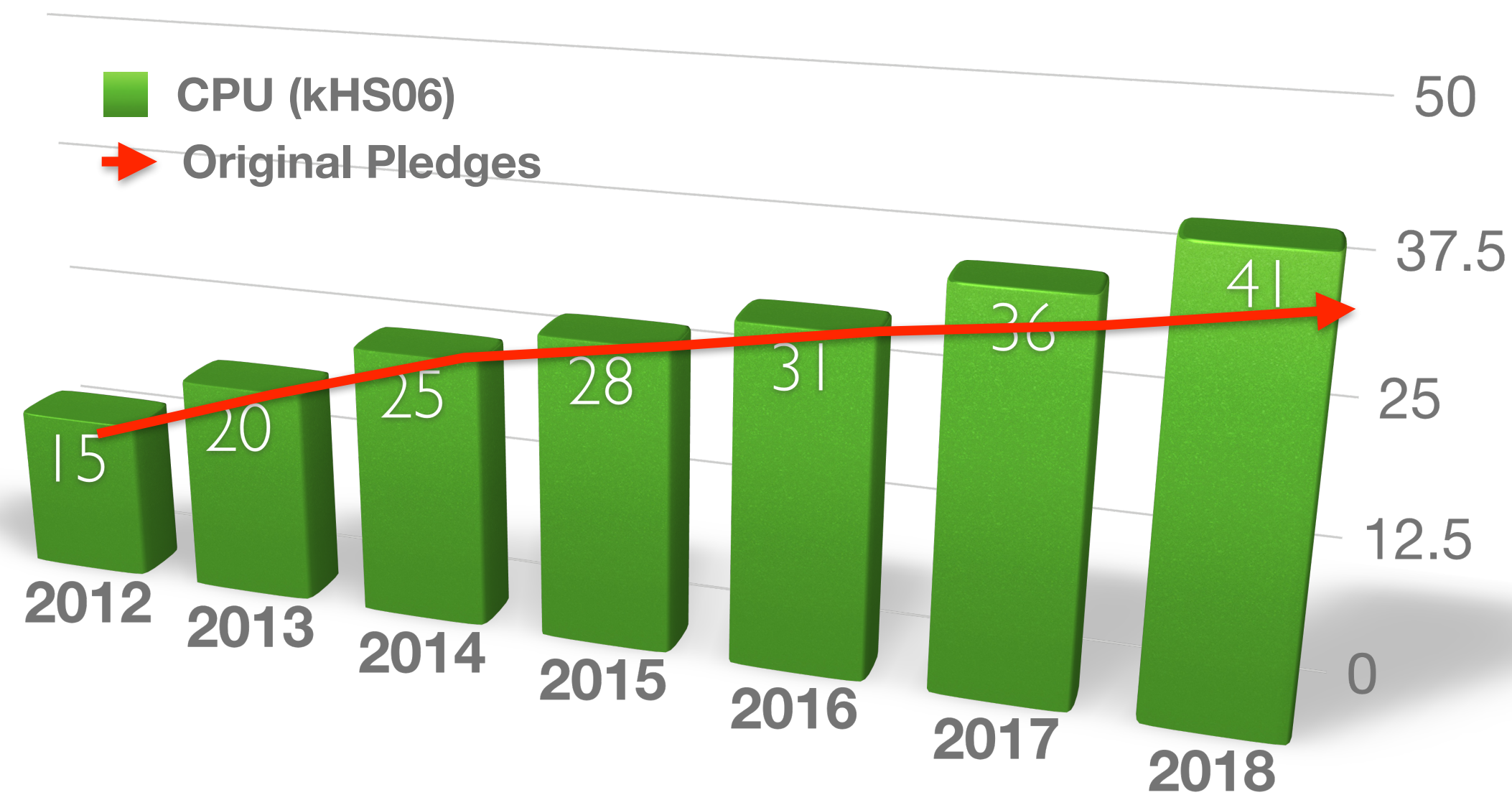
Asia Tier Center Forum report was given at WLCG GDB in March

11

Resource Pledges

ALICE computing resource requirement for RUN2 has been increased ~30% due to EXCELLENT operation of the LHC!! (C-RRB @ Oct 2016)

	2012	2013	2014	2015	2016	2017	2018
CPU (cores)	1,800	2,500	2,500	2,800	3,500	3,800	4,100
DISK (TB)	1,000	1,000	1,000	1,000	1,500	1,500	3,000
TAPE (TB)	-	1,500	1,500	1,500	1,500	3,000	3,000

- Tape capacity has been doubled recently
- More disk will be placed to fulfill the increase requirement (20-30%) for RUN2

Pledges Disk & Tape will be discussed and decided before C-RRB in Oct 2017

12

Resource Usage

T1 Proposal
Mar 2012

Full T1 Approval
Nov 2013

10Gb/s
May 2015

Current

Job

Job activity and Storage usage for 6 years

21.5M jobs done
3,500 concurrent jobs running
~ 37kHS06

**Smooth ramping up of job capacity
3.5M jobs done for the last 6 months**

RUN1

LS1

RUN2

Storage

p-Pb raw data transfer
Jun 2013

TAPE commissioned
Feb 2013

TAPE procured
Oct 2012

2.3 PB (Tape) used out of 3 PB

1.35 PB (Disk) used out of 1.5 PB

**More than 2 PB of raw data
transferred from ALICE experiment
after the start of RUN2**

KISTI_GSDC - SE2   KISTI_GSDC - TAPE

5 months taken for TAPE installation and full commissioning

13

System Architecture

Availability/Reliability

As of 2 Aug 2017

- **99.3% availability and reliability achieved in 2016**

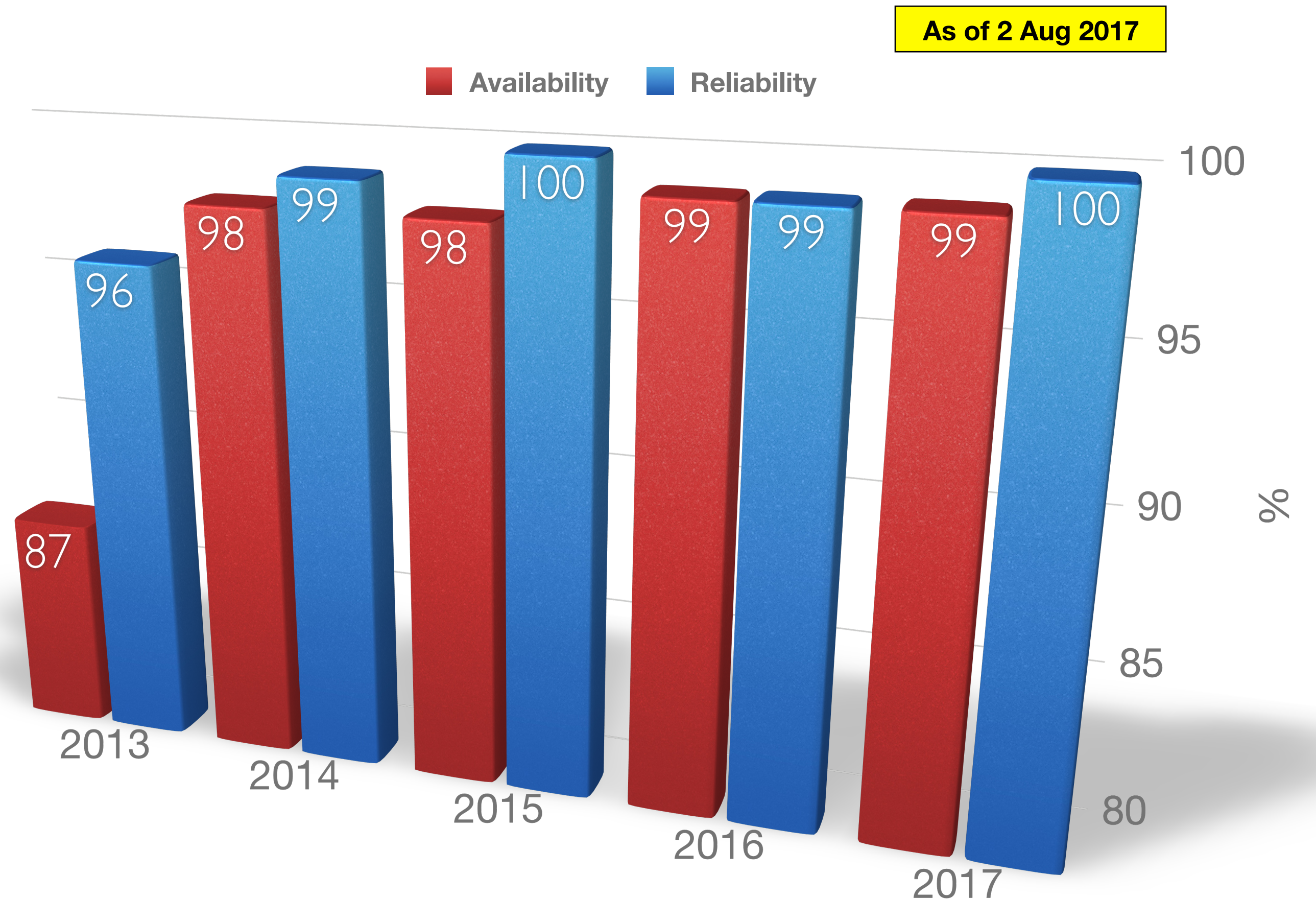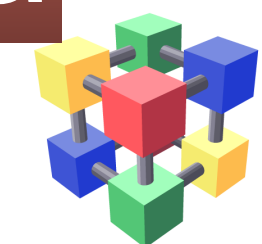- Key services are clustered, e.g. CE, squid, xrootd, etc.

- **24h 7/7 monitoring and on-call shift for prompt service recovery**

- Well organized maintenance to reduce downtime as much as possible

Availability   Reliability

2013 — 87, 96
2014 — 98, 99
2015 — 98, 100
2016 — 99, 99
2017 — 99, 100

100
95
90
85
80

%

On the track for the most reliable site in the WLCG

WLCG
Worldwide LHC Computing Grid
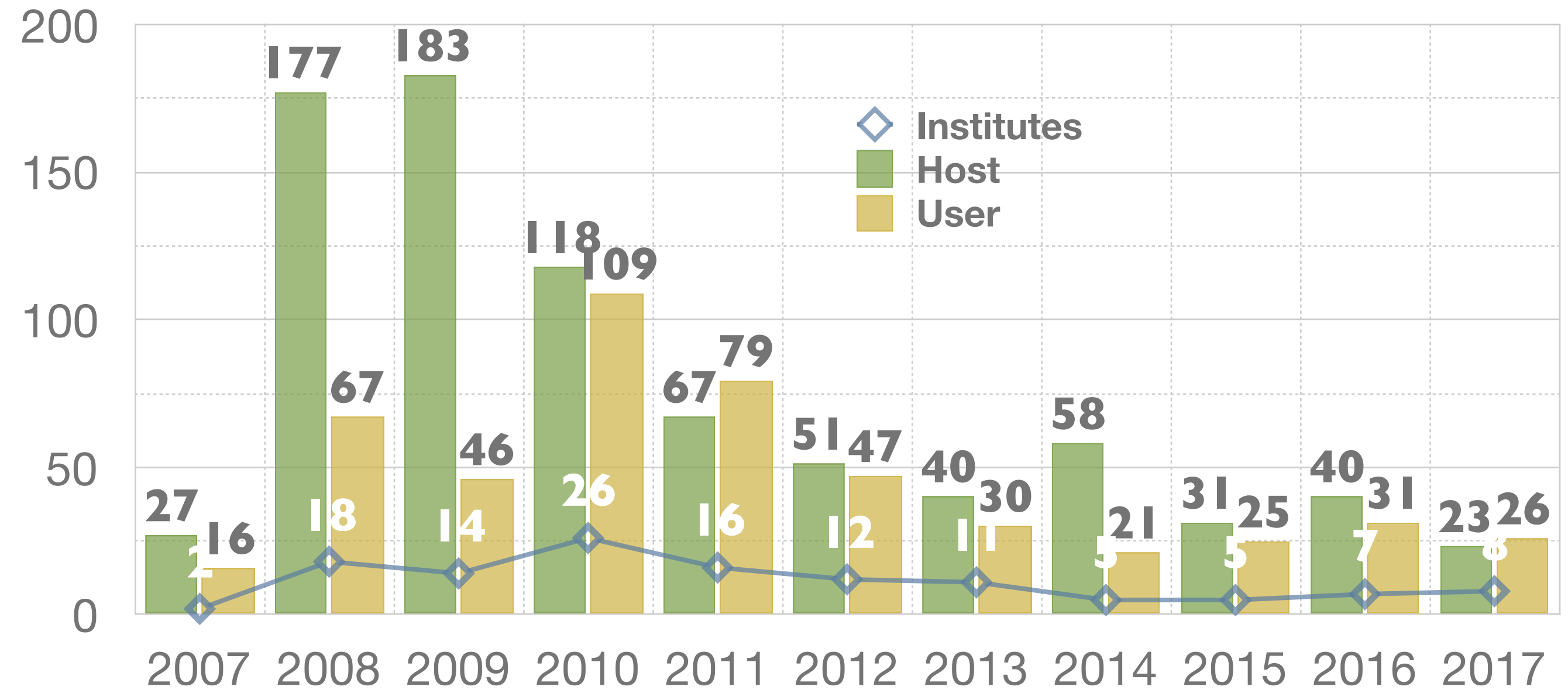
ALICE

Other activities

KISTI CA v3.0

Grid Certification Authority

- KISTI CA v3.0

  - Subject: C=KR, O=KISTI, CN=KISTI Certification Authority

  - **Valid from Apr 14, 2017 until Apr 9, 2037 (20 years)**

 - Signature algorithm: **SHA256** (Key size: 4096 bits)

- Online repository: http://ca.gridcenter.or.kr

Issued certificates

Legend: Institutes, Host, User

Host values by year: 27 (2007), 177 (2008), 183 (2009), 118 (2010), 67 (2011), 51 (2012), 40 (2013), 58 (2014), 31 (2015), 40 (2016), 23 (2017)

User values by year: 16 (2007), 67 (2008), 46 (2009), 109 (2010), 79 (2011), 47 (2012), 30 (2013), 21 (2014), 25 (2015), 31 (2016), 26 (2017)

Institutes values: 2 (2007), 18 (2008), 14 (2009), 26 (2010), 16 (2011), 12 (2012), 11 (2013), 5 (2014), 5 (2015), 7 (2016), 8 (2017)

Renewal Completed

Milestones of CA Migration from KISTI GRID CA v2.0 to KISTI CA v3.0

KISTI GRID CA v2.0 Ended its life

	2016			2017							
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
☑ CA Management Transfer Meeting	18.10.2016										
☑ CA Management Transfer				10.01.2017							
☑ Internal CP/CPS Revision					17.02.2017						
☑ Review request to APGrid PMA					21.02.2017						
☑ Review & feedback (multiple rounds expected)						30.03.2017					
☑ Generate new ROOT CA and publish onto repository							14.04.2017				
☑ To be reviewed by IGTF and included TA Release								11.05.2017			
☑ Re-issue certificates with new ROOT CA									22.06.2017		
☐ Revoke certificates signed by old ROOT CA											

User certs

- Kyungpook National Univ.
- Chonnam National Univ.
- Seoul National Univ.
- Soongsil Univ.
- Hanyang Univ.
- Univ. of Seoul
- Yonsei Univ.
- KISTI

Pie values: 4, 2, 3, 2, 1, 4, 6, 27
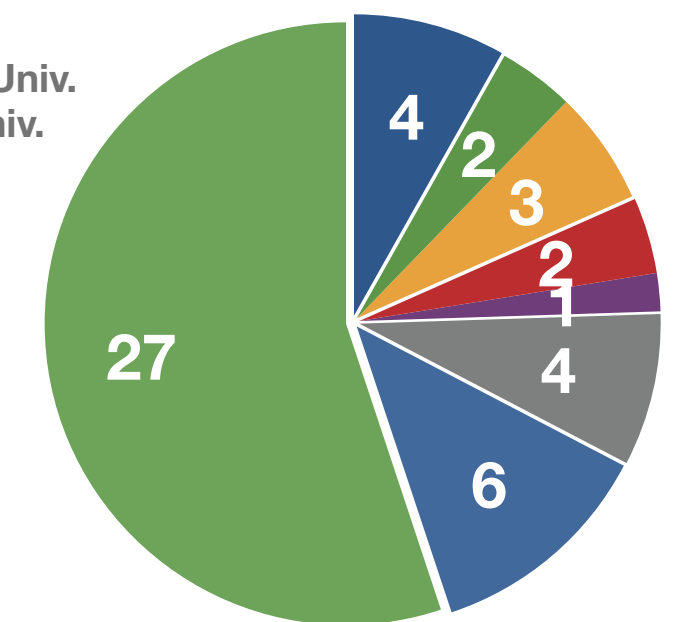
Type	User	Host	Total
Valid	26	23	49
Expired	0	0	0
Revoked	4	3	7
Total	30	26	56

GSDC School

- Computing school for Korean (under-)graduate students, post-docs and researchers from fundamental research as well as computer science

- Targeting whom requires some knowledge of computing for their research, and whom wants to learn some insight on the applications of computing technologies

- Gives practical examples on High Throughput Computing, Data management, Network and Security in order to help to grep a concept of Datacenter for large scale of data

4th GSDC School @ KIRD

Physics
Computer Science
Medical & Bio

1st, Feb 2015

2nd, Feb 2016

3rd, Dec 2016

4th, Jul 2017

29 Participants

24 Participants

Contribution to train cross-field experts

The 5th event will be scheduled next summer

GSDc Promoting Science

Thank you