Belle II Update

LHCOPN-LHCONE meeting #53

IHEP Beijing CN

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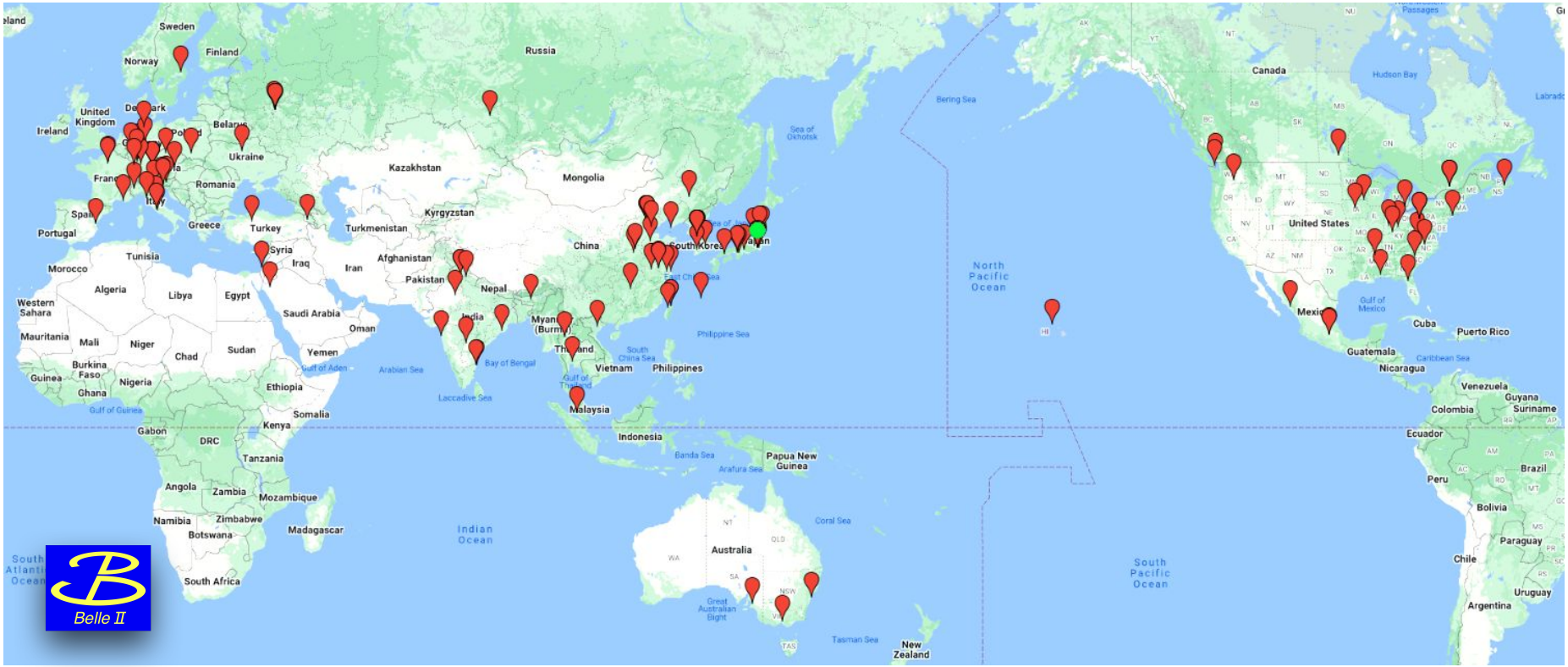
9 October 2024

The Belle II Experiment

Around 1200 members, 131 institutions, 28 countries

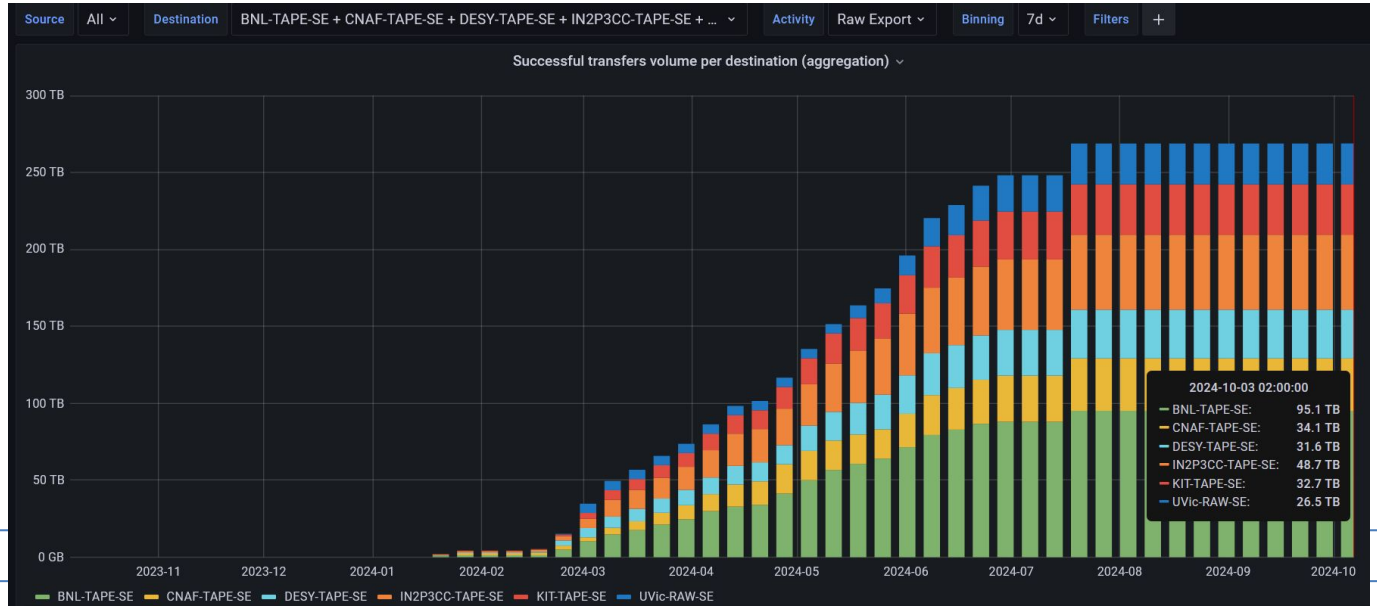


Belle II Status

Data taking started in 2019. In July 2022 we started the Long Shutdown 1

Data taking restarted early 2024, first collision 20 February 2024. Restarted the copy of RAW Data from KEK to RAW Data Centers.

Operations have been suspended for the summer shutdown, going to restart with Physics runs expected to start in October 2024.



KEKCC Renewal 2024

KEKCC has been renewed. The whole infrastructure has been moved over a new hardware.

Network Connection

- 100G LHCONE
- 20G Internet

Belle II distributed resources - site report 2024

- 58 sites
- 35 sites providing pledged resources
- 32 GRID Storages
- 5 Tape systems

TYPE	Resource provided	Pledged for 2024 JFY
CPU Pledge	512,6 kHS06/kHS23*	520kHS06
CPU Opport.	412.6 kHS06/kHS23	
DISK	21.292 PB	25 PB
TAPE	12.929 PB	9.520 PB

For Production: 34.9 kjobslots pledged + 36 kJobslot opportunistic

*Including local resources and calibration

TYPE	Resource provided
CPU	36,7 kHS06/HS23
DISK	1.685 PB

Specific Resource for calibration

NEW CHALLENGES FOR SITES

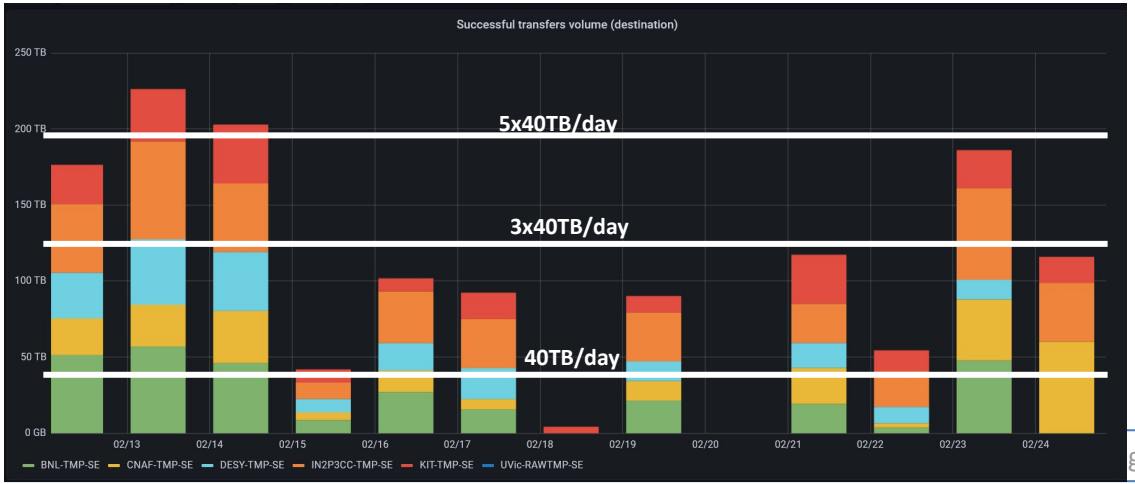
- Token Based Authentication
- Update the Operative system (RHEL9/Almalinux9)
- Network Operation (IPv6, Link update, Jumbo Frame)

Belle II Data Challenge 2024 within WLCG DC24

Main goal: Emulate data transfer conditions in a Belle II high-lumi scenario.

Transfers from KEK to RAW Data Centers according to our distribution schema (estimated 40TB/day to be distributed with the following share 30%BNL, 20%CNAF, 15% IN2P3CC, 15%UVic, 10%DESY, 10%KIT)

- Min - The target speed to achieve is 3x3.7Gbit/s = **11.1 Gbit/s**
- Max - The target speed to achieve is 5x3.7Gbit/s = **18.5 Gbit/s**



Tests fully succeeded. Results will be present at Poster Session of CHEP2024 in Krakow

https://indico.cern.ch/event/1338689/contributions/6010887/

MultiONE

Belle II site Connected to LHCONE

Here the list of LHCONE Sites which are expected to set Belle II communities:

Currently Belle II label seen on CNAF, KIT, KEK and Napoli.

Deployment monitored through a script.

Site	RC Site	Communities
CLOUD.Australia.au	Australia-ATLAS	
LCG.IHEP.cn	BEIJING-LCG2	
LCG.CESNET.cz	praguelcg2	
LCG.IN2P3CC.fr	IN2P3-CC	
LCG.IPHC.fr	IN2P3-IRES	
LCG.LAL.fr(IJCLAB)	GRIF	
LCG.DESY.de	DESY-HH	
LCG.KIT.de	FZK-LCG2	ALICE, ATLAS,BelleII, CMS, LHCb
LCG.KIT-TARDIS.de	FZK-LCG2	ALICE, ATLAS,BelleII, CMS, LHCb
LCG.CNAF.it	INFN-T1	ATLAS, CMS,LHCb, Alice, BelleII,Auger,
LCG.Napoli.it	INFN-NAPOLI-ATLAS	ATLAS, BelleII, CMS, LHCb, Auger e
LCG.Pisa.it	INFN-PISA	
LCG.Torino.it	INFN-TORINO	
LCG.Frascat.it	INFN-FRASCATI	
LCG.Legnaro.it	INFN-LNL-2	
LCG.KEK.jp	JP-KEK-CRC-02	BelleII, ILC, Perfsonar
LCG.CYFRONET.pl	CYFRONET-LCG2	
ARG.SIGNET.si	ARNES	
EuropHPC.Vega.si	ARNES	
LCG.KISTI.kr	KR-KISTI-GSDC-01	
LCG.ULABKIM.tr	TR-10-ULAKBIM	
OSG.BNL.us	BNL-ATLAS	
DIRAC.Uvic.ca/DIRAC.Uvic-local.ca	CA-UVic-Cloud	

MultiONE Monitor

To monitor the deployment of the Belle II BGP community on Belle II sites connected to LHCONE, a script has been set up to query the LHCONE Looking Glass (https://lhcone-lg.cern.ch/) for the IPv4 and IPv6 networks of these sites.

The script uses the lhcone.json file, which contains all LHCONE prefixes, to check the networks.

The prefixes are then looked up using the site names registered in CRIC.

MultiONE Monitor

```
06/10/2024  18:20.12  /home/mobaxterm/LHCONE  ./communities.sh INFN-NAPOLI-ATLAS 4
CHECK COMMUNITIES OF 90.147.67.0/24
              Communities: 137:5 137:6 20965:155 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 target:137:5
              Communities: 137:5 137:6 2603:2112 20965:155 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 target:137:5 target:2603:434300001 target:20965:111
              Communities: 137:5 137:6 57484:137 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 target:137:5
              Communities: 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 64805:13

06/10/2024  18:20.19  /home/mobaxterm/LHCONE  ./communities.sh INFN-NAPOLI-ATLAS 6
CHECK COMMUNITIES OF 2001:760:422a:137::/64
              Communities: 137:5 137:6 20965:155 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 target:137:5
              Communities: 137:5 137:6 2603:2112 20965:155 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 target:137:5 target:2603:434300001 target:20965:111
              Communities: 137:5 137:6 57484:137 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 target:137:5
              Communities: 61339:2 61339:3 61339:4 61339:6 61339:11 61339:60001 64805:13
```

IPv6 in Belle II

As for the Central Services of Belle II (DIRAC, Rucio, Condition DB, etc.), IPv6 is not configured yet, we plan to enable it.

Currently, we don’t have a plan in place to implement an IPv6-Only infrastructure.

IPv6 Implementation for SE as of June 2024

IPv6 Implementation Status	Percentage of Storage Elements (total 32 Storage)
dual stack enabled	78%
IPv4 only	11%
IPv6 implementation planned	4%
IPv6 can be implemented if needed	4%

In 2023 the percentage of storage elements in dual stack was 43%

IPv6 Implementation for WN as of June 2024

IPv6 Implementation Status	Percentage of sites which deployed dual stack WNs
dual stack enabled	26%
IPv4 only	57%
IPv6 implementation planned	13%
IPv6 can be implemented if needed	4%

Two sites reported that they are planning to implement IPv6 only resources in the future, but there is not time schedule yet.
In 2023 the percentage of of sites which deployed dual stack WNs was 16%

Belle II CEs with IPv6 preliminary analysis

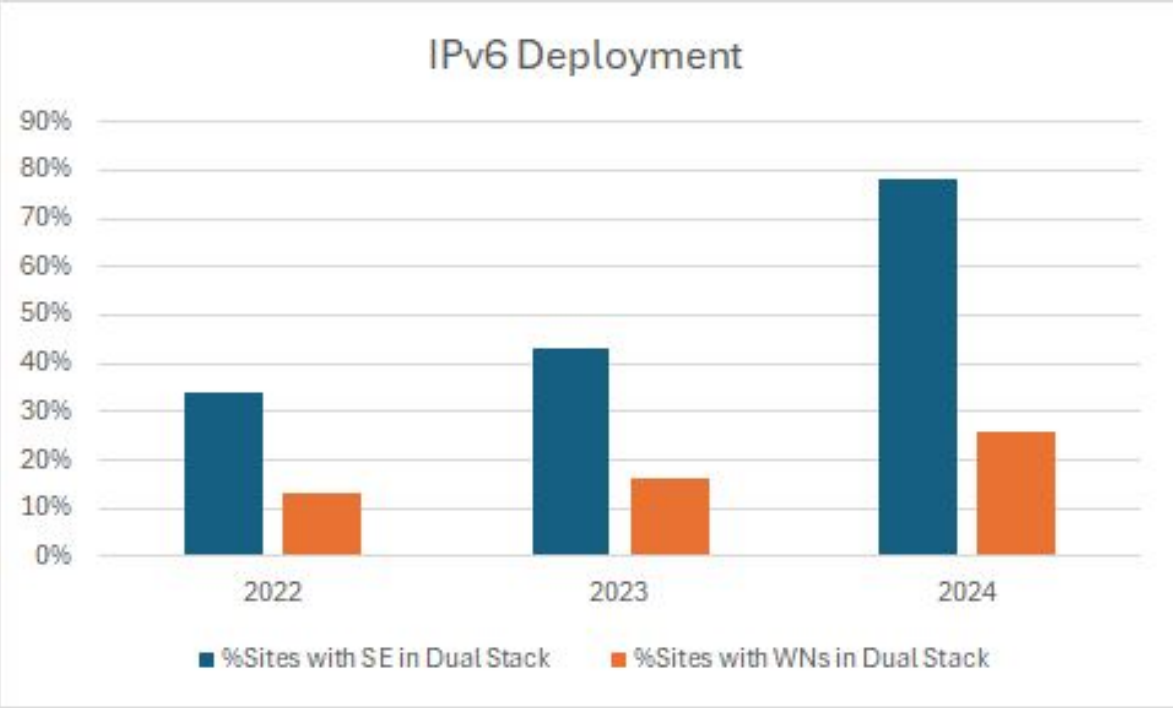
Computing Element analysis:

#CE with record AAAA (IPv6) that reply in IPv6: 31

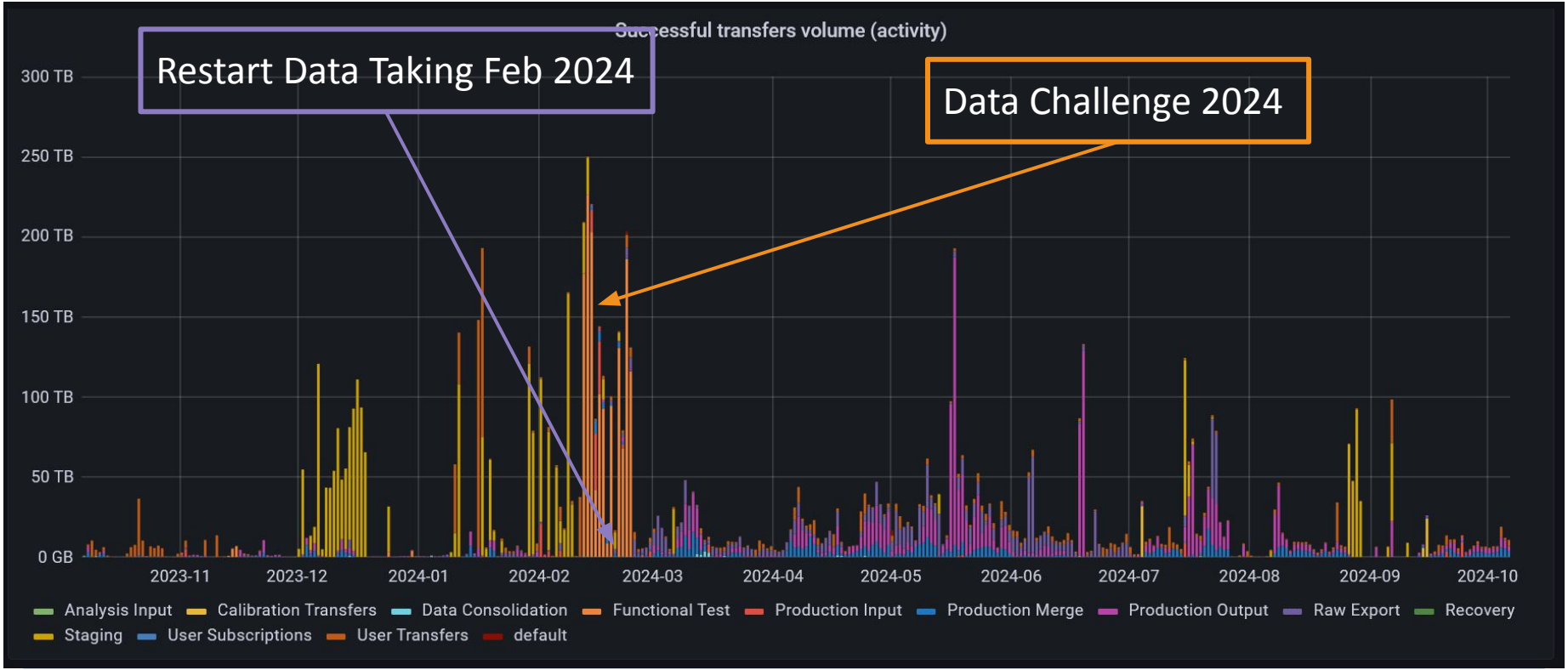
#CE with record AAAA (IPv6) that NOT reply in IPv6: 12

#CE without record AAAA (IPv6): 46

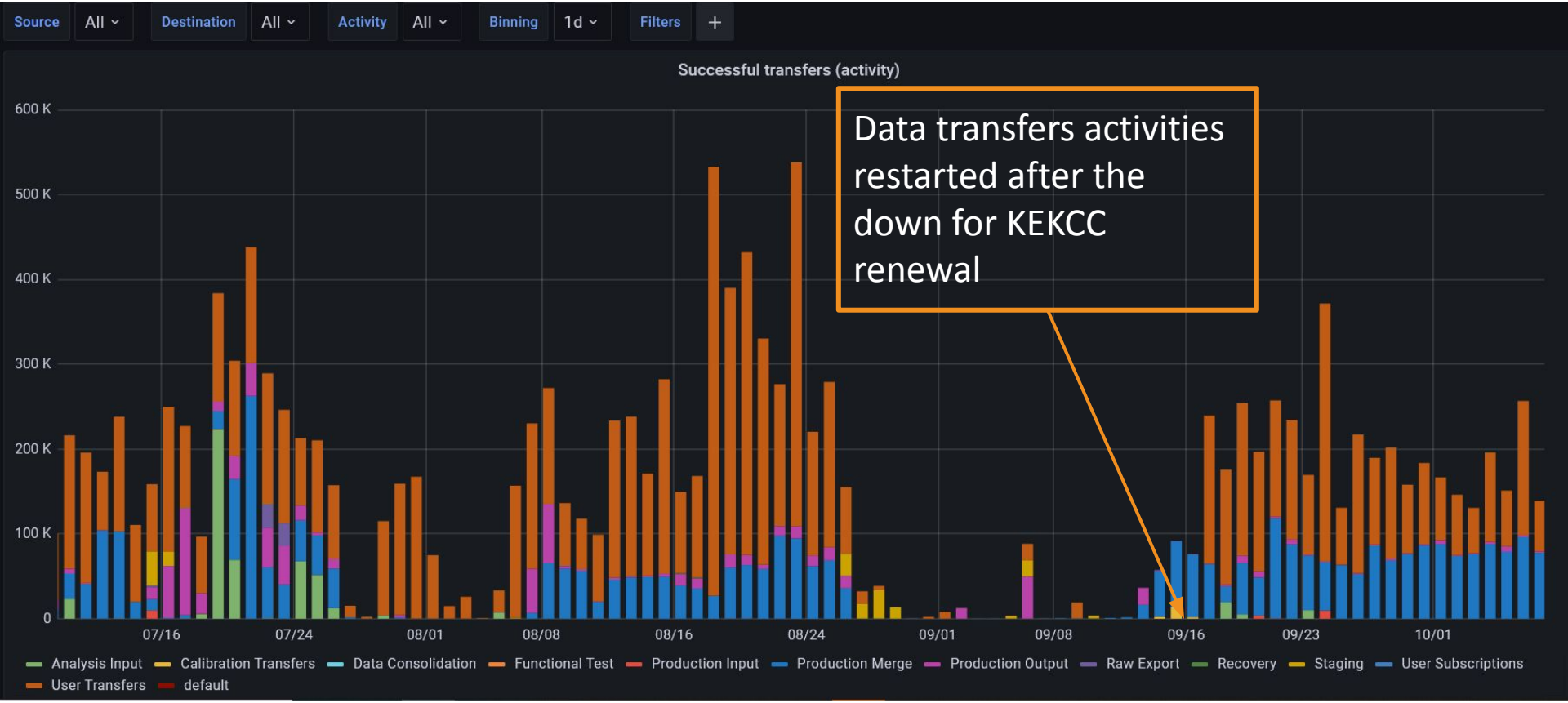
IPv6 Deployment vs years

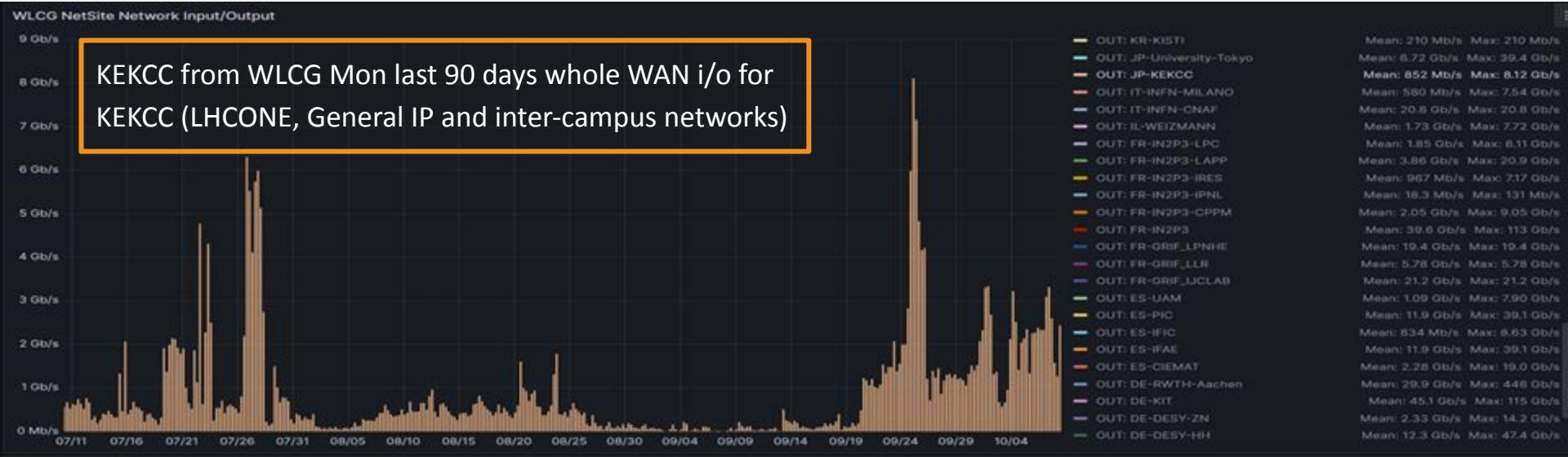


Successful Transfer Volume in the last 12 months (daily bin)



Successful transfers in the last 90 days




WLCG NetSite Network Input/Output
KEKCC from WLCG Mon last 90 days whole WAN i/o for KEKCC (LHCONE, General IP and inter-campus networks)
9 Gb/s
8 Gb/s
7 Gb/s
6 Gb/s
5 Gb/s
4 Gb/s
3 Gb/s
2 Gb/s
1 Gb/s
0 Mb/s
07/11 07/16 07/21 07/26 07/31 08/05 08/10 08/15 08/20 08/25 08/30 09/04 09/09 09/14 09/19 09/24 09/29 10/04
OUT: KR-KISTI Mean: 210 Mb/s Max: 210 Mb/s
OUT: JP-University-Tokyo Mean: 6.72 Gb/s Max: 39.4 Gb/s
OUT: JP-KEKCC Mean: 852 Mb/s Max: 8.12 Gb/s
OUT: IT-INFN-MILANO Mean: 580 Mb/s Max: 7.54 Gb/s
OUT: IT-INFN-CNAF Mean: 20.8 Gb/s Max: 20.8 Gb/s
OUT: IL-WEIZMANN Mean: 1.73 Gb/s Max: 7.72 Gb/s
OUT: FR-IN2P3-LPC Mean: 1.85 Gb/s Max: 8.11 Gb/s
OUT: FR-IN2P3-LAPP Mean: 3.86 Gb/s Max: 20.9 Gb/s
OUT: FR-IN2P3-IRES Mean: 967 Mb/s Max: 7.17 Gb/s
OUT: FR-IN2P3-IPNL Mean: 18.3 Mb/s Max: 131 Mb/s
OUT: FR-IN2P3-CPPM Mean: 2.05 Gb/s Max: 9.05 Gb/s
OUT: FR-IN2P3 Mean: 39.6 Gb/s Max: 113 Gb/s
OUT: FR-GRIF_LPNHE Mean: 19.4 Gb/s Max: 19.4 Gb/s
OUT: FR-GRIF_LLR Mean: 5.78 Gb/s Max: 5.78 Gb/s
OUT: FR-GRIF_IJCLAB Mean: 21.2 Gb/s Max: 21.2 Gb/s
OUT: ES-UAM Mean: 1.09 Gb/s Max: 7.90 Gb/s
OUT: ES-PIC Mean: 11.9 Gb/s Max: 39.1 Gb/s
OUT: ES-IFIC Mean: 834 Mb/s Max: 8.63 Gb/s
OUT: ES-IFAE Mean: 11.9 Gb/s Max: 39.1 Gb/s
OUT: ES-CIEMAT Mean: 2.28 Gb/s Max: 19.0 Gb/s
OUT: DE-RWTH-Aachen Mean: 29.9 Gb/s Max: 446 Gb/s
OUT: DE-KIT Mean: 45.1 Gb/s Max: 115 Gb/s
OUT: DE-DESY-ZN Mean: 2.33 Gb/s Max: 14.2 Gb/s
OUT: DE-DESY-HH Mean: 12.3 Gb/s Max: 47.4 Gb/s


WLCG NetSite Network Input/Output
0 Mb/s
-1 Gb/s
-2 Gb/s
-3 Gb/s
-4 Gb/s
-5 Gb/s
-6 Gb/s
-7 Gb/s
-8 Gb/s
-9 Gb/s
07/11 07/16 07/21 07/26 07/31 08/05 08/10 08/15 08/20 08/25 08/30 09/04 09/09 09/14 09/19 09/24 09/29 10/04
IN: UKI-NORTHGRID-LANCS-HEP Mean: 5.48 Gb/s Max: 25.4 Gb/s
IN: UKI-LT2-RHUL Mean: 2.11 Gb/s Max: 6.35 Gb/s
IN: UK-RAL Mean: 42.9 Gb/s Max: 135 Gb/s
IN: RU-JINR-T1 Mean: 9.68 Gb/s Max: 27.8 Gb/s
IN: RO-NIPNE_1 Mean: 2.15 Gb/s Max: 10.6 Gb/s
IN: RO-13-ISS Mean: 3.37 Gb/s Max: 18.8 Gb/s
IN: KR-KISTI Mean: 135 Mb/s Max: 135 Mb/s
IN: JP-University-Tokyo Mean: 8.73 Gb/s Max: 51.9 Gb/s
IN: JP-KEKCC Mean: 459 Mb/s Max: 8.33 Gb/s
IN: IT-INFN-MILANO Mean: 1.88 Gb/s Max: 17.6 Gb/s
IN: IT-INFN-CNAF Mean: 10.1 Gb/s Max: 10.1 Gb/s
IN: IL-WEIZMANN Mean: 348 Mb/s Max: 4.34 Gb/s
IN: FR-IN2P3-LPC Mean: 1.42 Gb/s Max: 10.00 Gb/s
IN: FR-IN2P3-LAPP Mean: 4.58 Gb/s Max: 23.6 Gb/s
IN: FR-IN2P3-IRES Mean: 5.47 Gb/s Max: 17.5 Gb/s
IN: FR-IN2P3-IPNL Mean: 34.7 Mb/s Max: 1.10 Gb/s
IN: FR-IN2P3-CPPM Mean: 1.90 Gb/s Max: 9.40 Gb/s
IN: FR-IN2P3 Mean: 55.7 Gb/s Max: 145 Gb/s
IN: FR-GRIF_LPNHE Mean: 8.32 Gb/s Max: 8.32 Gb/s
IN: FR-GRIF_LLR Mean: 36.3 Gb/s Max: 36.3 Gb/s
IN: FR-GRIF_IJCLAB Mean: 9.73 Gb/s Max: 9.73 Gb/s
IN: ES-UAM Mean: 1.15 Gb/s Max: 5.62 Gb/s
IN: ES-PIC Mean: 22.3 Gb/s Max: 94.3 Gb/s
IN: ES-IFIC Mean: 1.21 Gb/s Max: 9.97 Gb/s