LHCOPN-LHCONE meeting #48 summary notes
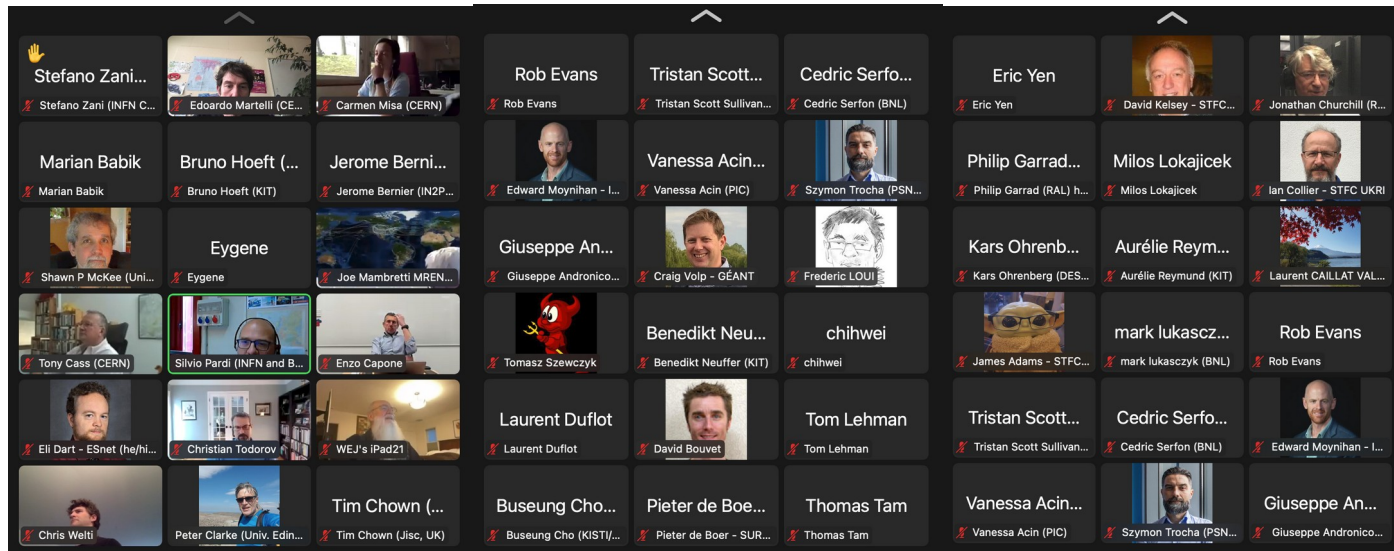
GDB – 13 April 2022
edoardo.martelli@cern.ch

Venue

- 29-30 of March 2022
- Two sessions of 3 hours in two days
- On video conference only, for the fifth time
- ~48 participants each day
- Agenda at https://indico.cern.ch/e/LHCOPNE48

LHCOPN - update

- No major changes since last meeting. Total of 1.3Tbps from the Tier0 to the Tier1s

- Traffic stats: moved 433PB in one year. +60% compared to previous year.
  Reached again traffic level of end of Run2

- Upcoming links: PIC 100G (waiting for GEANT upgrade, using 50Gbs on LHCONE for now)

- FNAL access now 4x100G

- DE-KIT will announce two new IPv4 prefixes (157.180.228.0/22 and 157.180.232.0/22)

- Construction of new CERN data-centre (PCC) has started. Should be ready by mid 2023
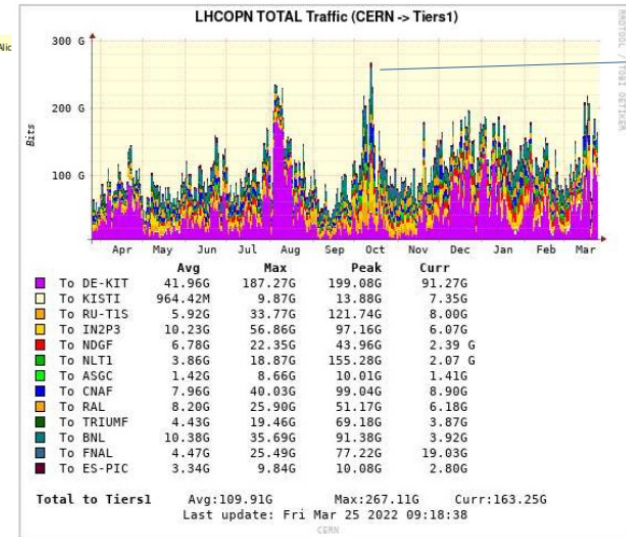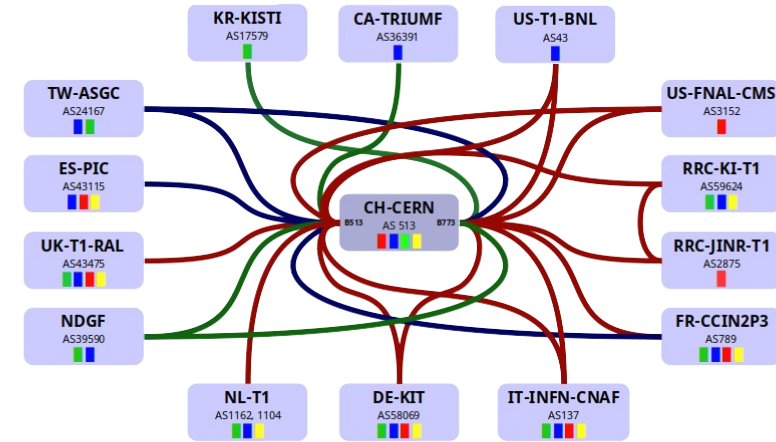
WLCG data Challenge ~10 Oct 2021

3

LHCONE L3VPN - update

Monitoring

- New LHCONE/OPN monitoring at CERN based on Grafana

Traffic statistics:

- ULAKBIM (Turkey) has started exchanging traffic

- large traffic increase in all regions

- High spikes during October 2021 and March 2022 WLCG challenges

- Ukraine traffic very low since start of the war (GEANT PoP in Kyiv disconnected for two
        weeks)

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

LHCONE map

LHCONE Map Ver. 5.7 (draft 1), March 9, 2022 – WEJohnston, ESnet, wej@es.net

LHCONE monitoring - update

perfSONAR

- perfSONAR 5: beta soon out. Now using Elasticsearch and Grafana
- 4.4.3 released in October, but still has problems hitting resource limits on busy nodes. Fixes will be in 4.4.4, soon out
- 100G mesh:
    - task force meeting every month to improve results
    - increase of TCP buffers to 1GB has improved performances
    - 25x 100G servers available, more coming
    - new Grafana dashboard available
- New home page for monitoring tools
- AAAS: developing detection of bandwidth and path changes

BelleII update

Currently in data taking. Collected 2.8PB of data since 2019

Good performance over LHCONE and General Internet

Long shutdown scheduled for late 2022

On-going:

- Migrating to DAVS protocols for data transfers

- Working also on Token authentication

Interested in participating in the packet marking activity

JUNO data challenge

Data generated at IHEP (CN), then sent to INFN-CNAF (IT) and from there to CCIN2P3 (FR) and JINR (RU)

Expected volumes: 2PB/y raw data, 200TB/y reconstructed data

Data challenge organization on-going.
    Goal: check transfer functionalities and performances, including network; set up proper monitoring

Previous data challenge has shown good results, with transfers around 8Gbps

Dashboard available (link)

Monitoring LHC data challenge with Stardust

Stardust: a new monitoring framework developed by ESnet

Designed to support multiple types of sources of measurements and metadata

Derived by NetSAGE and integrated with Open Source
components

Allow access via web dashboards and APIs, but also to raw data

Designed to "tell stories" and visual explain data flows

Set up dashboard (link) for October's WLCG data challenge
using ESnet data
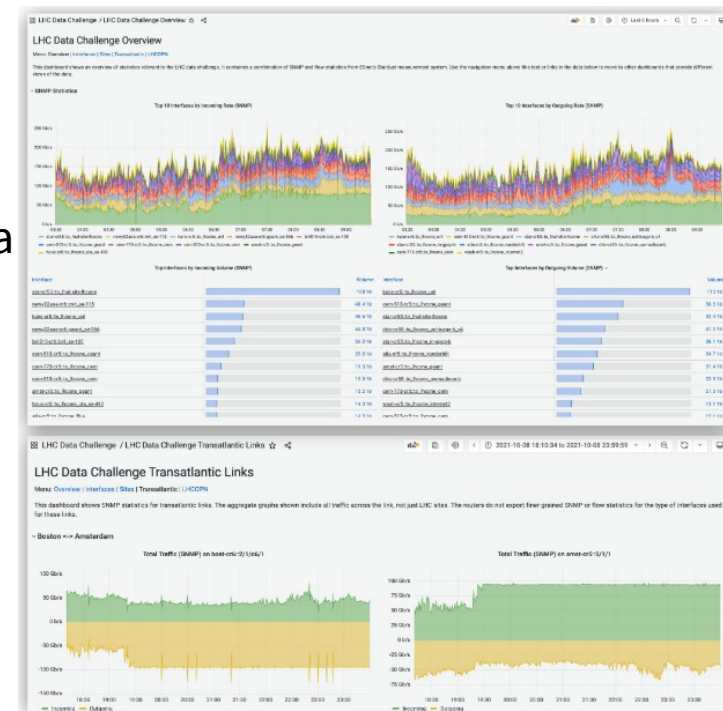
Impact of war in Ukraine

Open discussion:
- CERN hopes to not have to break the collaboration with Russia. Things have been made difficult by the statement made by Kurchatov supporting the invasion
- That statement doesn't seem to reflect what people working there think, though
- CERN is supporting the Russian physicists working in Geneva. There is lot of concern on the impact on them, if the collaboration would stop

Observations on the network:
- GEANT and CANARIE have stopped their LHCONE peerings with Russian LHCONE. General Internet peerings all up
- Large flow of data transfers for 18 days from Kurchatov; most likely data repatriation
- GEANT PoP in Kyiv disconnected several times because of long lasting fibre cuts
- Kharkiv Institute Tier2 is offline since 11th/3

https://indico.cern.ch/event/1110783/contributions/4766640/attachments/2417096/4136945/LHCOPNE-20220329-48-Ukraine.pdf

ESnet update

ESnet6 network upgrade:
- Deployed 74x 400G optical links in the US
- Deployed 42x routers
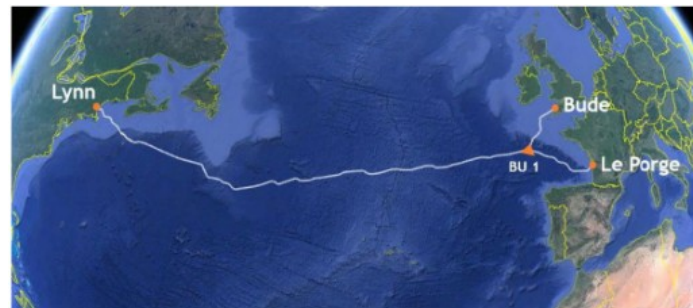- Most of provisioning done using new
    automation stack
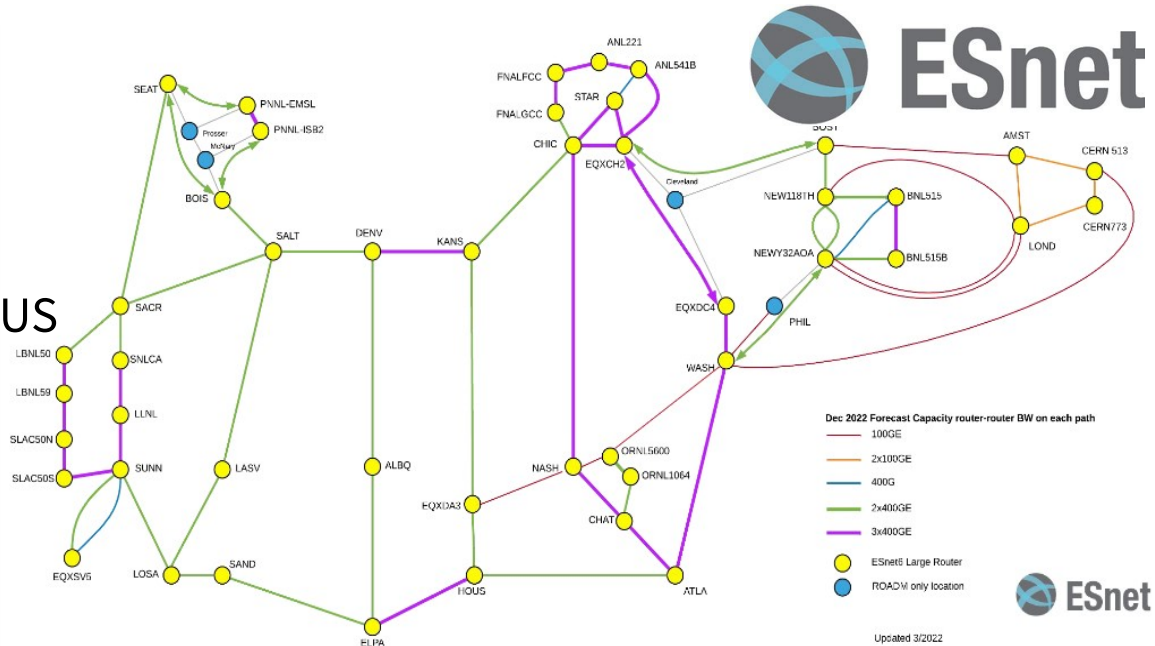
LHCONE
- All LHCONE connections in North America now on new ESnet6 routers

Transatlantic
- Acquired 2x 400Gbps links on Amitié cable system
  - available late 2022

400Gbps upgrades for data challenges in 2023

WLCG data challenge 2021

- Achieved expectations (10% of HL-LHC)
- Network not saturated, but stressed especially at exchange points
- Current 100Gbps connections inadequate for future challenges

WLCG data challenge 2023:

- 30% of HL-LHC
- Schedule not changed so far, but following challenges may be delayed
- 100Gbps links at exchange point will be upgraded to 400Gbps

Run3 is starting soon and traffic is already ramping up. LHCONE providers are monitoring the situation and planning necessary upgrades

NetSage for LHC

NetSage is a tool to make network monitoring stats easily accessible and understandable
- It can ingest data from many sources: SNMP counters, net/s/flow, perfSONAR...
- It is committed to privacy, fully GDPR compliant

Setting up pilot for LHCONE and LHCOPN
- https://lhc.netsage.global/
- Already showing data from CERN
  LHCOPN/ONE border routers
- Looking for other LHC network operators
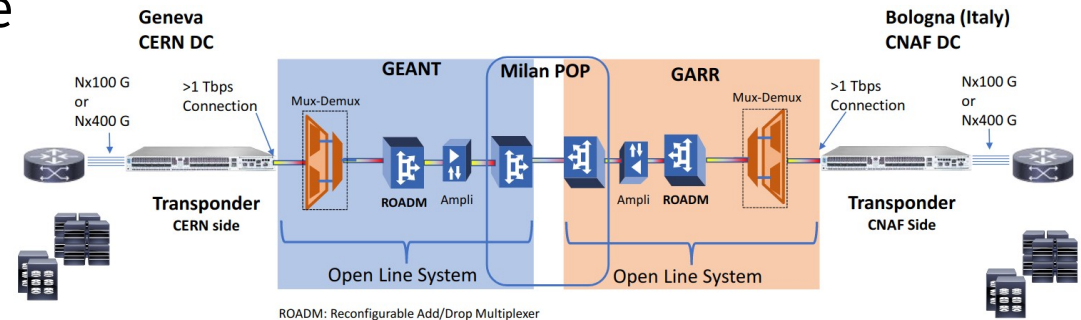 willing to share their counters
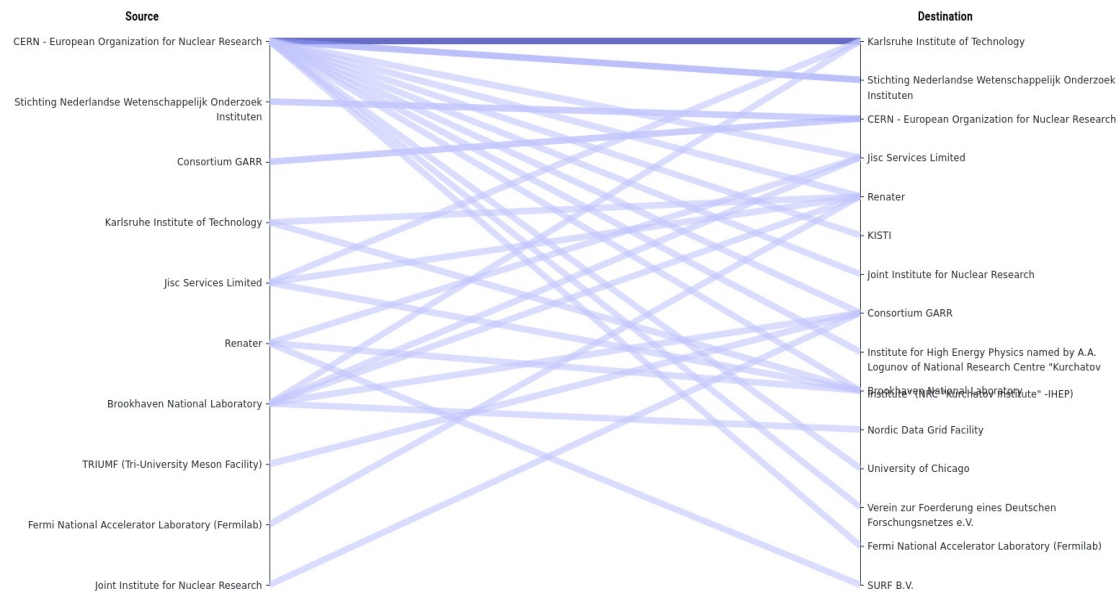
CNAF-CERN DCI

Pilot for a Tbps Data-Centre interconnections between INFN-CNAF and CERN

- to meet HL-LHC requirements at an affordable cost
- made using transmission devices at CNAF and CERN
  - no need to use expensive routers
- using optical channels on GARR and GEANT dark fibres
  - pilot also for their new Spectrum Sharing service
  - distance (~1000km) is also a challenge
- GARR will procure and manage the
  Infinera devices at both
  ends of the connection

https://indico.cern.ch/event/1110783/contributions/4700636/attachments/2417802/4137815/DCI-CERN-CNAF-LHCOPN-2022.pdf

CRIC Database for LHCONE

- Network information related to LHCOPN, LHCONE and network monitoring has been added to CRIC
  - source: LHCONE/OPN Twiki and routers' routing tables
- WLCG operations has created tickets for all sites to check their records
- Route-set RS-LHCONE in the RIPE whois database built daily from CRIC. It can be used to build security filters

bandwith = -1 means not connected to global network (LHCOPN, LHCONE)

NetworkRoute is VO specific and can apply bandwidth limits to LHCOPN/LHCONE networks

NetSite (Physical Site)

name

wan_bandwidth: int
lhcone_bandwidth: int
lhcopn_bandwidth: int

noc: Emails
monit_url: URL
lhcone_aup_signed: Date

providers: List
description

rcsite: RCSite

RCSite

PerfSonar (Service)

rcsite: RCSite

type=PerfSonar
falvour=[Latency, Bandwidth]

endpoint: URL

description: String (NetSite name)

SiteNetworkProfile (optional)

rcsite: RCSite

noc: Emails (default)
monit_url: URL (default)

lhcone_aup_signed: Date

NetworkRoute

name
subnets: List IPPrefixes
asn: int

lhcone_bandwidth_limit: int
lhcopn_bandwidth_limit: int

collaborations: ListVOs

netsite: NetSite
netsite_spare: NetSite (optional)

NEA3R redundancy for LHCONE

- NEA3R has a second transatlantic link that could be used to add redundancy to LHCONE over the Atlantic
- The setup will discuss among the Network providers in the ANA group

NEA3R network

NOTED demonstration at SC21

Ran a NOTED demo for Super Computing 2021
- NOTED used to detect FTS transfers between CERN-TRIUMF and KIT-TRIUMF.
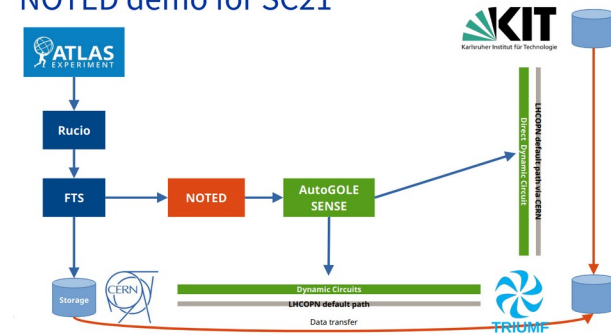- once detected, it requested a high bandwidth direct link to AutoGOLE/SENSE

Results and observation:
- NOTED detection of transfers worked, but could have been more accurate
- Dynamic circuit services work, but a bit fragile

Next steps:
- NOTED 2.0 beta being tested
- Improve decision algorithm with Machine Learning

NOTED demo for SC21

https://indico.cern.ch/event/1110783/contributions/4689267/attachments/2418020/4138271/LHCOPNE-20220330-48-NOTED-SC21.pdf

Research Network Technology WG - update

Main current activity: understand scientific traffic flows in detail
Website https://www.scitags.org/

Evaluating two approaches for flow tagging:
- Flow marking using UDP fireflies (works for both IPv4 and IPv6)
- Packet marking using IPv6 flowlabel

Fireflies tested during WLCG data challenge 2021.
Discussions on-going about the architecture of the fireflies collectors:
    in-line/distributed/central

scitags.org

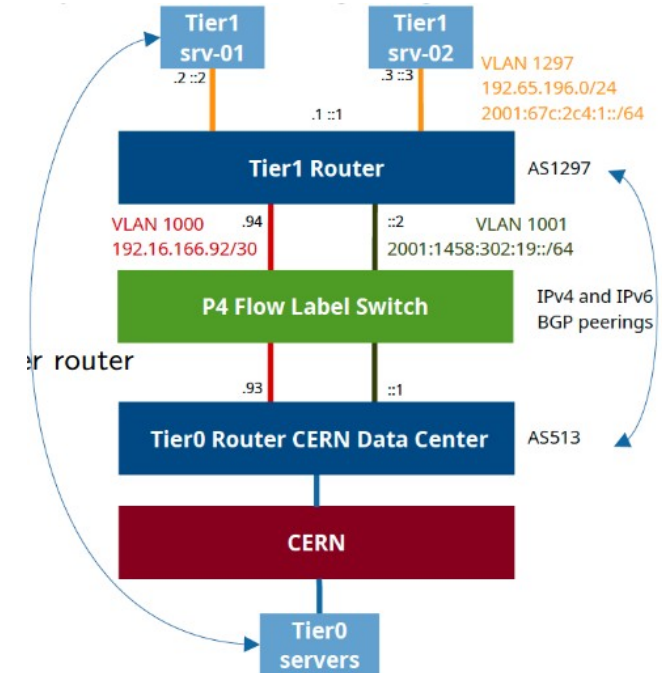# Flowlabel on programmable switches

Project at CERN to program a switch to count and route packets with a flowlabel tag

Using EdgeCore Wedge switch

Implemented two solutions:

- L3 flowlabel-tag based routing

- L2 bridging with flowlabel accounting

L2 accounting implemented on a dummy Tier1 connected to LHCOPN. Further tests will be run with production traffic

Conclusions

Summary

- LHCOPN and LHCONE traffic has greatly increased in the last months, back to the level of the end of Run2
- ESnet deploying two 400G transatlantic links
- Several monitoring solutions being tested
- CRIC now authoritative for LHCONE data
- CNAF and CERN preparing a DCI pilot using spectrum sharing in GEANT and GARR
- Packet marking activity: progresses in tagging and accounting

Actions for next meeting

- Implement perfSONAR info in CRIC
- Enlarge NetSAGE pilot for LHCONE monitoring
- Progress in packet marking

Next meeting

24-25 of October 2022
In person meeting, at CERN

It can be the opportunity to meet LHC Experiments and WLCG

Agenda will be published here:
https://indico.cern.ch/e/LHCOPNE49

References

Meeting agenda and presentations:
https://indico.cern.ch/e/lhcopne48

Questions?

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