

Belle II Update

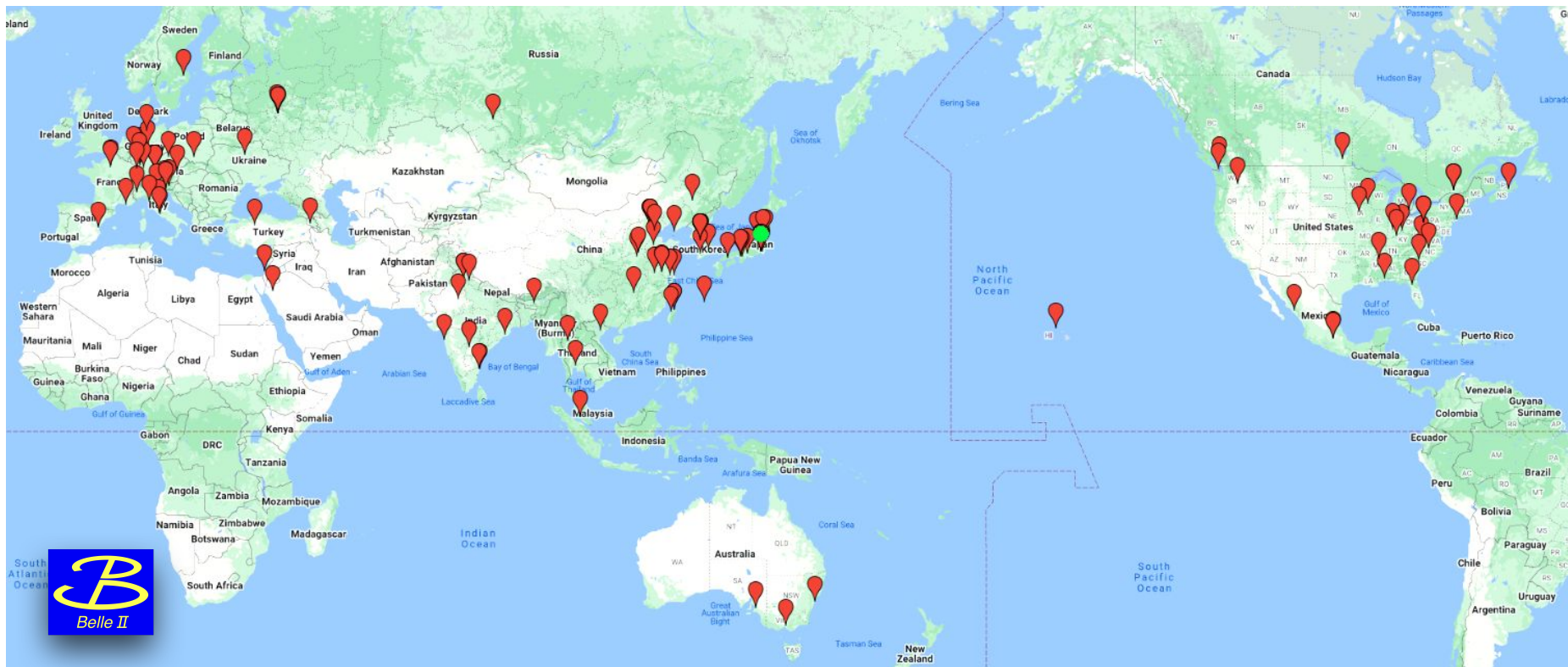
LHCONE/OPN - Victoria (CA)

Dr. Silvio Pardi

18 October 2023

The Belle II Experiment

1180 members, 131 institutions, 27 countries



Belle II Status and Plan

Around 2.8PB of RAW Data collected since 2019

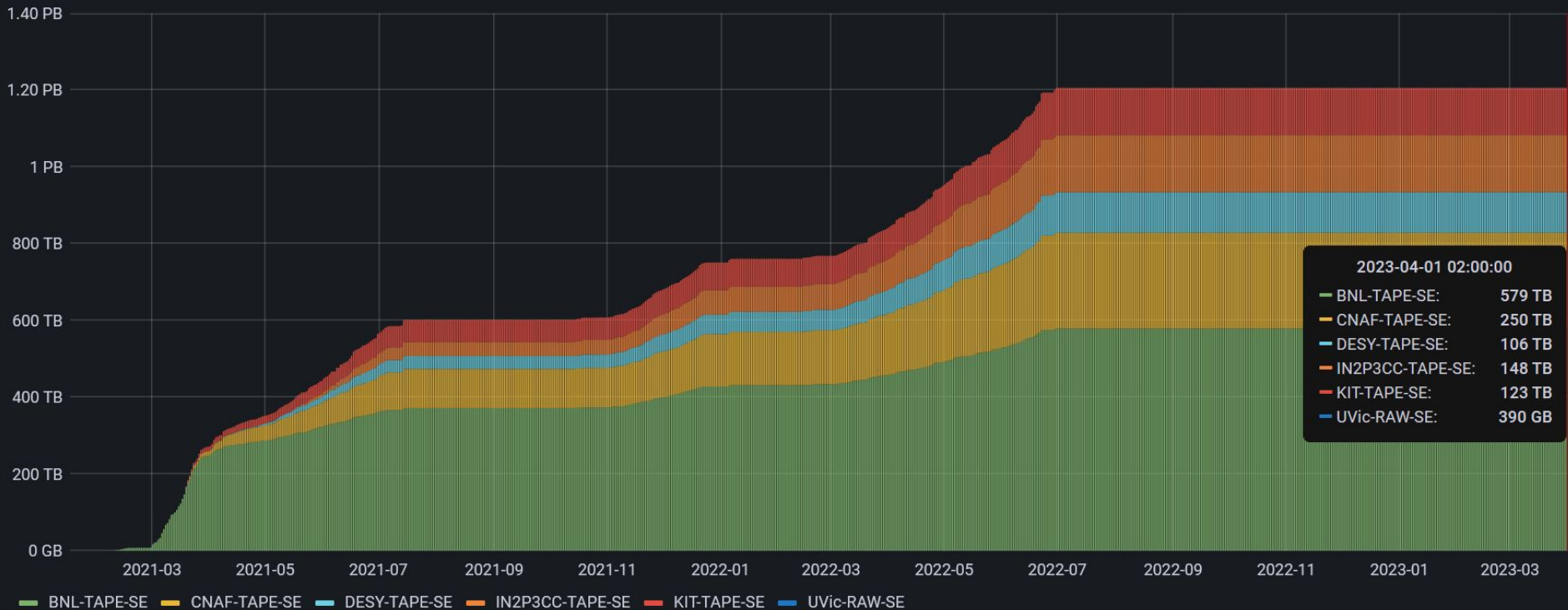
A full copy of RAW Data is stored at KEK Tier0. The secondary copy was stored at BNL (100%) for the first years, then distributed over the following RAW Data Centers since April 2021. Nominal share:

- BNL 30%
- CNAF 20%
- DESY 10%
- KIT 10%
- IN2P3CC 15%
- UVic 15%

Currently we are in Long Shutdown(LS1)

Raw Data Distribution with Rucio since the 2021

Successful transfers volume per destination (aggregation) ▾

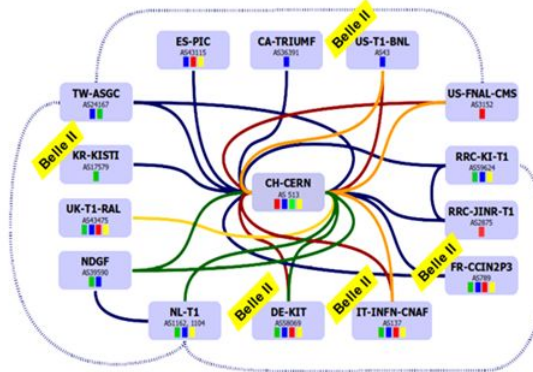


Belle II Network

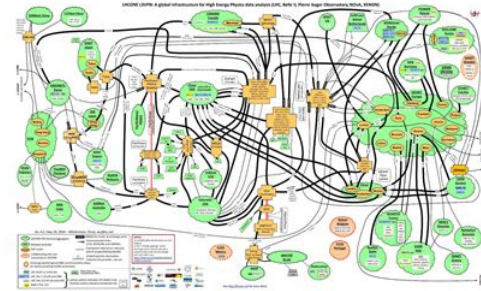
100G Global Ring via SINET



LHCOPN Optical infrastructure that can be used without jeopardizing resources



LHCONE L3 VPN Connecting all the major Data Centres



Belle II Computing Infrastructure

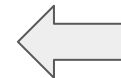
- 55 sites providing pledged and opportunistic resources
- 29 Storages
- 5 Tape systems

TYPE	Resource provided
CPU Pledge	451.6 kHS06/kHS23
CPU Opport.	408.9 kHS06/kHS23
DISK	16.8 PB
TAPE	11.9 PB

For Production: 31 kjobslots pledged and 33 kJobslot opportunistic

*Additional storage under implementation in some of the sites

TYPE	Resource provided
CPU	36,7 kHS06/HS23
DISK	550 TB



Resource for calibration

NEW CHALLENGES FOR SITES

- Token Based Authentication
- End-of-life of storage technologies (DPM, gsiftp, srm)
- Update the Operative system (RHEL9/Almalinux9)
- Network Operation (Link update, Jumbo Frame)

Network Overview from site report 2023

Network	#Sites
LHCONE	49%
GeneralIP	51%

More than 80% of kHS06 Running on LHCONE

More than 90% of Storage on LHCONE

IPv6 deployment	#Sites
Storage Dual Stack	43% (was 34%)
WorkerNode Dual Stack	16% (was 13%)

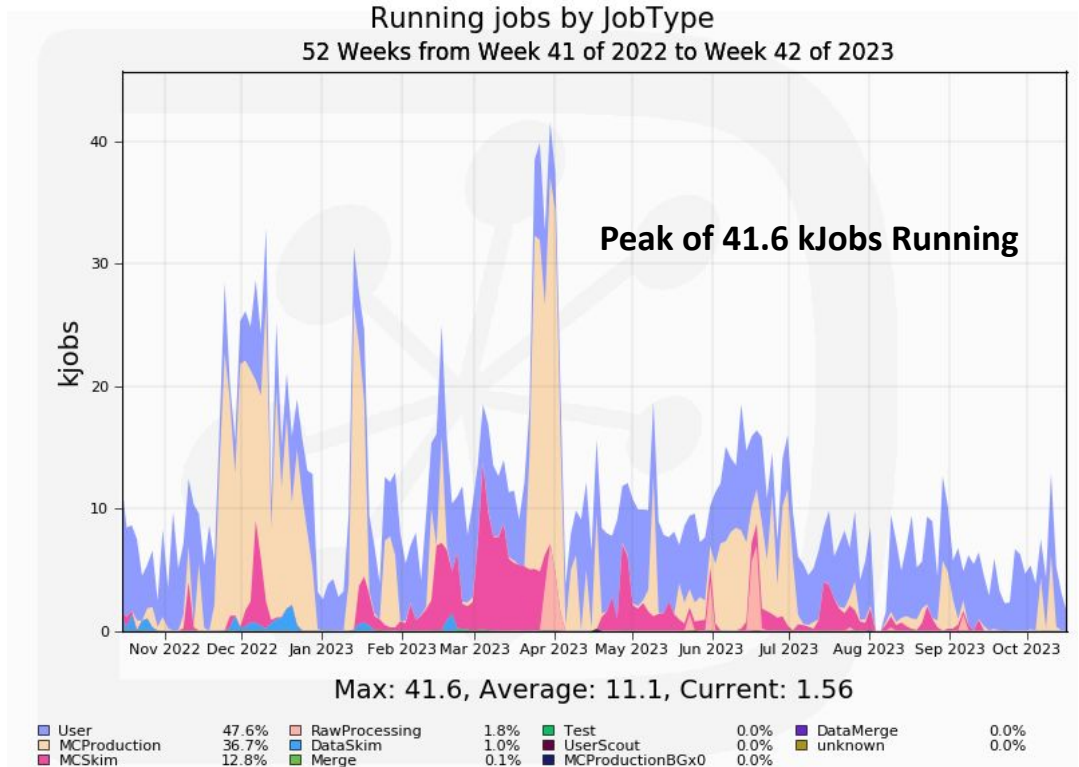
Other	#Sites
Jumbo frame	On 10 sites
Perfsonar	16 instances

Belle II Status

Computing activities currently focussed on MC and user analysis.

User analysis continuously performed, increased to respect last year

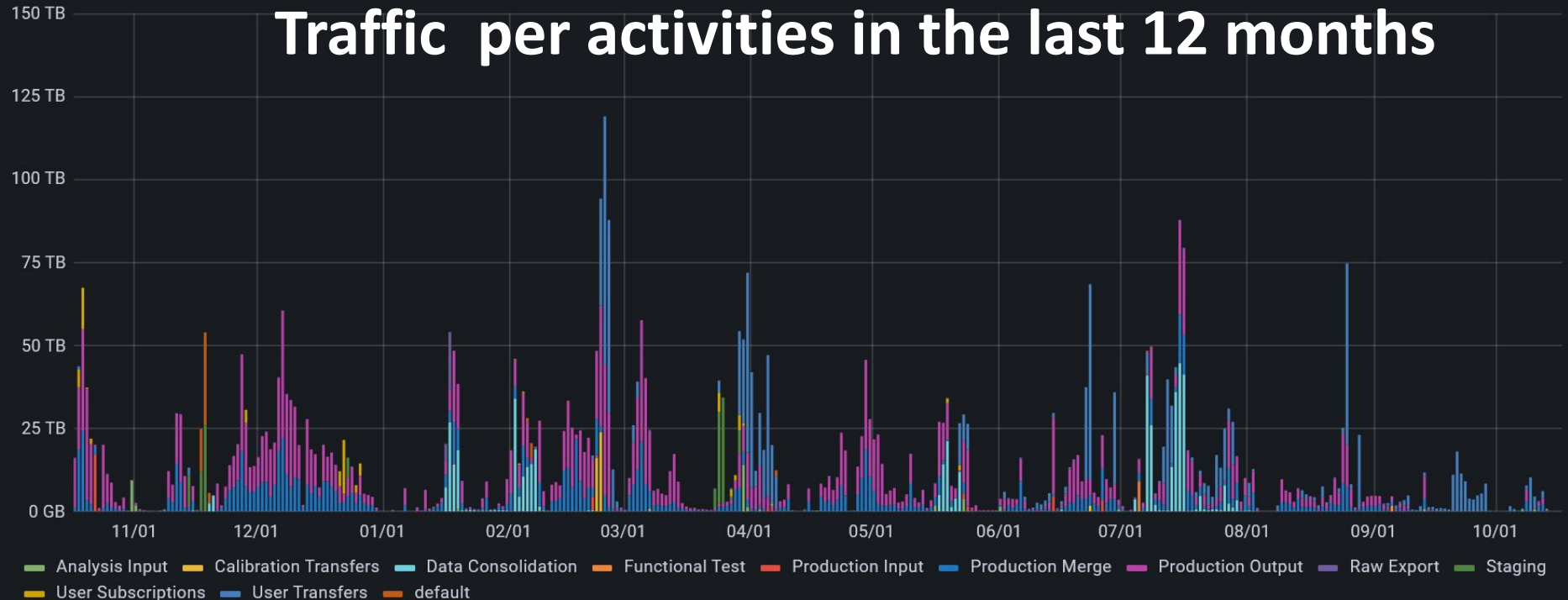
1.3M jobs per week



Traffic from the RUCIO Monitoring

Successful transfers volume (activity)

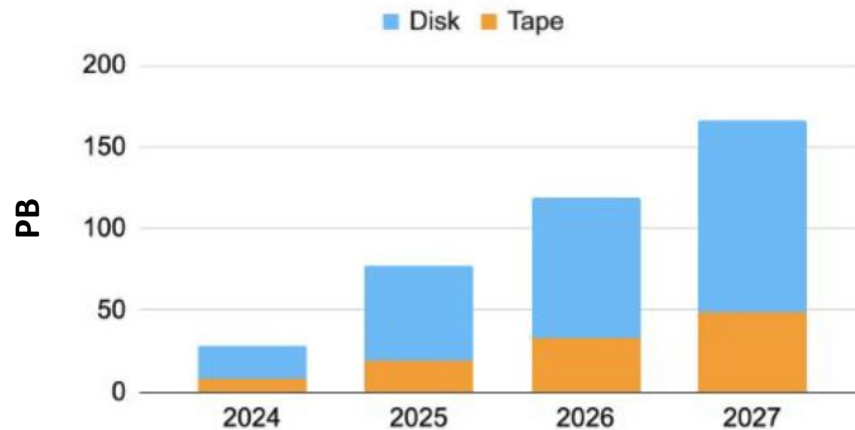
Traffic per activities in the last 12 months



Next activities

Two main activities in the next months will affect network usage

- Restart of Data taking (by the end of this year).
- WLCG Data Challenge 2024.



Belle II Data Challenge 2024

What should be exercised during DC24:

Technology that can be stressed: Network, DDM, FTS, Storages, Monitoring System, Protocols, IAM

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

Our current estimation for such scenario is 40 TB per day.

Transfers from KEK to raw data centers according to our distribution schema (30%BNL, 20%CNAF, 15%IN2P3CC, 15%UVic, 10%DESY, 10%KIT)

Considering that the average speed needed to transfer 40TB/day is 3.7Gbit/s in outbound at KEK vs all the Raw Data Centers.

- Hypothesis 1 - The target speed to achieved is $5 \times 3.7 \text{ Gbit/s} = 18.5 \text{ Gbit/s}$
- Hypothesis 2 - The target is sent $5 \times 40 \text{ TB}$ in one day, 5 times bigger than the expected amount of data

WLCG Data Challenge 2024 - Schedule

October - Deliverable 1: Data Set Creation, site assessment.

November - Deliverable 2: Early test with FTS + packet marking

December - Deliverable 3: Topology definition, Rucio Subscriptions creation, basic test.

January - Deliverable 4: Second round basic test

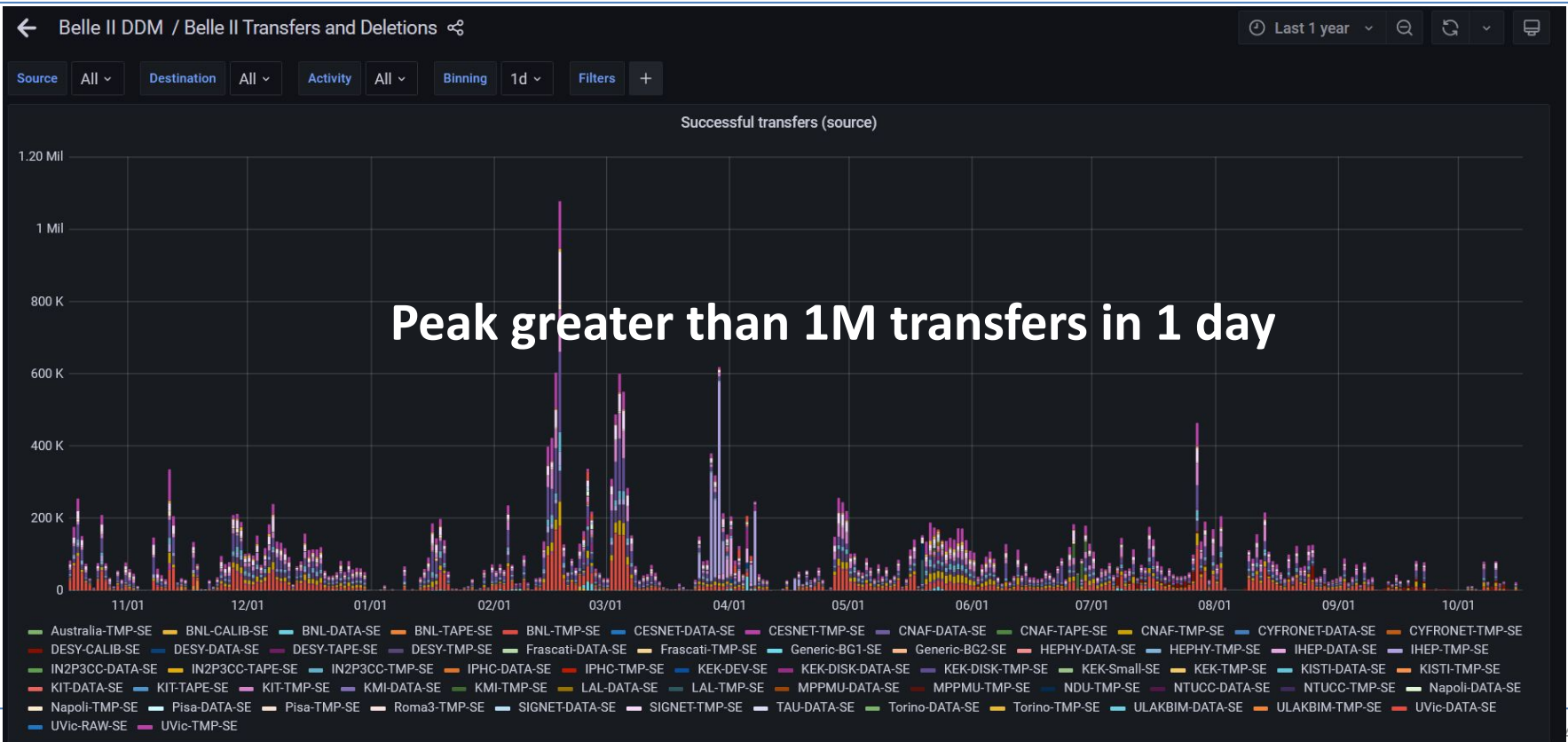
February: Data Challenge RAW Data

Sites and Tools Assessment

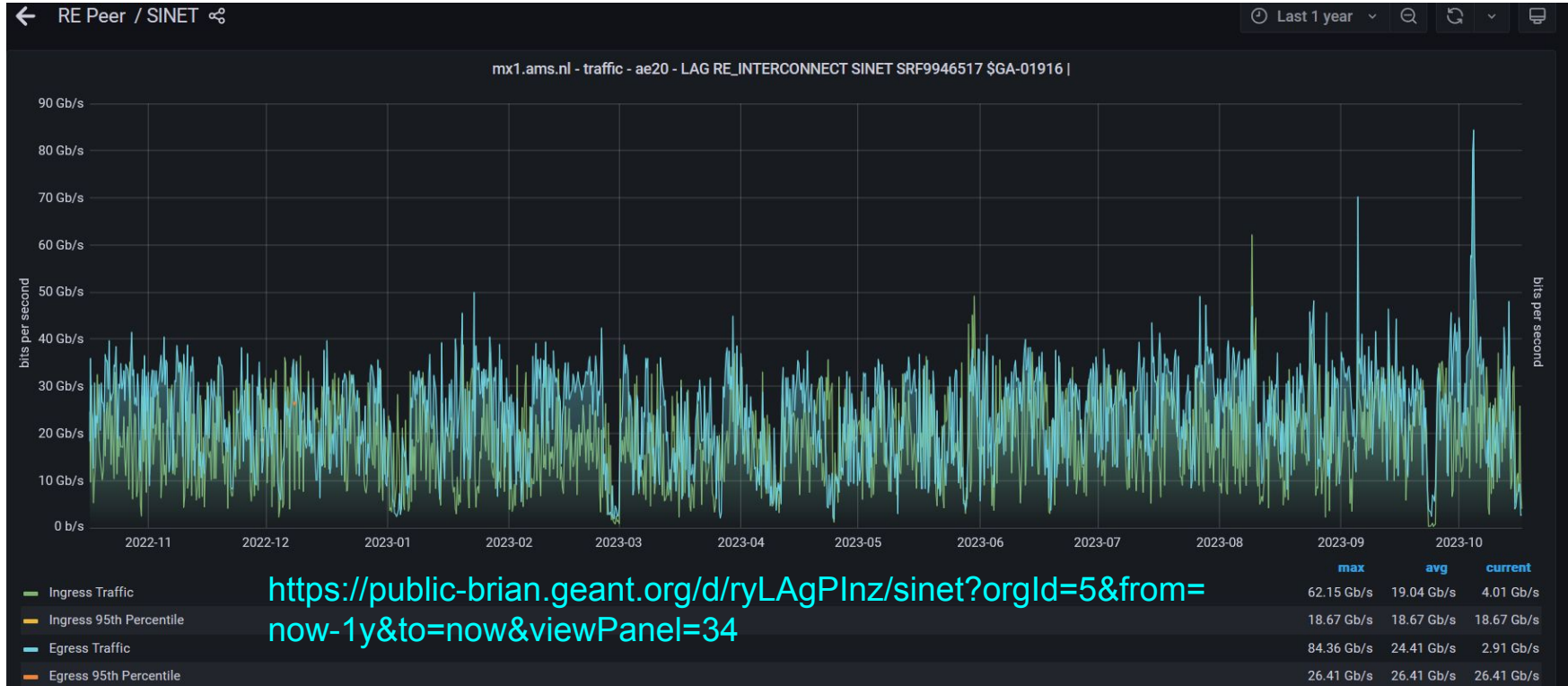
By this week we will start to check the status of all storages

- List of all the storages to be involve
- Readiness of Token Based Authentication on the Storage
- Readiness of IPv6
- Interest/Readiness to test any packet marking strategy
- Monitoring tools

RUCIO Monitoring



SINET - GEANT Peering - last 12 months



BNL from SINET Peering - last 12 months

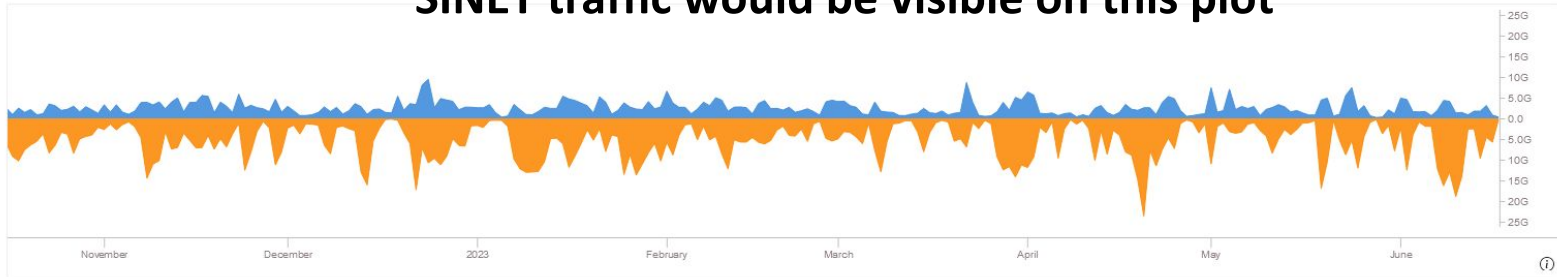
BREAKDOWN [LHCONE Participants](#) ▾

TIME 1h 6h day week month [custom](#)

Total Collaborator Traffic

Last updated June 17th 2023, 02:00 am

■ To ■ From



Top flows by vpsite

BNL		
UCHICAGO	140Mbps	100Mbps
AGLT2	84Mbps	120Mbps
UTA	75Mbps	24Mbps
SLAC	3.4Mbps	20Mbps
UNL	6.2Mbps	7.7Mbps
LBNL	2.8Mbps	1.7Mbps

Conclusion

Belle II activities are going smoothly through the LHCONE and General-IP network.

Rucio Monitoring system allow a fine grain analysis of data flow.

Data Taking going to restart by the end of this year

Preparation for Network Data Challenge 2024 is ongoing

BACKUP

Belle II Activities for packet marking

xx101000000x001000xx	Bellell	Data Consolidation
xx101000000x001001xx	Bellell	Data Rebalancing
xx101000000x001010xx	Bellell	Functional Test
xx101000000x001011xx	Bellell	Functional Test WebDAV
xx101000000x001100xx	Bellell	Recovery
xx101000000x001101xx	Bellell	Production Input
xx101000000x001110xx	Bellell	Production Output
xx101000000x001111xx	Bellell	Production Merge
xx101000000x010000xx	Bellell	Analysis Input
xx101000000x010001xx	Bellell	Analysis Output
xx101000000x010010xx	Bellell	Staging
xx101000000x010011xx	Bellell	Raw Export
xx101000000x010100xx	Bellell	Upload/Download (Job)
xx101000000x010101xx	Bellell	Upload/Download (User)
xx101000000x010110xx	Bellell	User Merge
xx101000000x010111xx	Bellell	User Transfers
xx101000000x011000xx	Bellell	User Subscription
xx101000000x011001xx	Bellell	T0 Tape
xx101000000x011010xx	Bellell	T0 Export

We are interested to participate at packet marking activities. (some of them used for test)

Preliminary set of activities collected in the Draft of packet marking.

- Analysis Input
- Calibration Transfers
- Data Consolidation
- Data Rebalancing
- Functional Test
- Production Input
- Production Merge
- Production Output
- Raw Export
- Recovery
- Staging
- T0 Export
- T0 Tape
- User Merge
- User Subscriptions
- User Transfers
- default