

Belle II DC24

12-23 February 2024

Dr. Silvio Pardi

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.

- Min - The target speed to achieve is $3 \times 3.7 \text{ Gbit/s} = \mathbf{11.1 \text{ Gbit/s}}$
- Max - The target speed to achieve is $5 \times 3.7 \text{ Gbit/s} = \mathbf{18.5 \text{ Gbit/s}}$

Belle II Data Challenge 2024

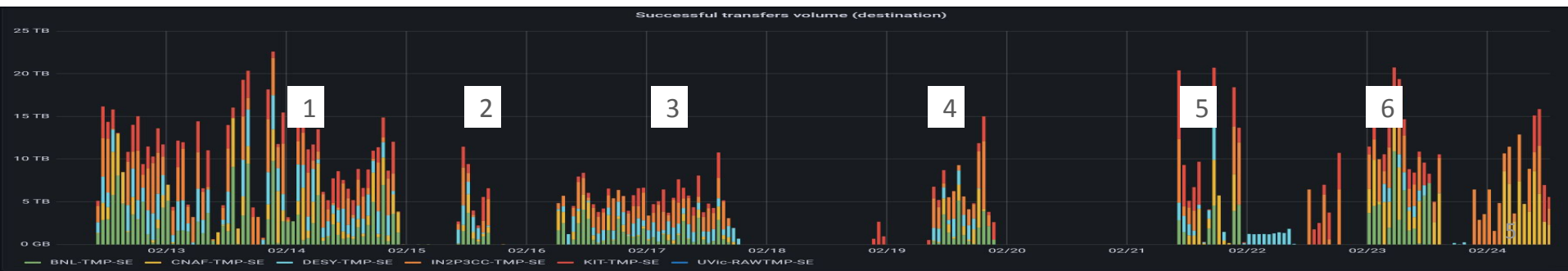
Storage Name	Site	Country	#5G Files	Minimal x3		Maximal x5	
				Ingress (Gbps)	Egress (Gbps)	Ingress (Gbps)	Egress (Gbps)
KEK-TMP-SE	KEK	JP	8000	0,0	11,1	0,0	18,5
BNL-TMP-SE	BNL	US	2400	3,3	0	5,6	0
CNAF-TMP-SE	CNAF	IT	1600	2,2	0	3,7	0
DESY-TMP-SE	DESY	DE	800	1,1	0	1,9	0
KIT-TMP-SE	KIT	DE	800	1,1	0	1,9	0
IN2P3CC-TMP-SE	IN2P3CC	FR	1200	1,7	0	2,8	0
UIVc-RAWTMP-SE	UIVc	CA	1200	1,7	0	2,8	0
Napoli-TMP-SE	Napoli	IT	TBD	TBD	TBD	TBD	TBD
SIGNET-TMP-SE	SIGNET	SL	TBD	TBD	TBD	TBD	TBD

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BNL-TMP-SE	BNL	US	2400	3,3	0	5,6	0
CNAF-TMP-SE	CNAF	IT	1600	2,2	0	3,7	0
DESY-TMP-SE	DESY	DE	800	1,1	0	1,9	0
KIT-TMP-SE	KIT	DE	800	1,1	0	1,9	0
IN2P3CC-TMP-SE	IN2P3CC	FR	1200	1,7	0	2,8	0
UIVc-RAWTMP-SE	UIVc	CA	1200	1,7	0	2,8	0
Napoli-TMP-SE	Napoli	IT	TBD	TBD	TBD	TBD	TBD
SIGNET-TMP-SE	SIGNET	SL	TBD	TBD	TBD	TBD	TBD

Activities

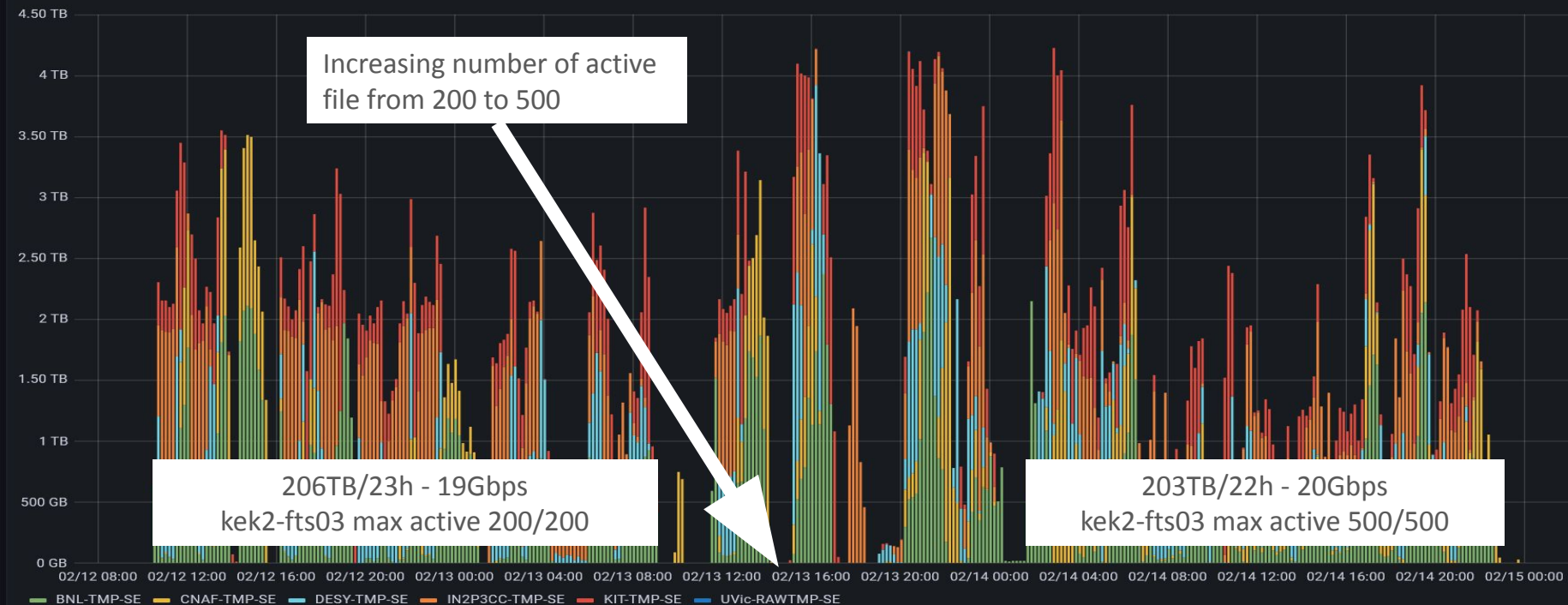
	DATE	Test	TOT	Peak (1h)	Average
1	12/02/2024 9:00 to 14/02/2004 23:00	KEK vs RAW DC (kek2-fts03 - v3.12.1)	606 TB/61h	50 Gbps	22,0 Gbps - Reached Max goal
2	15/02/2024 9:00 to 15/02/2024 16:00	KEK vs RAW DC (kek2-fts01 older)	39,9 TB/7h	25 Gbps	12,6 Gbps - Reached Min goal
3	16/02/2024 6:00 to 17/02/2024 19:00	KEK vs RAW DC (kek2-fts01)	194 TB/38h	24 Gbps	11,3 Gbps - Reached Min goal
4	19/02/2024 8:30 to 19/02/2024 21:30	KEK vs RAW DC + RAW DCs vs RAW DCs	80 TB/13h	27 Gbps	13,7 Gbps - Mixed traffic
5	21/02/2024 10:00 to 22/02/2024 9:00	RAW DCs vs RAW DCs (kek2-fts03)	141 TB/23h	46 Gbps	13,6 Gbps - Mixed traffic
6	23/02/2024 0:00 to 23/02/2024 14:00	KEK vs RAW DCs (kek2-fts03)	178 TB/15h	46 Gbps	26 Gbps - Reached Max goal



Zoom on 12/02/2024 9:00 to 14/02/2004 23:00



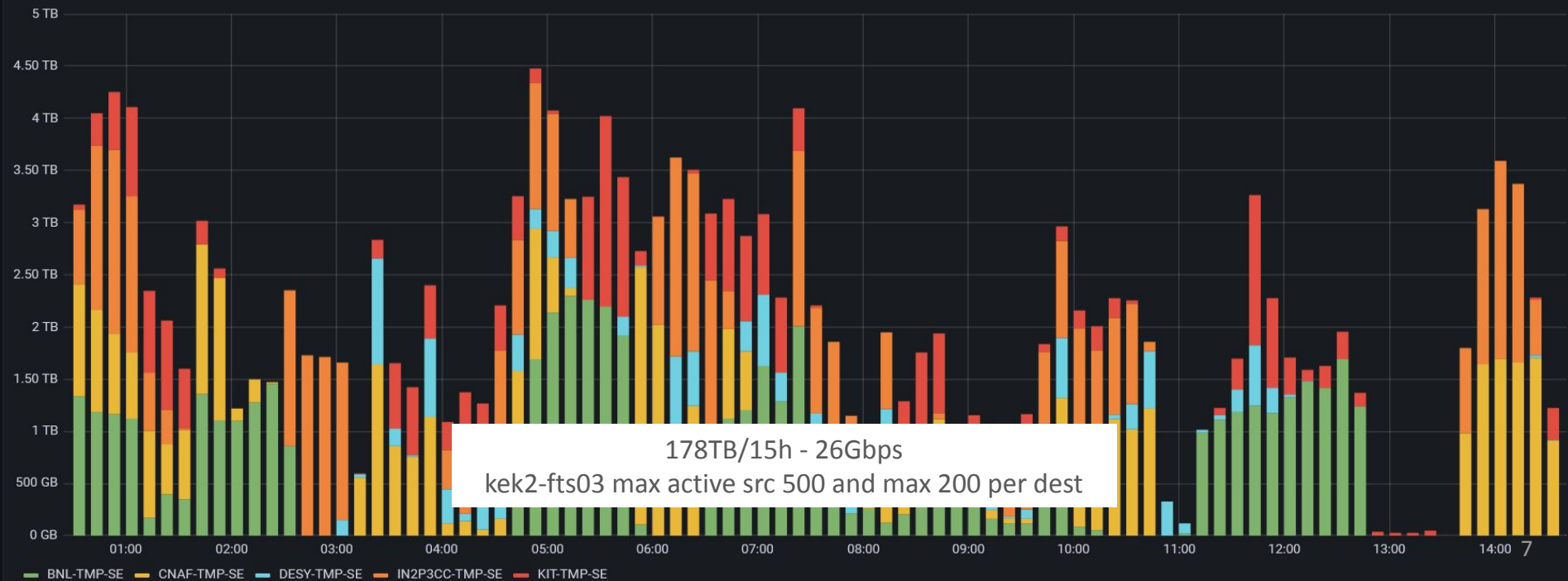
Successful transfers volume (destination)



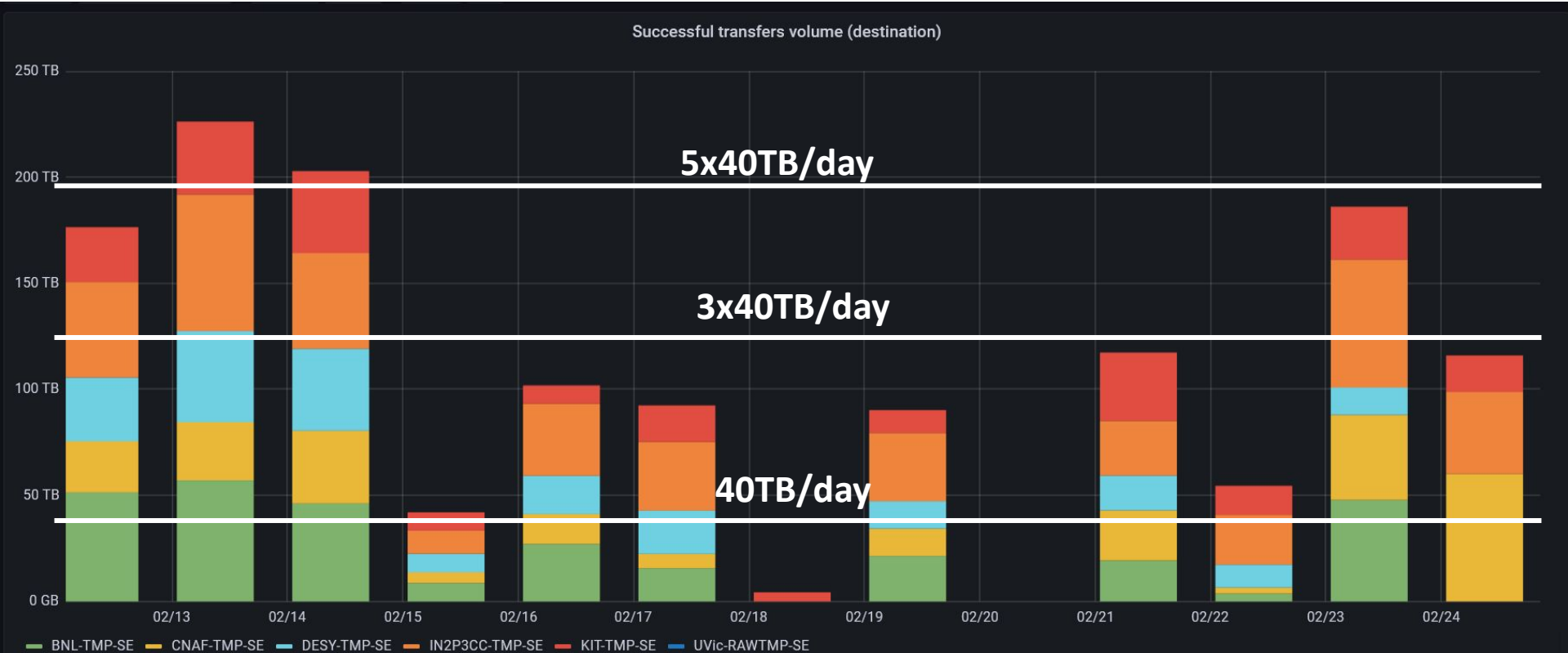
Zoom on 23/02/2024 0:00 to 23/02/2024 14:00



Successful transfers volume (destination)



Traffic per Day vs Goals

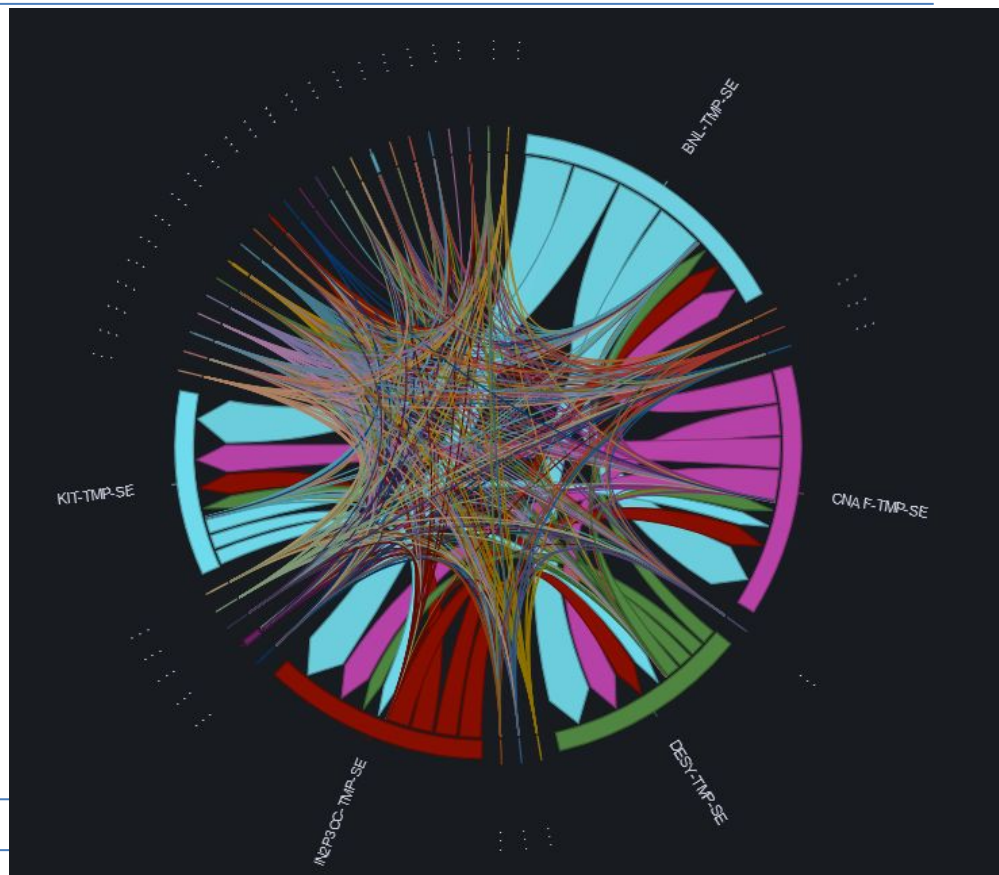


Traffic among RAW Data Centres 21/02/2024 9:00 to 22/02/2024 9:00



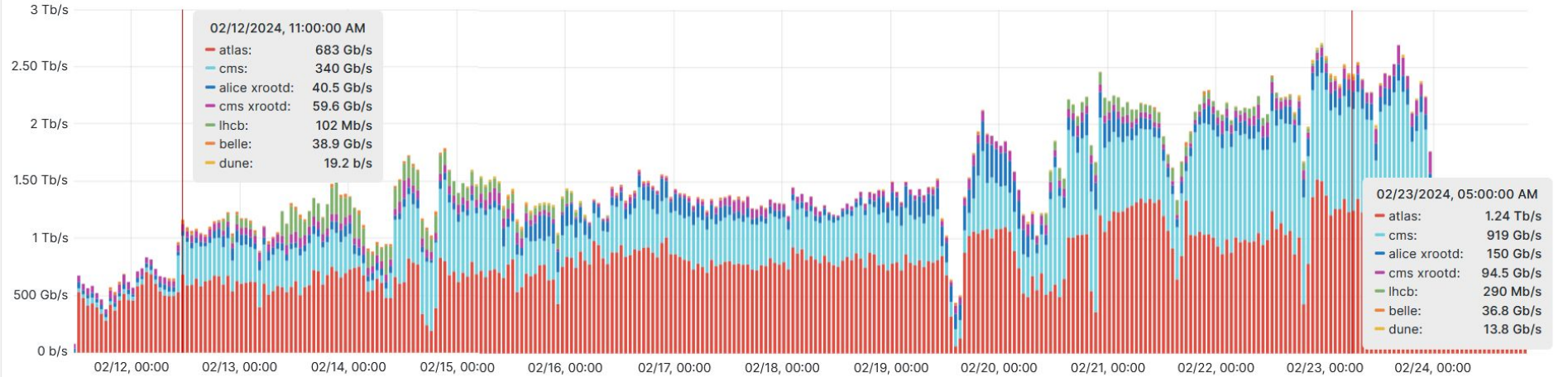
Expected routing table. Tentative of flow analysis ongoing.

	BNL	KIT	CNAF	DESY	IN2P3CC	Uvic
BNL		LHCOPN	LHCOPN	LHCONE	LHCONE	GeneralIP
KIT	LHCOPN		LHCONE	LHCONE	LHCONE	GeneralIP
CNAF	LHCOPN	LHCONE		LHCONE	LHCONE	GeneralIP
DESY	LHCONE	LHCONE	LHCONE		LHCONE	GeneralIP
IN2P3CC	LHCONE	LHCONE	LHCONE	LHCONE		GeneralIP
Uvic	GeneralIP	GeneralIP	GeneralIP	GeneralIP	GeneralIP	

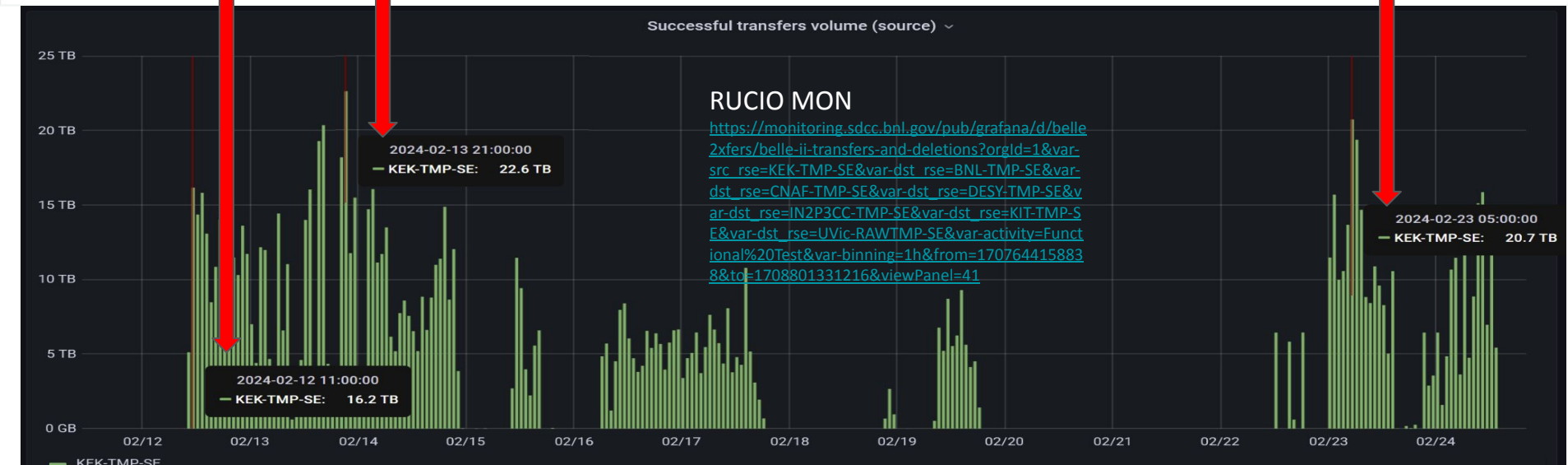
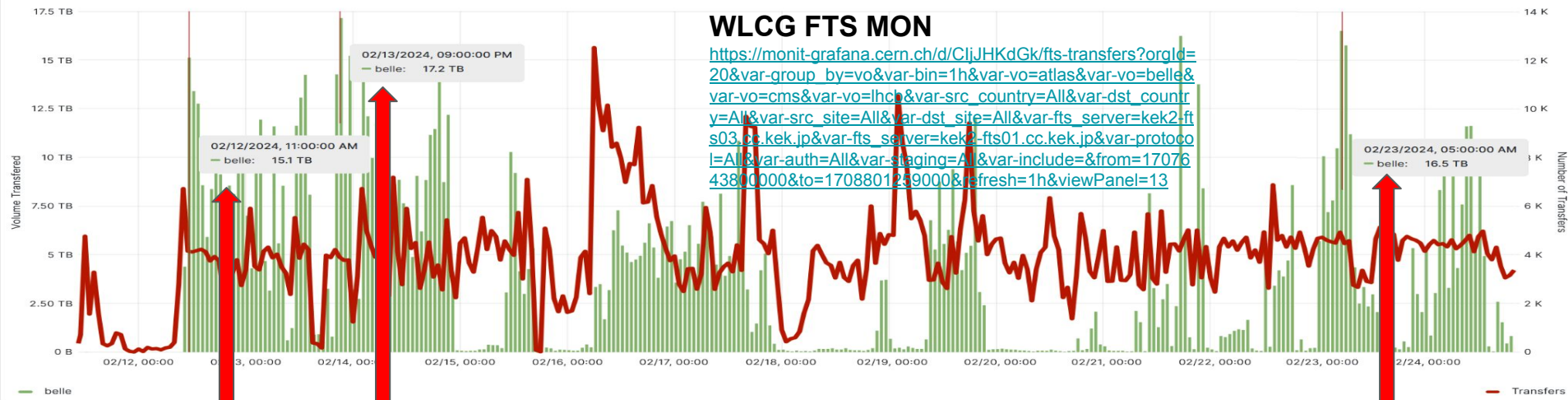


Belle II on the WLCG Dashboard for DC24

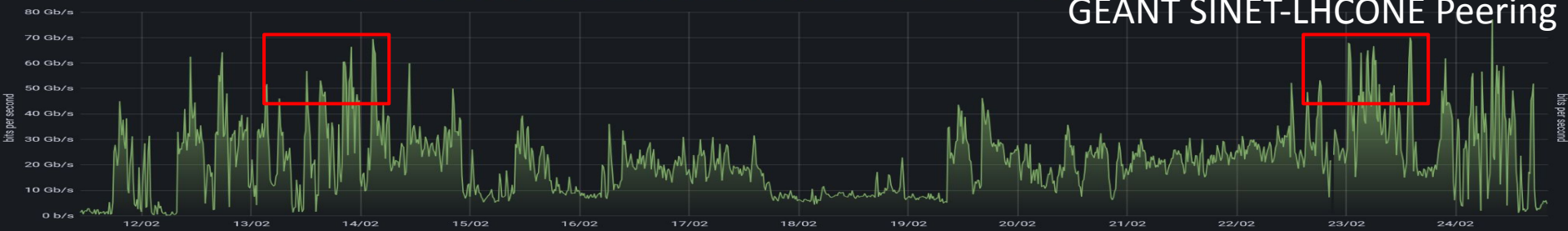
Transfers Throughput (Per VO - No DC traffic highlighted) ⓘ



	max	avg	current
atlas	1.52 Tb/s	787 Gb/s	328 Gb/s
cms	1.16 Tb/s	463 Gb/s	62.4 Gb/s
alice xrootd	349 Gb/s	111 Gb/s	156 Gb/s
cms xrootd	191 Gb/s	67.4 Gb/s	76.5 Gb/s
lhcb	382 Gb/s	44.0 Gb/s	822 Mb/s
belle	38.9 Gb/s	9.19 Gb/s	1.31 Gb/s



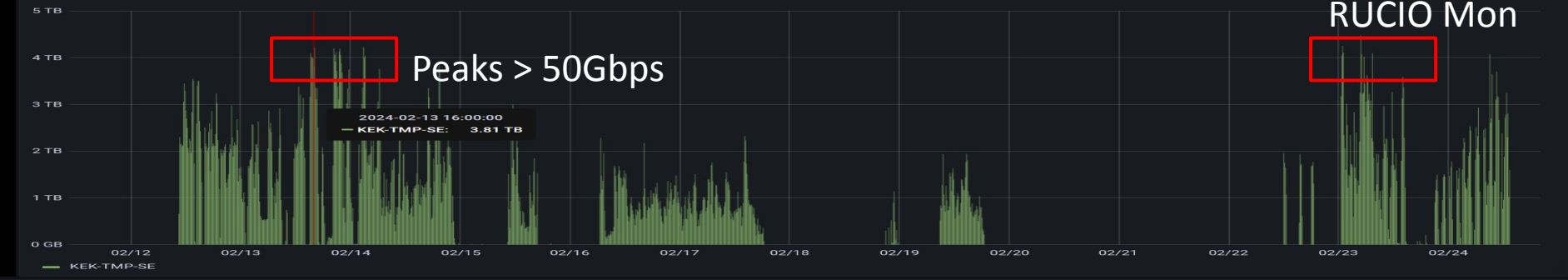
GEANT SINET-LHCONE Peering



- Ingress Traffic
- Ingress 95th Percentile
- Egress Traffic
- Egress 95th Percentile

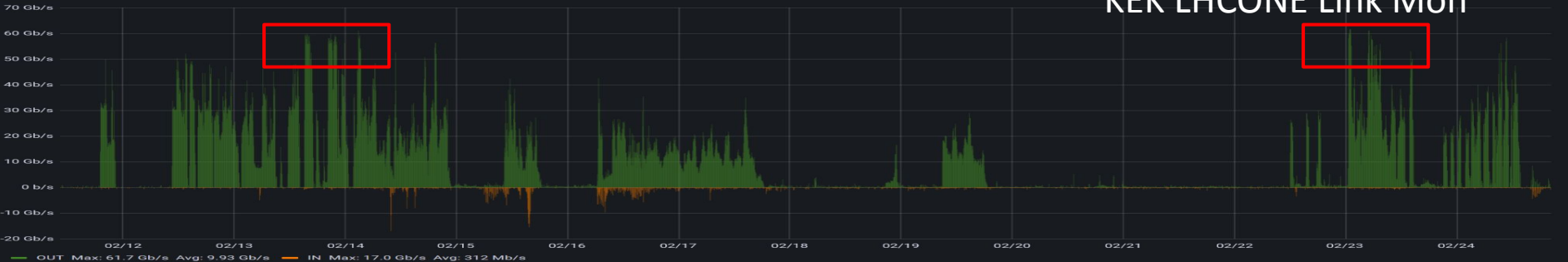
max	avg	current
77.04 Gb/s	21.44 Gb/s	4.72 Gb/s
42.38 Gb/s	42.38 Gb/s	42.38 Gb/s
67.40 Gb/s	23.33 Gb/s	1.99 Gb/s
39.15 Gb/s	39.15 Gb/s	39.15 Gb/s

Successful transfers volume (source) ▾

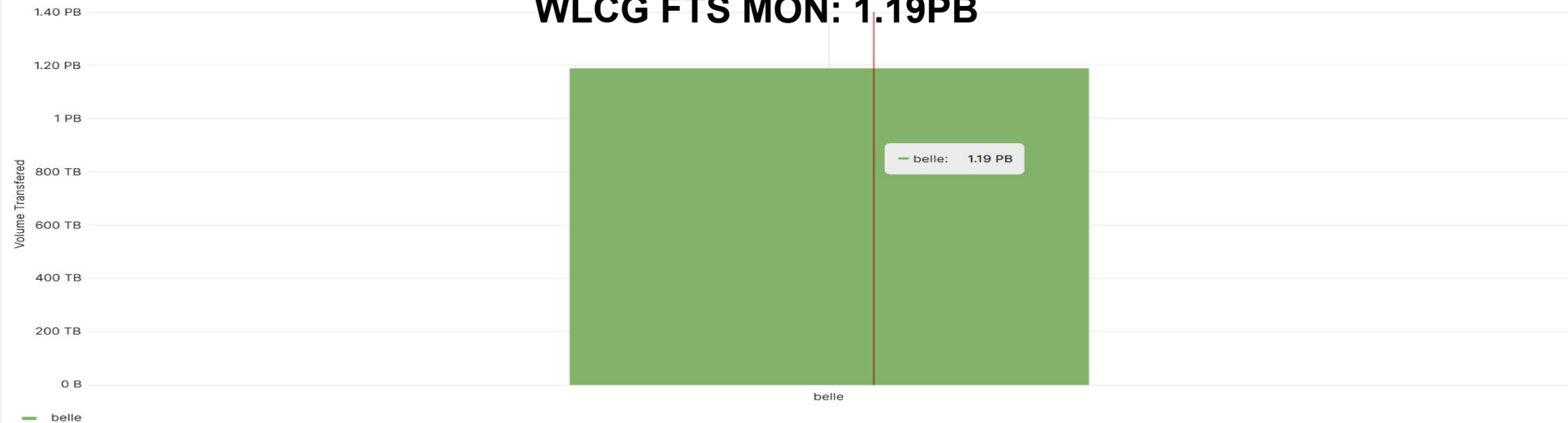


LHCONE

KEK LHCONE Link Mon

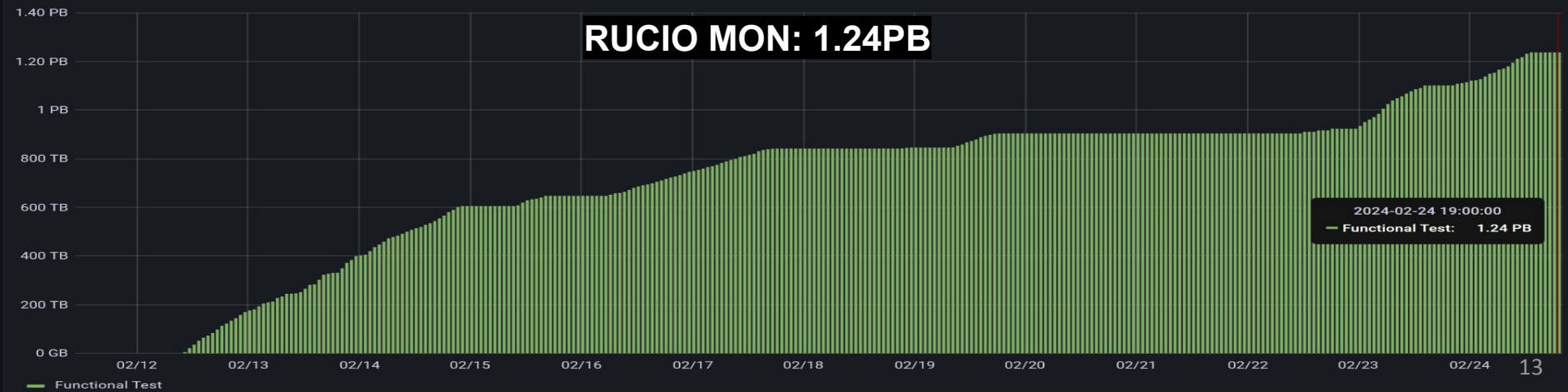


WLCG FTS MON: 1.19PB



Successful transfers volume per activity (aggregation) ~

RUCIO MON: 1.24PB



Summary

Data Challenge goals for Belle II have been reached in term of global throughput from KEK vs RAW DCs, even if working without one RAW DC.

26Gbps average throughput reached in the windows of maximum traffic generated by LHC experiments.

Substantial accordance among the Monitoring systems of Rucio, KEK and GEANT-SINET Peering. Some discrepancy with the FTS monitoring system to be investigate.

Other analysis on the collected data ongoing.

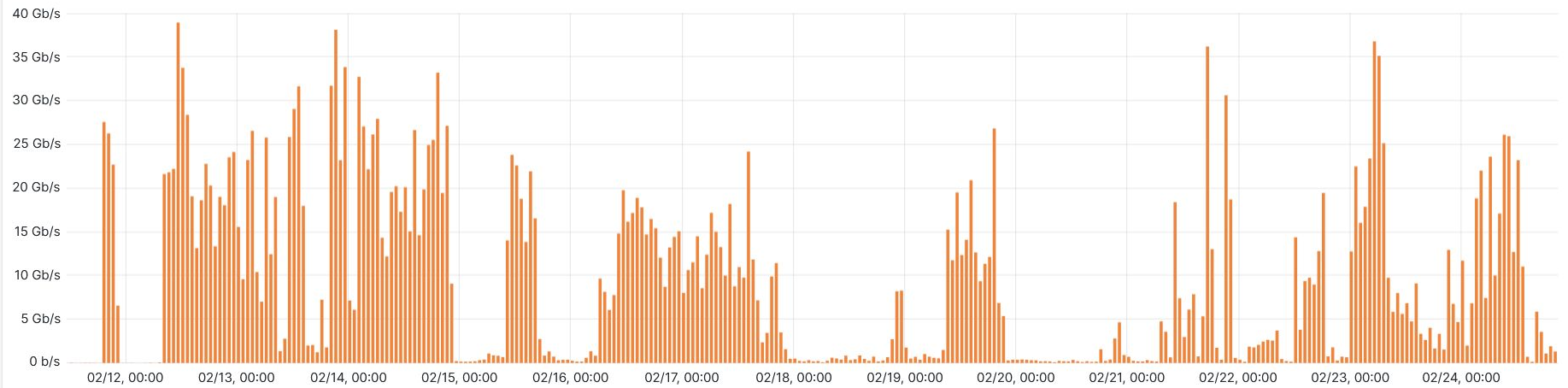
BACKUP SLIDES

group by activity bin 1h vo All activity Functional Test protocol All staging All fts server kek2-fts01.cc.kek.jp + kek2-fts03.cc.kek.jp src country All

dest country All src tier All dest tier All src site All dest site All src exp site All dest exp site All src rse All dst rse All filter_fts_raw +

filter_fts_agg + filter_wlwg_agg +

Transfers Throughput (Per VO - No DC traffic highlighted)

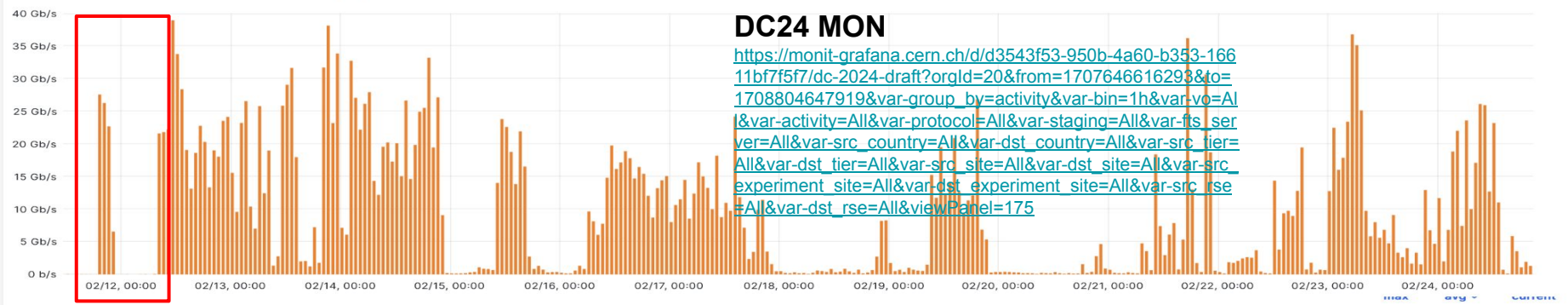


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dune	28.6 Gb/s	5.41 Gb/s	7.46 Gb/s



DC24 MON

https://monit-grafana.cern.ch/d/d3543f53-950b-4a60-b353-16611bf7f5f7/dc-2024-draft?orgId=20&from=1707646616293&to=1708804647919&var-group_by=activity&var-bin=1h&var-vo=All&var-activity=All&var-protocol=All&var-staging=All&var-fts_server=All&var-src_country=All&var-dst_country=All&var-src_tier=All&var-dst_tier=All&var-src_site=All&var-dst_site=All&var-src_experiment_site=All&var-dst_experiment_site=All&var-src_rse=All&var-dst_rse=All&viewPanel=175

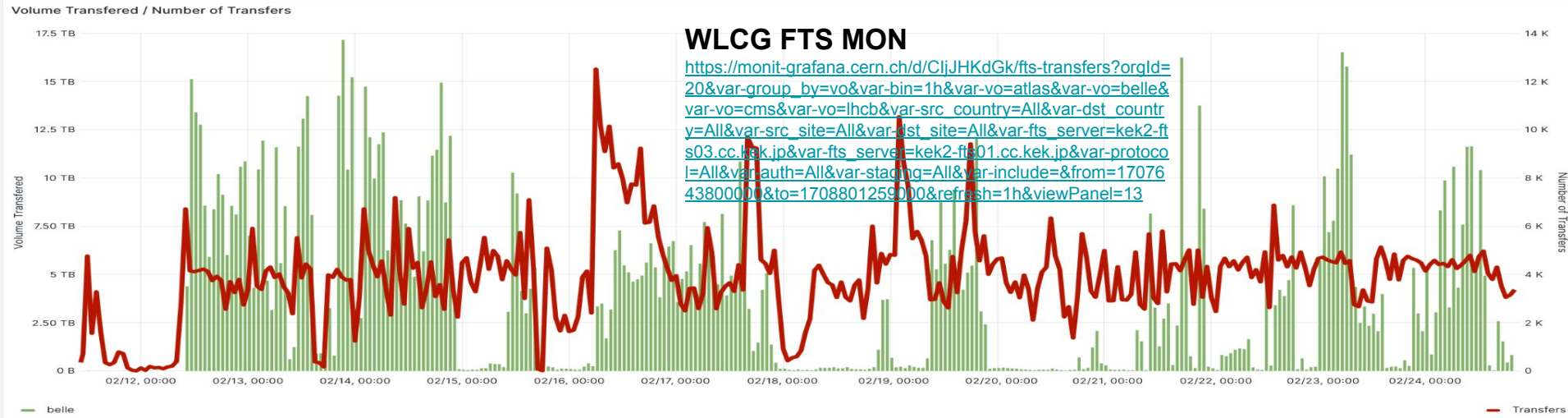


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Not Functional
Test

WLCG FTS MON

https://monit-grafana.cern.ch/d/CljJHKdGk/fts-transfers?orgId=20&var-group_by=vo&var-bin=1h&var-vo=atlas&var-vo=belle&var-vo=cms&var-vo=lhcb&var-src_country=All&var-dst_country=All&var-src_site=All&var-dst_site=All&var-fts_server=kek2-fts03.cc.kek.jp&var-fts_server=kek2-fts01.cc.kek.jp&var-protocol=All&var-auth=All&var-staging=All&var-include=&from=1707643800000&to=1708801259000&refresh=1h&viewPanel=13



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