

LHCOPN-LHCONE Meeting #50@Prague CZ

KREONET/KREONet2 Updates

April 18, 2023

Buseung Cho

Director of KREONET, KISTI
Ph.D. Principal Researcher,

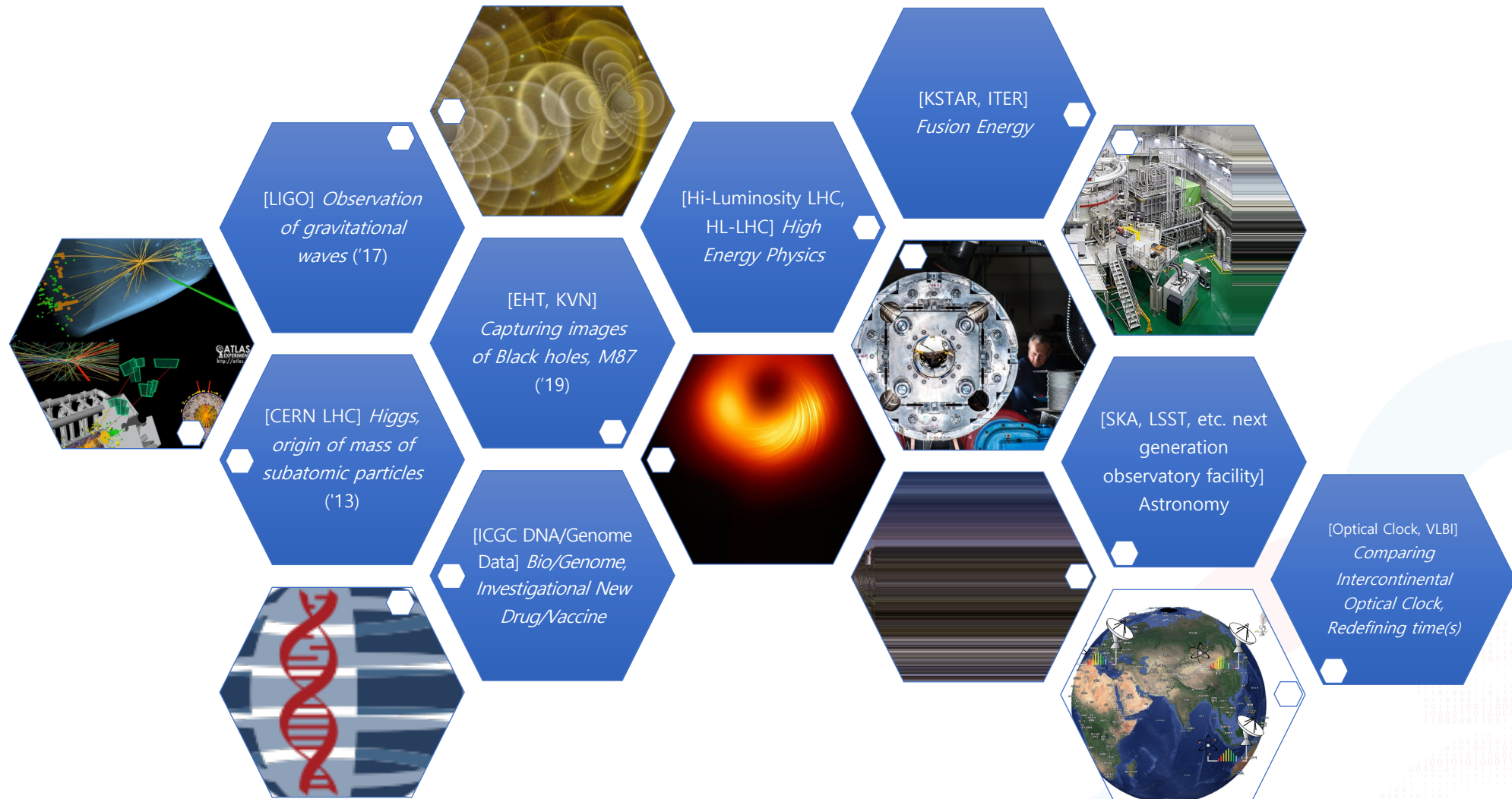
Associate Professor, UST



S&T Infra,

Changing the world with Data **KiSTi**

KREONET



Big science, Data Intensive Science, Interdisciplinary research

Map of KREONET 2023

Korea Research Environment Open NETwork

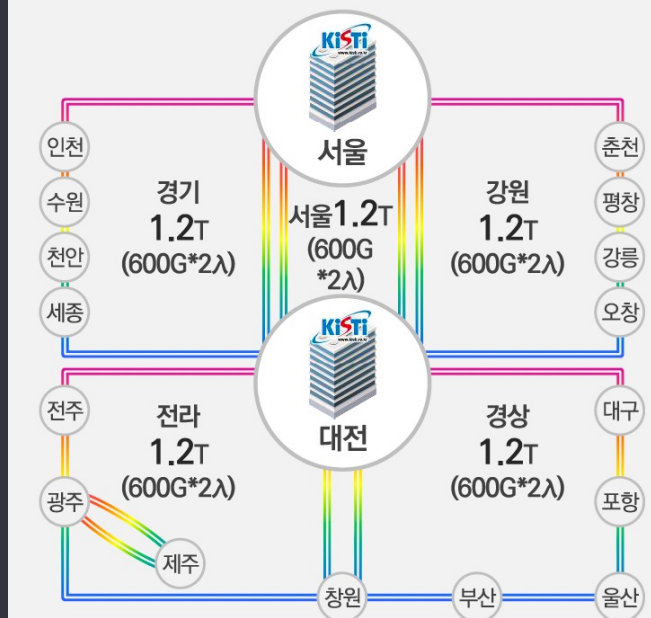


● KREONET PoP ● KRLight PoP

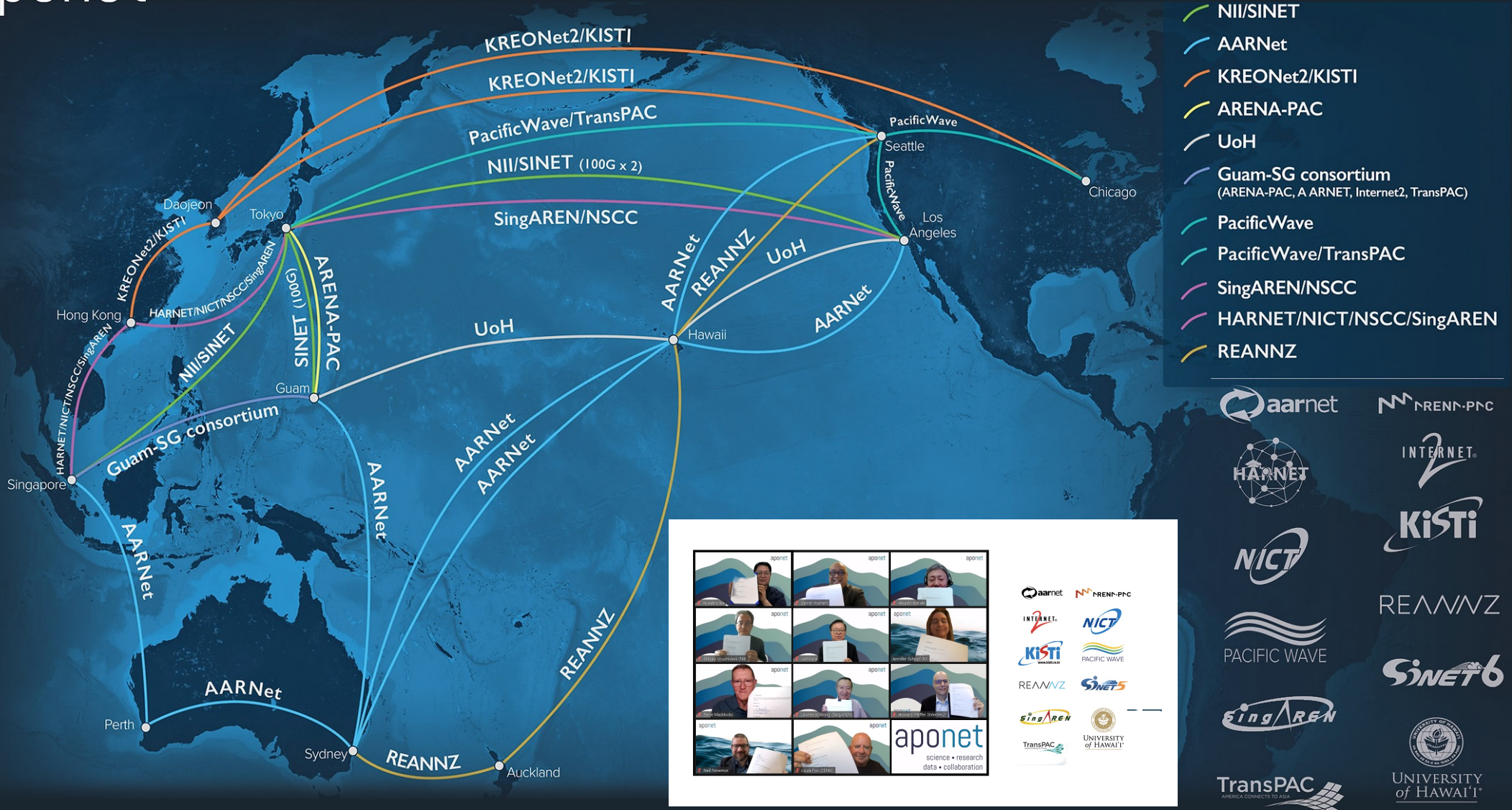
- Ciena 6500-14/6154
- 600Gbps Wavelength
- 6Tbps Total Capacity
- 100/400GE L2 Interface

- Cisco NCS5504/57C3
- SR-MPLS, SR-TE, TI-LFR
- L2/L3 VPN

- Network Automation with NSO (Network Service Orchestrator) (ongoing)



aponet ASIA PACIFIC OCEANIA NETWORK (APOnet)



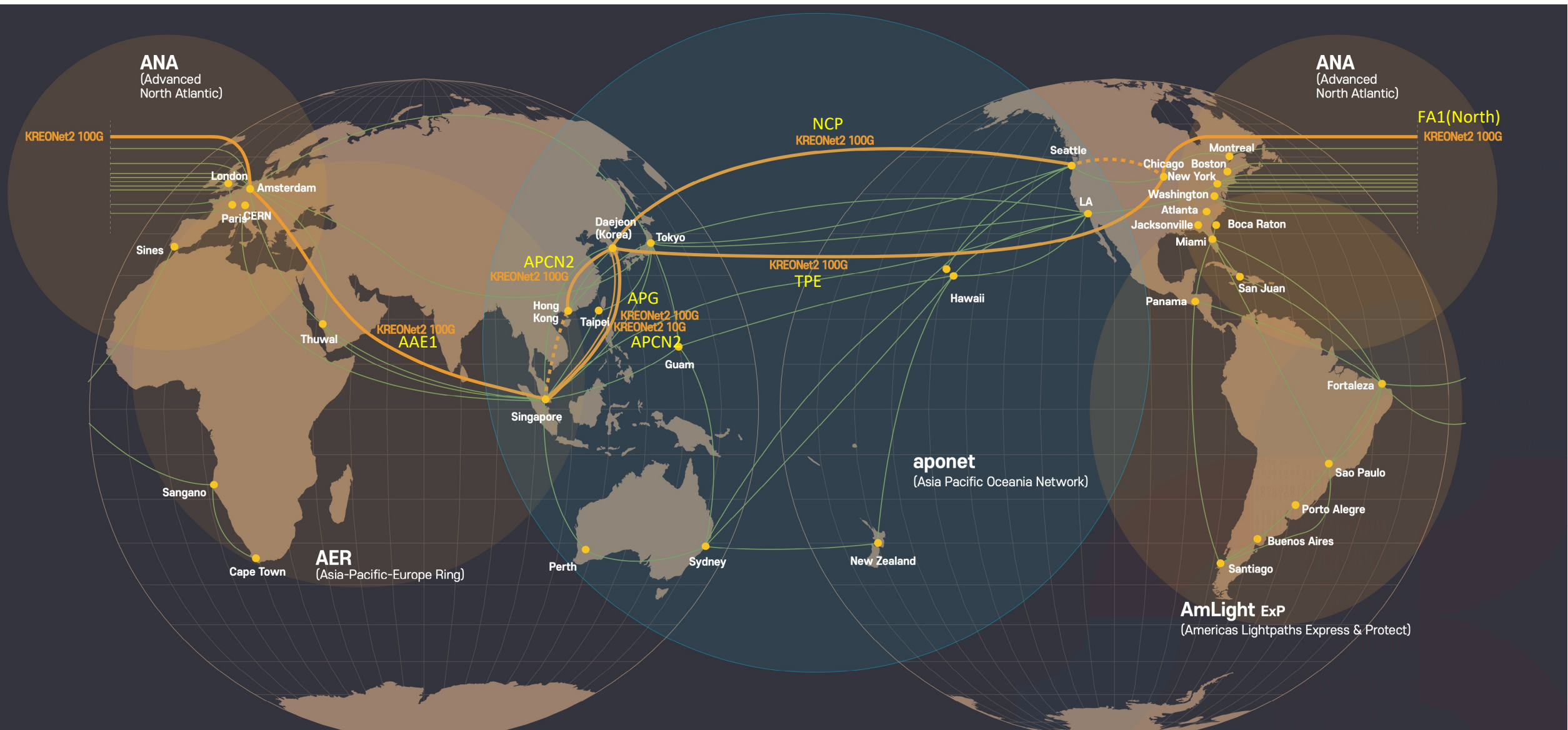
Asia-Pacific Europe Ring (AER)

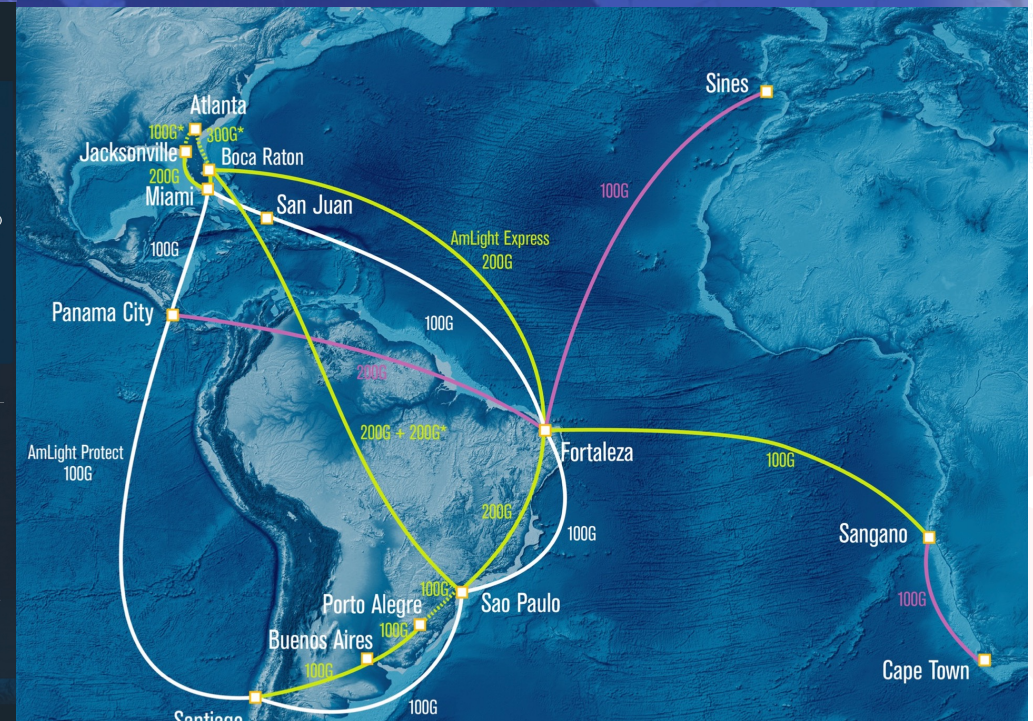
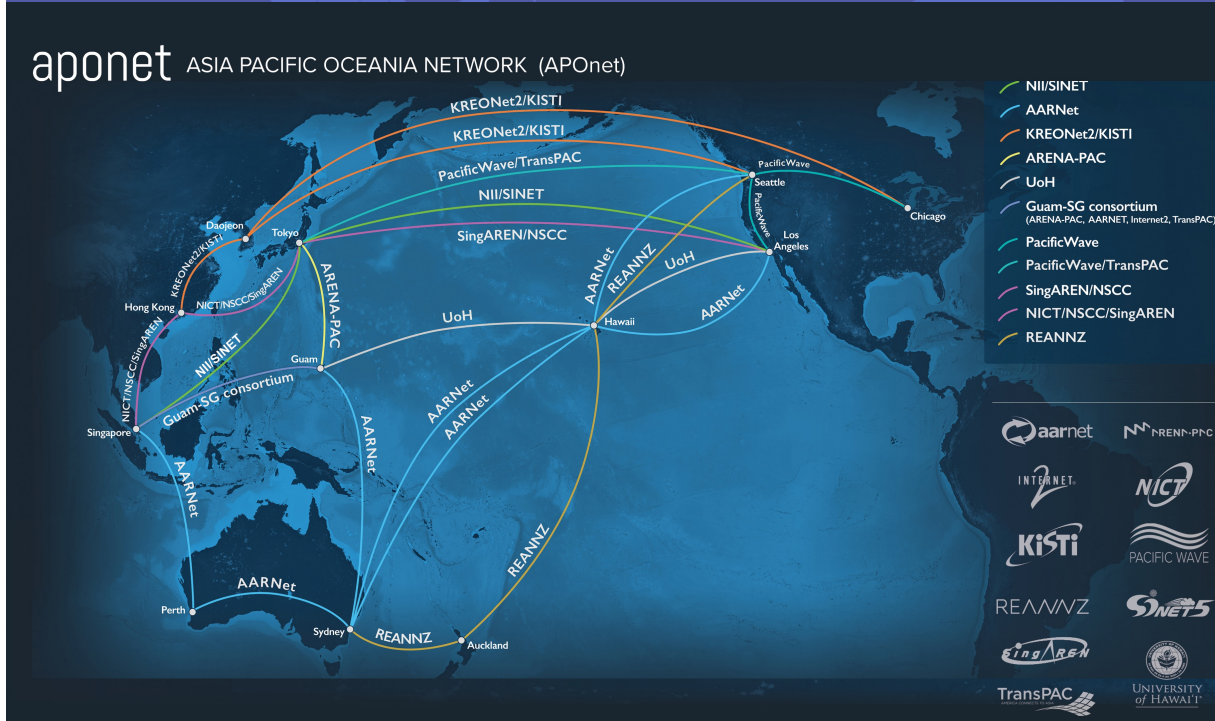
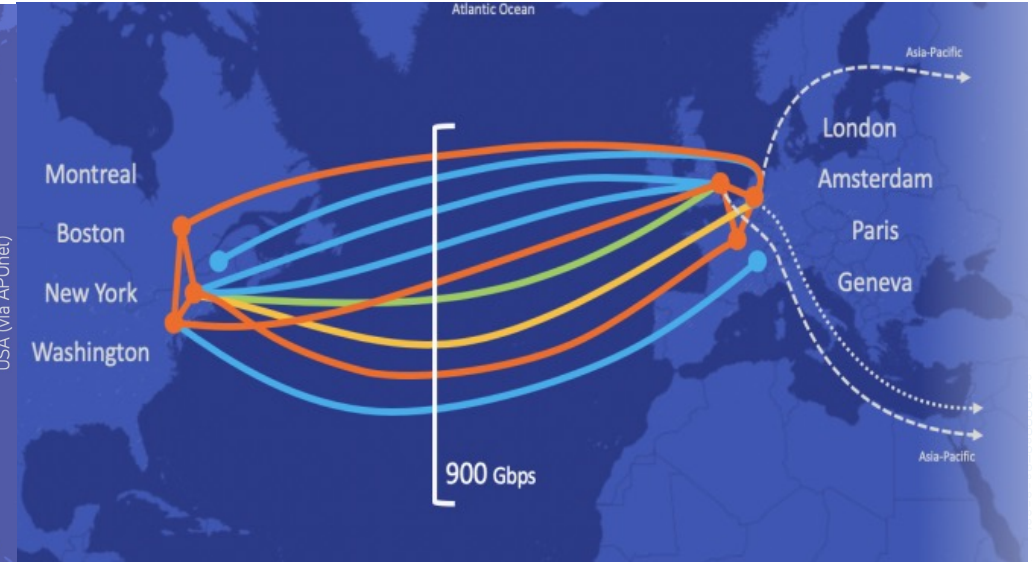
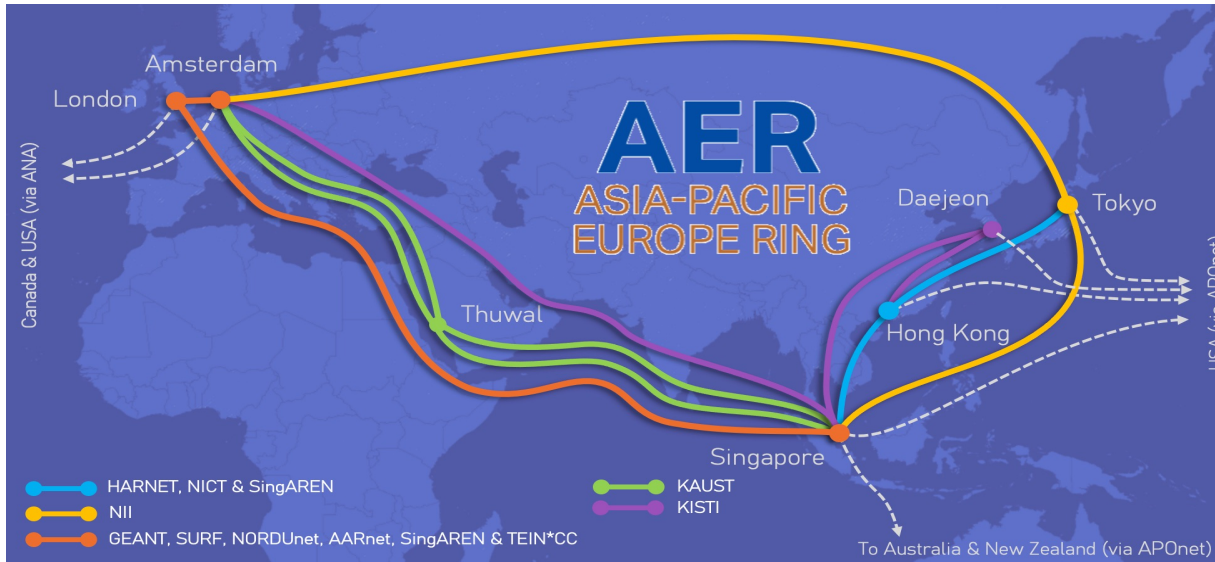


AER ASIA-PACIFIC EUROPE RING



- HARNET, NICT & SingAREN
- NII
- GEANT, SURF, NORDUnet, AARnet, SingAREN & TEIN*CC
- KAUST
- KISTI





5 years funding (about 10M USD) new project (2023~)

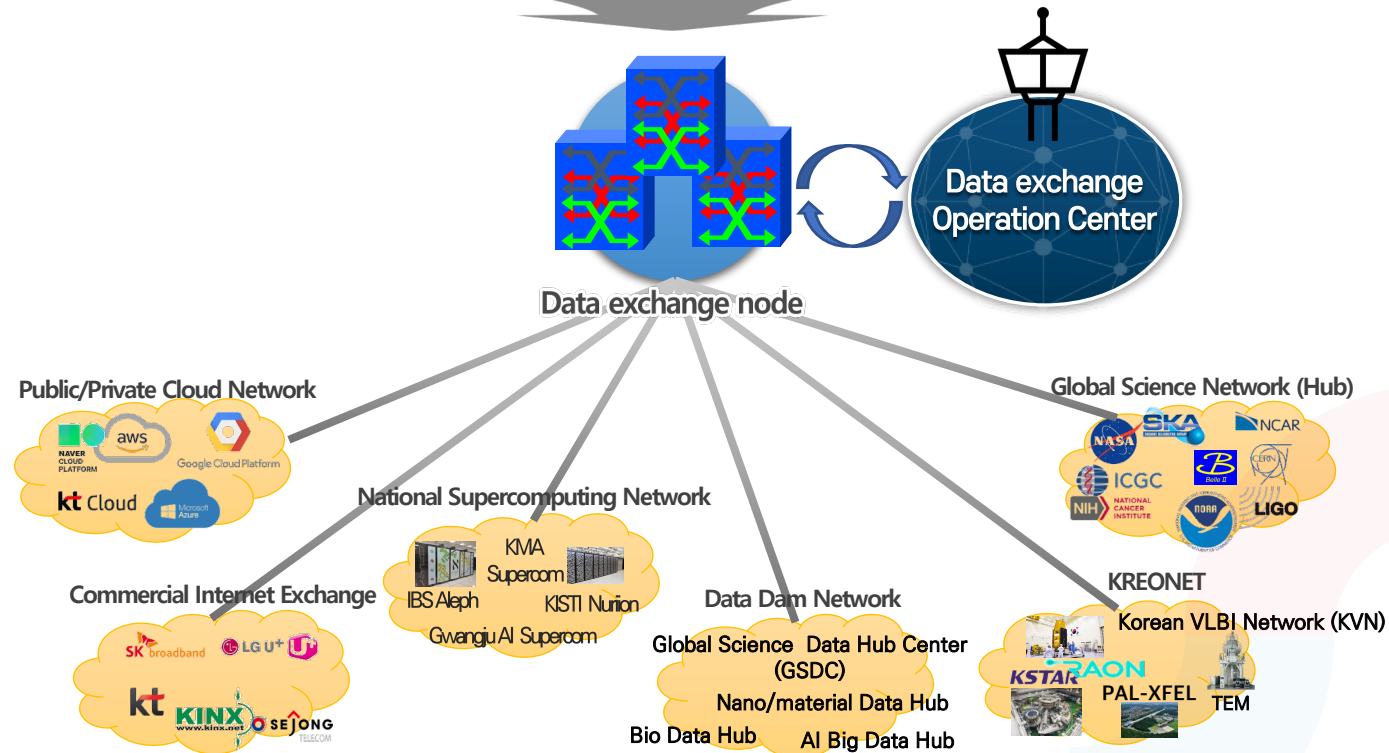
4 Key Technologies of Data exchange

1. High Performance (non-blocking)
Optical/Packet Switching Fabric

2. Software Data eXchange

3. Trust-based access and control
mechanism for Data exchange

4. High-precision Operation and
Management of Data exchange





- KOEXP as Korea Data Exchange Facility, the first open exchange in Korea
 - Built and operated by KISTI/KREONET
 - **Collocation space** in datacenter facility nearby largest submarine cable landing station (CLS) in Busan city
 - **Convenient Access Point** among Asia Pacific Submarine Cables with reliability
 - Connects to KREONET/KREONet2 with m*100Gbps
 - **Free backhaul connection btw KOEXP and CLS**
- Distributed KOEXP (Busan, Daejeon, and Seoul)
 - Research and Education Network: KREONET/KREONet2, National Supercomputing Network, etc.
 - Public Cloud Network: NHN Cloud, Naver Cloud, ...
- Open in June/July, 2023

Benefits of KOEXP@ Busan



The first Open Exchange located in Busan Cable Landing Station ever



Enough capacity of Submarine cables from East and West



Simply connect on submarine cables with cross-connections



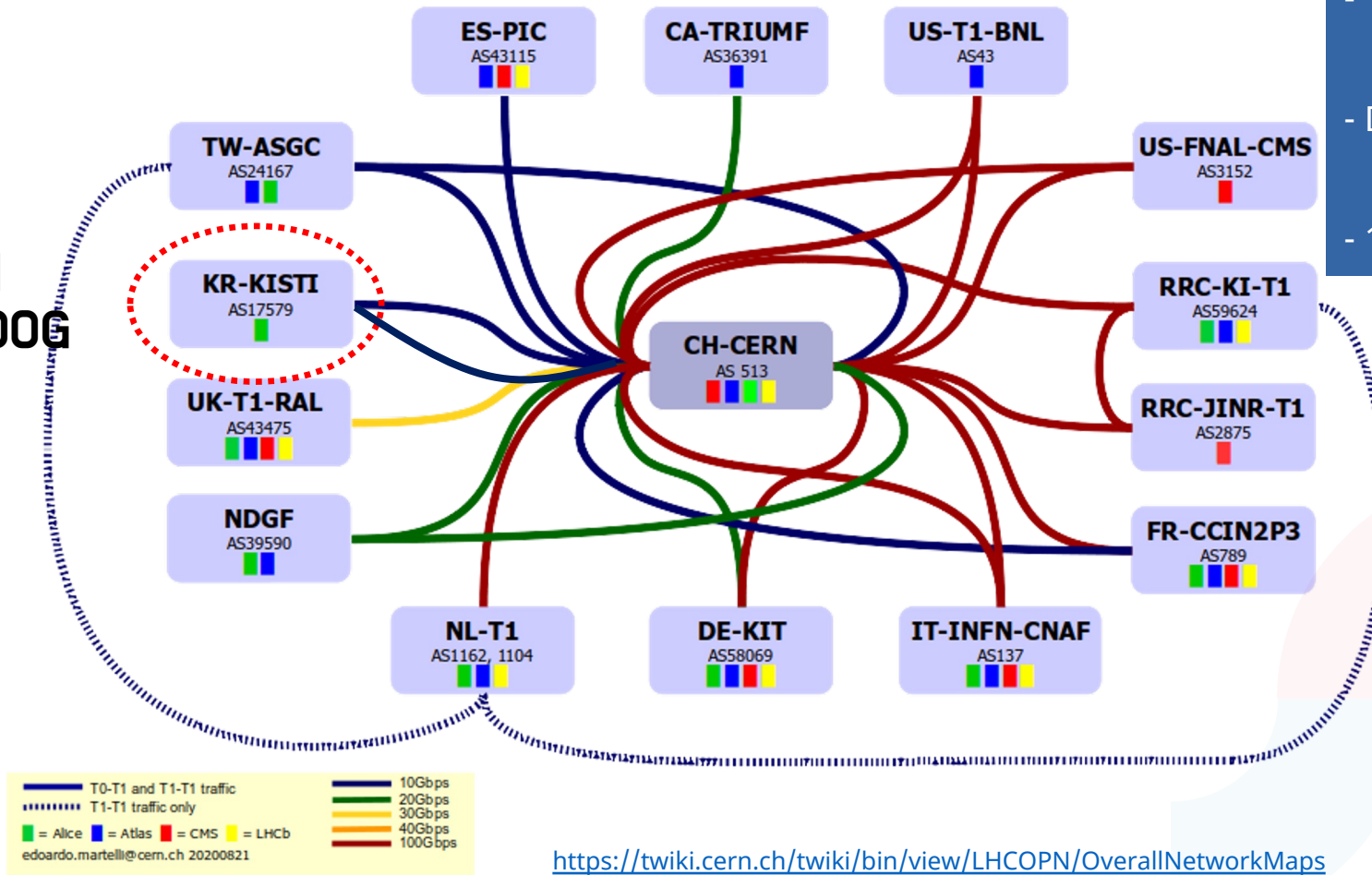
Operated by Experts Group of Submarine Cable NOC (KT) and KISTI

LHCOPN LHC Optical Private Network

Private network connecting Tier0 and Tier1s

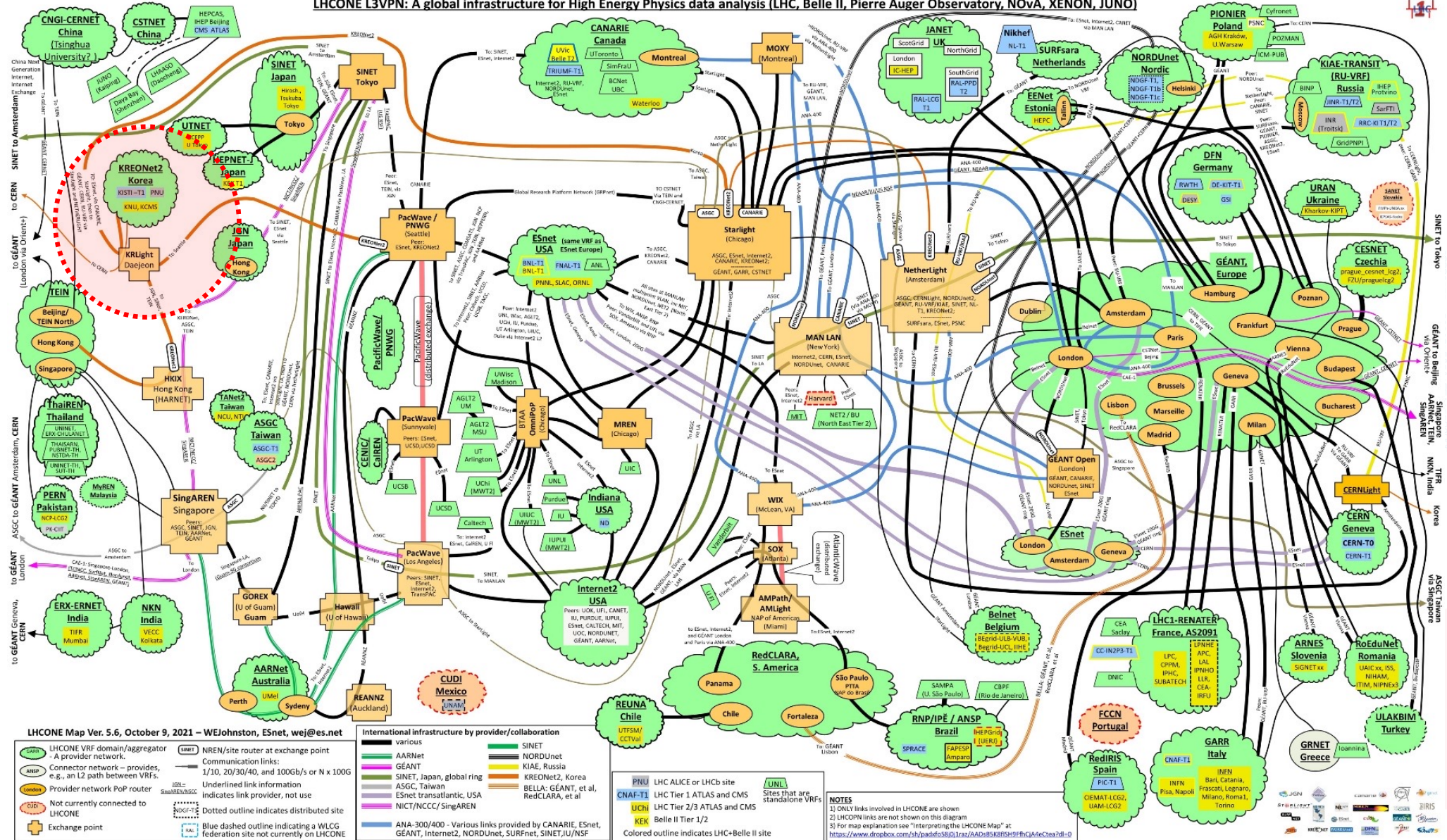
- Numbers**
- 14 Tier1s + 1 Tier0
 - 12 countries in 3 continents
 - Dual stack IPv4-IPv6
 - 1.1Tbps to the Tier0

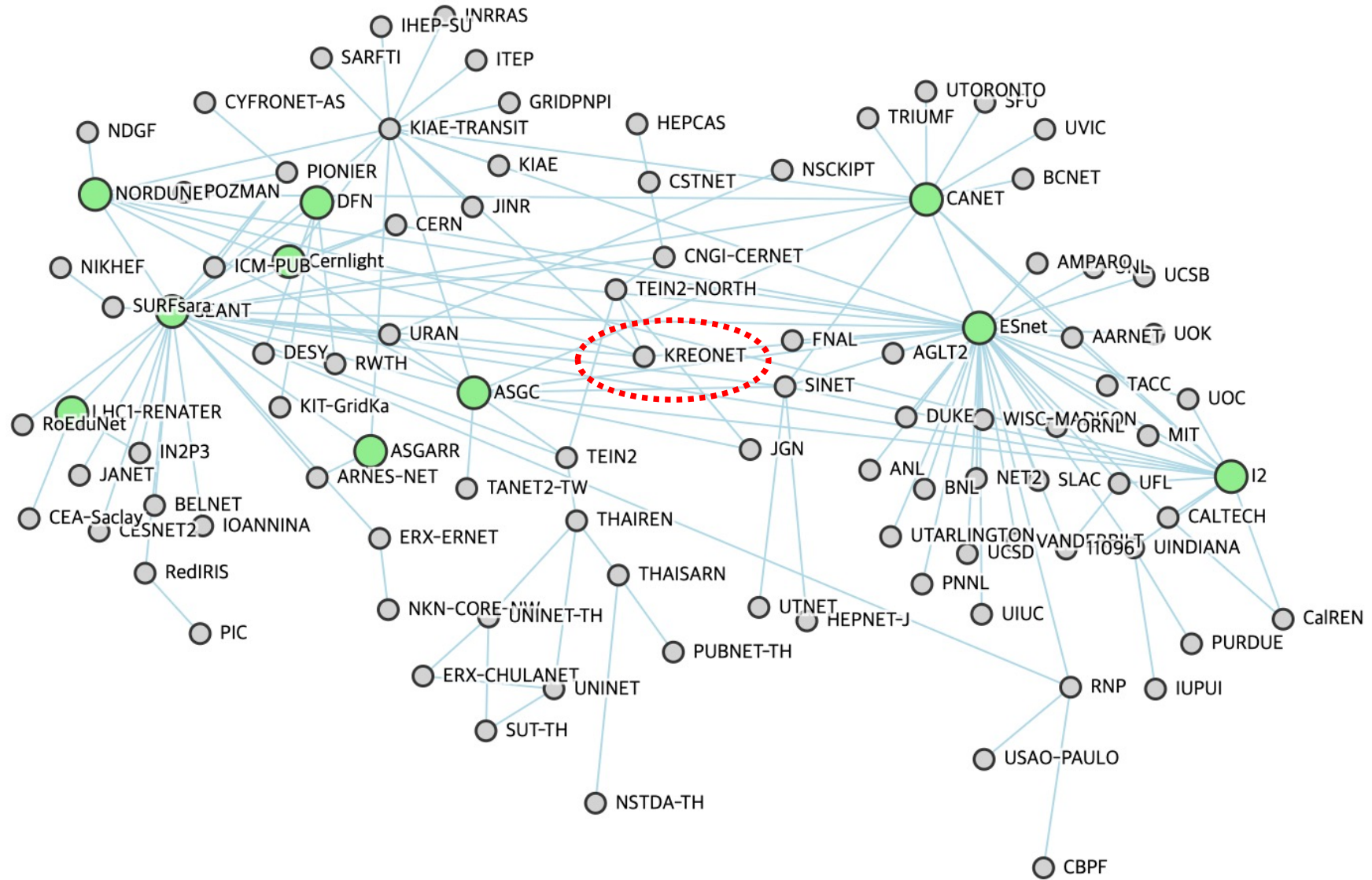
KISTI - CERN
: 20G -> 2*100G



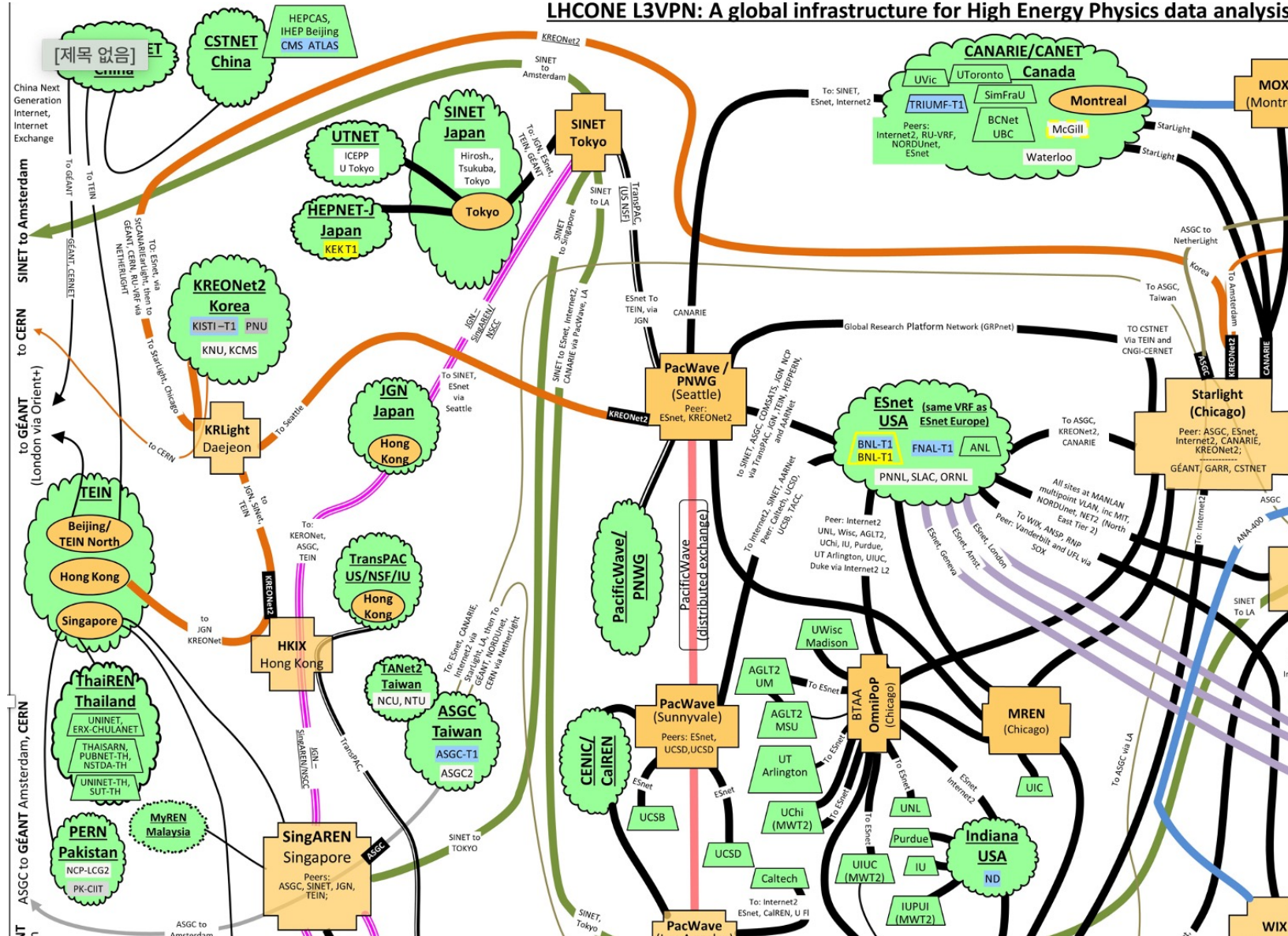
<https://twiki.cern.ch/twiki/bin/view/LHCOPN/OverallNetworkMaps>

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

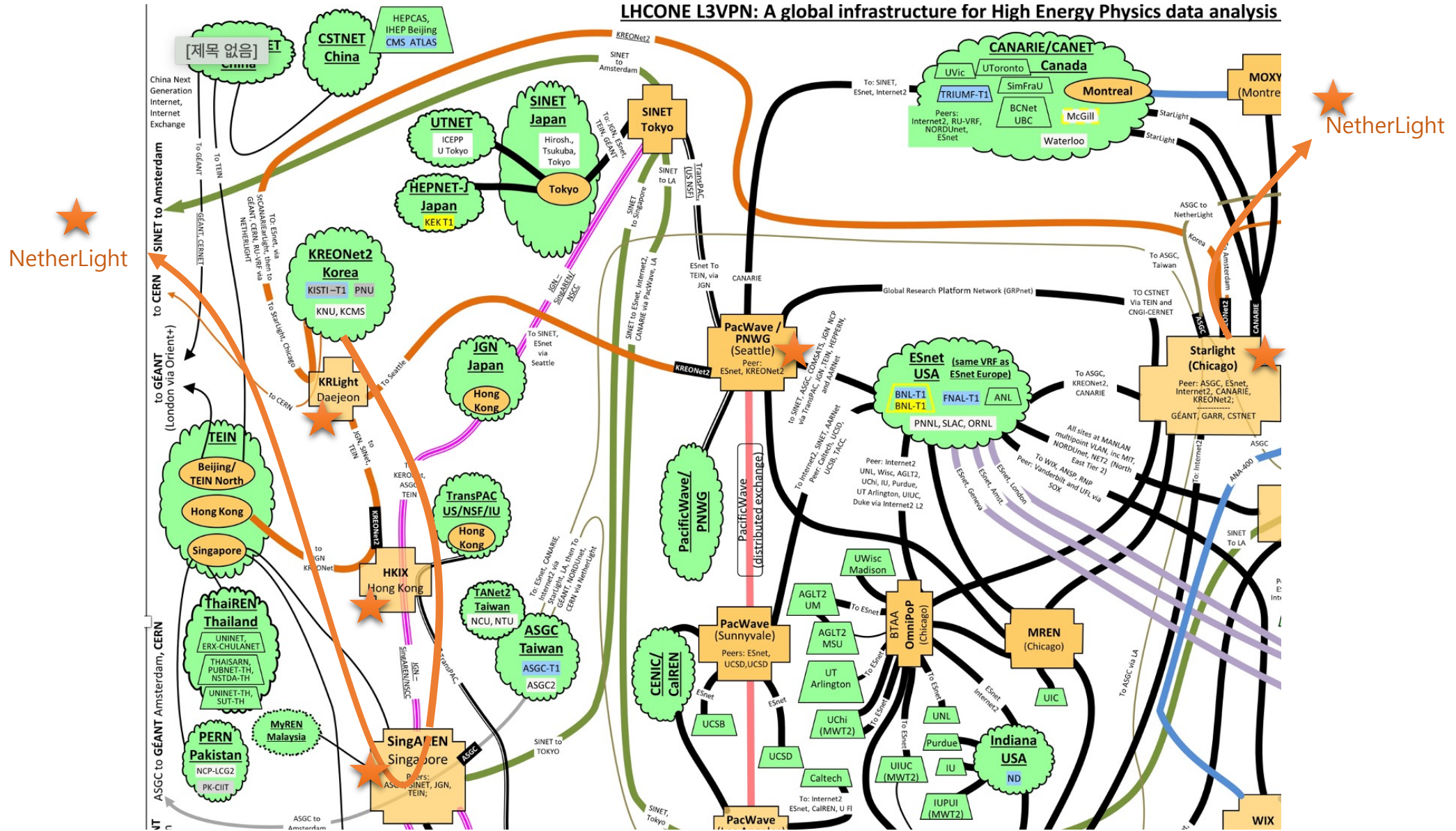




LHCONE L3VPN: A global infrastructure for High Energy Physics data analysis



LHCONE L3VPN: A global infrastructure for High Energy Physics data analysis

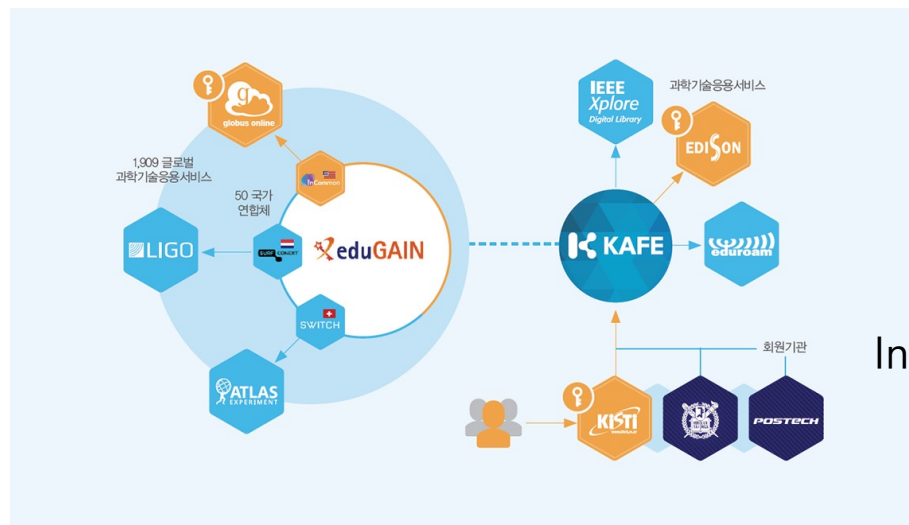




78 Domestic members
(SNU, KAIST, etc)



KAFE Members

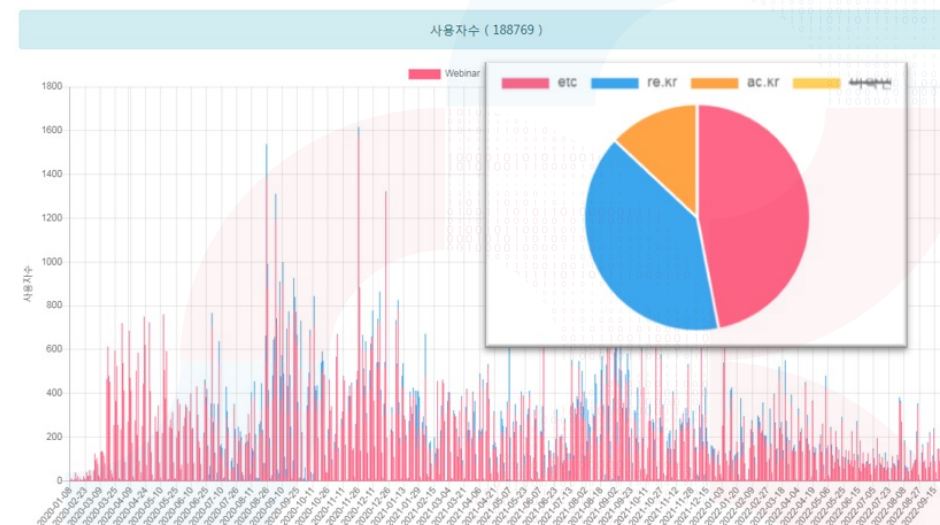


2,510

Inter-federated members
(CERN, CILogon, etc)

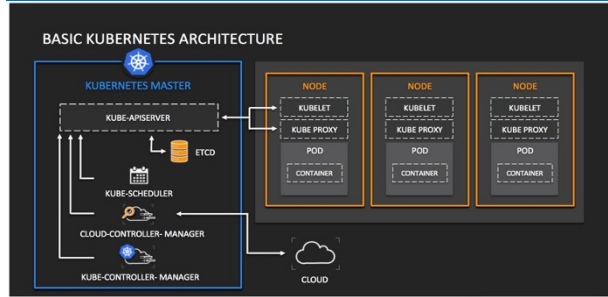
KAFE Federated Services

- KREONET Webinar, Globus, Portal
- KISTI SuperCom Cloud Service (KiCloud KAIROS)
- KISTI AI platform (AIDA), DataOn, ScienceOn
- IEEEExplore, etc (E-journal)
- CERN, LIGO, OpenAIRE, ...



of KREONET Webinar users

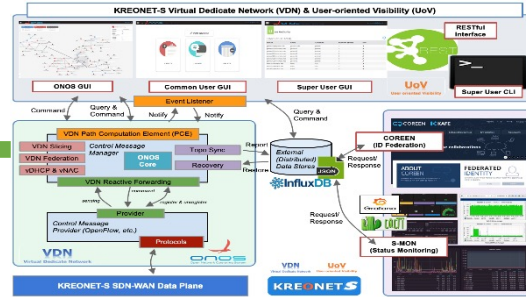
Kubernetes: Storage & Computing Resources



Distributed User Sites
Edge Networks

Physical & Virtual Service
Resource Provisioning on demand

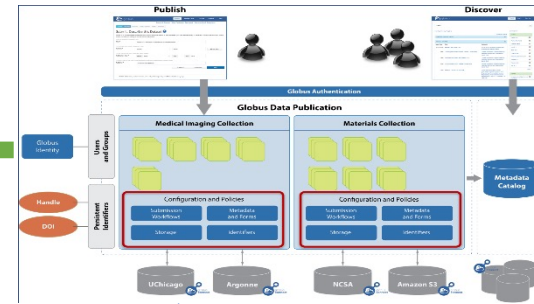
Virtual Dedicated Network: Networking Resources



Wide-area SDN Infrastructure

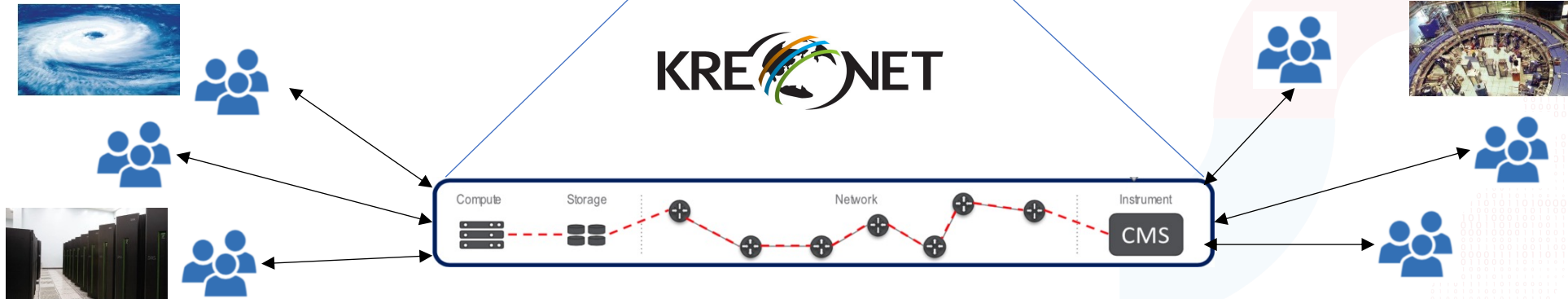
E2E High Performance Virtual Network Embedding

Globus Online: Research Data Management



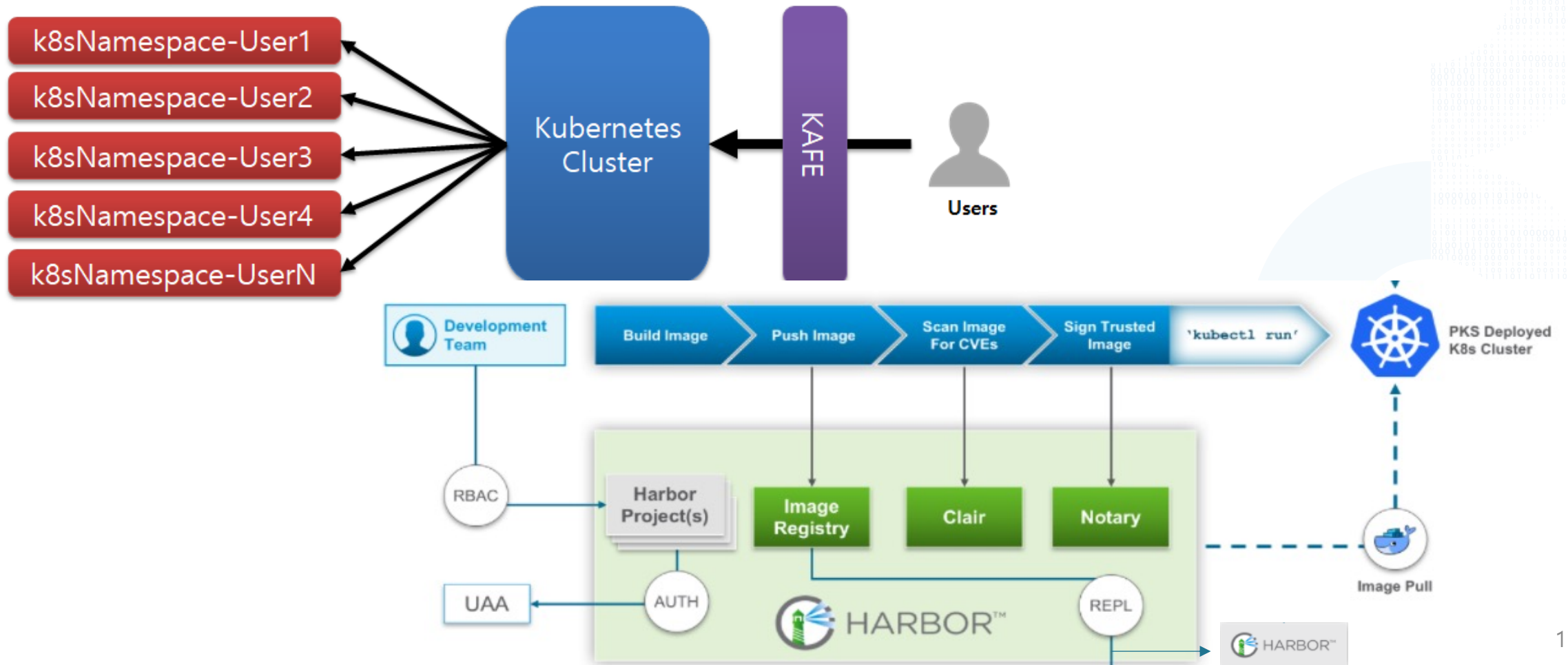
Big Data Transfer,
Sharing, Publication,
and Discovery
via Software-as-a-Service

KREONET N-S-C Orchestrator



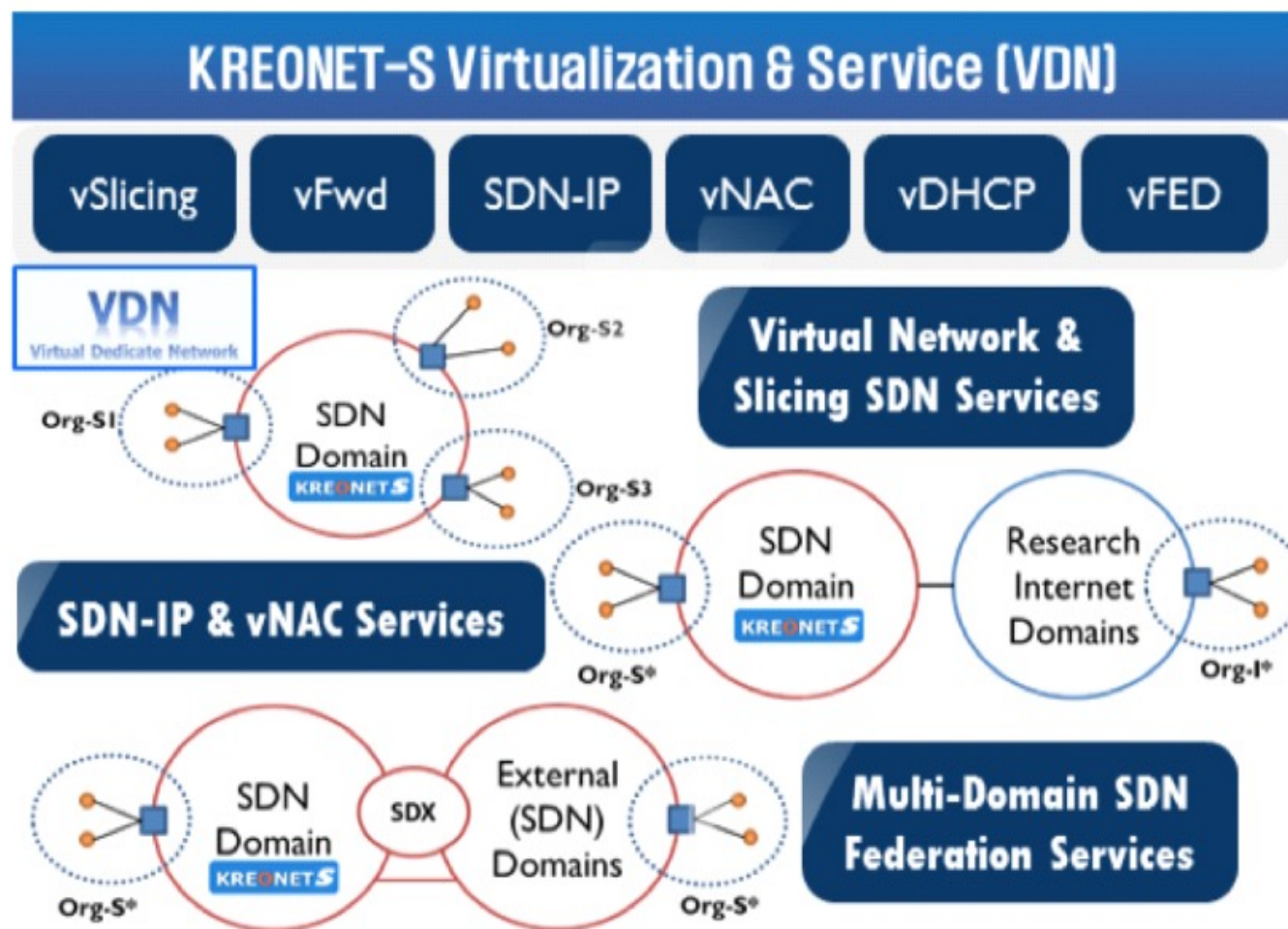
1) k8s oriented Storage & Computing Resource Management Module

- Container-based Computing and Storage Resource Management System using Kubernetes Cluster and Ceph Storage
- Easy and Integrated Log-in Facility based on KAFE (Korea Access Federation) - ID Federation Capability
- Private Image Repository Configurations using Open-source Software (e.g., Harbor)



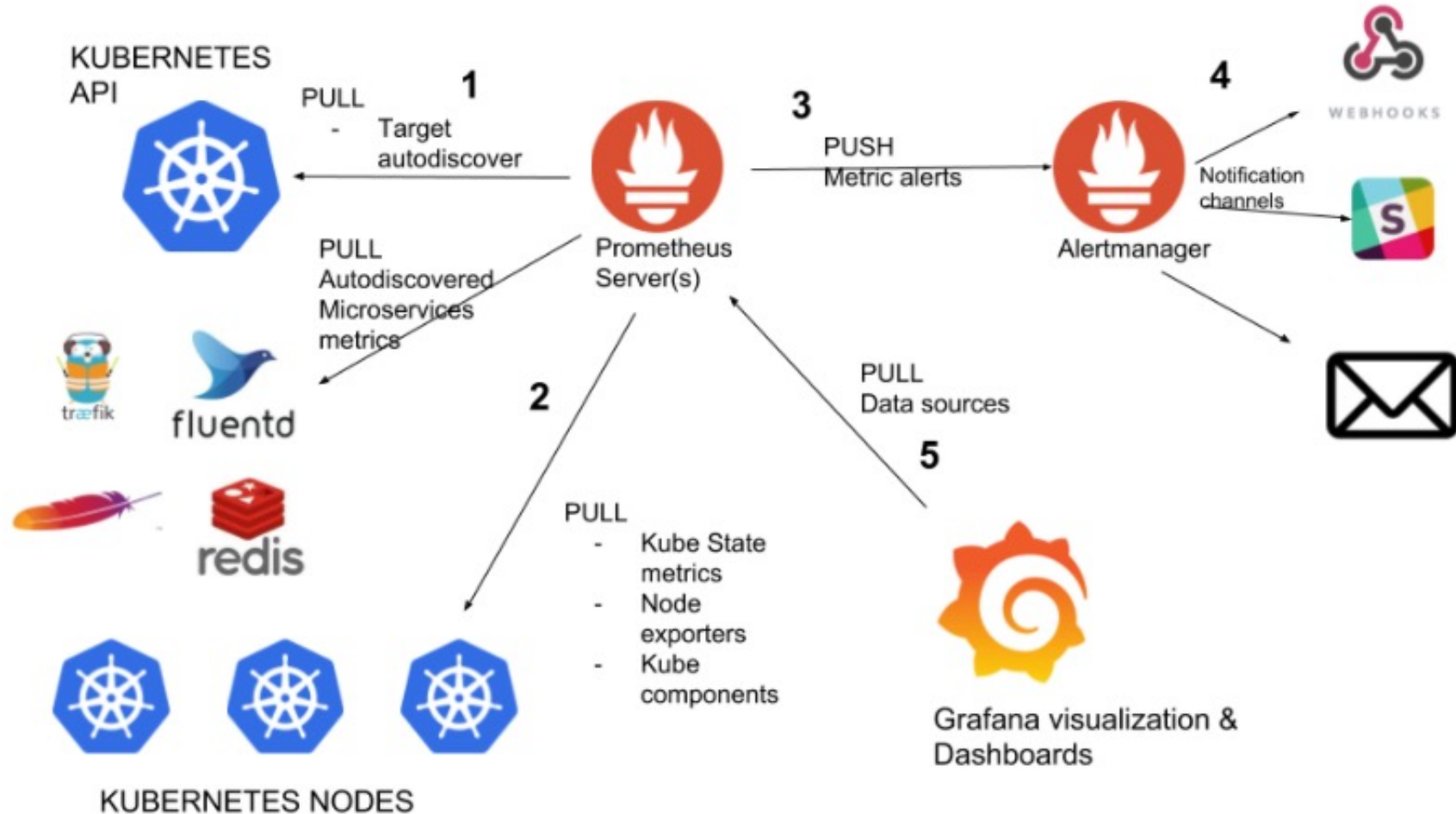
2) VDN Management Module for Network Slicing w/ Computing and Storage Resources

- Virtual Dedicated Network Management System which interacts with Computing and Storage Resources
- Container (k8s) Auto-Selection and Provisioning based on VDN-CNI and Location-oriented Algorithms
- VDN Create, Update, and Delete Operations for Administrators



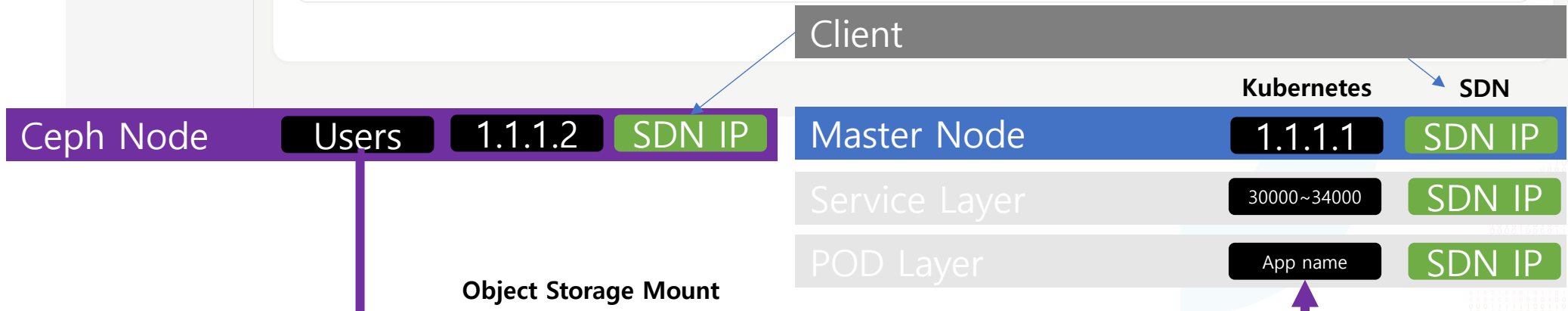
3) Monitoring & Visualization Module

- Individual Resource (Compute, Memory, Disk, etc.) Monitoring System coupled with k8s using Prometheus and Grafana
- System Log (Warnings and Errors) Collection System using Fluentd and ELK (Elasticsearch, Logstash, Kibana), etc.



VDN Creation

The screenshot shows the KREONET N-S-C ORCHESTRATOR interface. On the left is a navigation menu with items like '대시보드', '오케스트레이션 POD 관리', 'Device 관리', '스토리지 관리', 'Node 관리', 'Globus Online', '공지사항', and '문의사항'. The main area is divided into two sections: 'My POD' and 'My VDN'. 'My POD' contains a table with columns for 'POD 이름', '상태', '실행환경', '사용 가능 자원', '스토리지', '생성한 유저', 'ip', 'host_id', '인터페이스', '관리', 'VDN 정보', '생성시간', and '생성노드'. One entry is visible: 'test-221213(fuajp dkxtaxsyyalaprs)' with status 'Running' and environment 'Jupyter'. 'My VDN' contains a table with columns for 'VDN명', 'Bandwidth', 'Edge-Node', '생성일', '수정일', '생성한 유저', and '관리'. One entry is visible: 'nsc-kreonet-test00002@naver.com-test00002@naver.com-test-221213' with bandwidth '1000' and edge-node 'core'. A yellow box with the number '1' is placed below the 'My POD' table.



VDN Creation

- 대시보드
- 오케스트레이션 POD 관리
- Device 관리
- 스토리지 관리
- Node 관리
- Globus Online
- 공지사항
- 문의사항

My POD

새 POD 생성
POD 삭제
VDN 생성

POD 이름	상태	실행환경	사용 가능
<input type="checkbox"/> test-221213(fuajp dkortaxsyyalpr)	Running	Jupyter	1G 1Gi

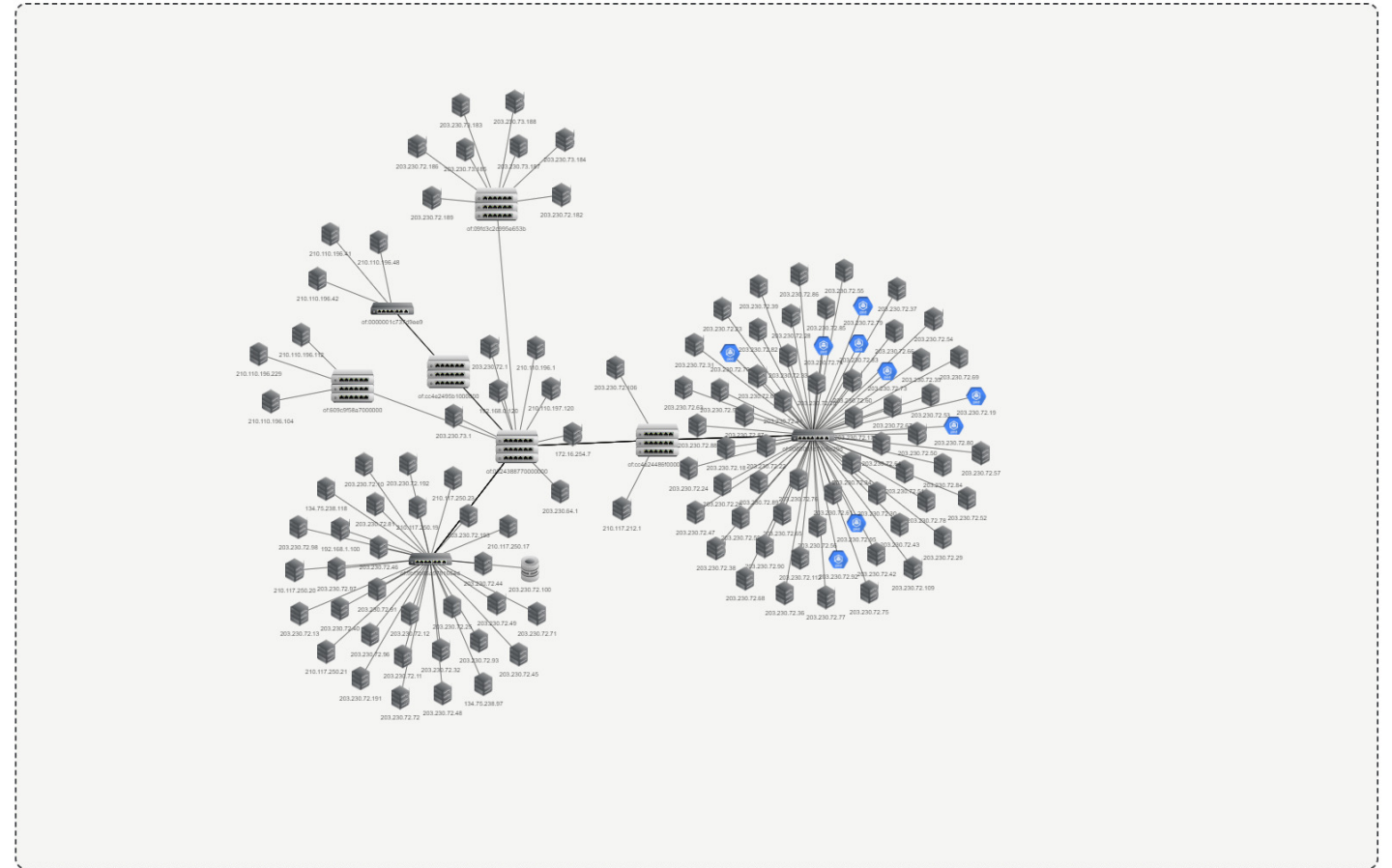
My VDN

My VDN
VDN 삭제

VDN명
<input type="checkbox"/> nsc-kreonet-test0002@naver.com-test0002@naver.com-test-

VDN 전체 접속 정보

더 상세하게 보기



Ceph Node Users 1.1.1.2 SDI

Object Storage Mount

Service Layer

30000~34000

SDN IP

POD Layer

App name

SDN IP



S&T Infra,

Changing the world with **Data KiSTi**

Thank you

Buseung Cho (bscho@kisti.re.kr)

