



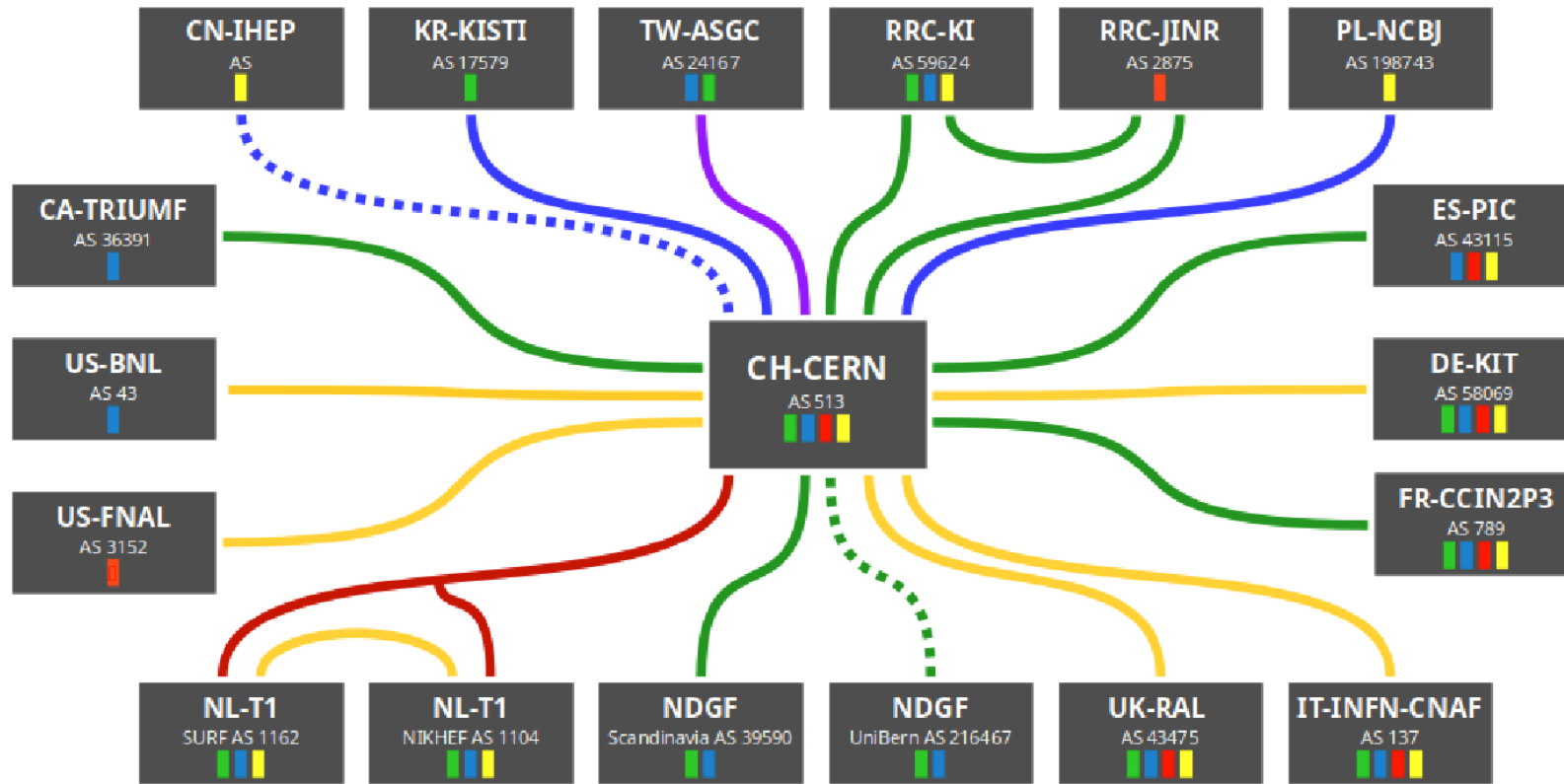
LHCOPN update

LHCOPN meeting #51, Victoria CA

18th October 2023

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LHCOPN



Numbers

- 18 sites for 15 Tier1s + 1 Tier0
- PL-NCBJ just joined, CN-IHEP and NDFG-LHEP in the process to connect
- 15 countries in 3 continents
- 2.1 Tbps to the Tier0

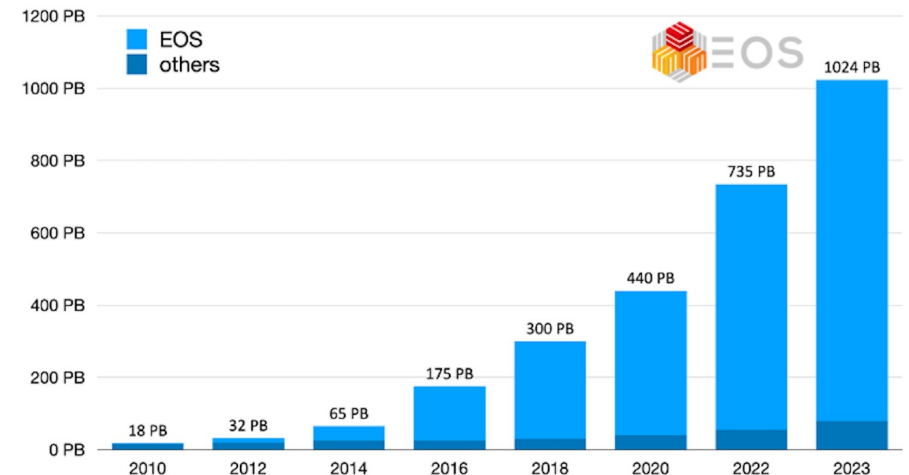
■ = Alice ■ = Atlas ■ = CMS ■ = LHCb
■ 10Gbps ■ 20Gbps
■ 100Gbps ■ 200Gbps
■ 400Gbps
 edoardo.martelli@cern.ch 20231003

<https://twiki.cern.ch/twiki/bin/view/LHCOPN/OverallNetworkMaps>

Latest news

CH-CERN:

- Upgraded LHCOPN/ONE connections to ESnet to 2x400Gbps. These links carry the LHCOPN connections for BNL, FNAL and LHCONE
- Preveessin Data Centre is ready. Phase1 installation of network equipment and servers will start in November 2023
- Total HD and SSD Storage now amounts to more than 1 Exabyte



LHCOPN latest news

NLT1:

- SURF has completed the migration of SARA and NIKHEF behind 400G link and SURF ASN

UK-RAL:

- New network now functionally complete
- Second 100G link in production
- Routing preference: LHCOPN, then LHCONE, then JANET Internet

PL-NCBJ:

- Primary link 2x10G in production. Backup link just made ready (20G over shared PIONIER network)
- NCBJ has a 32bits AS number AS198743. Its LHCOPN BGP community for Do-Not-Announce-To is an extended one, 513:3:2135 (asdot notation)

LHCOPN latest news

NDGF-UniBern:

- 100G link to CERN provided by SWITCH. Physical link ready, will be configured in November 2023.
- Another 32bits ASN: 216467, LHCOPN community 513:3:19859

CN-IHEP

- Some delays with the procurement of the link to CERN. Situation now unblocked, the link should arrive very soon.

US-BNL:

- BNL will increase its capacity to ESnet to 4x400Gbps. The LHCOPN link will have a capacity of 400Gbps (limited at CERN and over the Atlantic)

LHCOPN latest news

KR-KISTI:

- Link Daejon-Amsterdam upgraded to 100Gbps. Working on completing the full 100Gbps path

US-FNAL:

- Connection to ESnet recently upgraded to 2x 400Gbps. New routers for the perimeter network will arrive in Q1 2024

TW-ASGC:

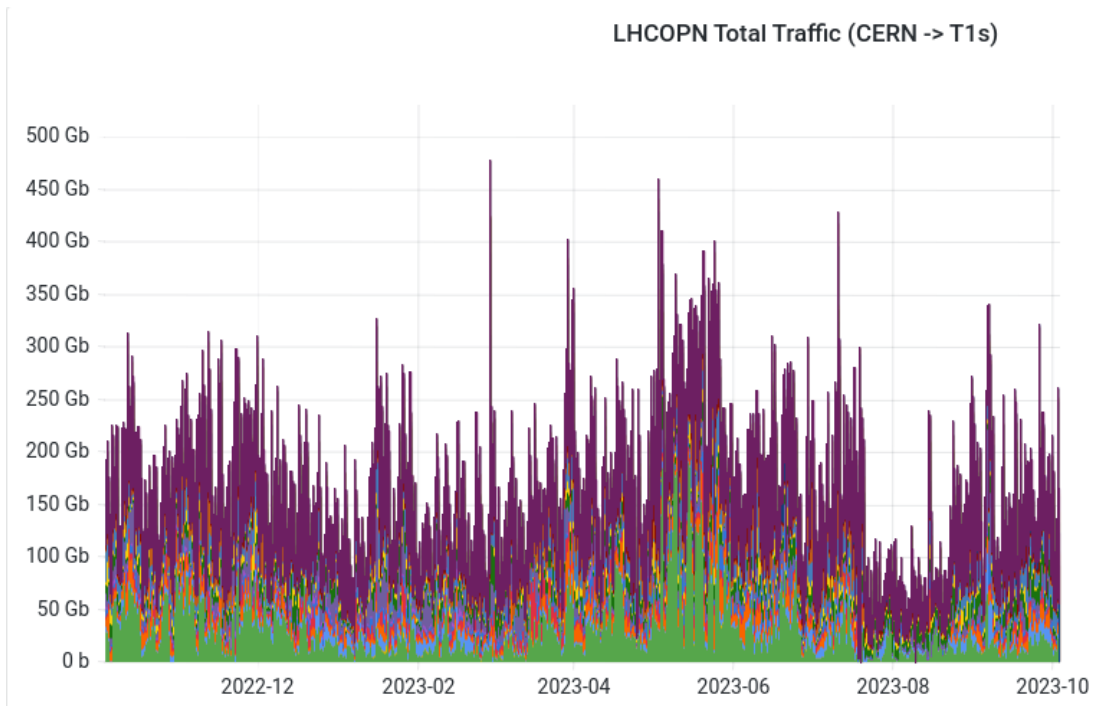
- TW-ASGC ends Tier1 operations in October 2023.
- Working with ESnet to get LHCONE transit as ATLAS sponsored Tier2
- **Thank you for being with us for all these years**

Latest news

Other Tier1s

- [input from the audience]

LHCOPN Traffic – last 12 months



	Mean	Max
Outgoing DE-KIT	53.0 Gb	251 Gb
Outgoing KR-KISTI	198 Mb	9.39 Gb
Outgoing RU-T1	6.60 Gb	42.6 Gb
Outgoing FR-IN2P3	11.5 Gb	89.4 Gb
Outgoing NDGF	6.87 Gb	83.3 Gb
Outgoing NL-T1	6.12 Gb	104 Gb
Outgoing TW-ASGC	1.14 Gb	9.69 Gb
Outgoing IT-INFN-CNAF	12.3 Gb	130 Gb
Outgoing UK-RAL	9.44 Gb	40.5 Gb
Outgoing CA-TRIUMF	5.96 Gb	75.7 Gb
Outgoing US-BNL	12.7 Gb	98.8 Gb
Outgoing US-FNAL	6.76 Gb	81.3 Gb
Outgoing ES-PIC	4.43 Gb	81.8 Gb
Outgoing PL-NCBJ	246 Mb	18.9 Gb
Total	137 Gb	479 Gb

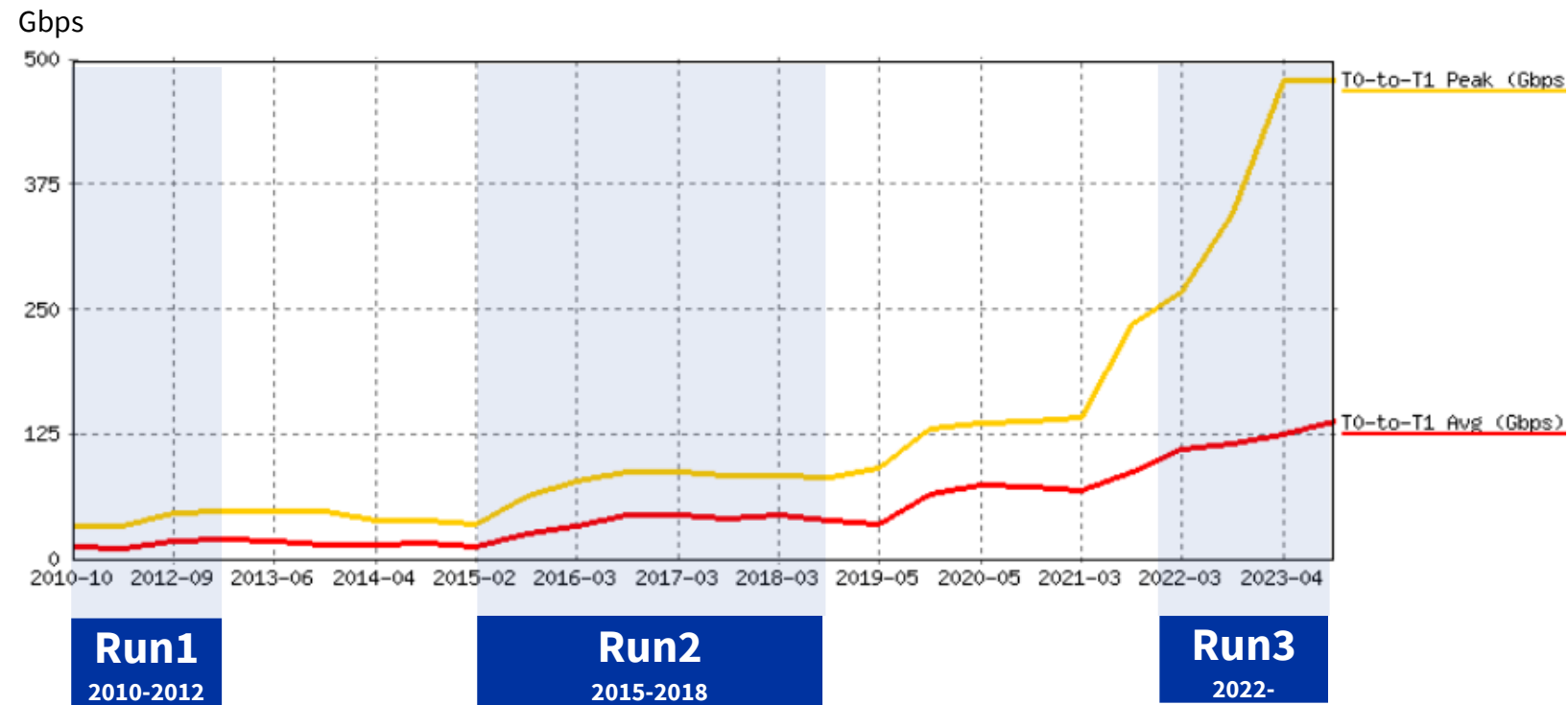
Numbers:

Moved ~540 PB in the last 12 months

+18% compared to previous year (457PB)

Peak at ~479Gbps

LHCOPN: Long-term growth



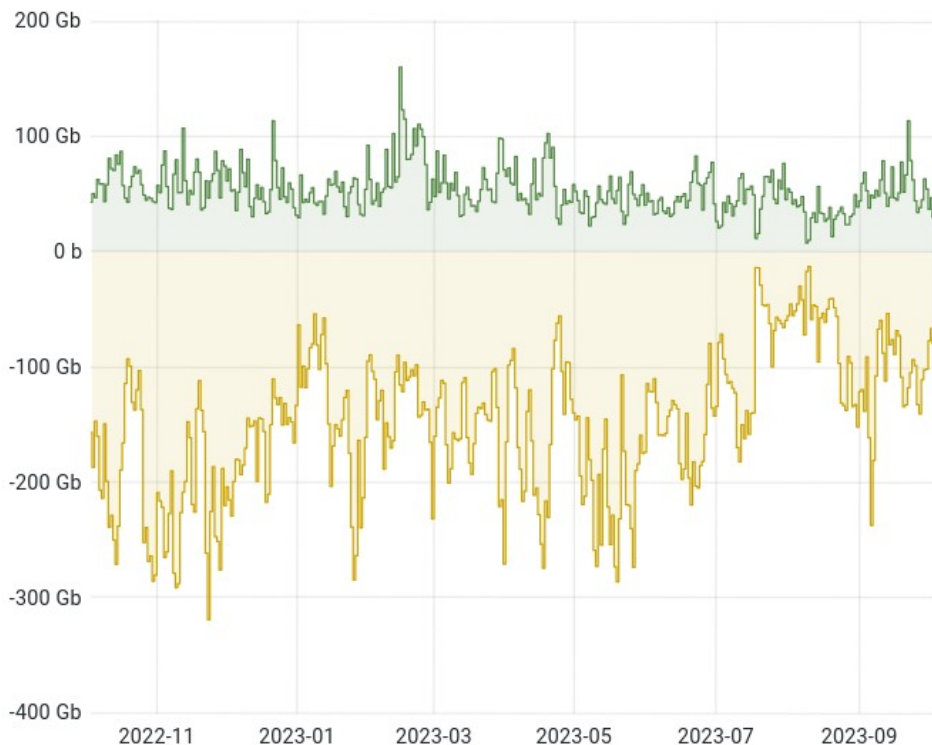
Run1: 2010-12
LS1: 2013-14
Run2: 2015-18
LS2: 2019-21
Run3: 2022-25

Y-Axis: Gbps - Average bandwidth of previous 12 months



CERN total traffic

LHCOPN+LHCONE+Internet



	min	max	avg
Internet IPv4 In	0 b	13.7 Gb	3.78 Gb
Internet IPv4 Out	0 b	107 Gb	20.8 Gb
Internet IPv6 In	0 b	24.2 Gb	7.57 Gb
Internet IPv6 Out	0 b	38.5 Gb	9.71 Gb
Internet Total In	0 b	28.1 Gb	11.3 Gb
Internet Total Out	0 b	124 Gb	30.6 Gb
WLCG IPv4+IPv6 In	0 b	141 Gb	42.1 Gb
WLCG IPv4+IPv6 Out	0 b	271 Gb	118 Gb
Total In	7.49 Gb	160 Gb	53.4 Gb
Total Out	13.1 Gb	319 Gb	148 Gb

Numbers:

Sent out ~583 PB
in the last 12
months

+9% compared to
previous year
(536PB)

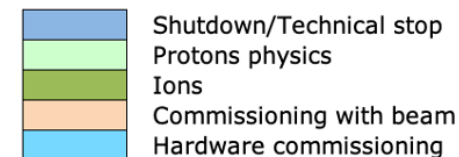
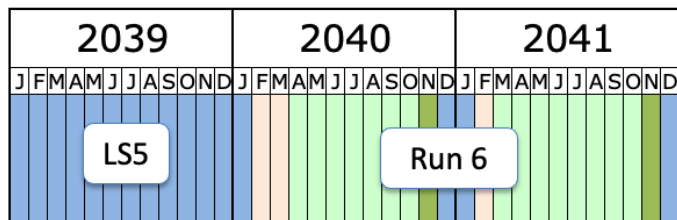
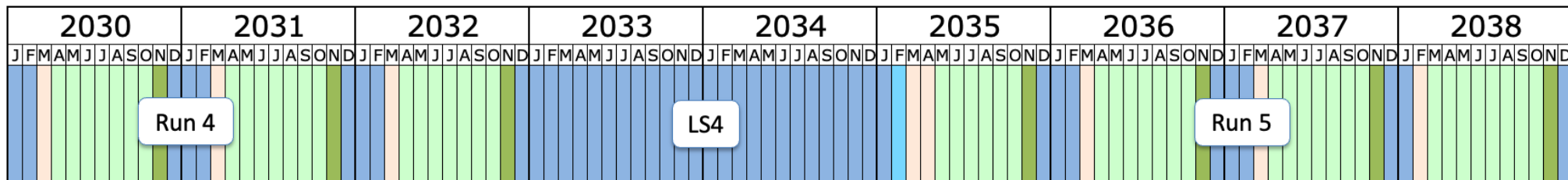
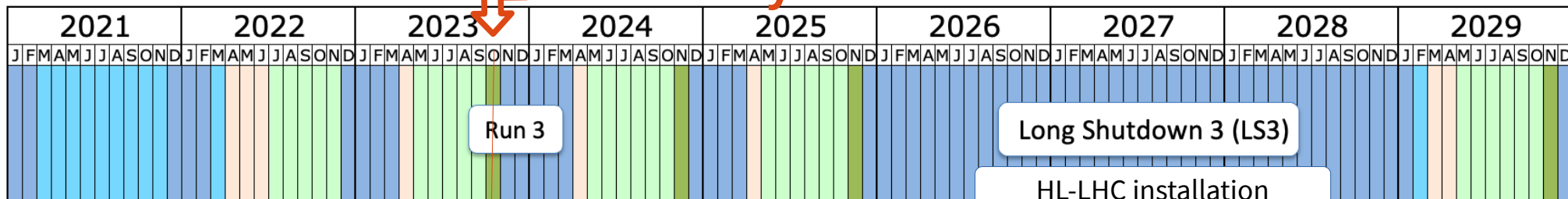
Cooling system
incident
reduced data
production
during the
summer

Ref: https://monit-grafana.cern.ch/d/cScW82Tnz/00-overview?orgId=14&var-source=long_term&var-bin=1d&from=now-1y&to=now



LHC schedule

Here today



Last update: April 2023

<https://lhc-commissioning.web.cern.ch/schedule/LHC-long-term.htm>



Questions?

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