LHCOPN-LHCONE meeting

in Taipei

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Belle I SuperKEKB/Belle II Time line





First turn of beam!

http://www.desy.de/news/news_search/index_eng.html?openDirectAnchor=945&two_columns=0

DESY	ACCELERATORS PHOTON SCIENCE PARTICLE PHYSICS Deutsches Elektronen-Synchrotron A Research Centre of the Helmholtz Association	Google" Custom Search					
	DESY HOME RESEARCH! NEWS: ABOUT DESY CAREER CONTACT	f 🛛 🖸 📾 🚍 🚍					
DESY INFORM	Home / News / News Search						
DESY IN THE PRESS	phase 1 operation for 5 months						
PRESS	2016/03/02						
NEWS SEARCH	Back First particles turning inside upgraded SuperKEKB accelerator						
EVENTS							
LECTURE SERIES	Accelerator experts in Japan started up the completely upgraded particle accelerator SuperKEKB this						
	week. For the first time since its five-year upgrade, electrons and positrons are once again making turns						

Accelerator experts in Japan started up the completely upgraded particle accelerator SuperKEKB this week. For the first time since its five-year upgrade, electrons and positrons are once again making turns around the three-kilometre-long accelerator ring. This is an important step towards producing particle collisions inside the similarly refurbished detector Belle II, in which DESY and other universities and institutes in Germany are significantly involved. With the help of these collisions, physicists are hoping to find an answer to the question why the universe consists of matter even though equal amounts of matter and antimatter should have been produced in the Big Bang. SuperKEKb is the first new collider to start up after the Large Hadron Collider at CERN in Geneva.



The circulating particles mark an important milestone, yet the project is still at its very beginning. The research programme will not start for another two years. Until a few years ago, the accelerator was called "KEKB" and the detector "Belle", and together they provided some important fundamental insights into the structure of matter. That success led to the Nobel Prize in Physics being awarded to the Japanese theoretical physicists Makoto Kobayashi and Toshihide Maskawa in 2008. The upgraded SuperKEKB is expected to produce 50 times more

Operation at larger scale



Belle T

17 countries/regions

Australia, Austria, Canada, China, Czeck R., Germany, India, Italy, Japan, Korea, Poland, Russia, Slovenia, Taiwan, Turkey, Mexico, USA

~40 sites

GRID, Cloud, local cluster is available

aiming the larger scale





SE

DESY-TMP-SE

Napoli-TMP-SE

KEK2-TMP-SE

CNAF-TMP-SE

KMI-TMP-SE

KIT-TMP-SE

CESNET-TMP-SE

SIGNET-TMP-SE

Total

Contribution by sites

Destination Storages

Capacity and usage by SRM space token (lcg-info for DESY)

Share

30

20

15

10

10

5

5

5

100

(**) KEK: some data duplicated at KEK

DESY also contributes on

(***) SiGNET: added later

(*) DESY: subtracting the usage by Belle1 (~260 TB)

• Old data (before MC5): included (DESY, KEK, CNAF, KMI), not incl. (others)

Capacity

560 TB

313 TB

560 TB

150 TB

200 TB

171 TB

44 TB

200 TB

2,198 TB

Used

148.7 TB

153.9 TB

100.5 TB

81.3 TB

57.1 TB

35.8 TB

23.5 TB

830.8 TB

~230 TB (*)

CPU days



Timeline for the network availability



- SINET4 + present KEKCC
 - NYC link by SINET4 (upto 10G)
 - non LHCONE
- SINET5 + present KEKCC
 - London link by SINET5 (upto 20G)
 - non LHCONE
- SINET5 + new KEKCC
 - London link by SINET5 (upto 20G)
 - with LHCONE



KEK-SINET4 (until the end of March)



- 2 x 10G
 - redundant w/o load balancing
 - One for Ordinary internet connection
 - One for Inter-labs VPNs
 - HEP groups in domestic universities
 - VC to ESnet+CANARIE
- additional 8x1G for inter-campus
 connection of KEK

KEK-SINET5 (April ~ August)



Belle T

- New border switch install
 - **-** 100G + 4x40G
 - 2x40G are dedicated to new KEKCC
- 100G to SINET5
 - Inter-labs VPNs without internet connectivity
 - including present VC to ESnet
 - probably for LHCONE
 - 10G to SINET5
 - bypass new border switch
 - Ordinary internet connection
 - Inter-labs VPNs with internet connectivity



KEK-SINET5 with LHCONE

- Present connection is limited by single 10G link
- New KEKCC will have 40G link for LHCONE



Timeline for the network availability



- SINET4 + present KEKCC
 - NYC link by SINET4 (upto 10G)
 - non LHCONE
- SINET5 + present KEKCC
 - London link by SINET5 (upto 20G)
 - non LHCONE
- SINET5 + new KEKCC
 - London link by SINET5 (upto 20G)
 - with LHCONE



Data challenge scope and strategy

Goal: stress the Belle II Grid network infrastructure and software stack

Data challenge between major sites pair, both ways Test files not registered in any catalog No concurrent transfer to-and-fro to avoid cross-talk

mimic the raw data transfer

KEK → PNNL KEK → EU (PNNL→ EU) mimic the processed data transfer $PNNL \rightarrow EU$ (mdst for beam data and MC) $EU \rightarrow PNNL$ $EU \rightarrow EU$ $PNNL \rightarrow EU$ $PNNL \rightarrow KEK$ $EU \rightarrow KEK$







Overview of Data Challenge setup

Vikas Bansal



SIGNET

Marko Bracko, Dejan Lesjak



Data challenge PNNL ↔ KEK

- ►~100 files with each file ~10 GB. This implies ~1 TB of data.
- Throughout monitoring via GridFTP Marker data analysis.
- GridFTP marker data does not include ethernet packet overhead of 64 84 Bytes. This corresponds to ~5% (MTU: 1500 B) and ~1% (MTU: 9000 B).
- Given background traffic and ethernet overhead, GridFTP marker data analysis is consistent with throughput from edge router monitoring.





Data challenge PNNL ↔ KEK

Vikas Bansal

	2019 Inbound Network bandwidth requirement (user analysis not incld.)	2024 Inbound Network bandwidth requirement (user analysis not incld.)	2015 Data Challenge Result	Comment
KEK → PNNL	5 Gbps	8 Gbps	4 Gbps	100 Gbps SINET link coming up this Mar. 26
PNNL →KEK	< 3 Gbps	< 4.5 Gbps	4.6 Gbps	chieved
KEK → SIGNET	0.4 Gbps	0.6 Gbps	0.8 Gbps (high success rate) 2.4 Gbps (low success rate)	Achieved
KEK → NAPOLI	1.1 Gbps / 2*	4.7 Gbps / 2*	3 Gbps	3 Gbps with appropriate load. Higher bandwidths may be possible
КЕК → КІТ	1.2 Gbps / 2*	4.8 Gbps / 2*	3.5 Gbps Achieved	\leq
KEK → DESY	1.2 Gbps / 2*	4.8 Gbps / 2*	3.0 Gbps	2
*	equal site splitting in cou	intry		5

Belle I GEANT and Peering with EU sites during DC

Vikas Bansal



rx1-bo1-ru-l3vpn-lhcone-infn-cnaf.bo1.garr.net



Data challenge : PNNL \leftrightarrow DESY

Vikas Bansal

- ► PNNL ↔ DESY link is symmetric with respect to throughput.
- ▶ To sustain high concurrent transfers more capacity/resilience is needed at PNNL.
 - PNNL has recently (Jan. 2016) increased storage capacity.





Data challenge: PNNL ↔ KIT

Vikas Bansal

- ▶ PNNL ↔ KIT link is not necessarily asymmetric with respect to throughput.
- ▶ SpaceToken BELLE used for the test.
- SRM problem found and KIT-team resolved it. See later results from KIT.





Data challenge : PNNL ↔ Napoli



PNNL → NAPOLI saturates at 3 Gbps



NAPOLI -> PNNL saturates at 8 Gbps





Data challenge PNNL ↔ EU

Vikas Bansal

	2019 Inbound Network bandwidth requirement (user analysis not incl.)	2024 Inbound Network bandwidth requirement (user analysis not incl.)	2015-2016 Data Challenge Result : PNNL ↔ EU
PNNL → DESY	< 3 Gbps	< 4.2 Gbps	6.6 Gbps
PNNL → KIT	< 3 Gbps	< 4.2 Gbps	> 4.0 Gbps
PNNL → NAPOLI	< 3 Gbps	< 4.2 Gbps	3 Gbps Achieved Overlapped with ATLAS- LHC traffic. Could be better
PNNL → CNAF	< 3 Gbps	< 4.2 Gbps	8 Gbps Achieved
DESY → PNNL	1 Gbps / 2*	2 Gbps / 2*	6.6 Gbps
KIT → PNNL	1 Gbps / 2*	2 Gbps / 2*	6 Gbps
CNAF → PNNL	1 Gbps / 2*	2 Gbps / 2*	9 Gbps
NAPOLI → PNNL	1 Gbps / 2*	2 Gbps / 2*	8 Gbps
PNNL → SIGNET	~ 0.4 Gbps	~0.6 Gbps	0.6 Gbps

* equal site splitting in country

Summary of Data transfer challenge

		Rows show <u>download</u> bandwidth						
	Source →	КЕК	PNNL	DESY	КІТ	CNAF	NAPOLI	Signet
Columns show upload bandwidth	KEK		4.6 Gbps	4 Gbps	5 Gbps	7 Gbps	5.5 Gbps	2.5 Gbps
	PNNL	4 Gbps		6.6 Gbps	6 Gbps	9 Gbps	8 Gbps	-
	DESY	3 Gbps	6.6 Gbps		8 Gbps	8 Gbps	8* Gbps	3 Gbps
	КІТ	3.5 Gbps	>4* Gbps	6-8 Gbps		6-8 Gbps	6 Gbps	3 Gbps
	CNAF	-	8 Gbps	10 Gbps	6 Gbps		8* Gbps	3 Gbps
	NAPOLI	3* Gbps	3* Gbps	3* Gbps	3 Gbps	3* Gbps		3* Gbps
	Signet	0.8 Gbps	0.6*Gbps	5 Gbps	2-5 Gbps	5 Gbps	2* Gbps	

* Site has storage/SRM related problems that were tackled later





Accelerator / Detector

phase1 detector (BEAST2) was installed and new data in coming First turn of beam is achieved

Computing

distributed computing system operation has started several MC production campaign was done entire KEKCC will be replaced in this summer

Network

SINET4 (now) \rightarrow SINET5 (Apr.-Aug.) \rightarrow SINET5 + LHCONE (Aug. -)

Data transfer challenge

Network bandwidth required for the Belle II operation until 2014 is fulfilled in KEK \leftrightarrow EU, PNNL \leftrightarrow EU, EU \leftrightarrow EU, but KEK \leftrightarrow PNNL

The availability of "SINET5 + LHCONE" must improve the bandwidth between KEK and PNNL Need to update the data challenge results

Necessary to test the data transfer under more realistic situation mixture of raw data, mDST transfer as well as data transfer for user analysis Big thank to all participants in the Belle II data transfer challenge !!