



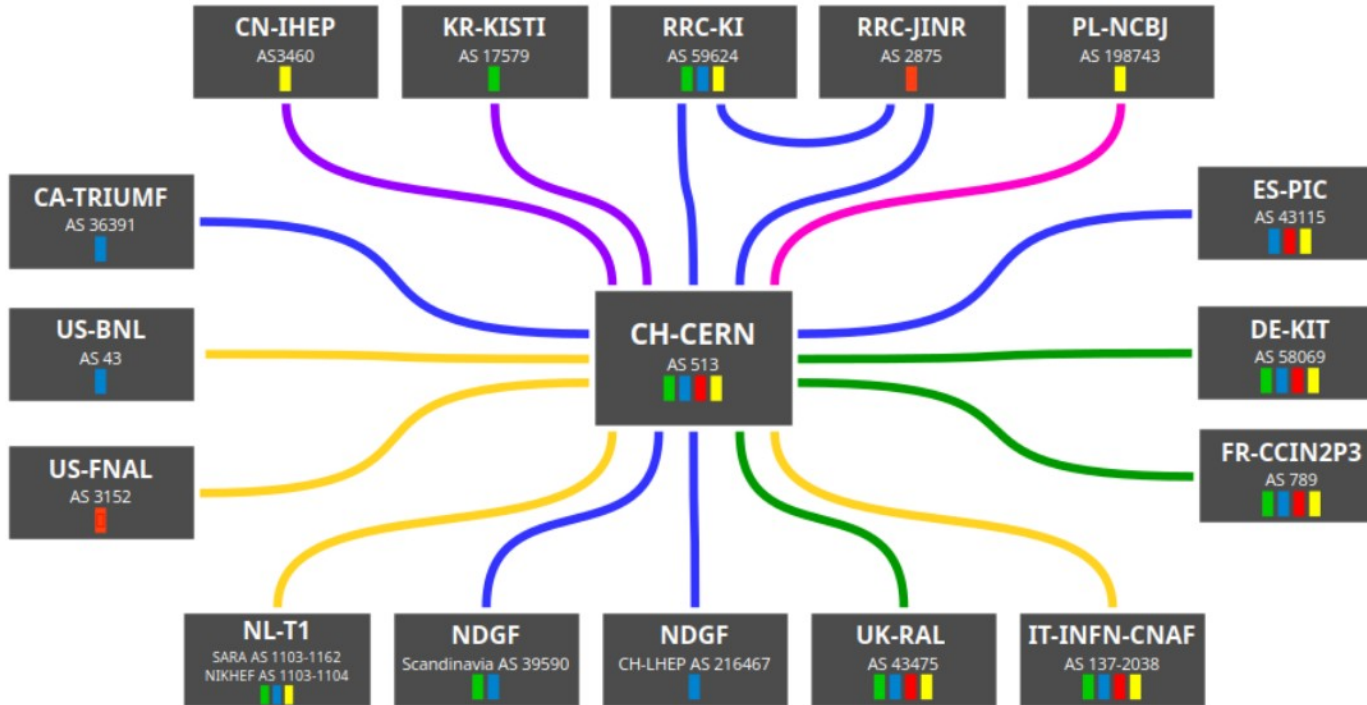
LHCOPN update

LHCOPN meeting #53, IHEP Beijing CN

9th October 2024

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LHCOPN



Line speeds:

- 20Gbps (purple)
- 10Gbps (magenta)
- 100Gbps (blue)
- 200Gbps (green)
- 400Gbps (yellow)
- 800Gbps (orange)

Experiments:

- Alice (green)
- ATLAS (blue)
- CMS (orange)
- LHCb (yellow)

Last update:

- 20241003
- edoardo.martelli@cern.ch

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

Numbers

- 17 sites for 15 Tier1s + 1 Tier0
- 14 countries in 3 continents
- 2.88 Tbps to the Tier0



LHCOPN latest news

IT-INFN-CNAF:

- Soon ready to move to new datacentre. The DCI connections will be upgraded to multiple 400Gbps by then

US-BNL:

- Now with 400Gbps capacity for LHCOPN

New Serbian CMS Tier1:

- The Vinča Institute of Nuclear Sciences in Belgrade is working to become a CMS Tier1. They have a datacentre in Kragujevac, south of Belgrad.
- Working with AMRES and GEANT for the LHCOPN and LHCONE connectivity

LHCOPN latest news

PL-NCBJ:

- LHCOPN link upgraded to 40Gbps; provided by GEANT over a 100Gbps connection.

NDGF:

- NORDUnet is upgrading its routers at CERN and we'll soon be able to provide 100Gbps redundancy to NDGF

US-FNAL:

- Aggregate WAN capacity upgraded to 2.4Tb/s
- LHCONE capacity now 1.6Tb/s, with LHCOPN capacity remaining at 400Gb/s (limited by trans-Atlantic link(s))

LHCOPN latest news

CH-CERN:

- Tony Cass will retire soon and is no longer at the head of the IT-CS group.
A very big Thank you for his contribution to LHCOPN and LHCONE over many years
- Eric Grancher, the new IT-CS group leader, will join our next meeting

Latest news

Other Tier1s

- [input from the audience]

LHCOPN Traffic – last 12 months

Numbers:

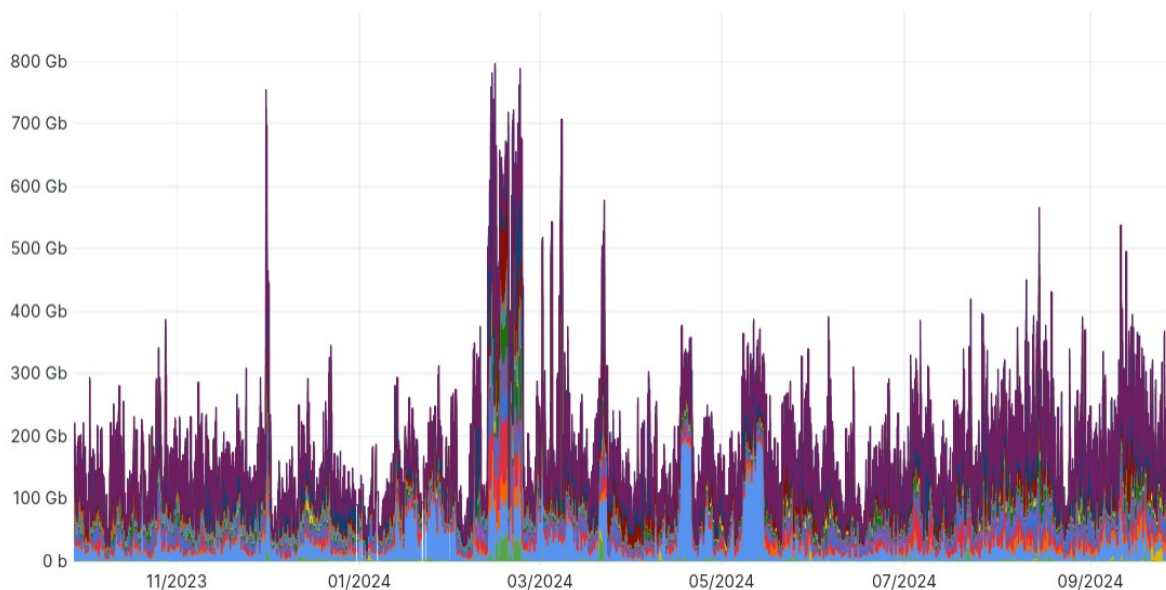
Moved ~658 PB in the last 12 months

+6% compared to previous year (540 PB)

Peak at ~800Gbps (during DC24)

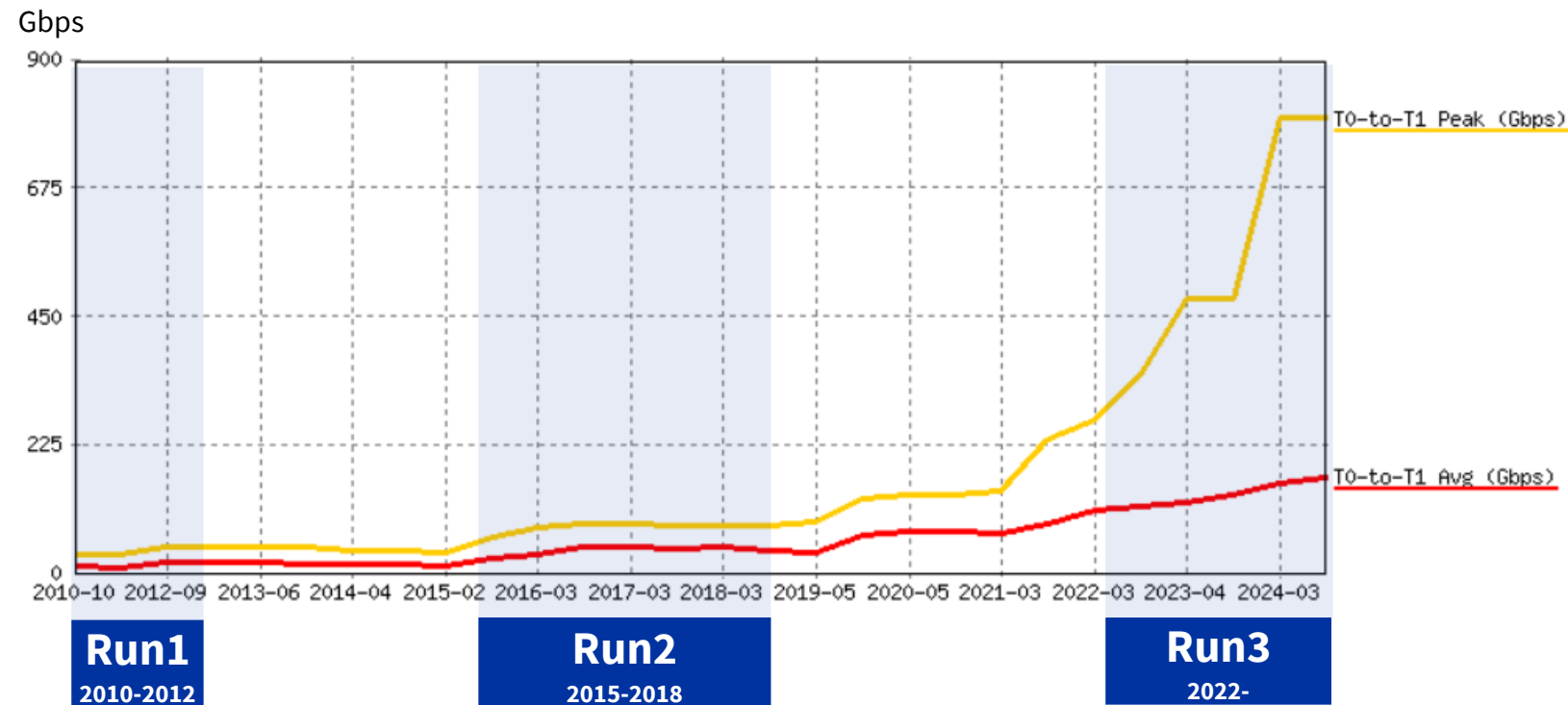
Recent production peak at 570 Gbps

LHCOPN Total Traffic (CERN → T1s)



| Name | Mean | Max |
|-----------------------|---------|---------|
| Outgoing CA-TRIUMF | 6.94 Gb | 69.9 Gb |
| Outgoing CN-IHEP | 657 Mb | 22.1 Gb |
| Outgoing DE-KIT | 42.5 Gb | 202 Gb |
| Outgoing ES-PIC | 7.53 Gb | 97.2 Gb |
| Outgoing FR-IN2P3 | 20.1 Gb | 169 Gb |
| Outgoing IT-INFN-CNAF | 14.3 Gb | 105 Gb |
| Outgoing KR-KISTI | 1.38 Gb | 18.6 Gb |
| Outgoing NDGF | 11.1 Gb | 110 Gb |
| Outgoing NL-T1 | 14.3 Gb | 545 Gb |
| Outgoing-PL-NCBJ | 1.58 Gb | 17.4 Gb |
| Outgoing RU-T1 | 8.00 Gb | 73.9 Gb |
| Outgoing UK-RAL | 2.81 Gb | 36.0 Gb |
| Outgoing US-BNL | 18.7 Gb | 148 Gb |
| Outgoing US-FNAL | 17.6 Gb | 204 Gb |
| Total | 167 Gb | 797 Gb |

LHCOPN: traffic growth



Run1: 2010-12

LS1: 2013-14

Run2: 2015-18

LS2: 2019-21

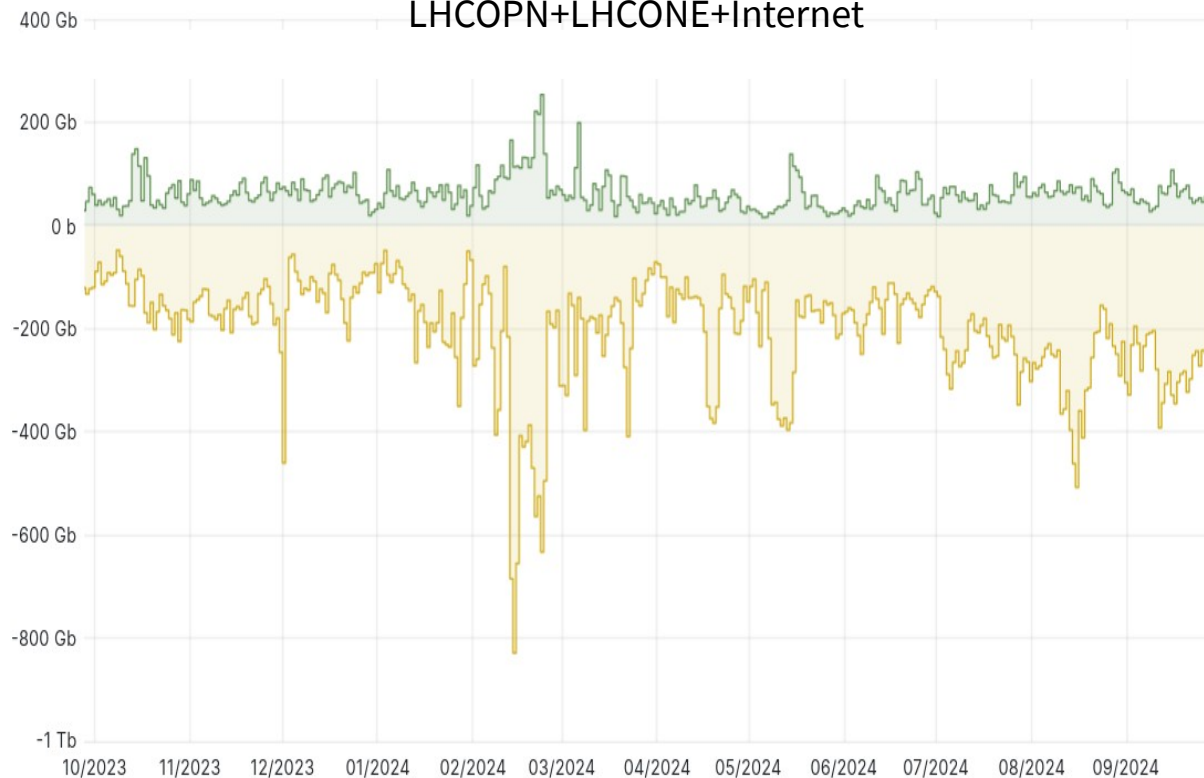
Run3: 2022-26

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



CERN total traffic

LHCOPN+LHCONE+Internet



| | max | avg |
|--------------------|---------|---------|
| Internet IPv4 In | 7.40 Gb | 2.11 Gb |
| Internet IPv4 Out | 95.6 Gb | 13.6 Gb |
| Internet IPv6 In | 20.8 Gb | 1.25 Gb |
| Internet IPv6 Out | 41.1 Gb | 3.92 Gb |
| Internet Total In | 27.7 Gb | 3.36 Gb |
| Internet Total Out | 95.6 Gb | 17.5 Gb |
| WLCG IPv4+IPv6 In | 254 Gb | 59.3 Gb |
| WLCG IPv4+IPv6 Out | 827 Gb | 197 Gb |
| Total In | 254 Gb | 61.0 Gb |
| Total Out | 827 Gb | 202 Gb |

Numbers:

Sent out ~796 PB
in the last 12
months

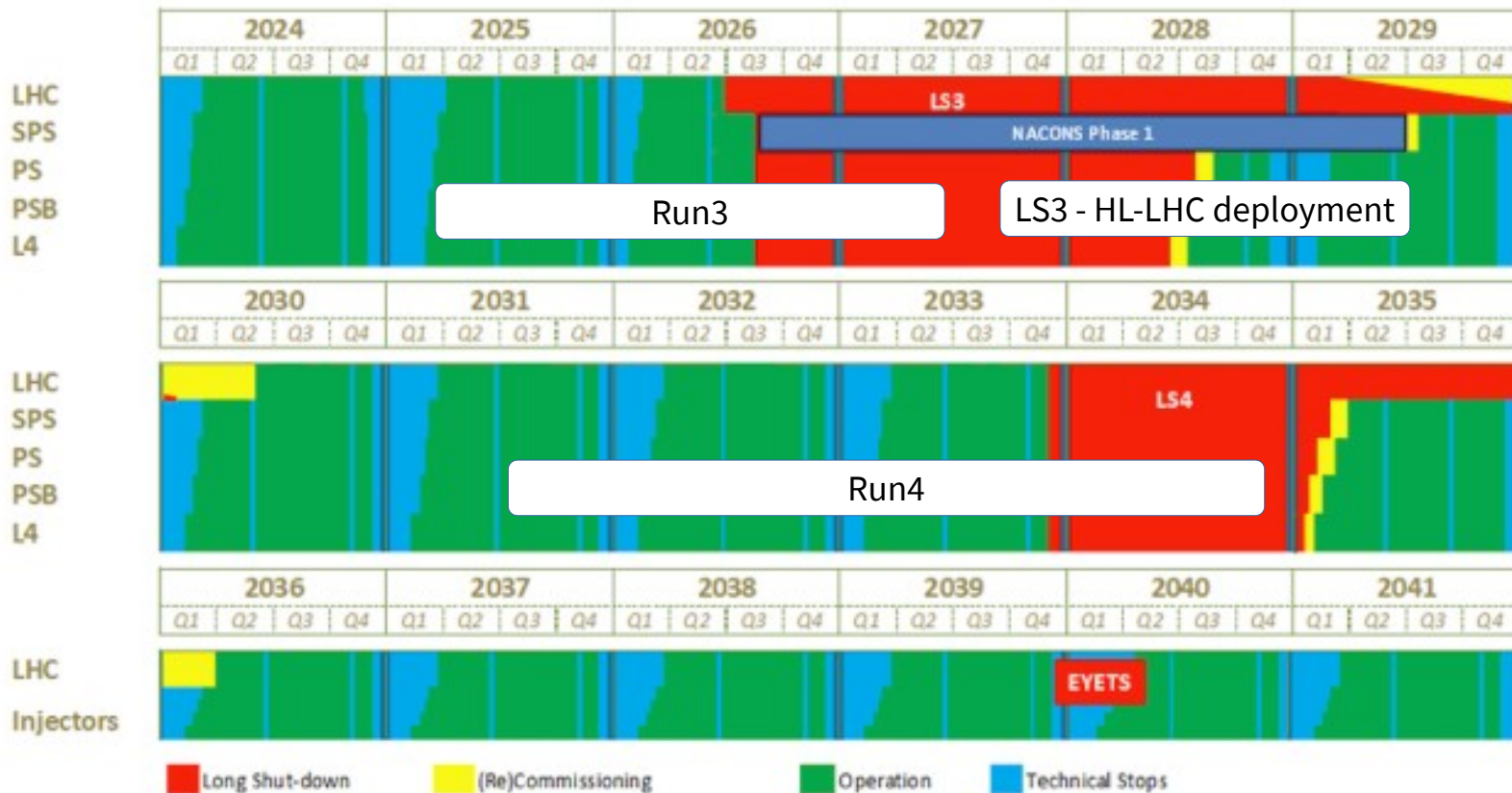
+36% compared
to previous year
(583PB)

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



New LHC schedule

Long Term Schedule for CERN Accelerator complex

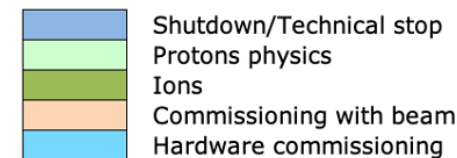
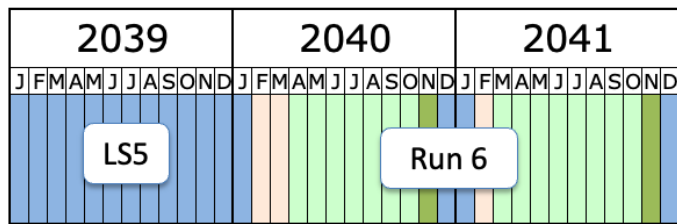
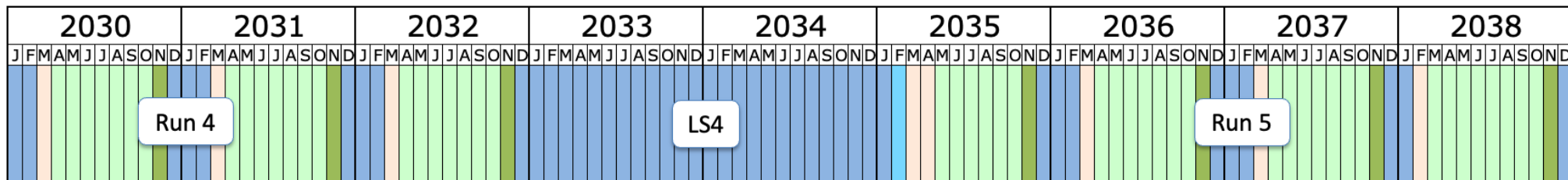
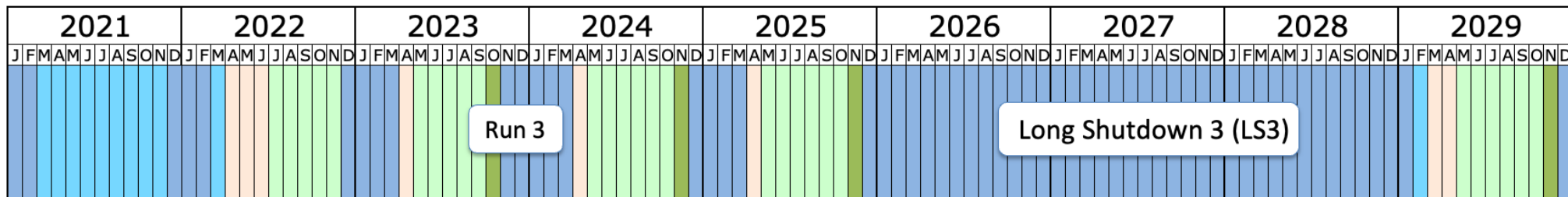


LS3 now scheduled to begin July 2026, 8 months later than planned

High-Luminosity LHC (**Run4**) will start June 2030, 14 months later than planned

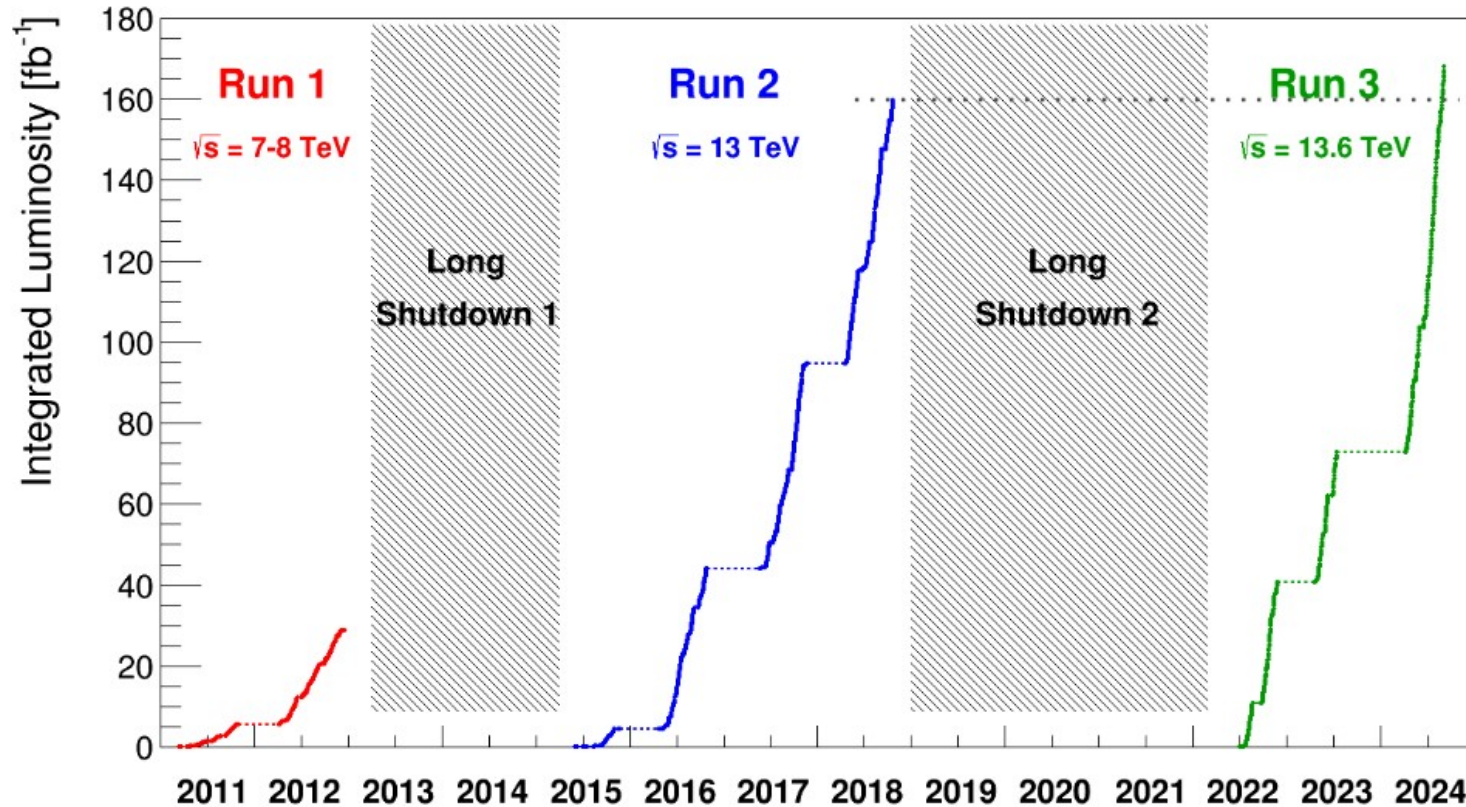
LS4 is delayed one year

Old LHC schedule



Last update: April 2023

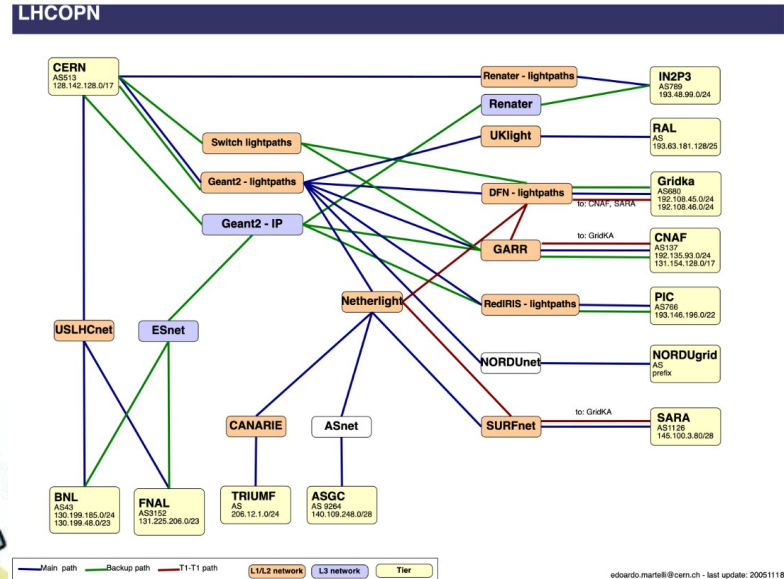
LHC performances: exceeding Run2



Soon 20 years of LHCOPN

LHCOPN was started in 2005

Next year we should celebrate the
20th anniversary



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Questions?

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