Introduction to GSDC

(Role Expansion to National Data Center)

Global **S**cience experimental
Data hub **C**enter

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Data & Infra-driven R&D Era

Research Paradigm Shift

Data & Infrastructure are Key in Scientific Discovery

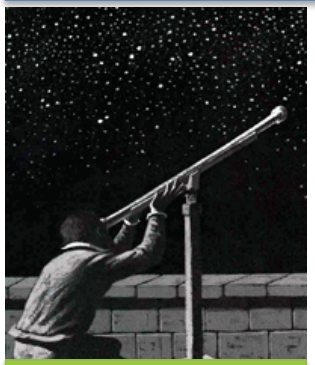
Describing natural phenomena based on Observation

Modeling and Theory

Computing Simulation

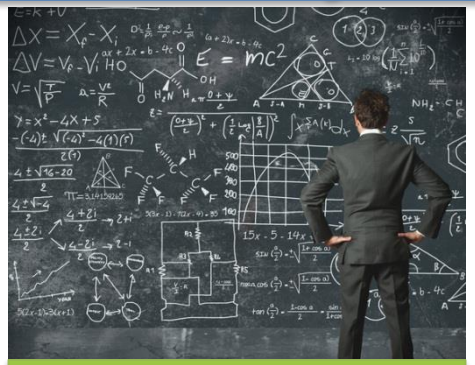
Data Analysis of tremendous data produced from large experimental facilities

Research Paradigm Shift to Data Intensive Scientific Discovery



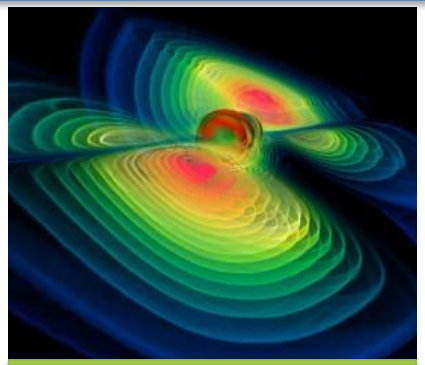
1st Generation: Observation

Galileo's telescope



2nd Generation: Theory

Higgs Theory



3rd Generation: Simulation

Black Hole Simulation

4th Generation: Data

CERN's CMS and ATLAS experiments → Higgs discovery

More chance to do research with advanced equipment, higher chance to get Nobel prize

87% of Nobel prizes have been given to researchers who produced outstanding scientific discoveries using advanced experimental equipment since 1914.

Source: The Fourth Paradigm

“Open Science”…hot keyword among Policy Makers

- OECD produced [the first Open Science report](), mainly focusing on Open Access, Open Collaboration and Open Data (2015)

- Several expert groups in GSF have been formed to build advisory policy for Open Science: [Research Infrastructure, Data Infrastructure for Open Science]()

Open Data, Open Access and Open Collaboration through Information and Communication Technology

Acknowledgment on the importance of openness

Open science is ***more than open access to publications or data***; it includes many aspects and stages of research processes. […]

… is ***a broader concept*** that includes
- interoperability of scientific infrastructure
- open and shared research methodologies

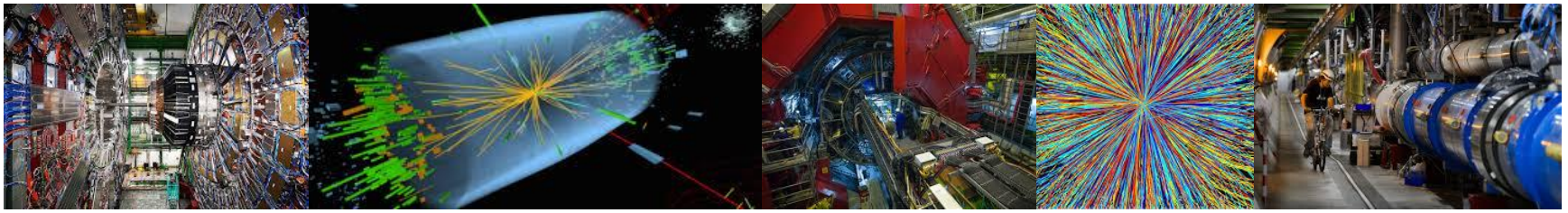
➲ Provides cost-effective access to digital research data ***from public funding***

➲ Enhances utilizations of research data ***to scientific communities as well as societies*** including corporate sectors

Data Infrastructure…that is what we need

Science relies on data, requiring infrastructure for data.

Data is getting more important and growing fast.



Data Infrastructure is the one of key factors for successful science and tackling big problems of humankind.

KISTI has been in preparation for big data research era. Our mission is gradually expanding to national role for data intensive research.

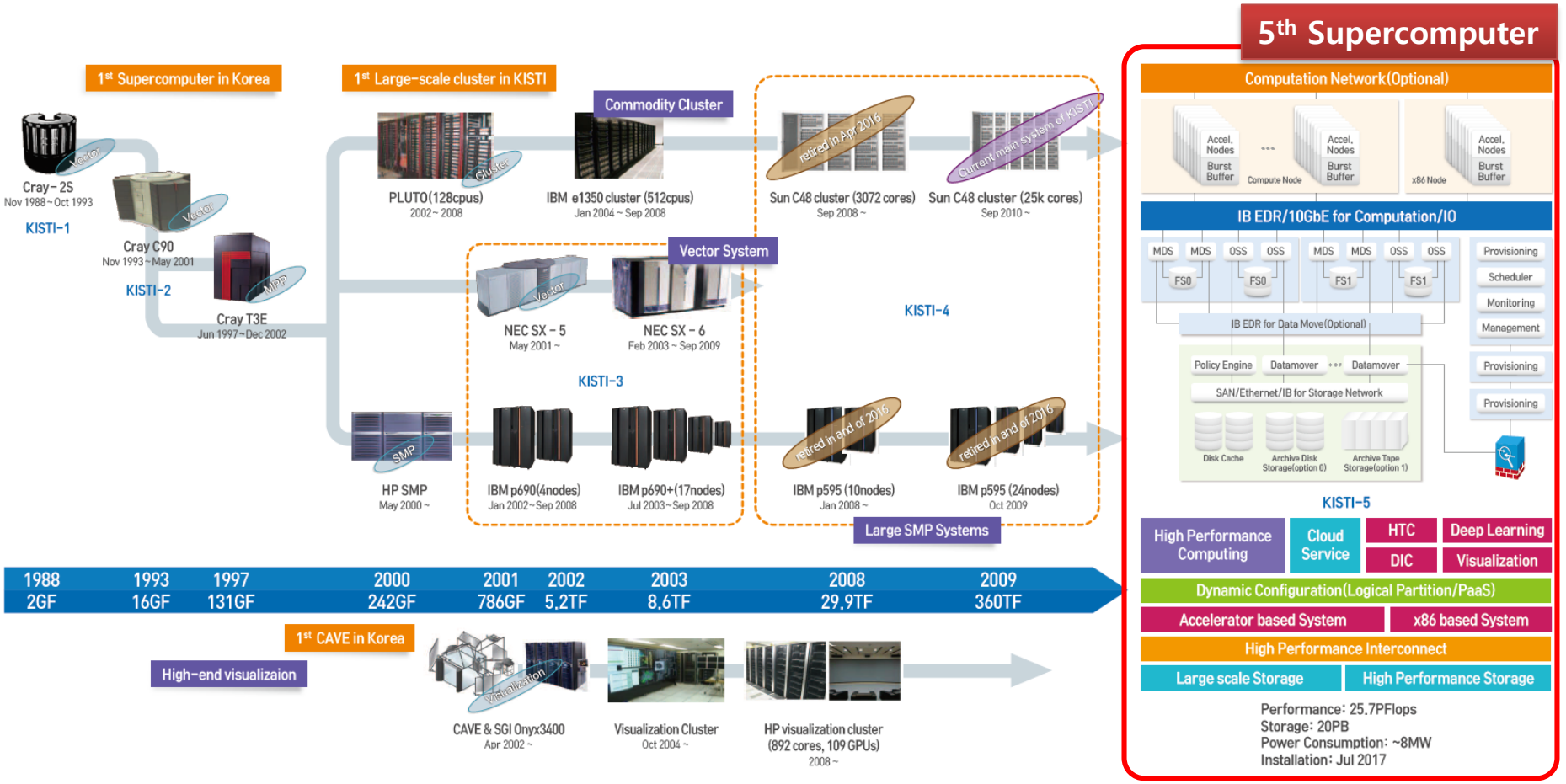
Data Infrastructure: KISTI-GSDC

KISTI…providing powerful ICT infra. service

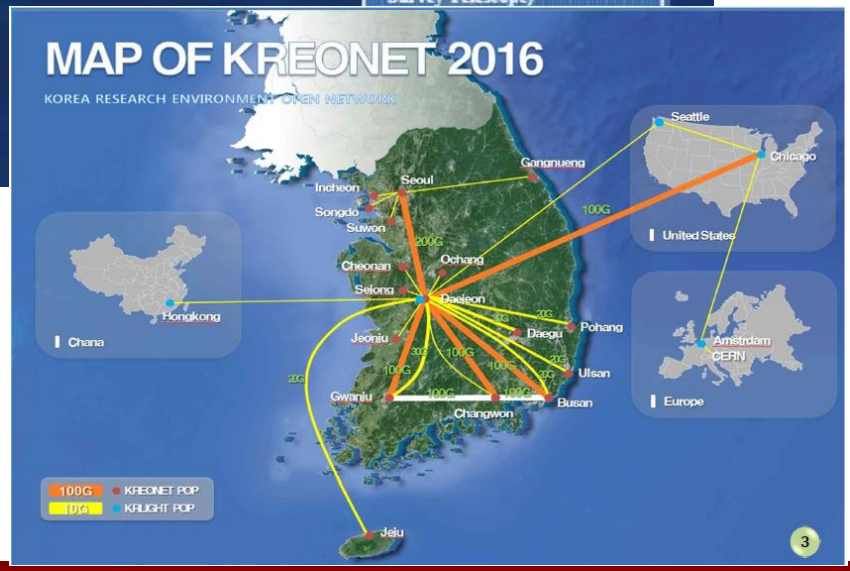
Unique organization in Korea, our mission is to support various R&D activities through ICT infra. service

Supercomputer...not for specific, but for open to various R&D

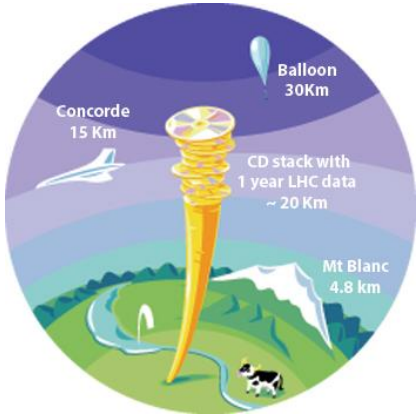
- Current supercomputer, introduced in 2008, provides 360TFlops(Rpeak)
- Supporting various R&D areas including academy and industry
- Preparation for new supercomputer having 25.7PFlops and 20PB, targeting the 4th quarter this year(2017)



Advanced KREONET Center…fast & secure data transmission



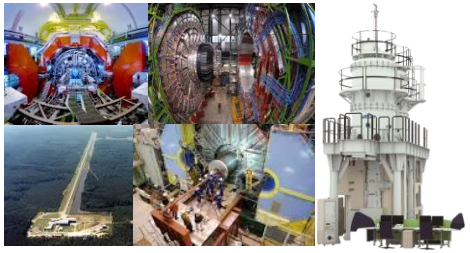
Providing domestic researchers with a constraint free collaborative research environment through KREONET(locally) and GLORIAD(globally)



Large-scale Scientific Data:
20Km CD stack with data produced per year in CERN

Global Science experimental Data hub Center

Collaboration with global laboratories



Data from
large and high-valued research equipment

- **(Global)**
  Contribution to global scientific research
- **(Domestic)**
  Scientific data management and analysis platform service

History

Collaborations

1. Particle Physics
2. Detector Construction and Exploitation
3. **LHC Computing Grid**
4. CERN's training programs and schools

Korea-CERN Agreement — 2006.10

Korea-CERN (LHC) Protocol — 2007.07

Enhancement of Grid Computing Support for large-scale research facility (Science & Technology Master Plan 577) — 2008.08

Strategy Study on Computing Infrastructure for experimental Data sharing — 2009.12

2010.07 — **Launched Global Science experimental Data hub Center@KISTI**

2014.04 — **WLCG Tier-1 Approved (11th Nation)**

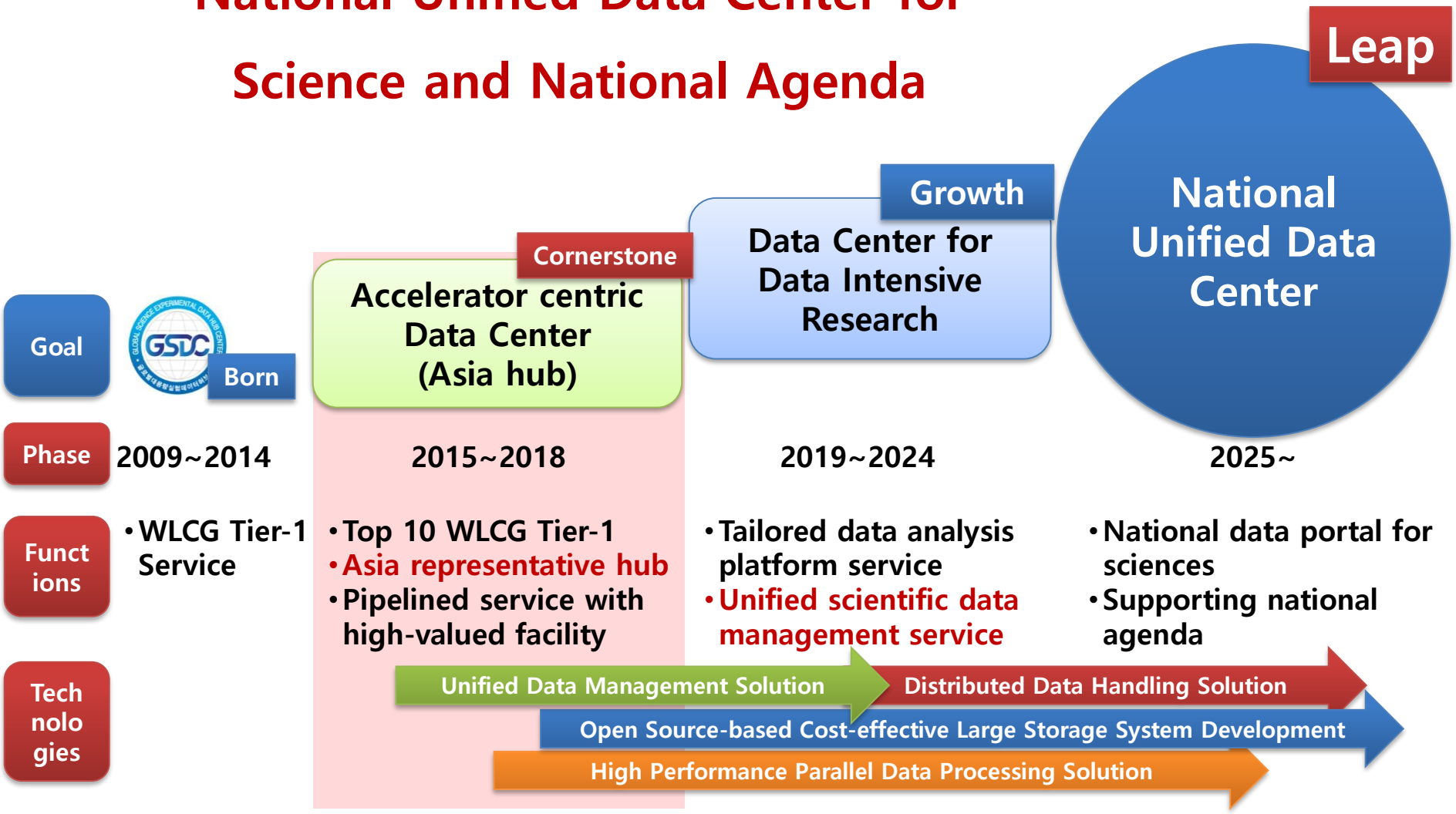
2015.5 — **KISTI-CERN 10Gbps Network Established**

2016 — **Top Quality of Service (~11th ranked)**

Asia's Top 1 WLCG Tier-1

Goal and Roadmap

National Unified Data Center for Science and National Agenda



Strategy

Promotion of Data Intensive Research

GSDC Promoting Science

R&D Partner for World-class Scientific Achievement

Role of GSDC

National Unified Data Center for Science and National Agenda

Service · Development

Technology

- Data Mgmt.
- Efficient Storage
- Infra Unification

Tailored Service for Research

- Edu
- KiAF (ALICE)
- LDG (LIGO)
- CMS T3
- RAON
- Med/Genome
- Climate
- TEM
- Brain
- NA

Global Data Hub

- WLCG Tier-1 Asia Hub
- Nat'l Agenda

Collaboration

Infrastructure

Open Science Data Platform

Data

Basic Science | Medical · Bio | High-valued | Safety· Infra

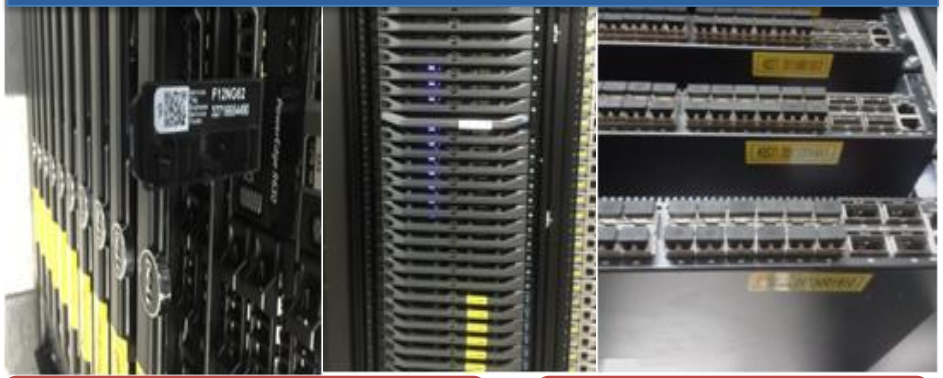
World-class CERN Tier-1 Center

WLCG Tier-1 officially certified in 2014 (Applied in 2012)

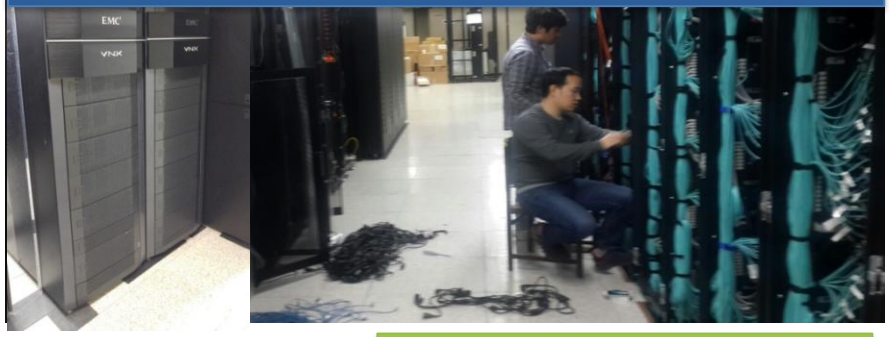
Worldwide LHC Computing Grid

Providing reliable and stable service

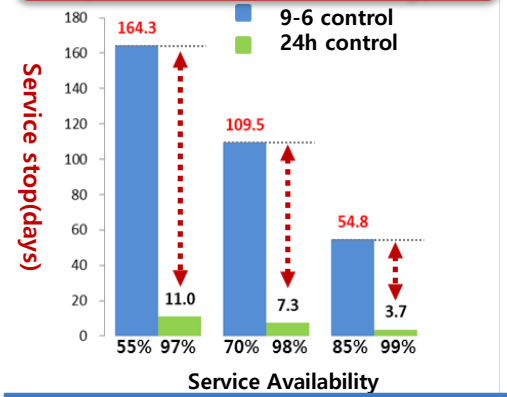
Best equipment procured every year



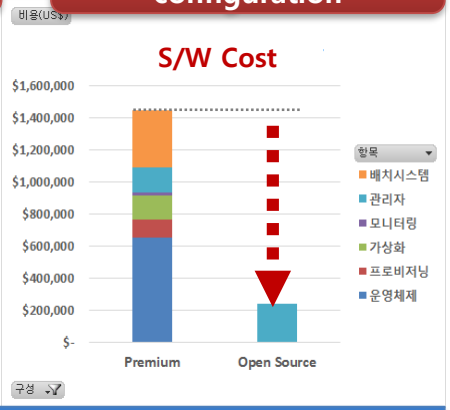
Interlocking with existing systems done by 100% KISTI experts



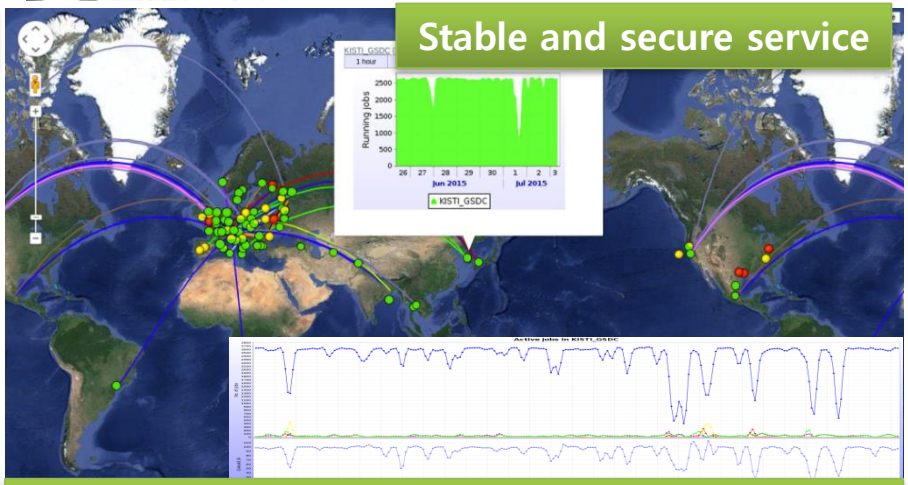
24x365 service quality control (at least 97% availability)



Cost-effective service configuration



Stable and secure service



100% open source used, requiring expertise and advanced skills [NOT FREE]

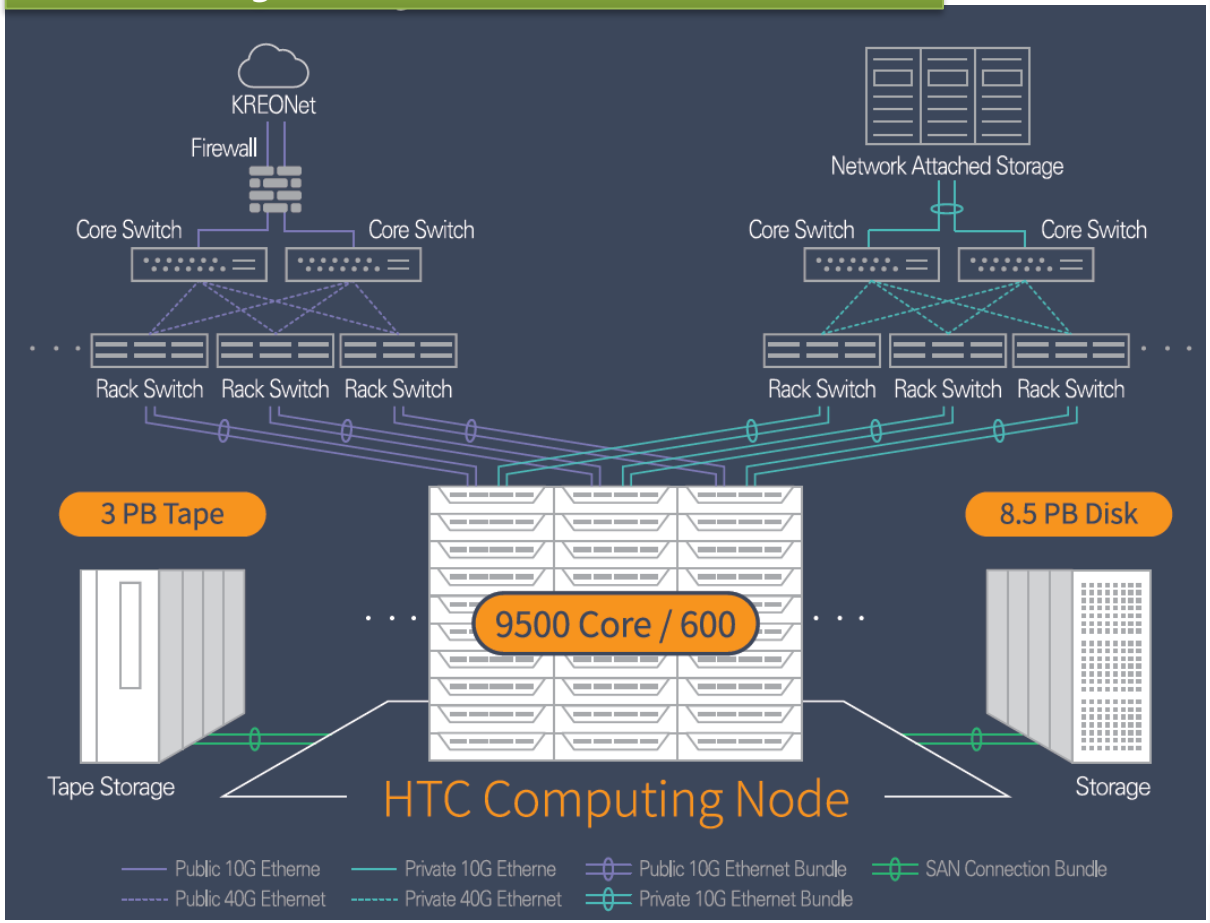
4.5 million data analysis completed per year

* Service quality measurement based on annual WLCG report

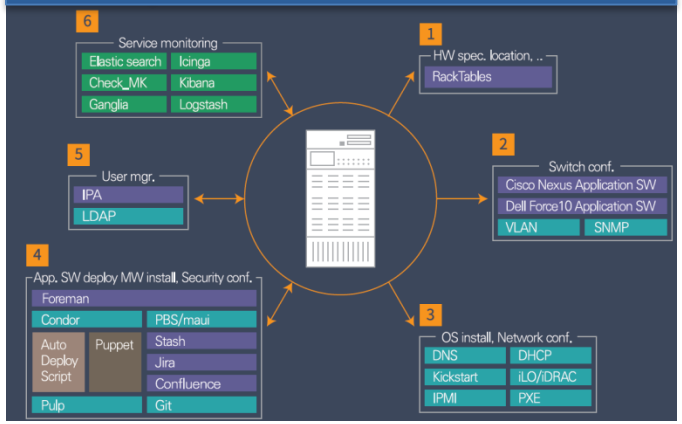
Infrastructure @ KISTI-GSDC … keep growing

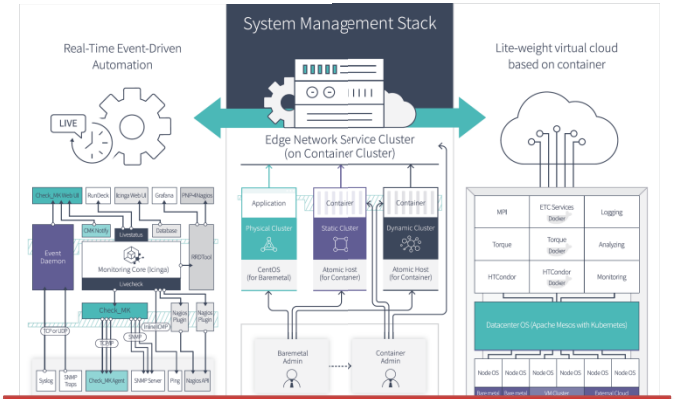
Major vendors' competition place due to every year procurement, requiring big efforts. It is impossible without expertise.

25 storage racks with 5 different vendors



Six steps to enable basic functions





Automatic System Management Stack for Service

Role Expansion to National Data Center

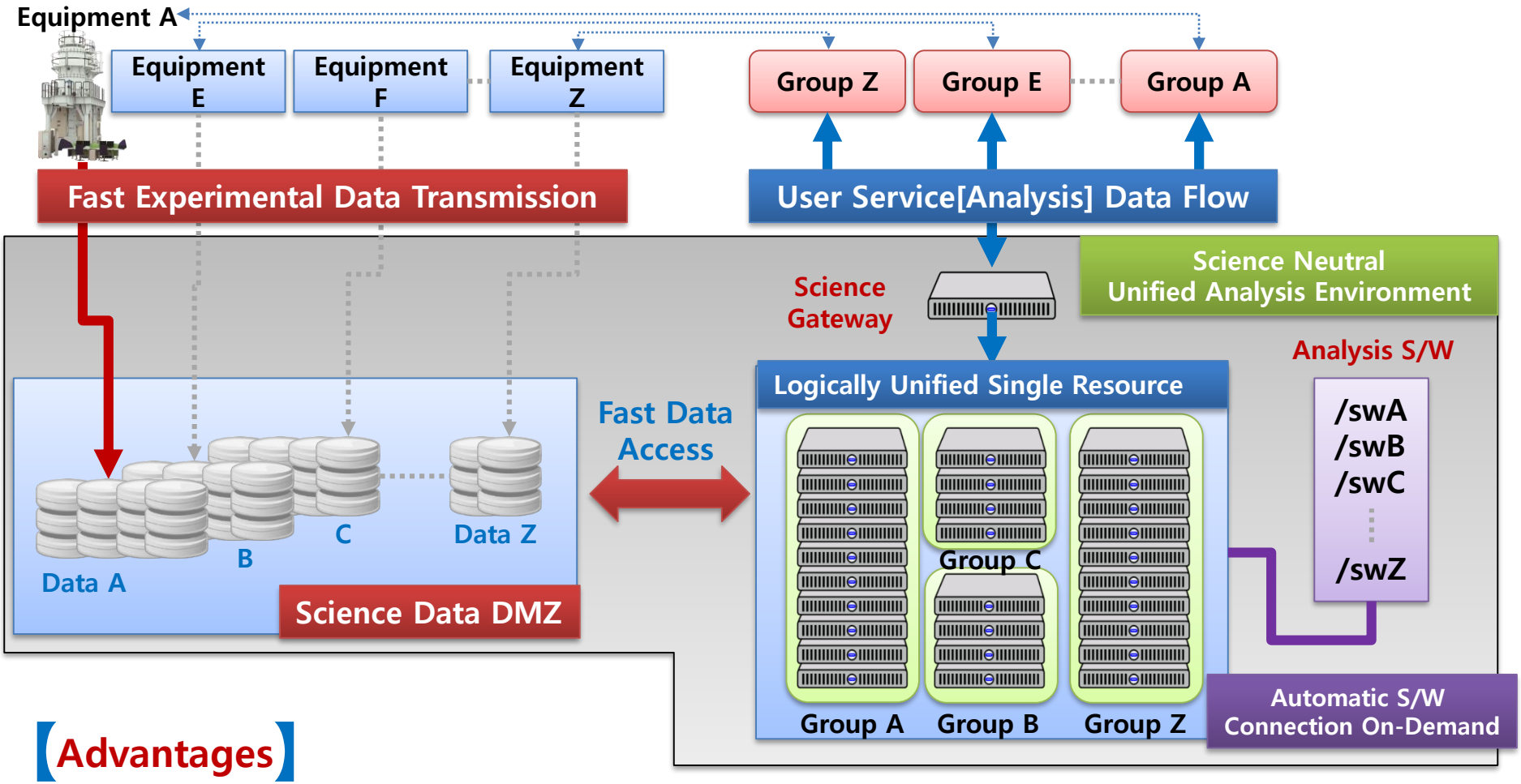
Expanding to other Scientific Domains

Experience on WLCG Tier-1 operation and service has given many benefits to expand its service availability to other scientific domains in Korea

and it is still expanding to many other research areas.

Service for additional domestic experiments is under preparation.

Unified Data Analysis Platform @ KISTI-GSDC

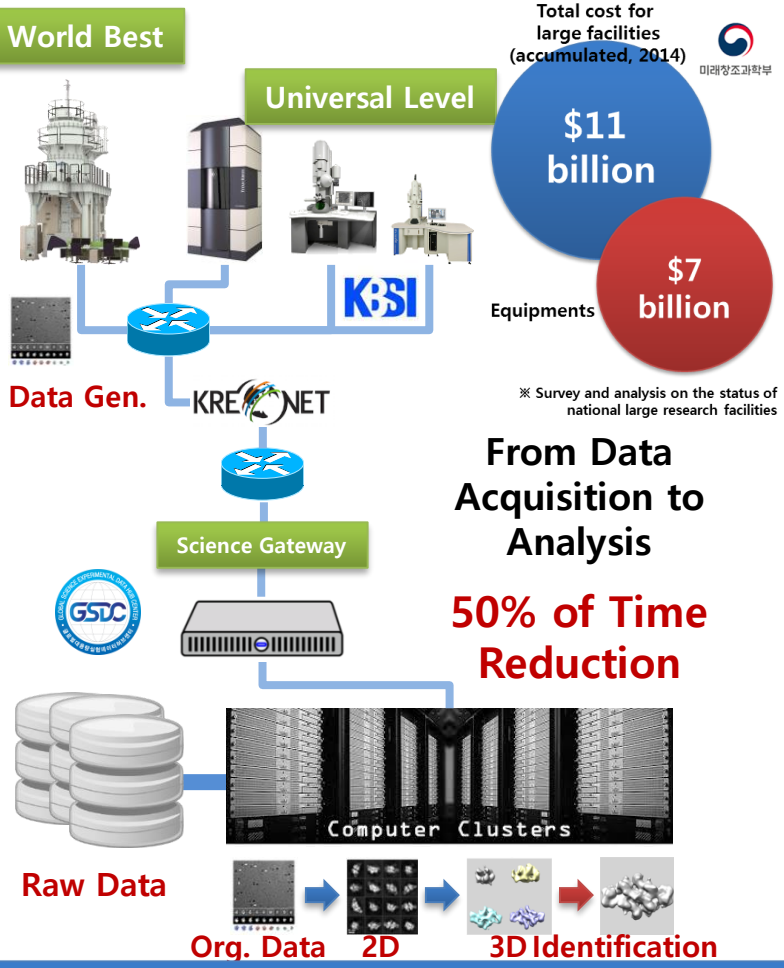


【Advantages】

1. Pluggable Science → Supports in unified way for various groups and equipment
2. Data Infra. Sharing → Reuse and full utilization of infra. saving tax-payer's money
3. Simple R&D Process → Fast results from data acquisition to data analysis

Role Expansion

Transmission electron microscopy Data Sharing·Analysis Farm



Officially joined KEK Belle II Computing Grid

MOU
KISTI & Belle II

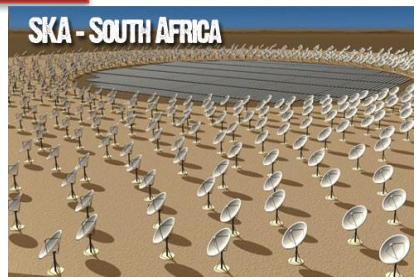
2016.11.16

RAON

New Accelerator in Korea

Utilization of Tier-1 know-how for data management

SKA



Regional data center (under discussion)

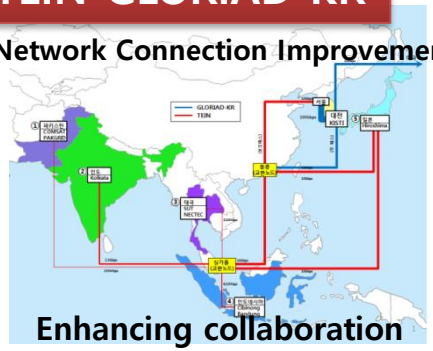
KAGRA

Gravitational Wave Detector in Japan

Officially participation in data management

TEIN-GLORIAD-KR

Network Connection Improvement



Enhancing collaboration in Asian community

Thank you.