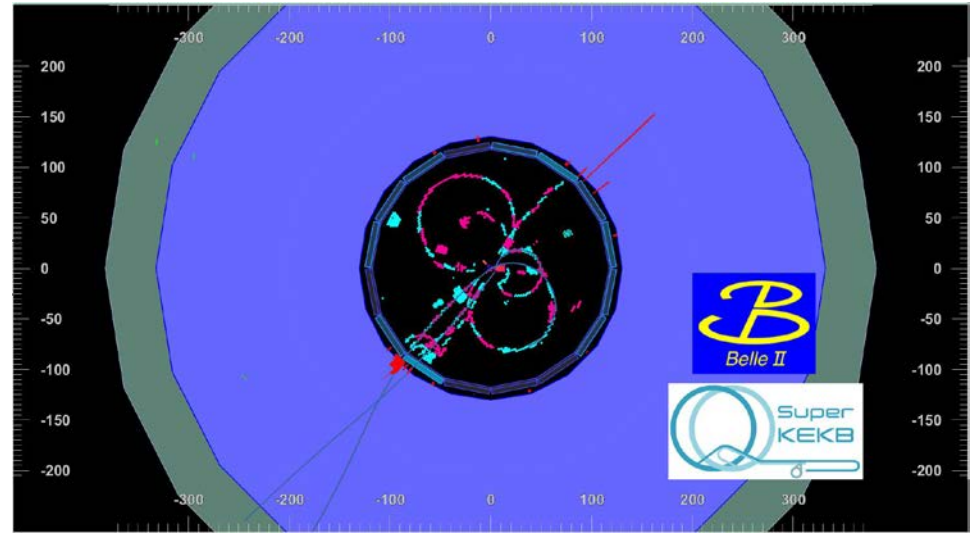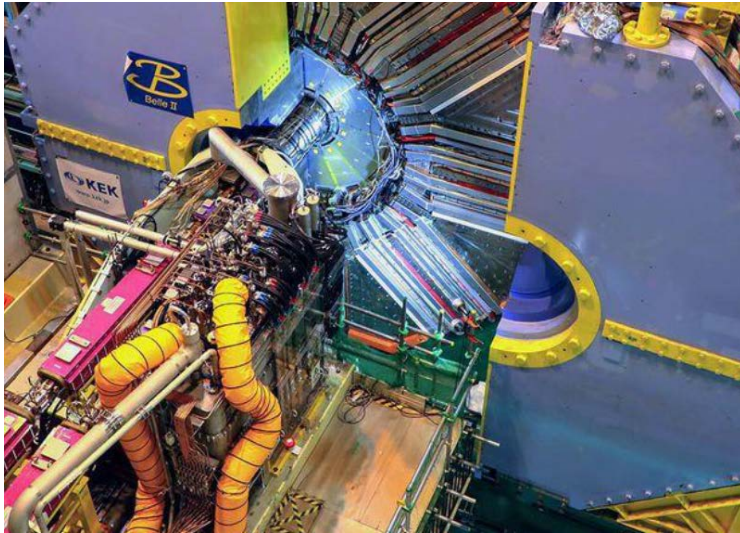# KEK Site Report

Tomoaki Nakamura, Go Iwai, Jiro Suzuki, Soh Suzuki

Computing Research Center
Applied Research Laboratory
HIGH ENERGY ACCELERATOR RESEARCH ORGANIZATION, KEK

Computing Research Center

SuperKEKB/Belle II experiment

The first collision, ee→qq (Apr. 26th, 2018)

This year's beam operation was over on Jul. 18th, 2018.
Accumulated 500 pb-1 of collision data in total.
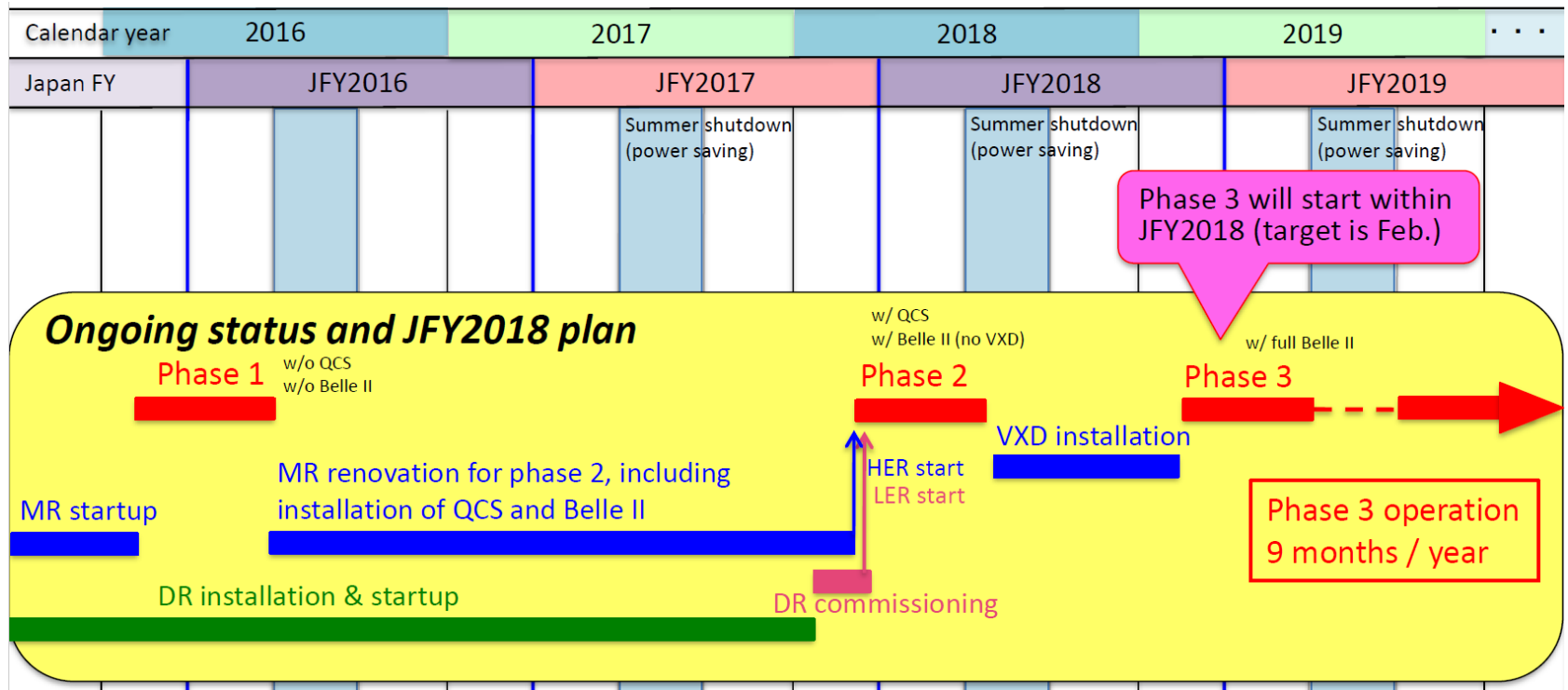250 pb-1 can be used for the physics analysis.
ρ, ϕ, J/ψ, B, ...
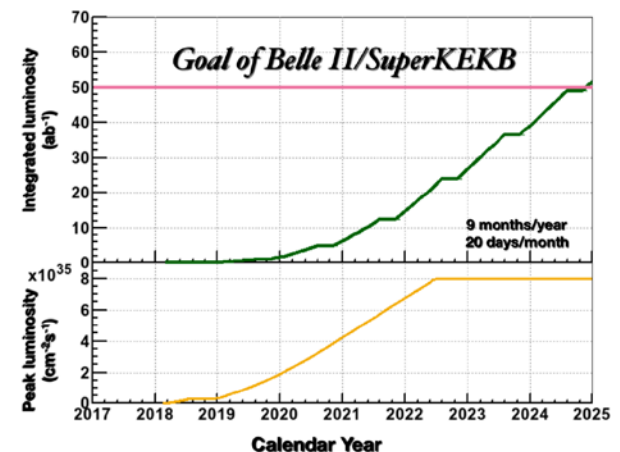Remaining data are used for the detector calibration.

T. Konno (JPS, Sep. 2018)

Schedule of SuperKEKB/Belle II

2010: KEKB end of beam operation
Upgrade of accelerator and detector
2016: Phase 1 beam commissioning of SuperKEKB
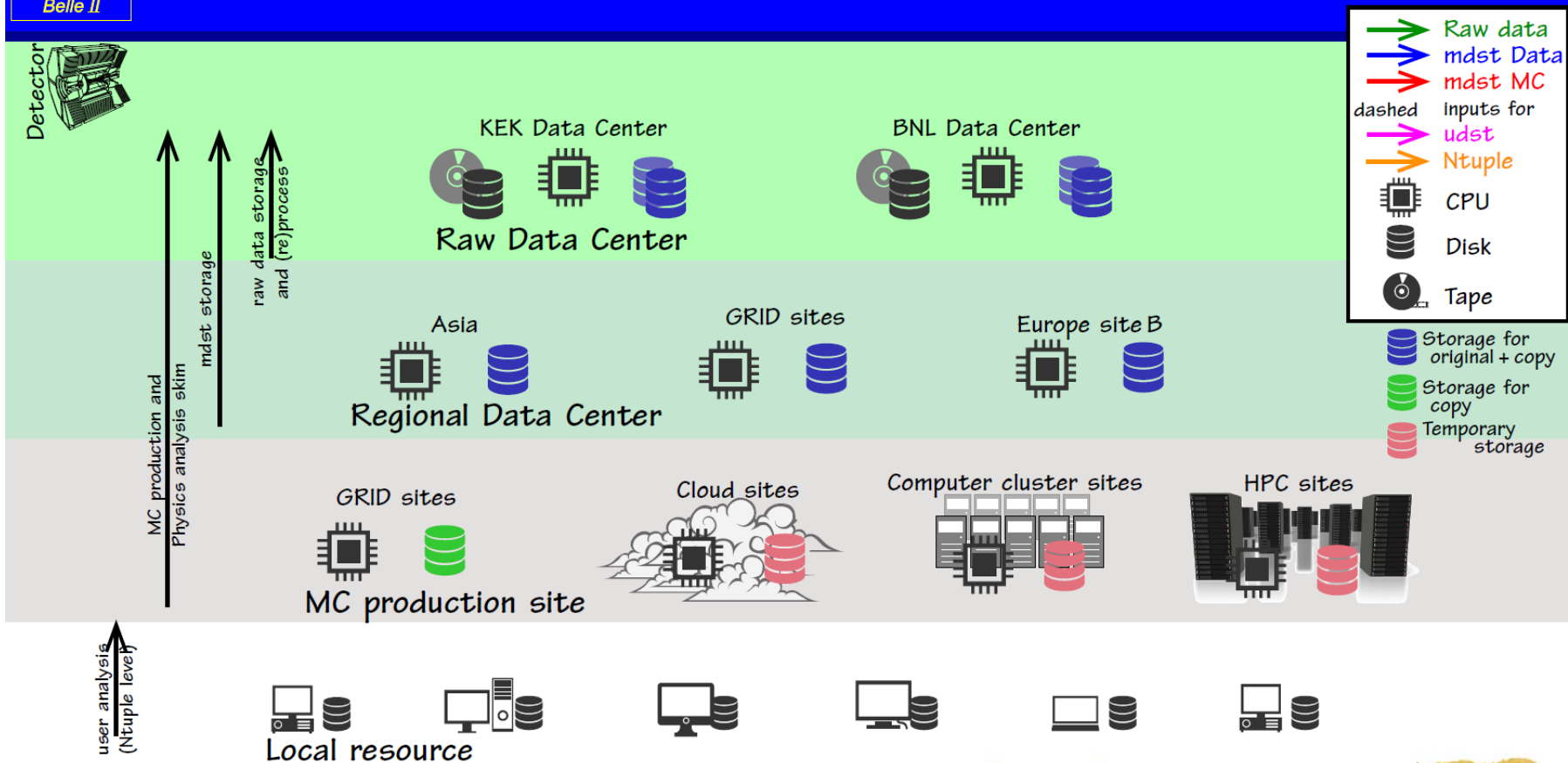2018: Phase 2 physics run (w/o VXD)
2019: Phase 3 physics run (w VXD)

T. Konno (JPS, Sep. 2018)

Applied Research Laboratory
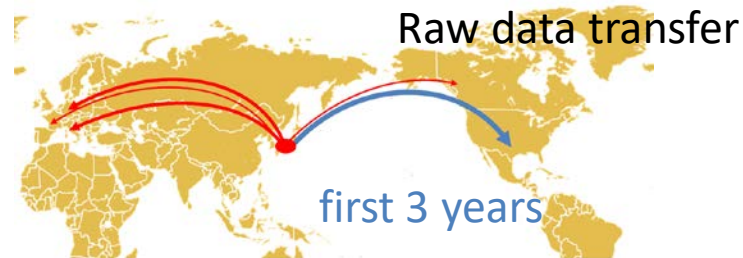
Belle II

T. Hara (GDB, Mar. 2018)

Grid and Tier-0 services in KEK
- ✓ **VOMS, CVMFS Stratum0/1, FTS3, AMGA**
- ✓ **CREAM-CE, HTTP proxy, StoRM, LFC, Site-ARGUS**
- ✓ **BDII-top, BDII-site**
- ✓ **GRID-CA for Japanese users and non Japanese users for Belle II**

Raw data transfer

first 3 years

Experiments in J-PARC
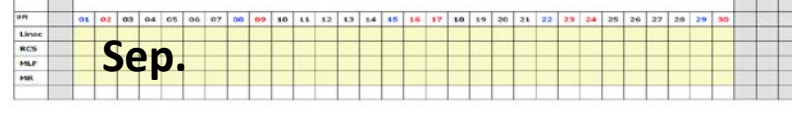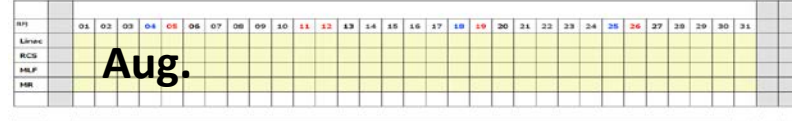
No beam operation during the summer season for the accelerator maintenance.

http://j-parc.jp/ja/Operation/Operation-j18_0409F.html
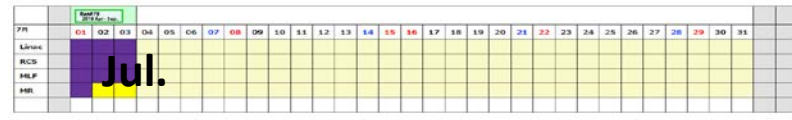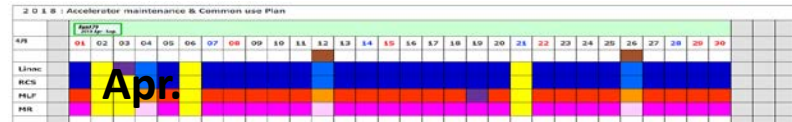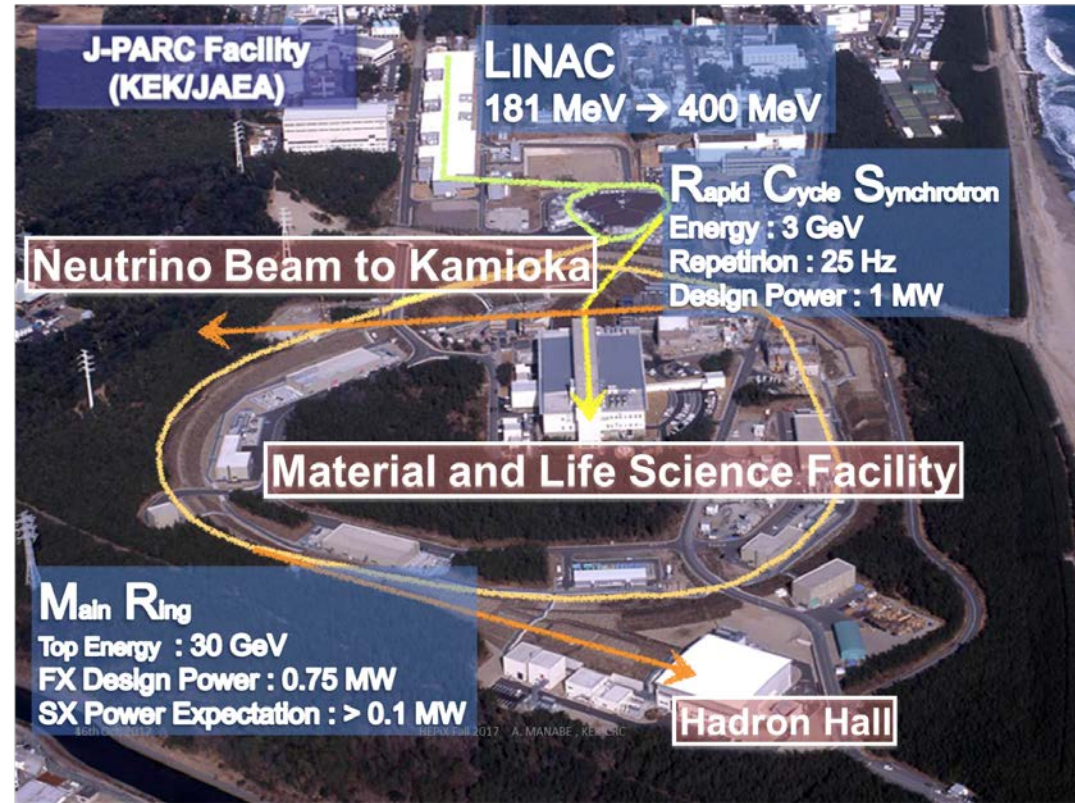
Network for J-PARC

Dedicated link for the pulse timing

SINET

To Kamioka

internet

L2VPN

10Gbps   1Gbps   100Gbps

JAEA

neutrino

MLF

hadron
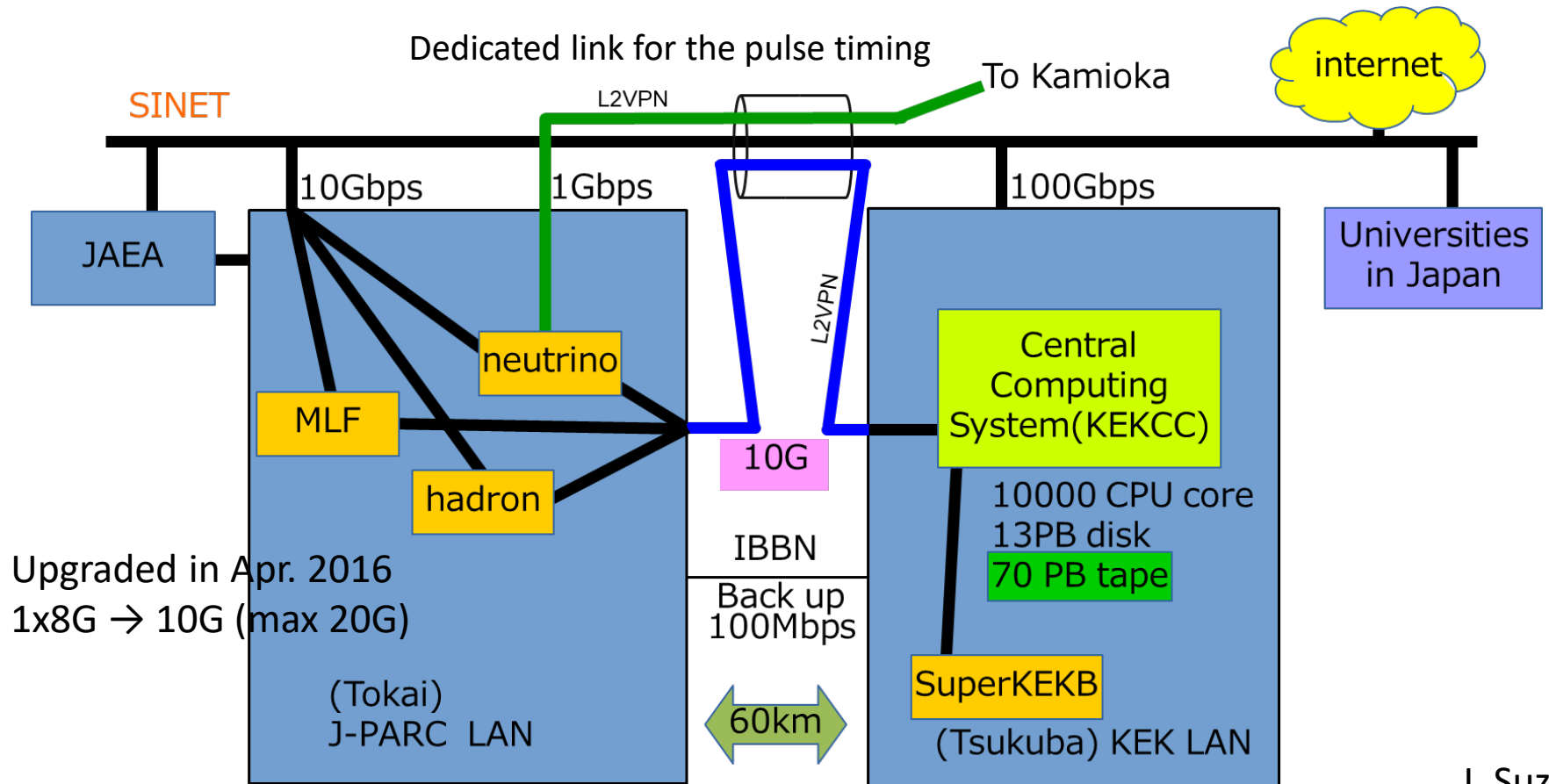
Upgraded in Apr. 2016
1x8G → 10G (max 20G)

(Tokai)
J-PARC LAN

L2VPN

10G

IBBN

Back up
100Mbps

60km

Central
Computing
System(KEKCC)

10000 CPU core
13PB disk
70 PB tape

SuperKEKB

(Tsukuba) KEK LAN

Universities
in Japan

J. Suzuki

Most of experiment data
produced in J-PARC is
stored on GHI of KEKCC

KEKCC is shared
by most of experiment
and theory groups.

IBBN:Ibaraki Broad Band Network
hosted by Ibaraki Prefecture

Launched at Sep. 2016

KEKCC 2016

SYSTEM RESOURCES

CPU : 10,024 cores
- Intel Xeon E5-2697v3 (2.6GHz, 14cores) x 2 358 nodes
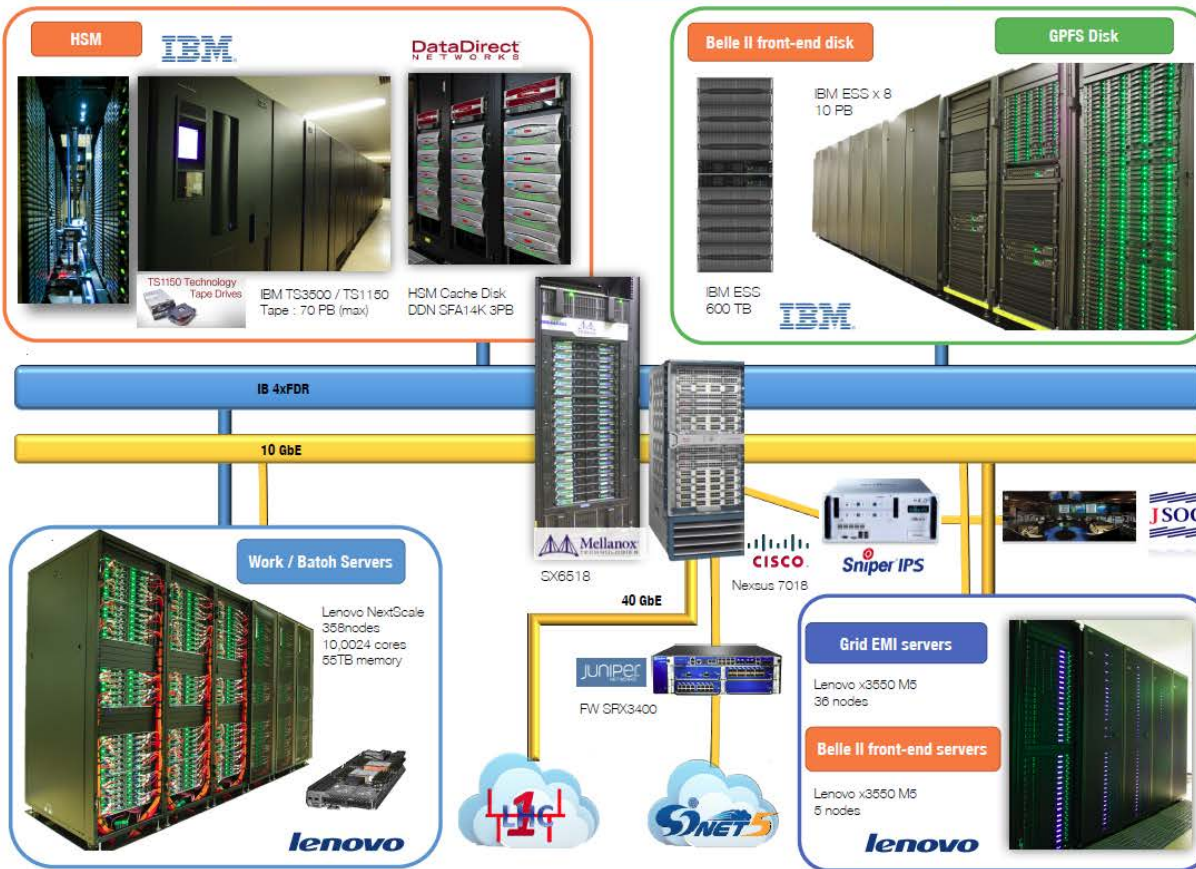- 4GB/core (8,000 cores) / 8GB/core (2,000 cores) (for app. use)
- 236 kHS06 / site

Disk : 10PB (GPFS) + 3PB (HSM cache)

Interconnect : IB 4xFDR

Tape : 70 PB (max cap.)
HSM data : 8.5 PB data, 170 M files, 5,000 tapes

Total throughput : 100 GB/s (Disk, GPFS), 50 GB/s (HSM, GHI)

JOB scheduler : Platfrom LSF v9

K. Murakami

Continue operation until Aug. 2020 in the current plan, then upgrade to the new system.

Compute node

CPU: Intel Xeon E5-2697v3 (2.6GHz, 14cores) x 2
          358 nodes, 10,024 cores, 236kHS06/site

Memory: 4GB/core (8,000 cores)
          8GB/core (2,000 cores)

CPU usage: breakdown by groups,
normalized by the total CPU usage per month

CPU usage has been reached 80 - 90 % of total resource

Storage

Disk: 10PB (GPFS, IBM ESS x8 racks)
              3PB (HSM cache)

Interconnect: InfiniBand 4xFDR (56 Gbps)

Tape: 70 PB (max cap.)

Throughput

100 GB/s (Disk, GPFS), 50 GB/s (HSM, GHI)
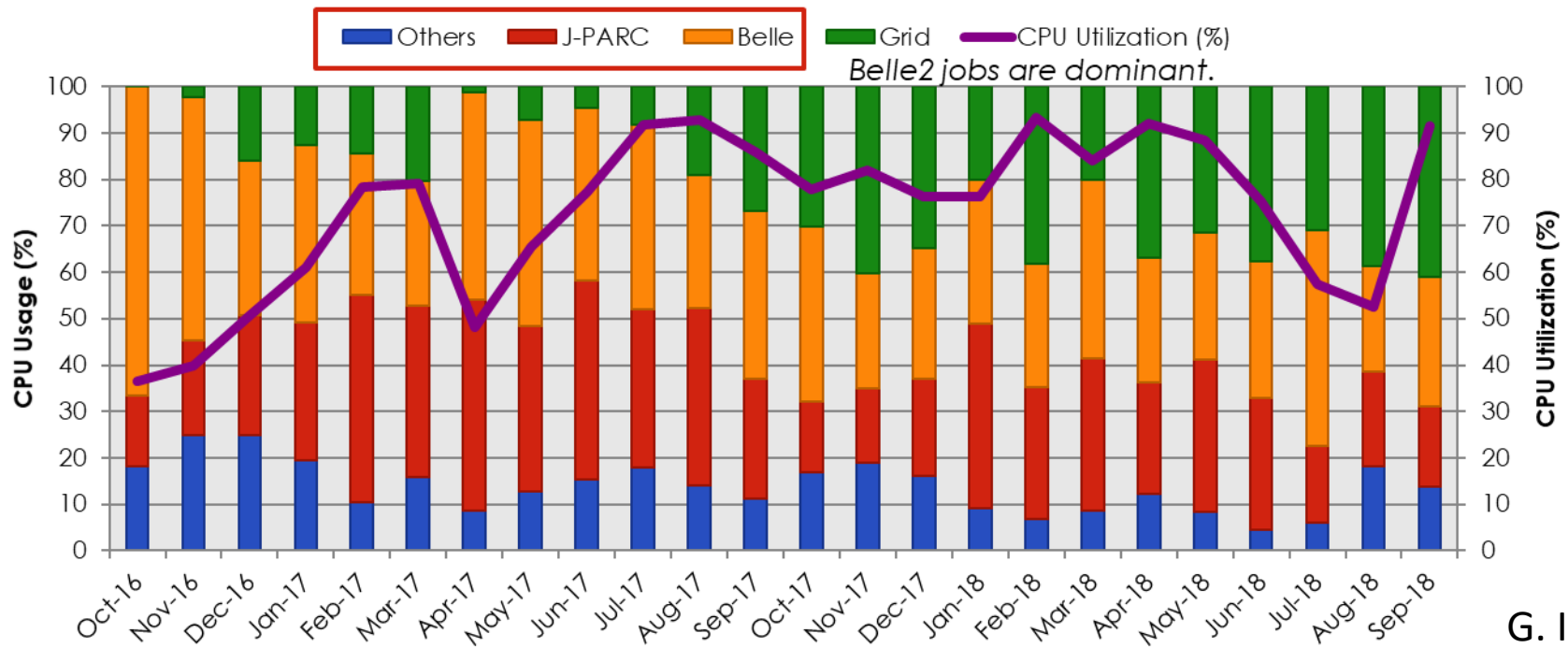
G. Iwai

50% of KEKCC for
100% Availability

Grid Jobs

~168M HS06 hour /month
(23.5 HS06/core)
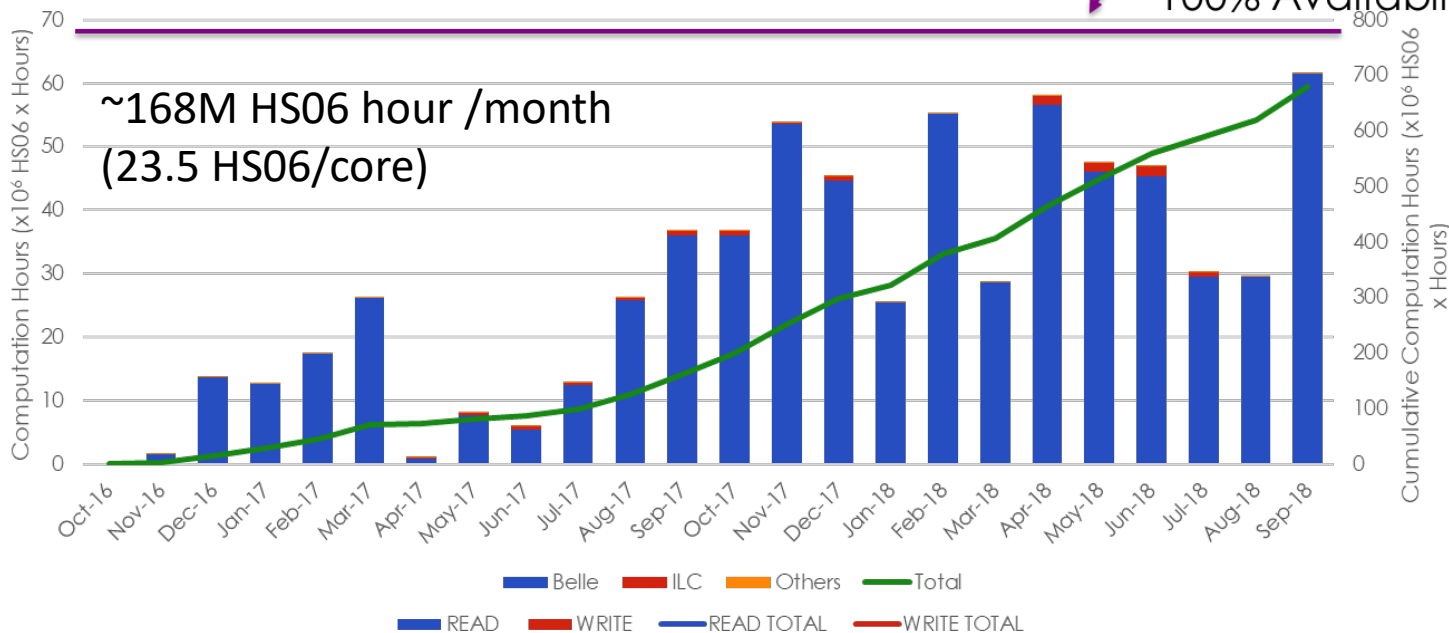
Grid storage
read/write
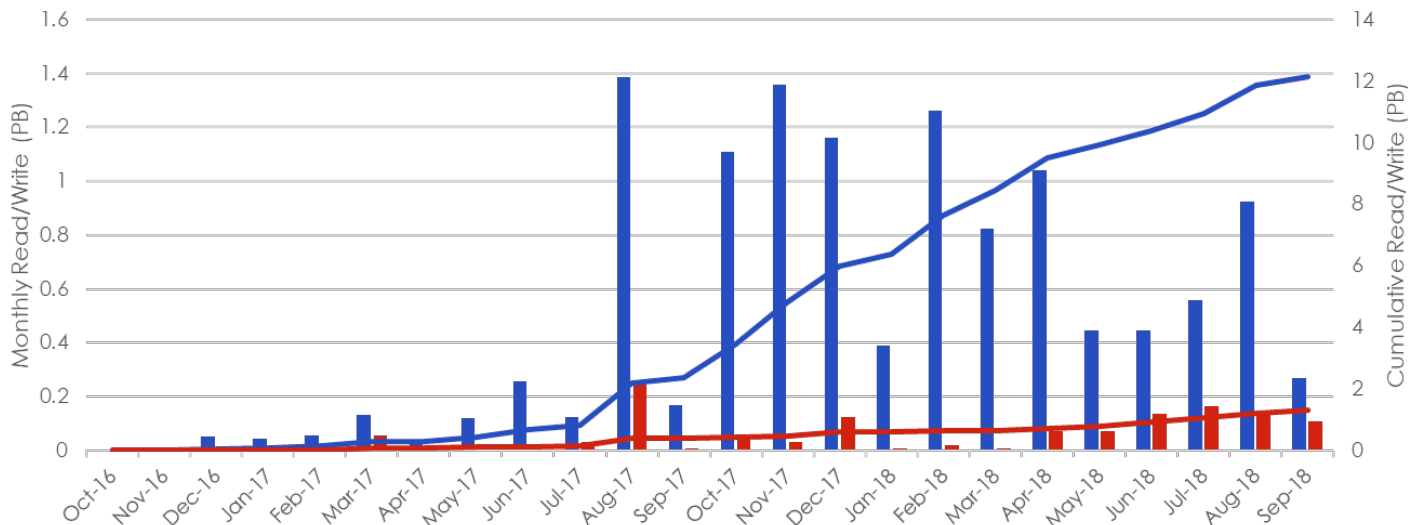
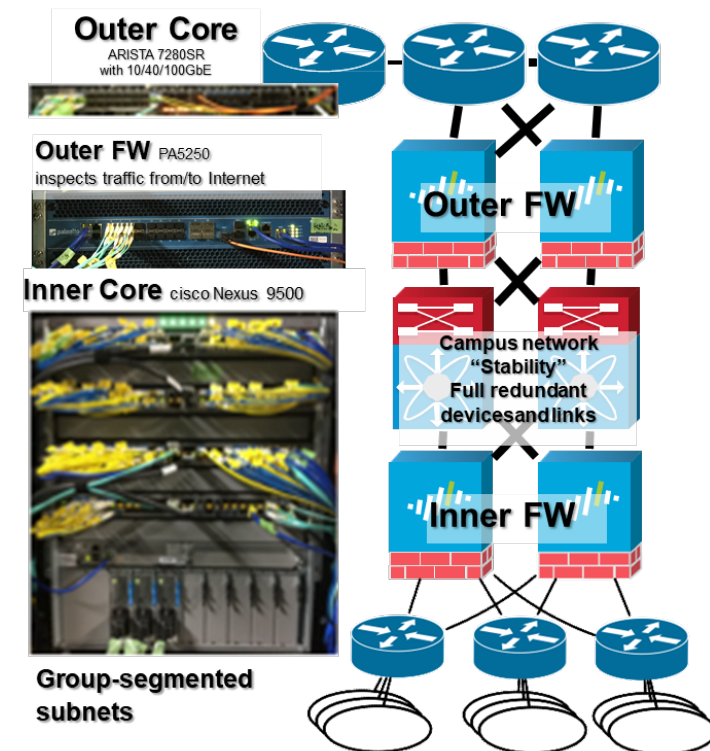G. Iwai

What's updated?

Sep. 2018

▶ 👏 We've left Catalyst 6500

▶ More than 90% links are still 1G because of optics cost

▶ 😨 ARISTA: VRF doesn't route GRE tunnel properly

▶ 🙀 Nexus: Silently discards DHCP relay in some condition

    ▶ DHCP server: Proprietary => FreeRADIUS + PostgreSQL

	2013~2018	2018~2024
Border Switch	Catalyst 6504E	ARISTA 7280SR
BW	1G/10G	10G/40G/100G
Core Switch	Catalyst 6506E	Nexus 9500
BW	1G/10G	1G/10G/40G
FW	PaloAlto 5060	PaloAlto 5250
BW	1G/10G	10G/40G
Edge Switch	Apresia 13000-52	Apresia NP 2000
BW	1G	1G/10G

Outer Core ARISTA 7280SR with 10/40/100GbE

Outer FW PA5250 inspects traffic from/to Internet

Inner Core cisco Nexus 9500

Group-segmented subnets

Outer FW

Campus network "Stability" Full redundant devices and links

Inner FW

S. Suzuki

The KEK central computer system (KEKCC) has become the third year operation. Actually, it is in the quite stable phase by a lot of minor fixes and optimizations, then providing stable service and computing resource for the Belle II, J-PARC, and the other experiments taking the data concurrently.

The renewal of KEK campus network was completed in Sep. 2018 after the upgrade of WAN connectivity in 2016. This configuration will be kept for 6 years (until 2024).

We will be going into the procurement process of the next KEKCC which is expected to be launched from 2020. Firstly, we will start the demand survey to settle the specification based on each experimental group requirement by the end of this year.