LHCONE L3VPN status update

Enzo Capone

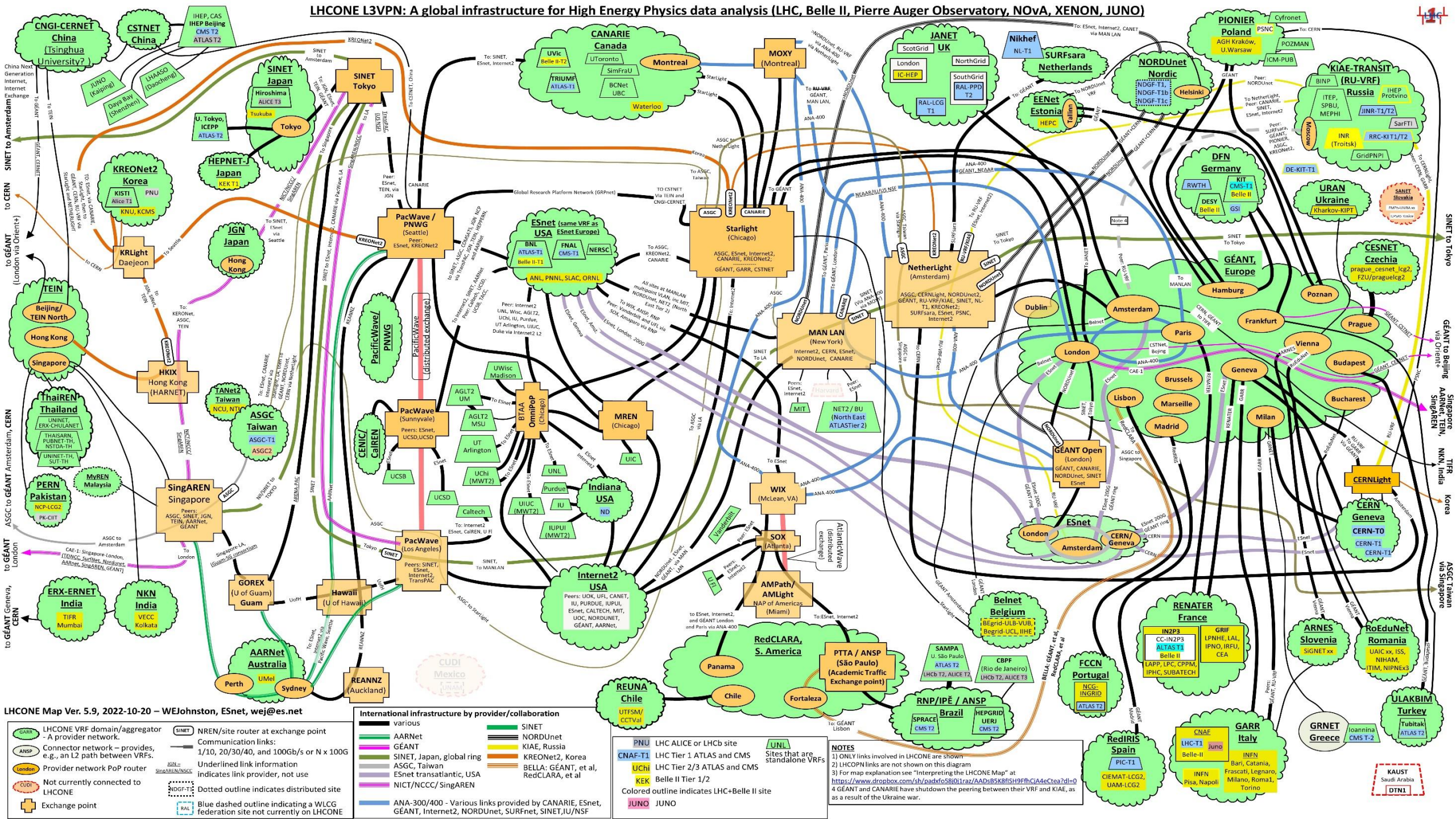
Head of Research Engagement and Support

LHCONE-OPN Meeting

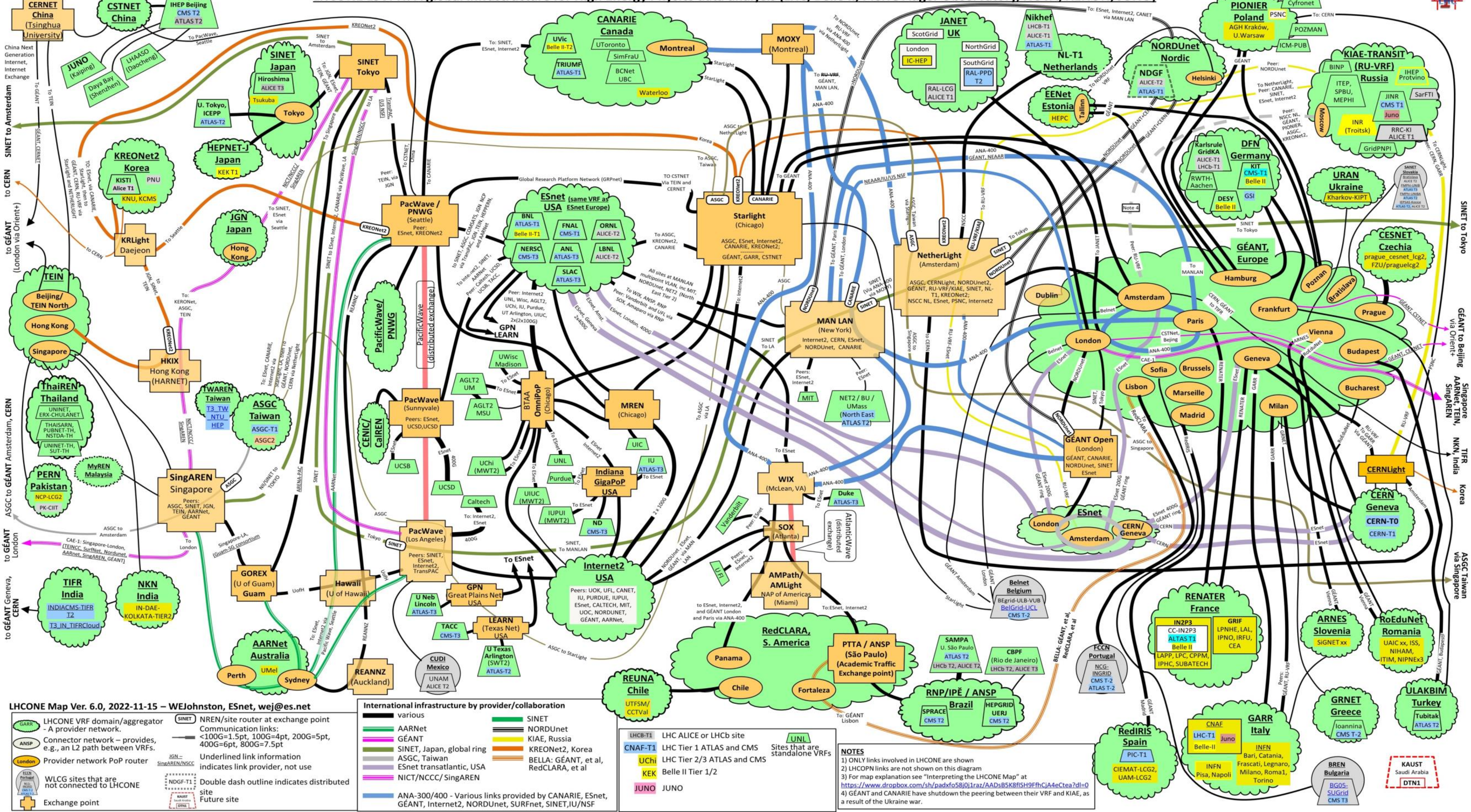
18th March 2023

LHCONE around the world

LHCONE L3VPN: A global infrastructure for High Energy Physics data analysis (LHC, Belle II, Pierre Auger Observatory, NOvA, XENON, JUNO)



LHCONE L3VPN: A global infrastructure for High Energy Physics data analysis (LHC, Belle II, Pierre Auger Observatory, NOvA, XENON, JUNO)



LHCONE Map Ver. 6.0, 2022-11-15 – WEJohnston, ESnet, wej@es.net

- LHCONE VRF domain/aggregator - A provider network.
- Connector network – provides, e.g., an L2 path between VRFs.
- Provider network PoP router
- WLCG sites that are not connected to LHCONE
- Exchange point
- NREN/site router at exchange point
- Communication links: <100G=1.5pt, 100G=4pt, 200G=5pt, 400G=6pt, 800G=7.5pt
- Underlined link information indicates link provider, not use
- Double dash outline indicates distributed site
- Future site

International infrastructure by provider/collaboration

- various
- AARNet
- GÉANT
- SINET, Japan, global ring
- ASGC, Taiwan
- ESnet transatlantic, USA
- NICT/NCCC/ SingAREN
- ANA-300/400 - Various links provided by CANARIE, ESnet, GÉANT, Internet2, NORDUnet, SURFnet, SINET,IU/NSF
- SINET
- NORDUnet
- KIAE, Russia
- KREONet2, Korea
- BELLA: GÉANT, et al, RedCLARA, et al

- LHCB-T1 LHC ALICE or LHCb site
- CNAF-T1 LHC Tier 1 ATLAS and CMS
- UChi LHC Tier 2/3 ATLAS and CMS
- KEK Belle II Tier 1/2
- JUNO JUNO
- UNL Sites that are standalone VRFs

NOTES

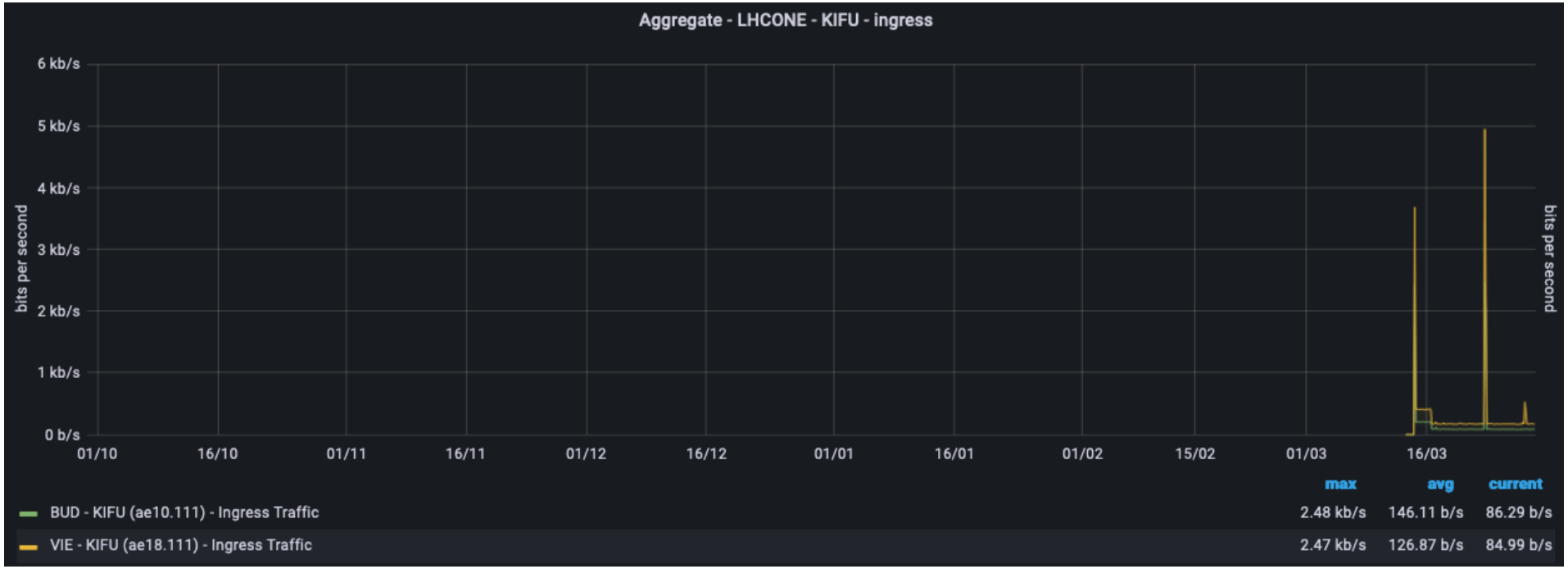
1) ONLY links involved in LHCONE are shown
2) LHCOPN links are not shown on this diagram
3) For map explanation see "Interpreting the LHCONE Map" at https://www.dropbox.com/sh/padxfo58j0j1raz/AADsB5K8flSH9FfhCjA4eCtea?dl=0
4) GÉANT and CANARIE have shutdown the peering between their VRF and KIAE, as a result of the Ukraine war.

NRENs and sites news

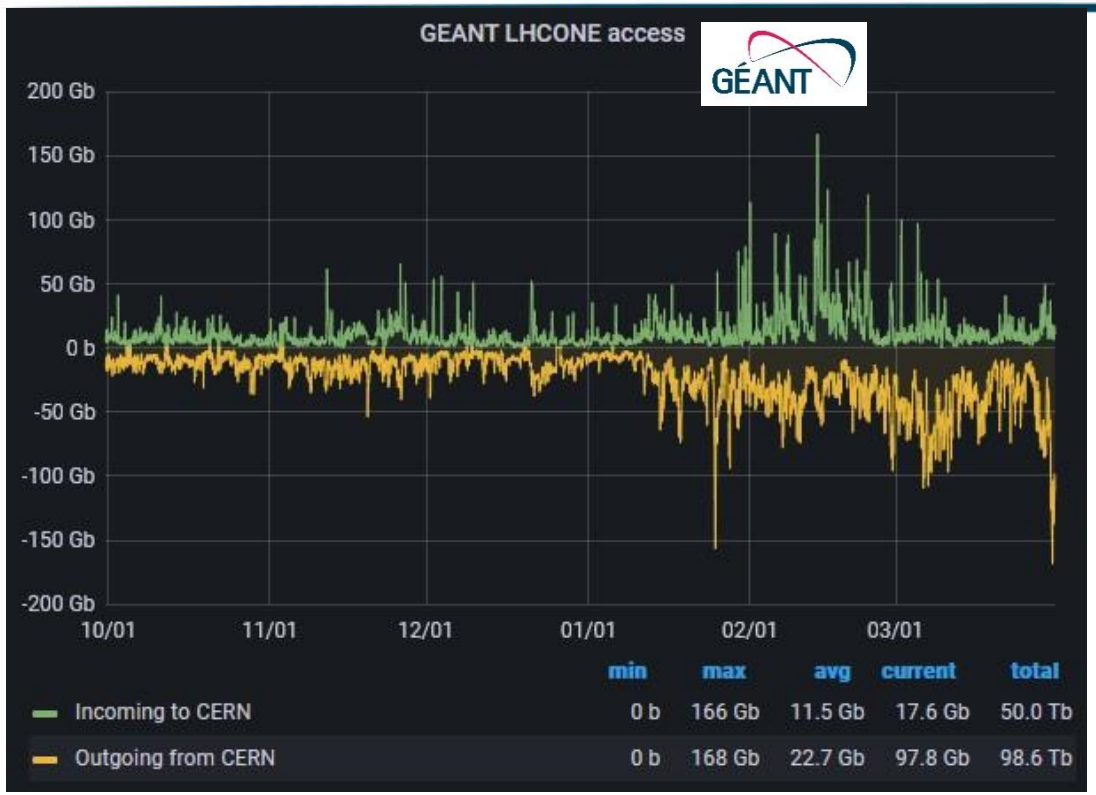
- CERN upgraded LHCONE access to 2 x 400G
- RAL expanded the announced IP prefixes
- Lawrence Berkeley National Laboratory (ESnet)
- University of Massachusetts – Amherst (ESnet)

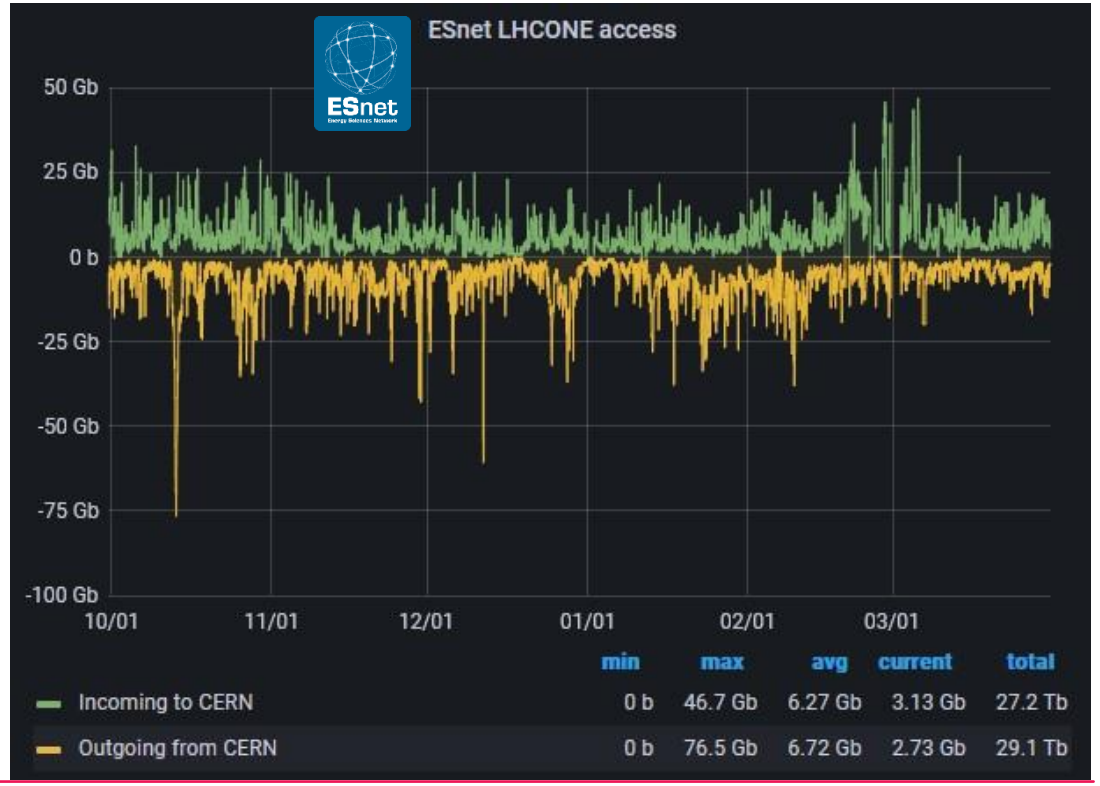
NRENs and sites news

- New NORDUnet peering in AMS
- KIFU joins LHCONE
  - HU-HGCC-T2 (ALICE and CMS)
  - T3-HU-Debrecen (CMS)

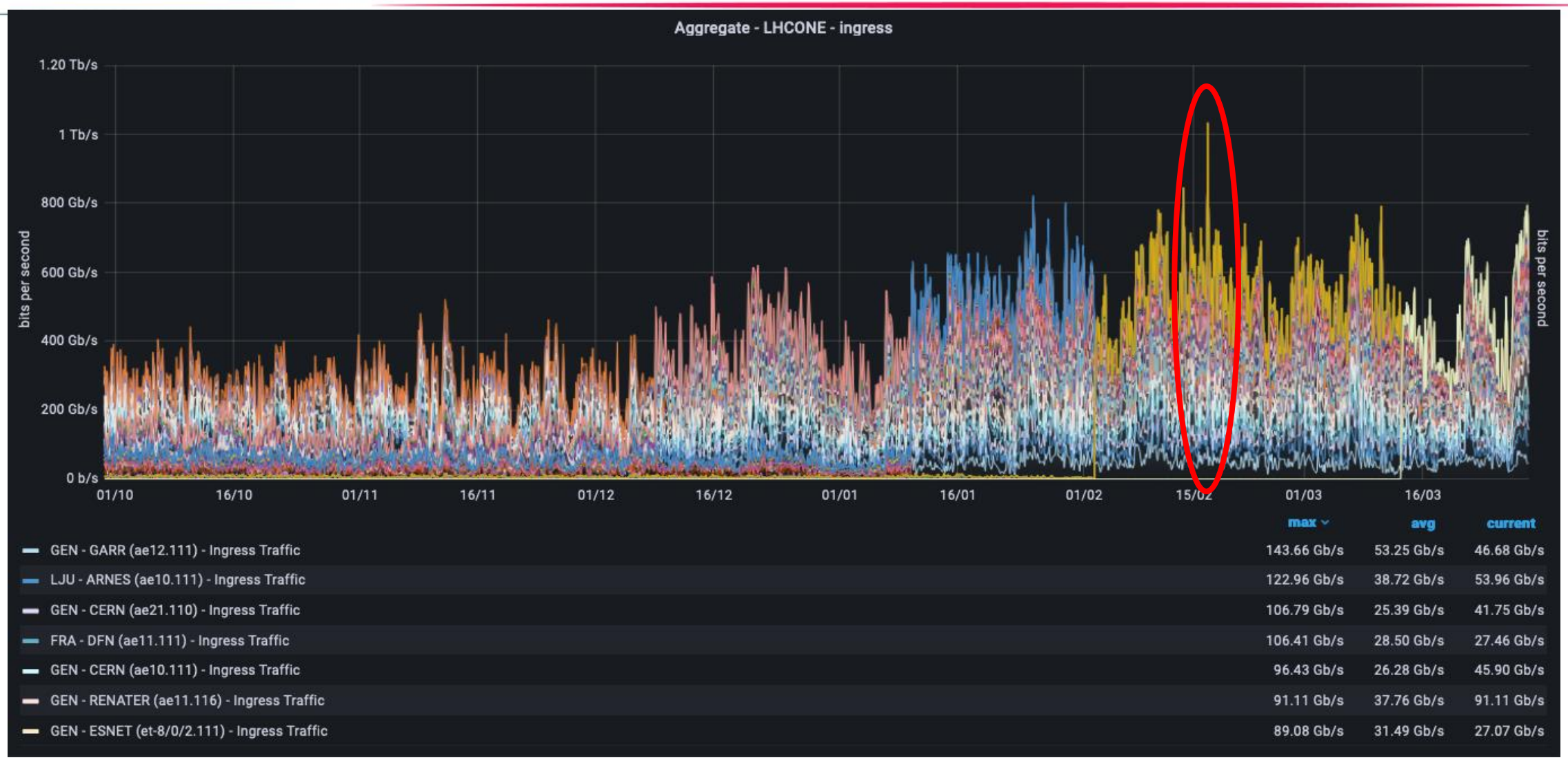


CERN

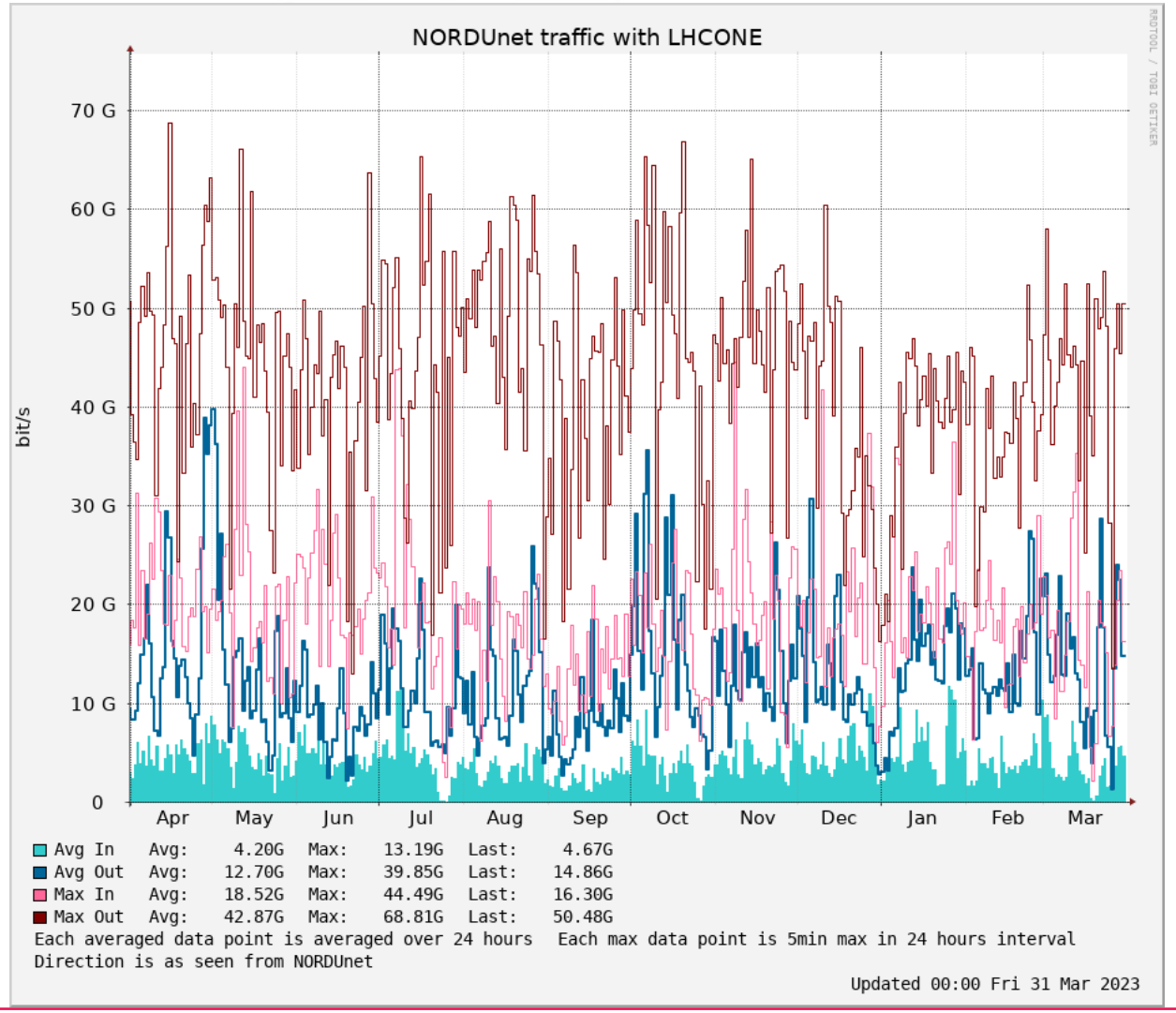

GEANT LHCONE access
GÉANT
200 Gb
150 Gb
100 Gb
50 Gb
0 b
-50 Gb
-100 Gb
-150 Gb
-200 Gb
10/01
11/01
12/01
01/01
02/01
03/01
min max avg current total
Incoming to CERN 0 b 166 Gb 11.5 Gb 17.6 Gb 50.0 Tb
Outgoing from CERN 0 b 168 Gb 22.7 Gb 97.8 Gb 98.6 Tb


ESnet LHCONE access
ESnet
50 Gb
25 Gb
0 b
-25 Gb
-50 Gb
-75 Gb
-100 Gb
10/01
11/01
12/01
01/01
02/01
03/01
min max avg current total
Incoming to CERN 0 b 46.7 Gb 6.27 Gb 3.13 Gb 27.2 Tb
Outgoing from CERN 0 b 76.5 Gb 6.72 Gb 2.73 Gb 29.1 Tb

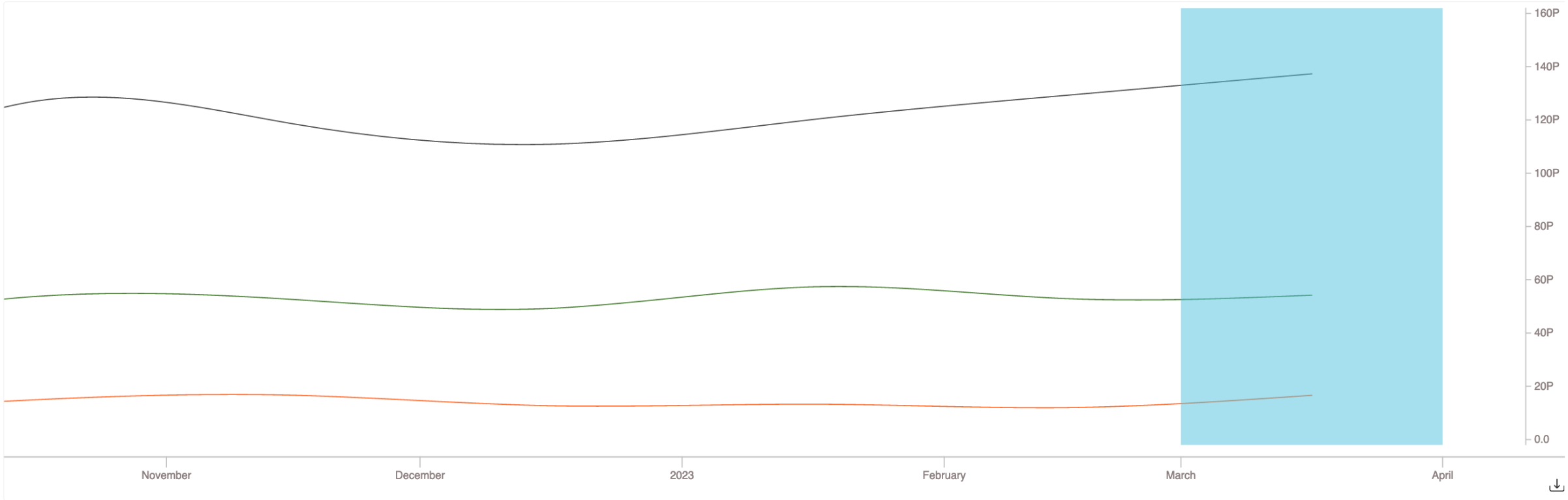
GÉANT overall



NORDUNet


NORDUnet traffic with LHCONE
70 G
60 G
50 G
40 G
30 G
20 G
10 G
0
bit/s
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Avg In Avg: 4.20G Max: 13.19G Last: 4.67G
Avg Out Avg: 12.70G Max: 39.85G Last: 14.86G
Max In Avg: 18.52G Max: 44.49G Last: 16.30G
Max Out Avg: 42.87G Max: 68.81G Last: 50.48G
Each averaged data point is averaged over 24 hours Each max data point is 5min max in 24 hours interval
Direction is as seen from NORDUnet
Updated 00:00 Fri 31 Mar 2023

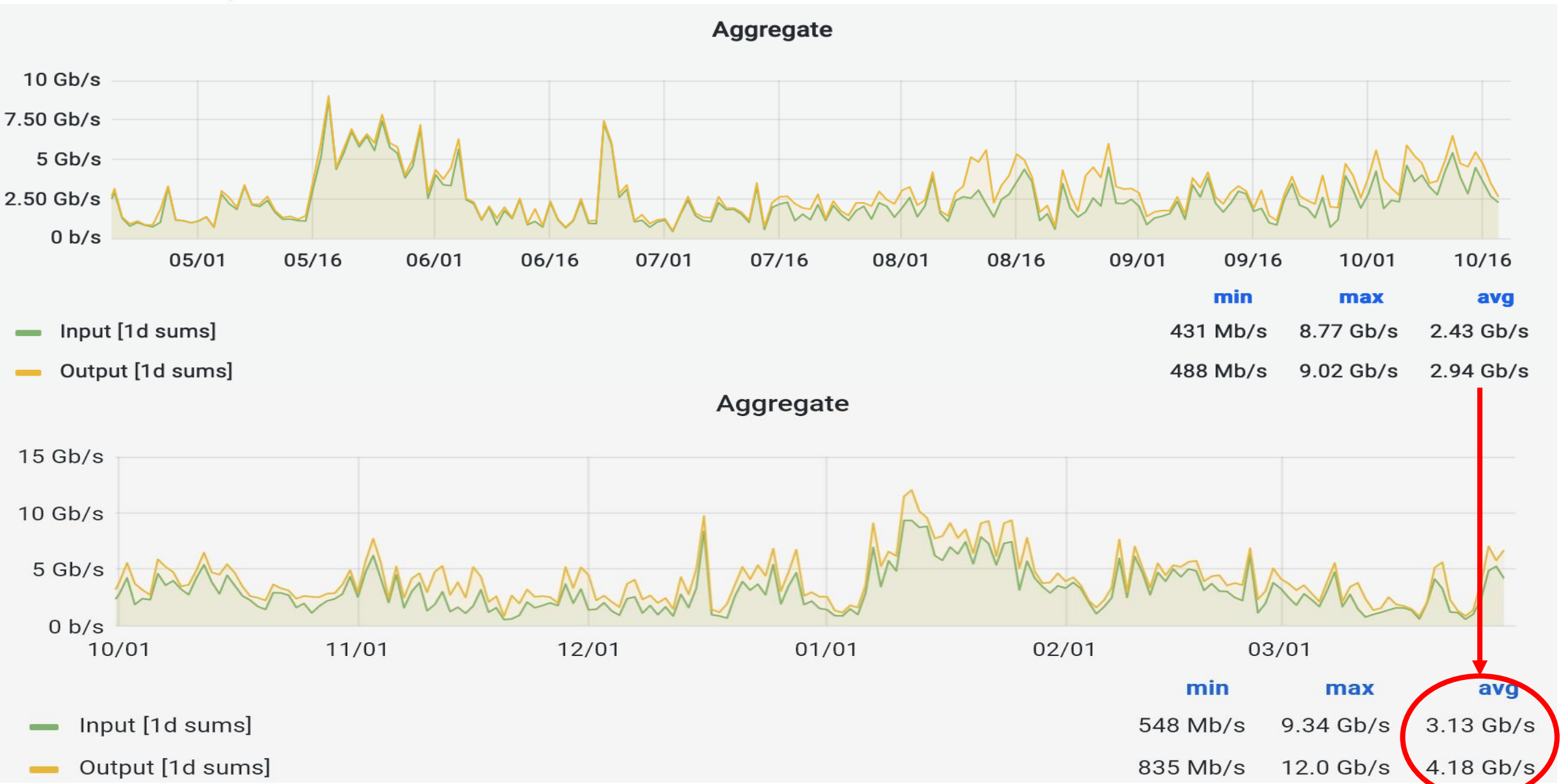
ESnet



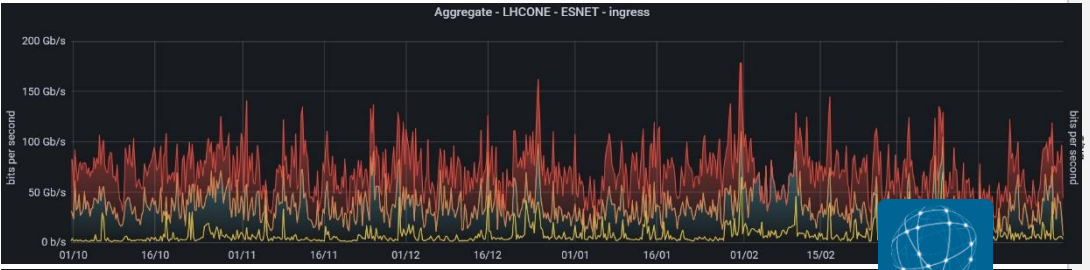
	Bytes	Percent of Total	One Month Change	One Year Change
OSCARS	16.63PB	12.1%	+38.8%	+25.9%
LHCONE	54.22PB	39.5%	+2.35%	+15.5%
Normal traffic	66.5PB	48.4%	+3.62%	+39.5%
Total	137.35PB		+6.36%	+27.4%

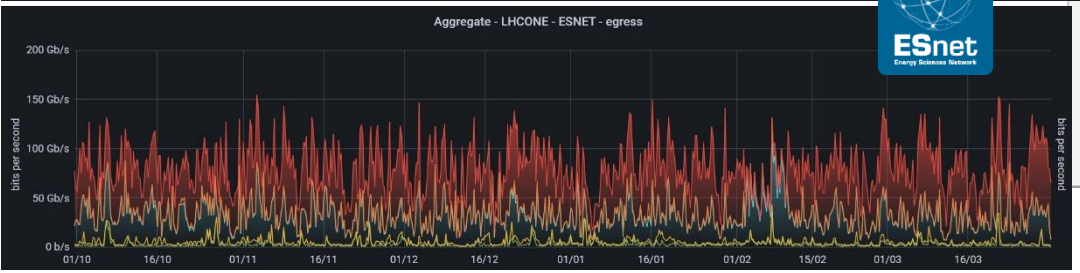
Internet2

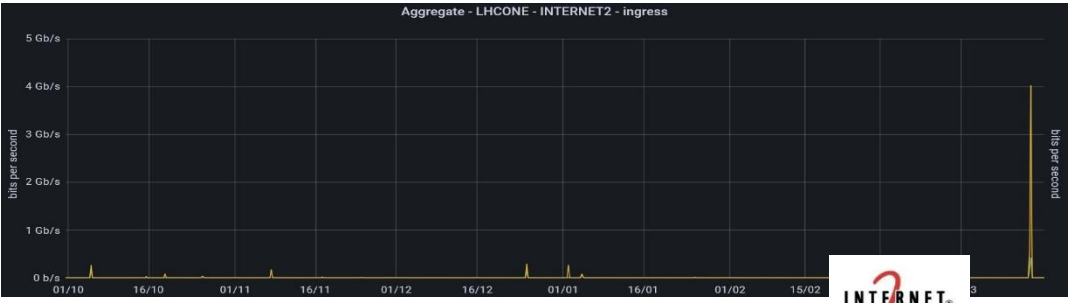
GÉANT

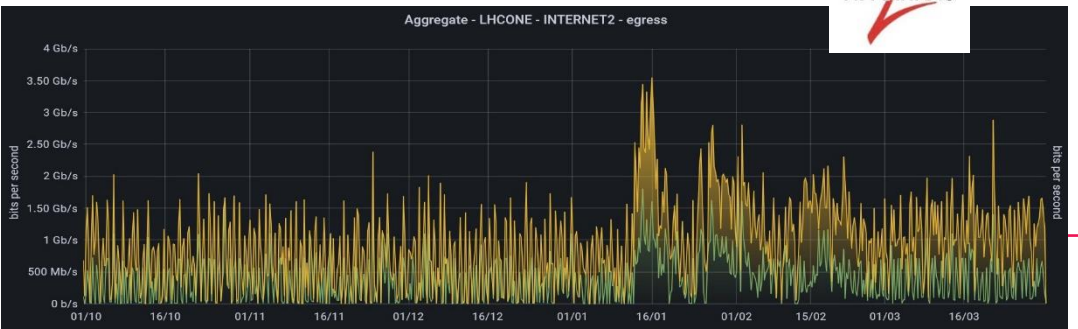


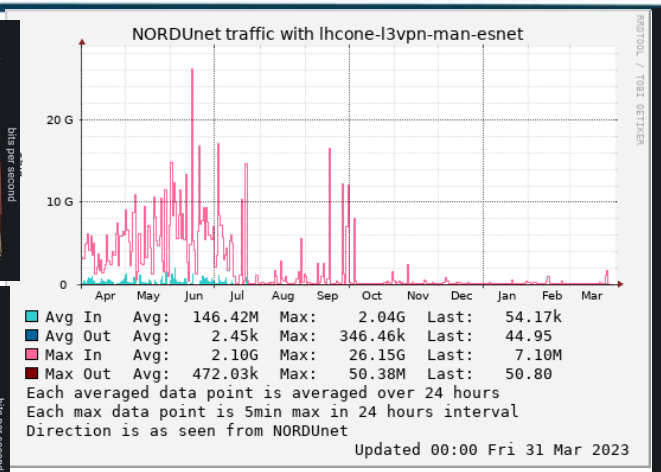
EU <-> North America

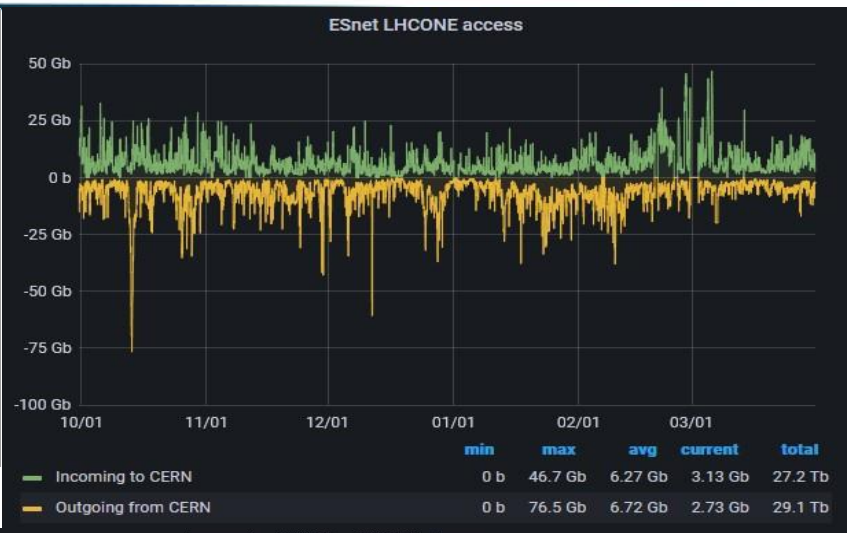


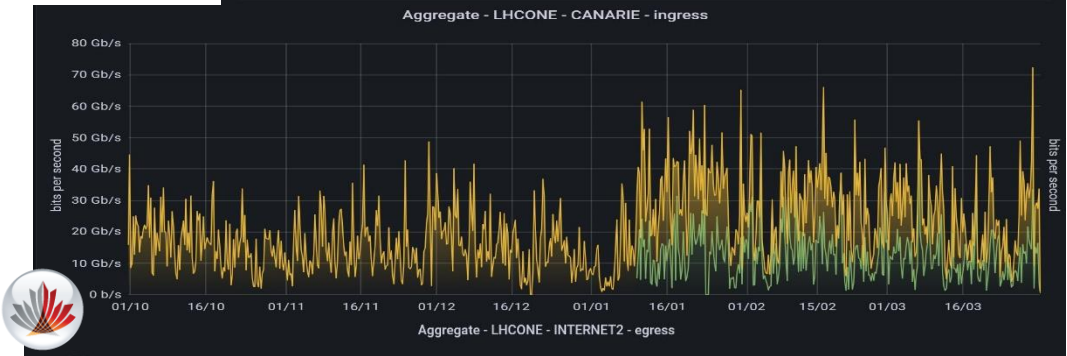


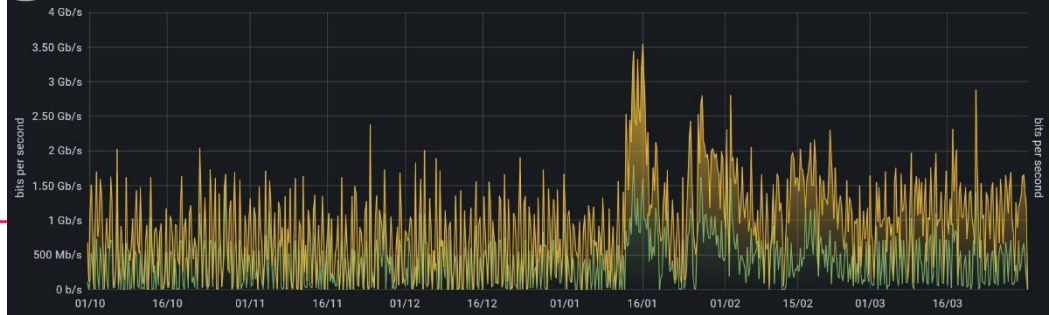












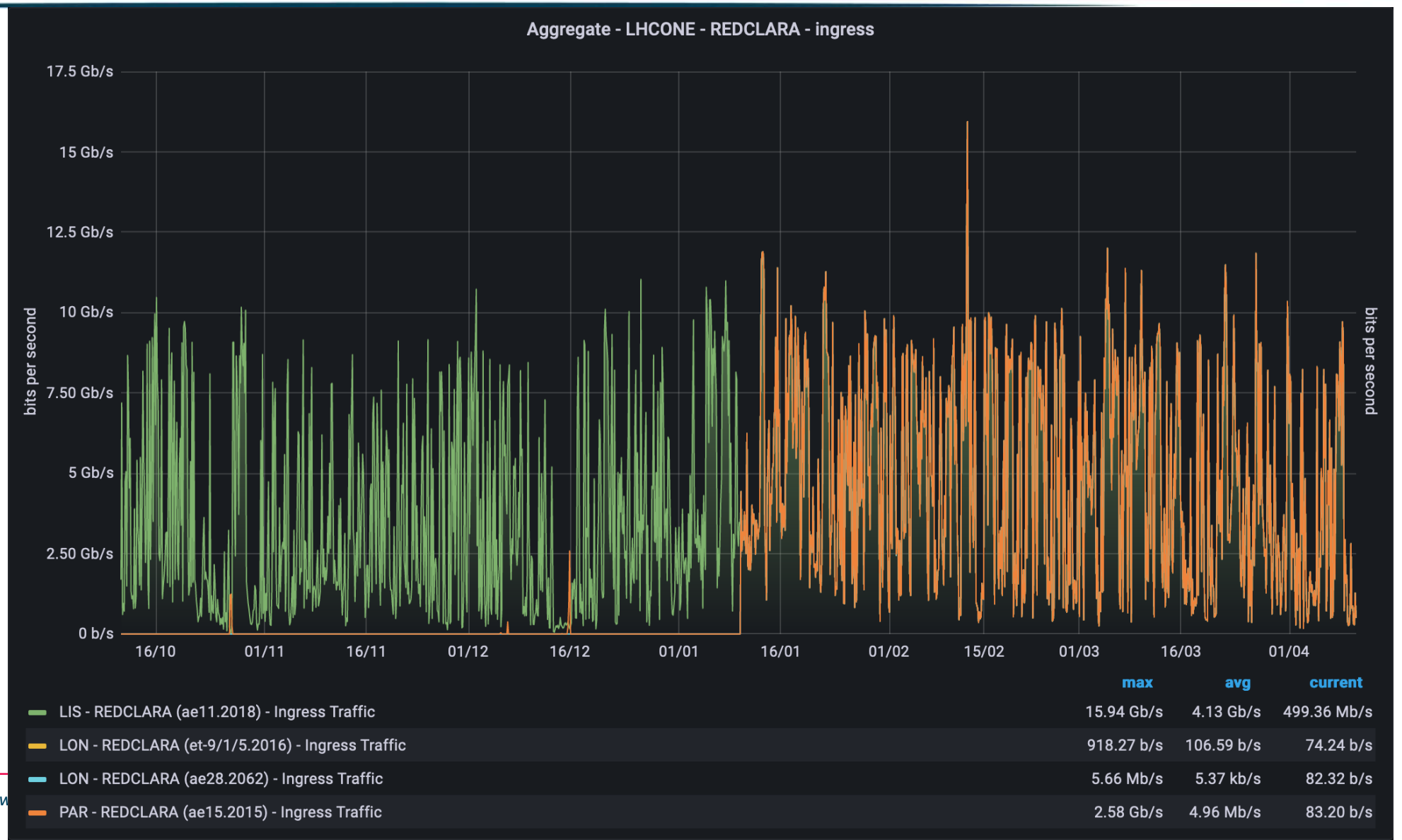
EU <-> Latin America

BELLA
Building the Europe Link to Latin America

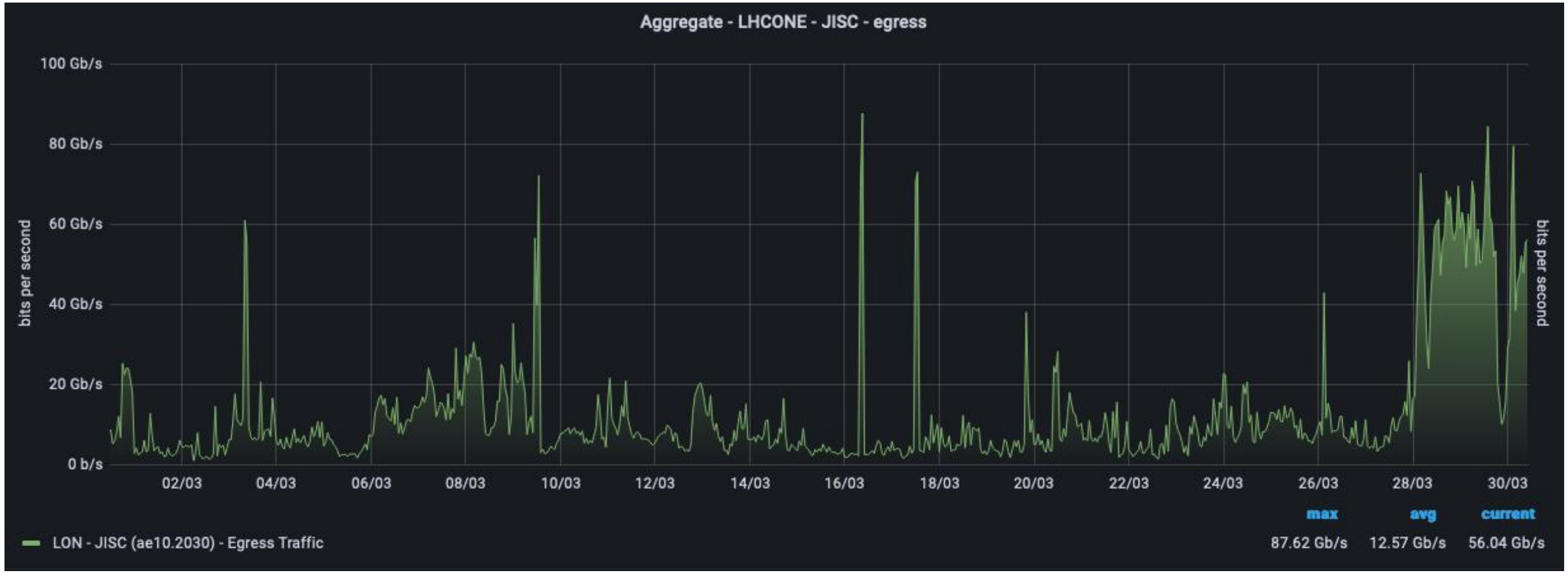
RedCLARA
+ Red + Ciencia

RNP

RedUNA

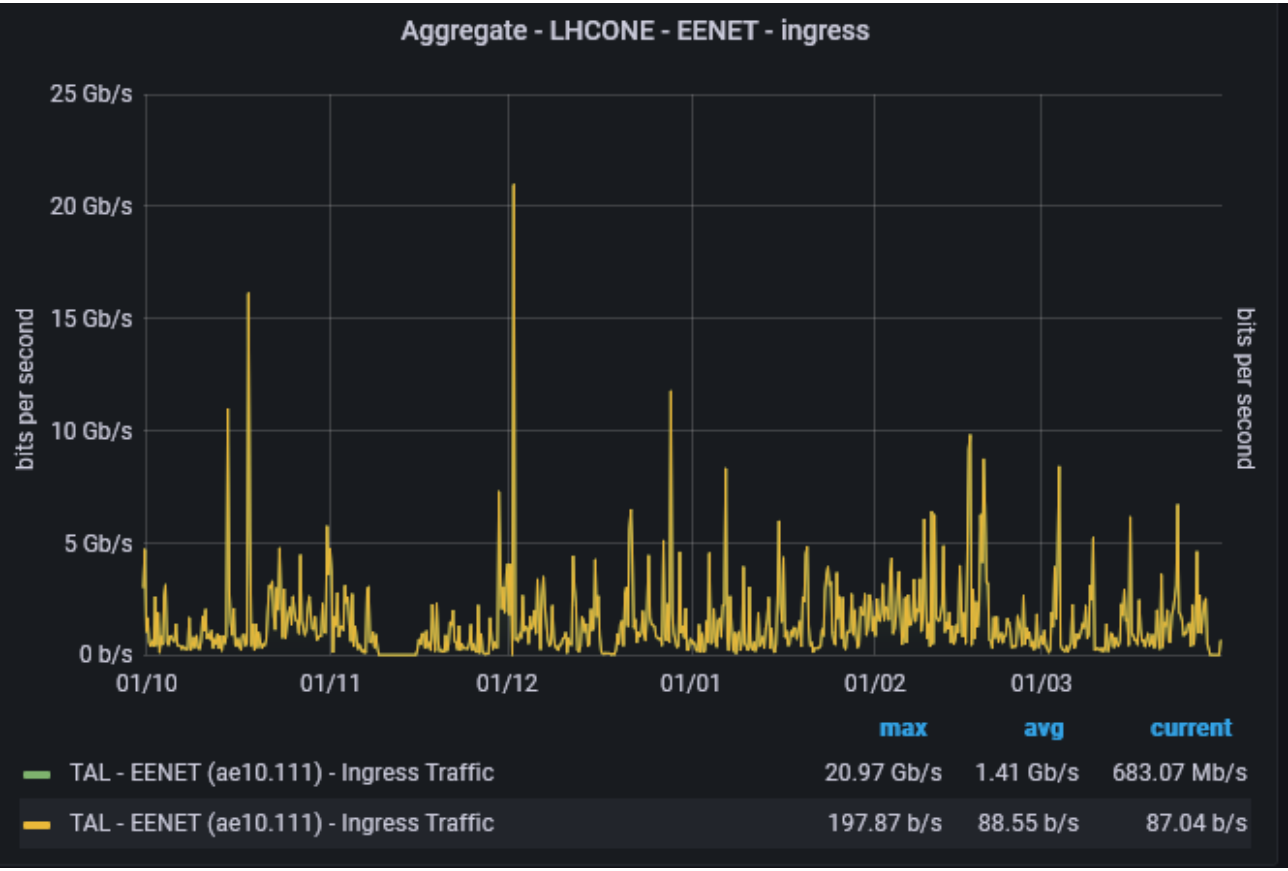


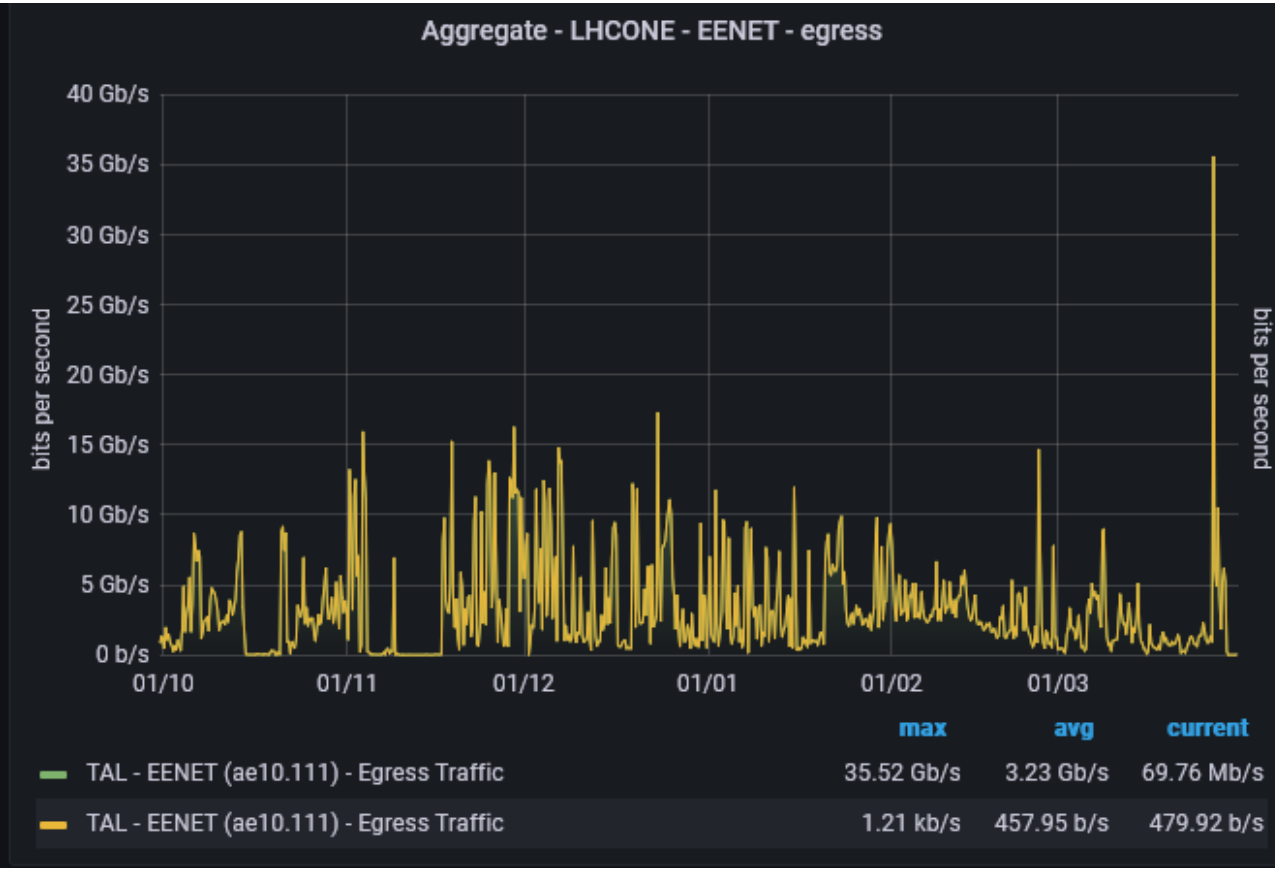
Highlight of the year



Highlight of the year

HARIDUS- JA TEADUSMINISTEERIUM





Thank you!

vincenzo.capone@geant.org

@EnzinoCapone

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