LHCONE L3VPN Status Update

Mian Usman (presented by Enzo Capone) (DANTE)

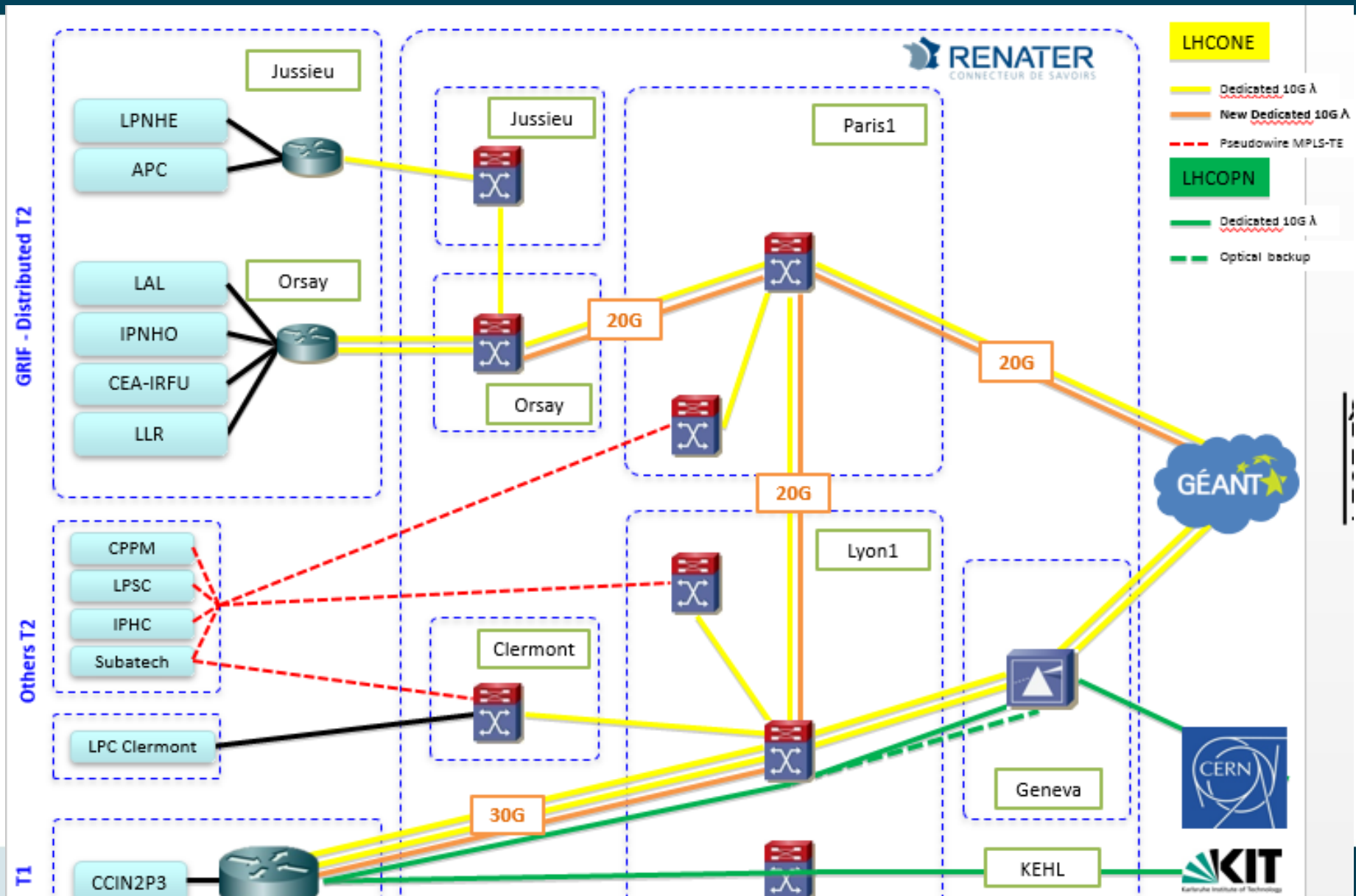
LHCOPN/ONE Joint Meeting

University of Michigan, 15th/16th September 2014

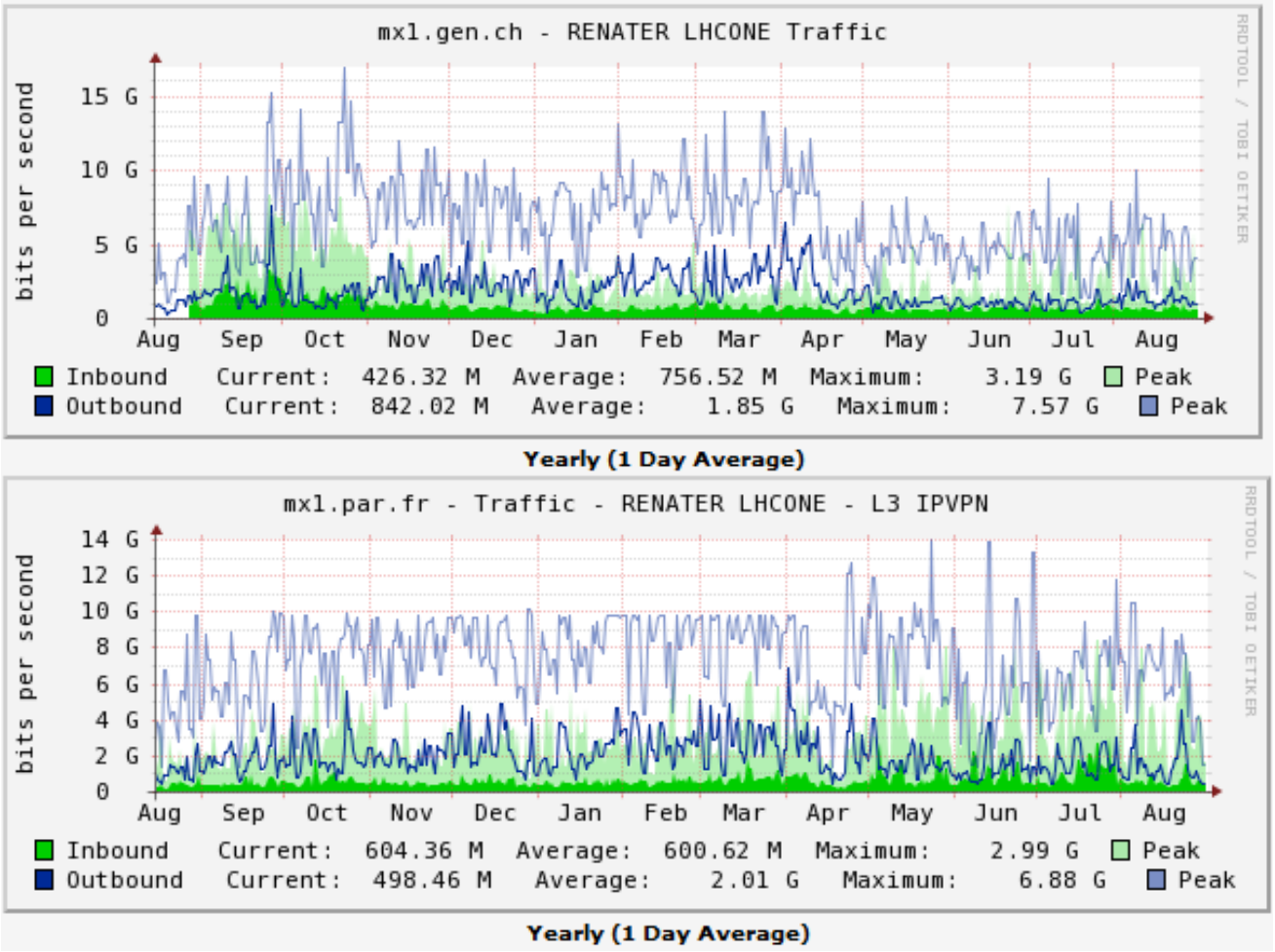
Agenda

- LHCONE in Europe
- LHCONE in North America

LHCONE in Europe
RENATER (French NREN)

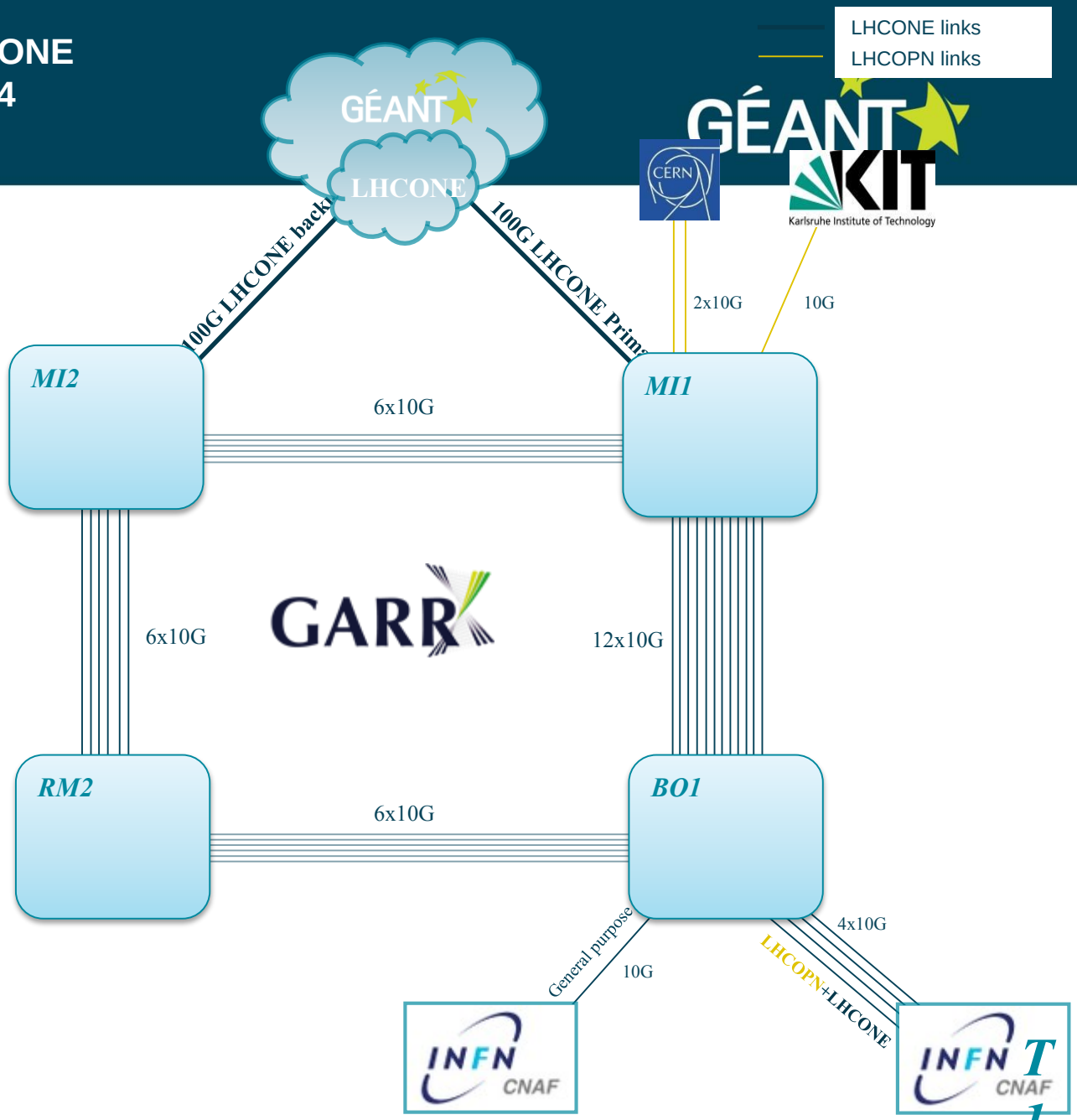


LHCONE in Europe
RENATER (French NREN)



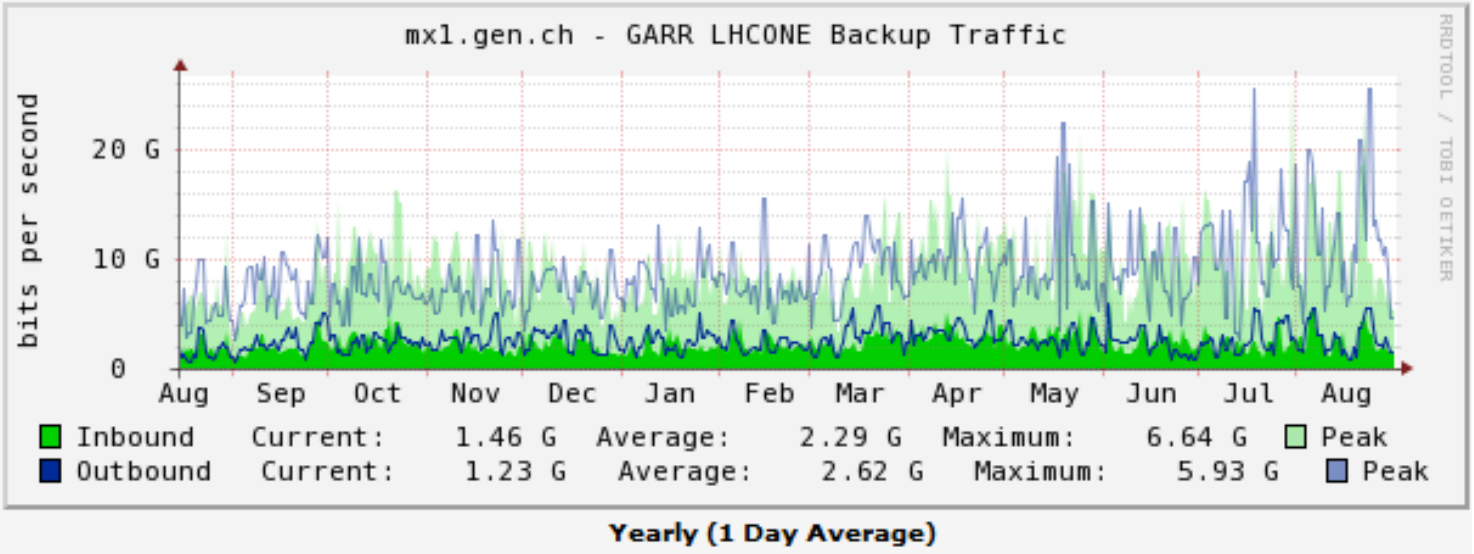
HCOPN/LHCONE
ARR Q1 2014

Site	Connection
INFN-CNAF Bologna (T1)	4x10G (LHCONE+LHCOPN)
INFN-Bari (T2)	10G (LHCONE)
INFN-Catania (T2)	10G (LHCONE)
INFN-Frascati (T2)	10G (LHCONE)
INFN-Legnaro (T2)	2x10G (LHCONE+GP)
INFN-Napoli (T2)	10G (LHCONE)
INFN-Milano (T2)	10G (LHCONE)
INFN-Pisa (T2)	2x10G (LHCONE+GP)
INFN-Roma1 (T2)	10G (LHCONE)
INFN-Torino (T2)	10G



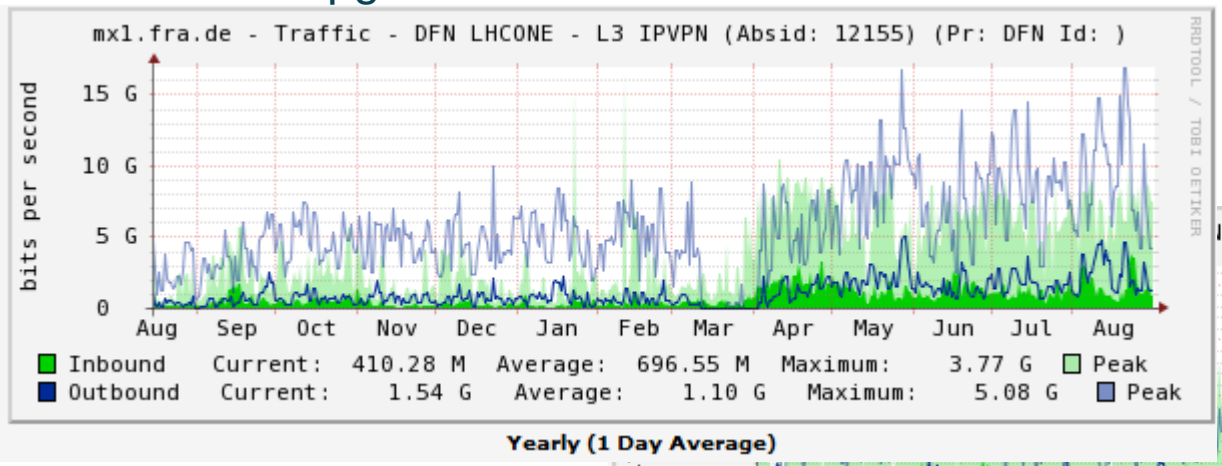
LHCONE in Europe
GARR (Italian NREN)

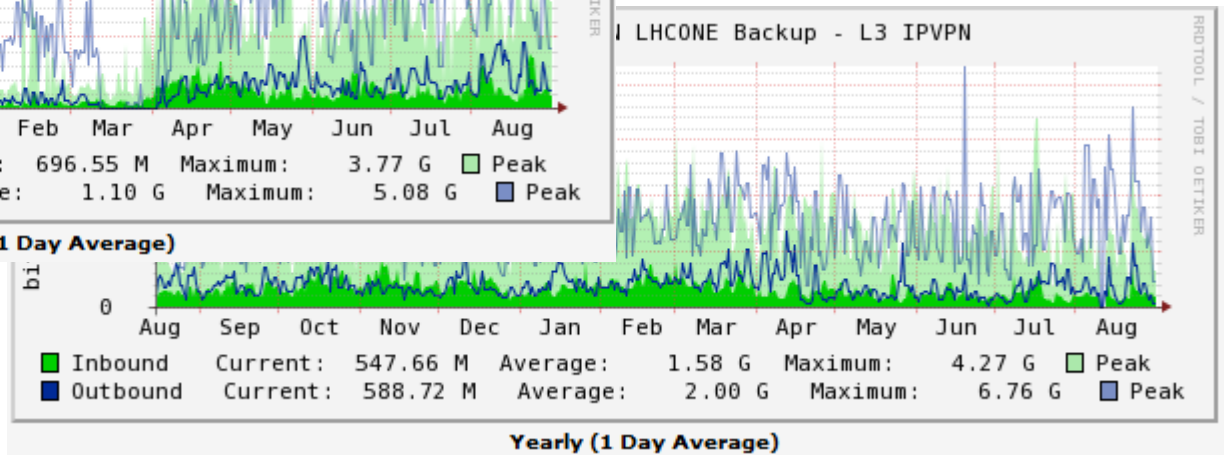
- Link to GEANT 100G primary and 100G backup (Shared)
- CNAF T1 connected at 40G (4x10G)
- The T2s might be upgraded to 2x10G in 2014



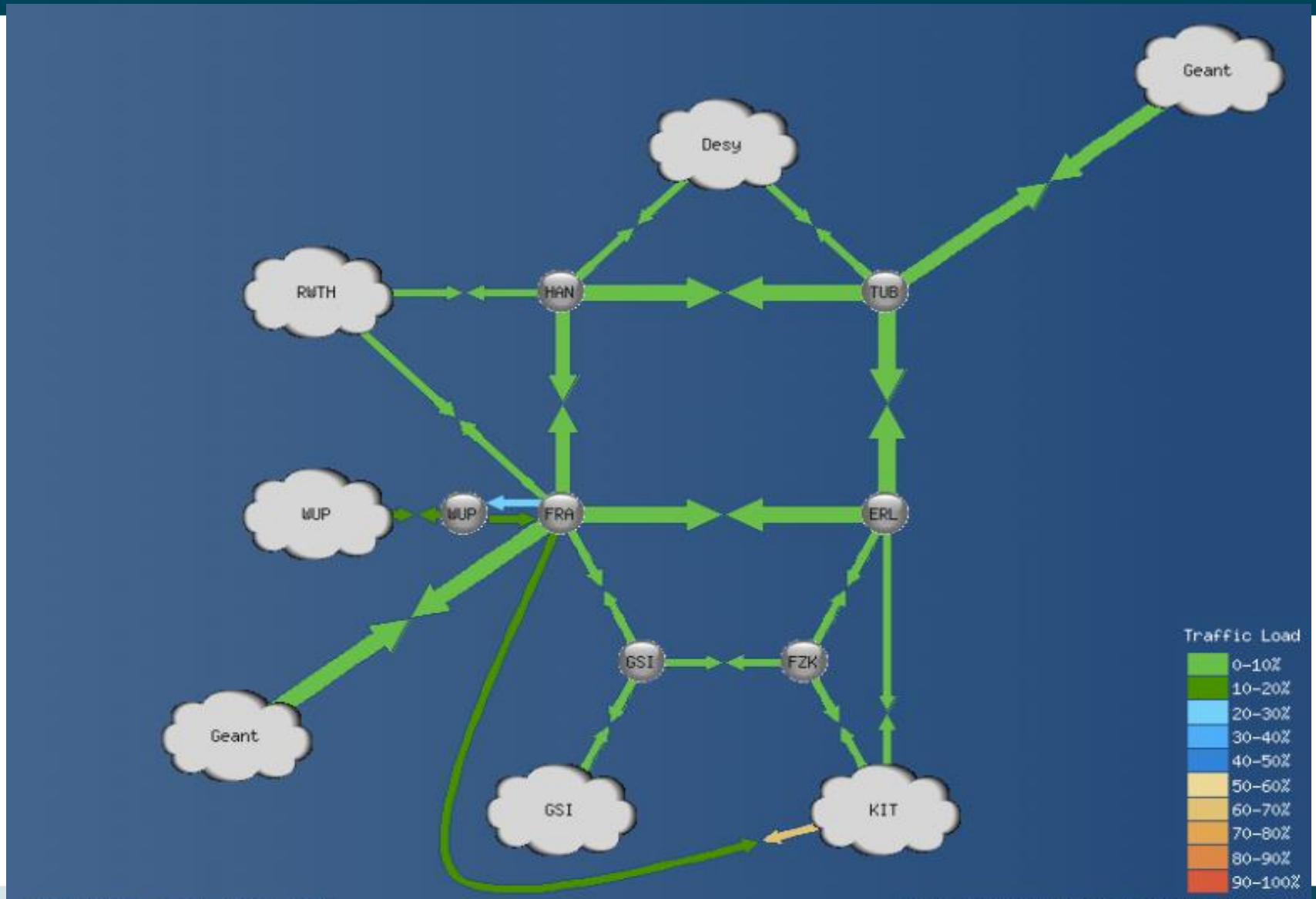
LHCONE in Europe
DFN (German NREN)

- Connects KIT, DESY, GSI, RWTH Aachen and Frankfurt
- Peer with GEANT VRF in Amsterdam and Frankfurt at 100GE(Shared)
- Recent changes
  - Upgrade of DE-KIT link in Frankfurt and Erlangen



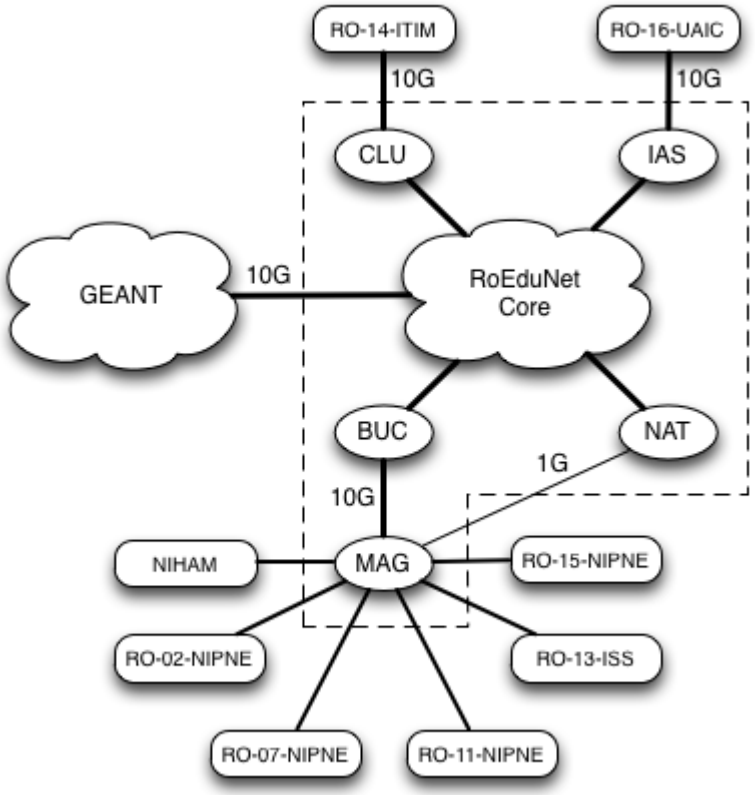


LHCONE in Europe
DFN (German NREN)



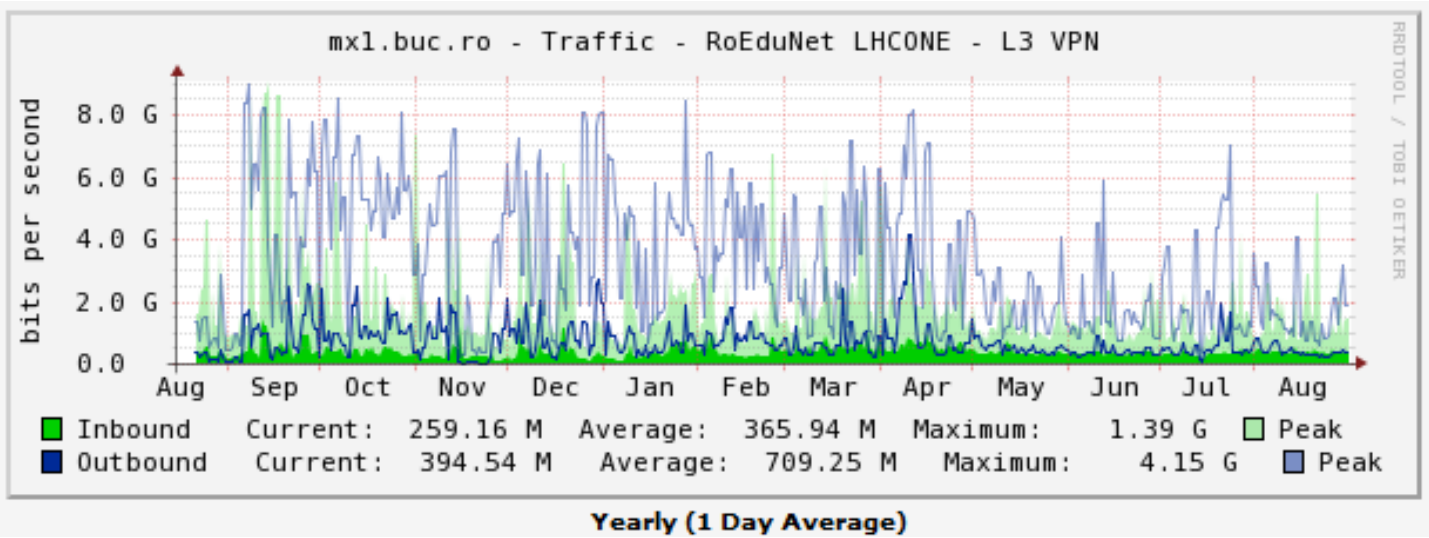
LHCONE in Europe
RoEduNet (Romainian NREN)

- Configured as separate VRF on RoEduNet
- All Seven T2s in Romania connected:
  - 1. RO-02-NIPNE
  - 2. RO-07-NIPNE
  - 3. RO-11-NIPNE
  - 4. RO-13-ISS
  - 5. RO-15-NIPNE
  - 6. RO-14-ITIM
  - 7. RO-16-UAIC
- Peers with GEANT LHCONE VRF



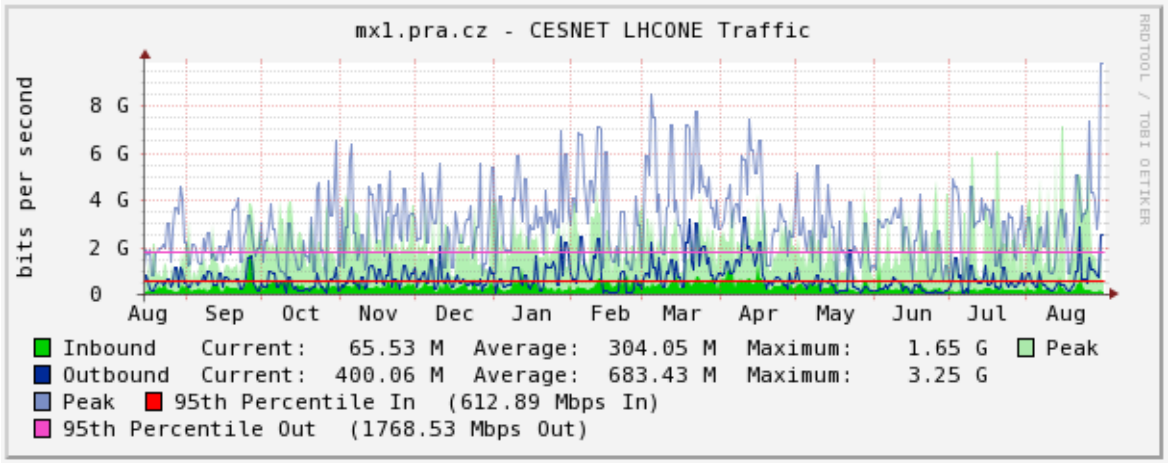
LHCONE in Europe
RoEduNet (Romainian NREN)

- Average Traffic to GEANT ~2Gbps
- Sustained peaks of over 6 Gbps

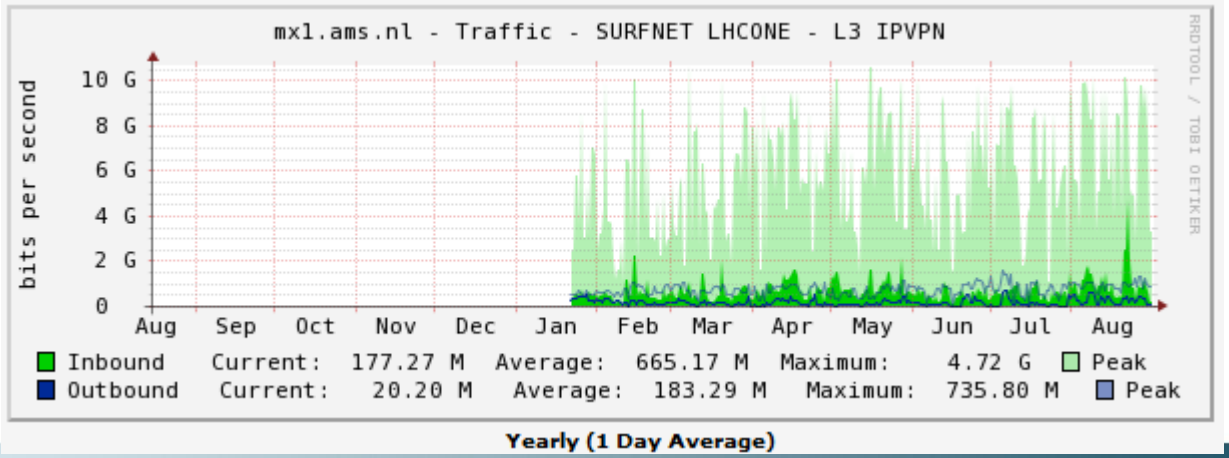


LHCONE in Europe
CESNet (Czech Republic), NL-T1

- Link between CESNet and GEANT 10G dedicated:

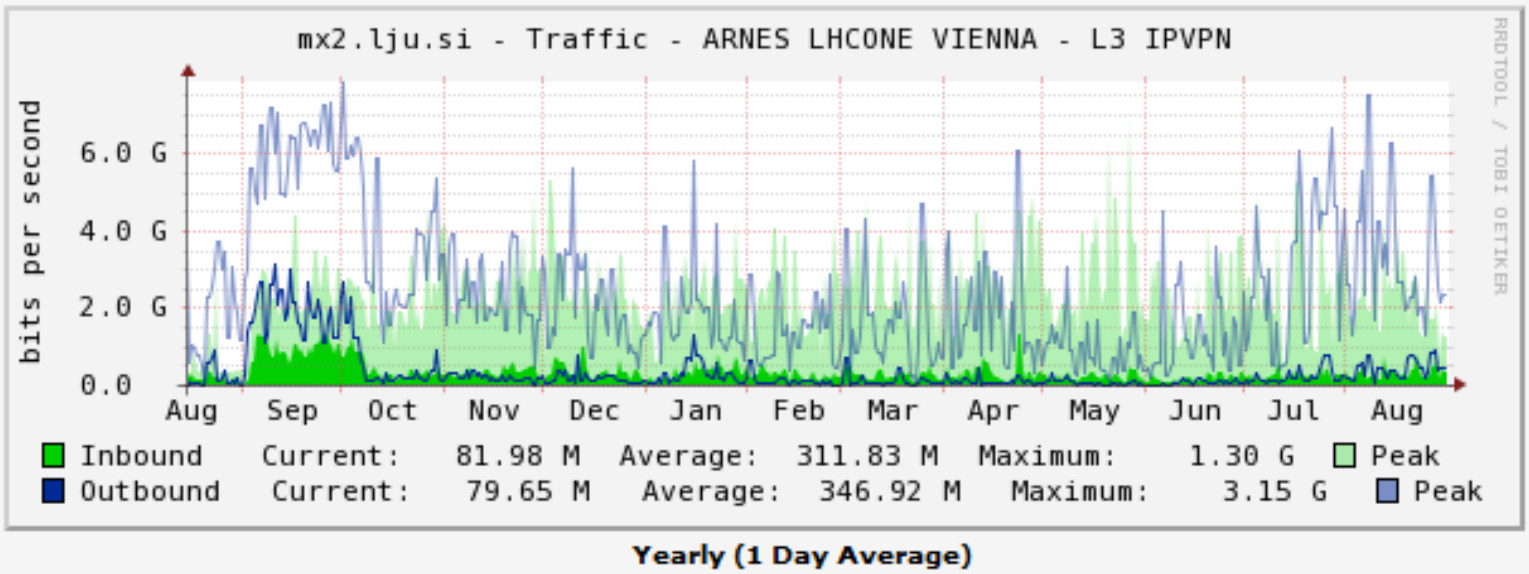


- NL-T1 now connected to LHCONE via SURFNet in Amsterdam:

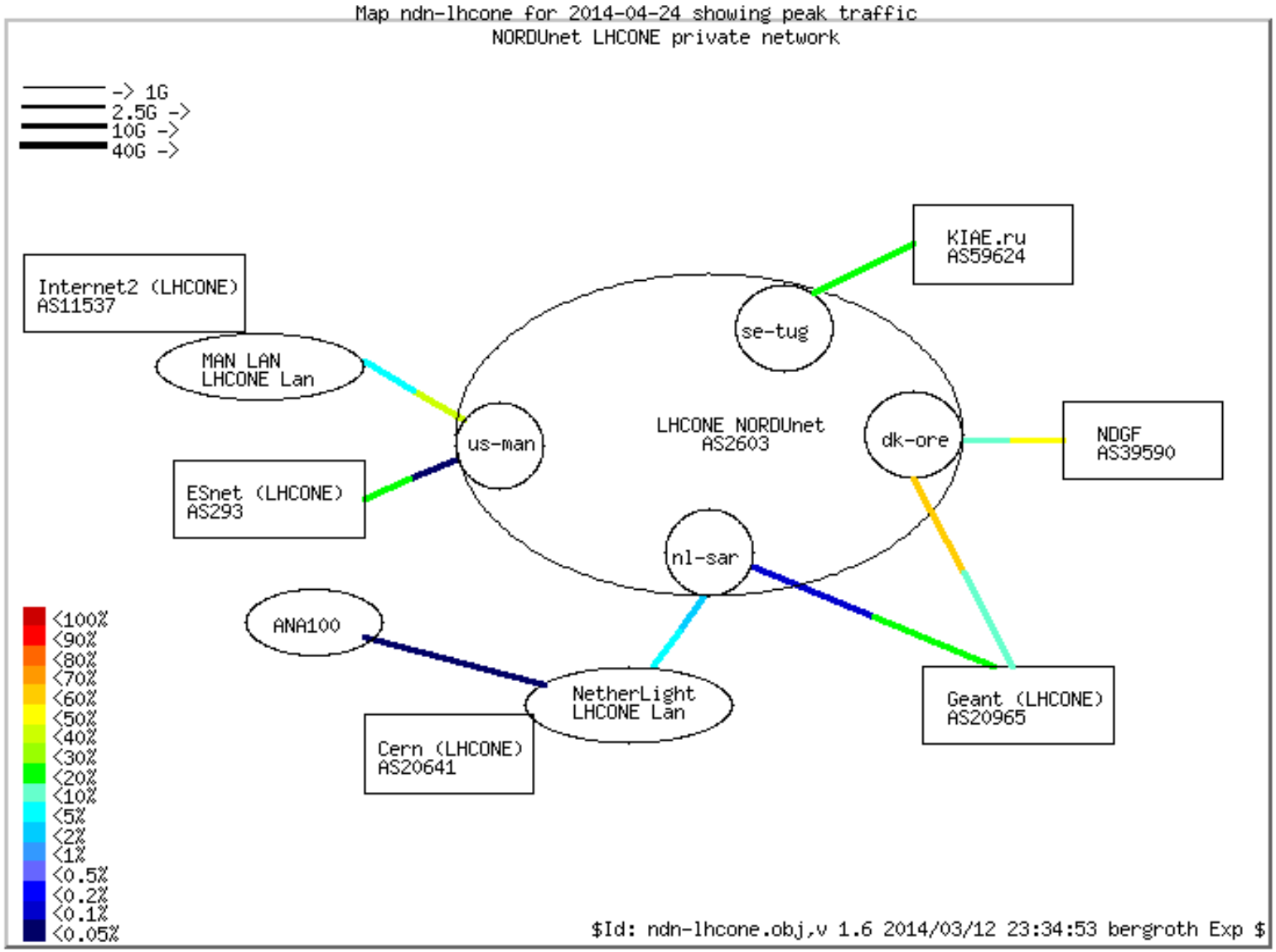


LHCONE in Europe
ARNES (Slovenian NREN)

- Configured as separate VRF on ARNES network and peers with GEANT and GARR (Italian) VRF
- Connects Slovenian T2
- Traffic to/from GEANT VRF average ~2.5Gbps and peaks at ~7Gbps

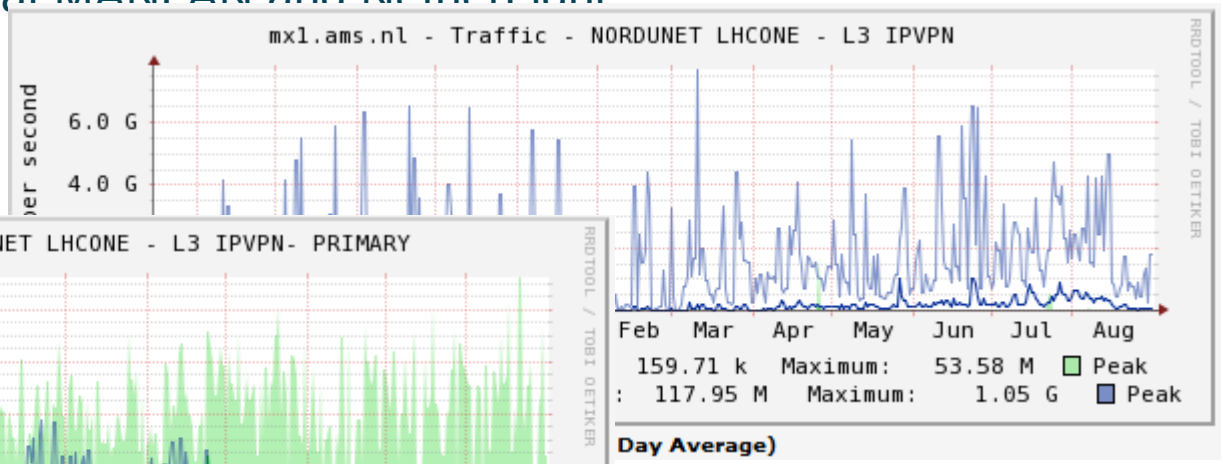


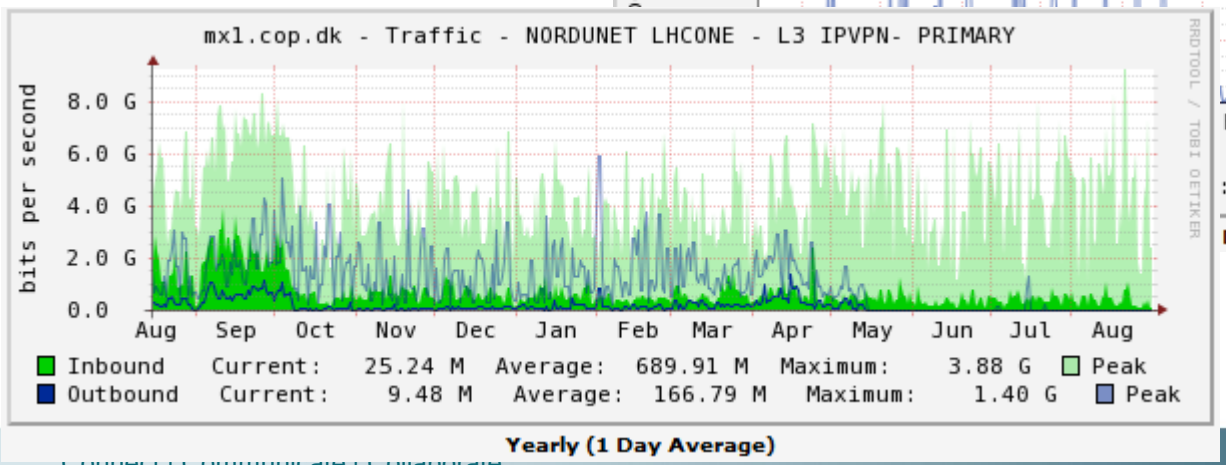
LHCONE in Europe
NORDUNet



LHCONE in Europe
NORDUNet

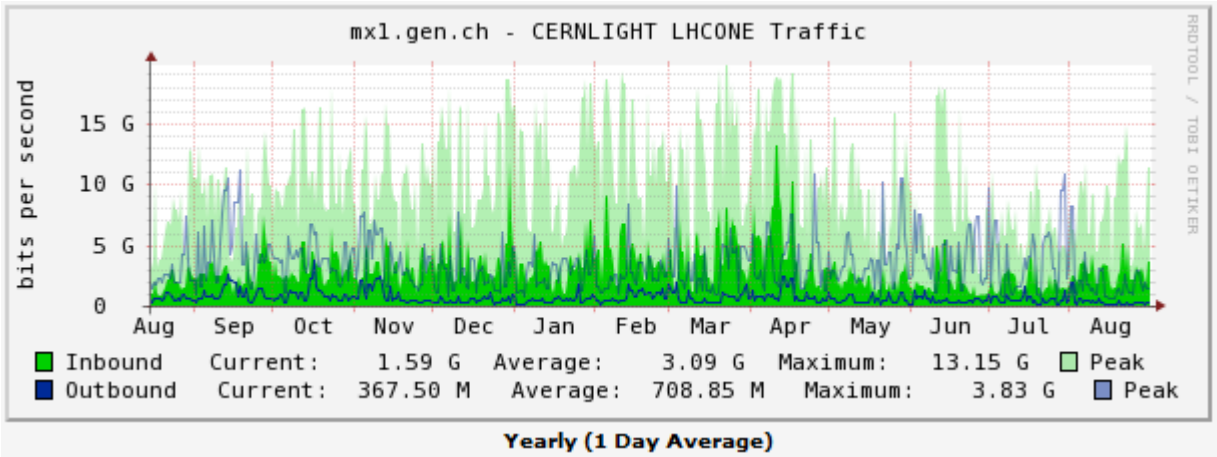
- Configured as VRF on NORDUnet backbone network
  - Connects Nordic T1 NDGF and Russian T2
- NORDUnet VRF peers with GEANT, CERNLight, ESNet and Internet2 VRF
- NORDUnet present at MANLAN and NetherLight



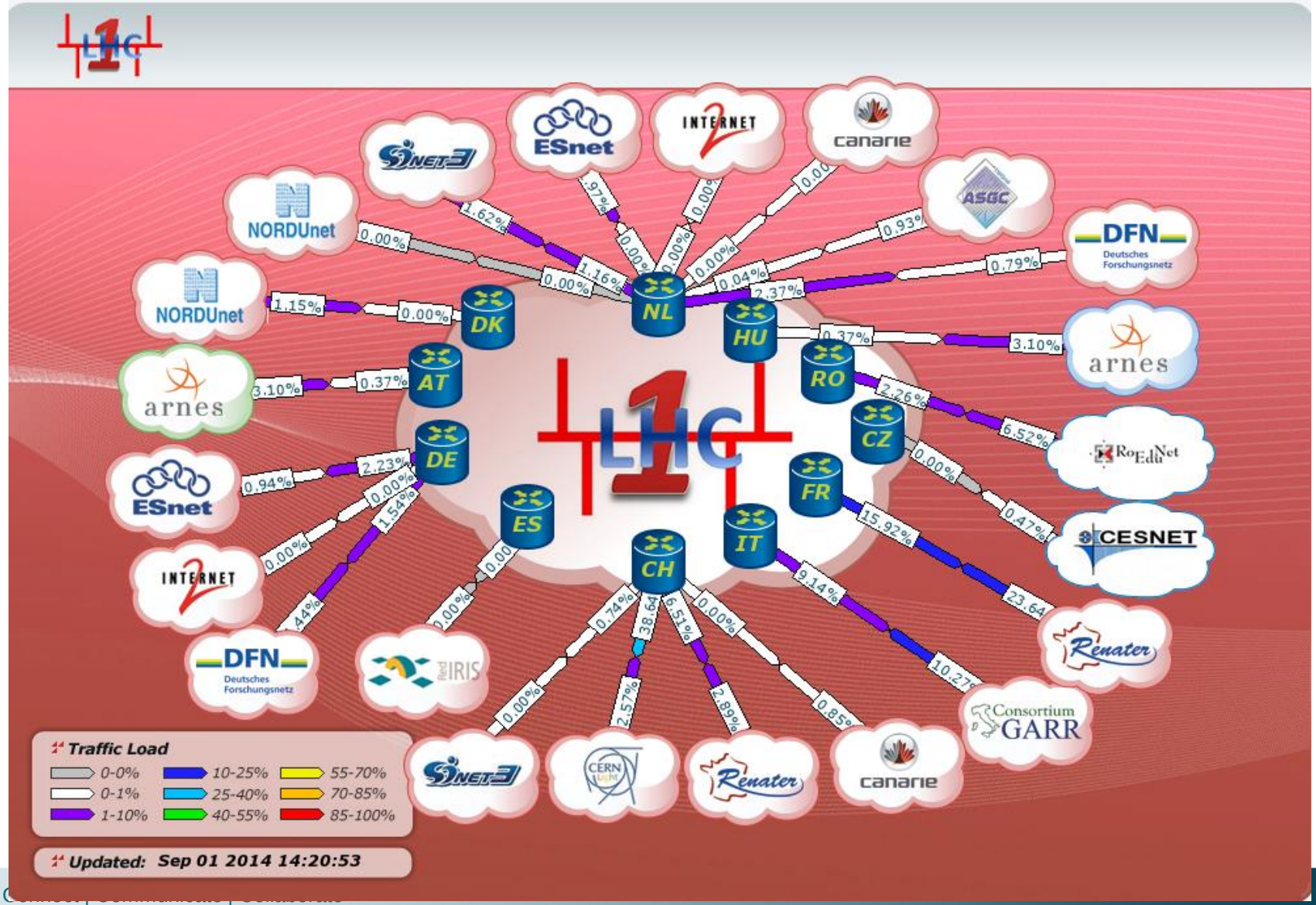


LHCONE in Europe
CERNLight

- Configured as L3VPN VRF on CERN Brocade MLXe
- CERNLight VRF peers with GEANT, NORDUNet, ESNet and Internet2 VRF
- Connects 2 Sites:
  - CERN T1

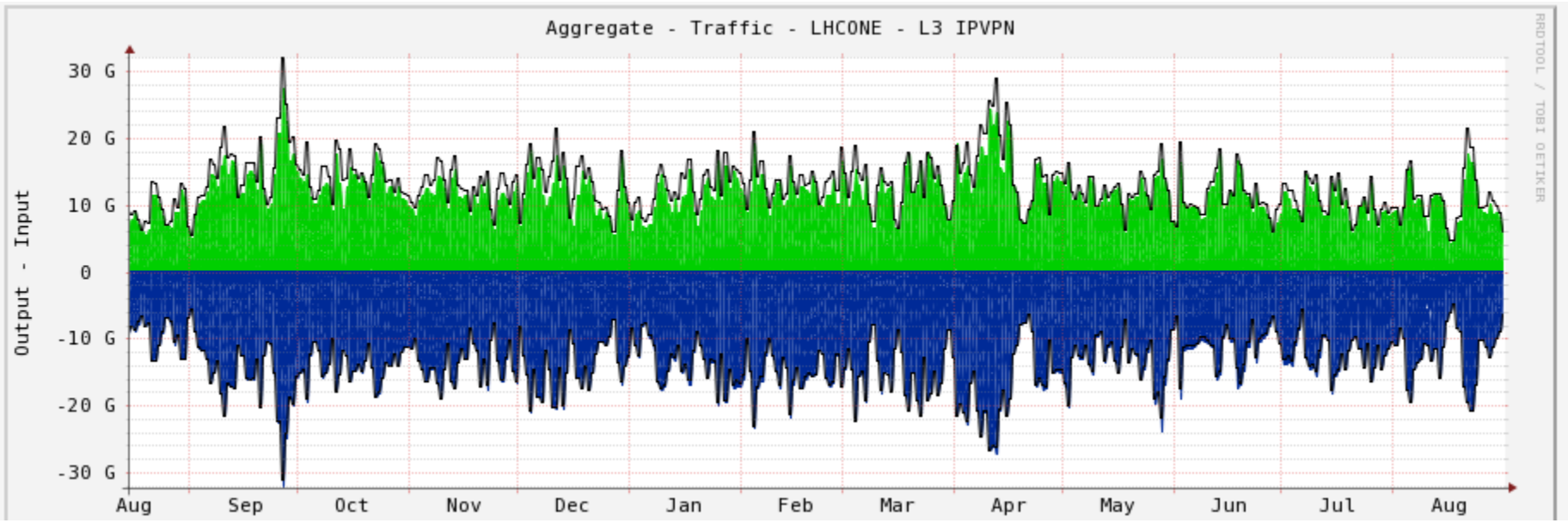


LHCONE in Europe
GEANT



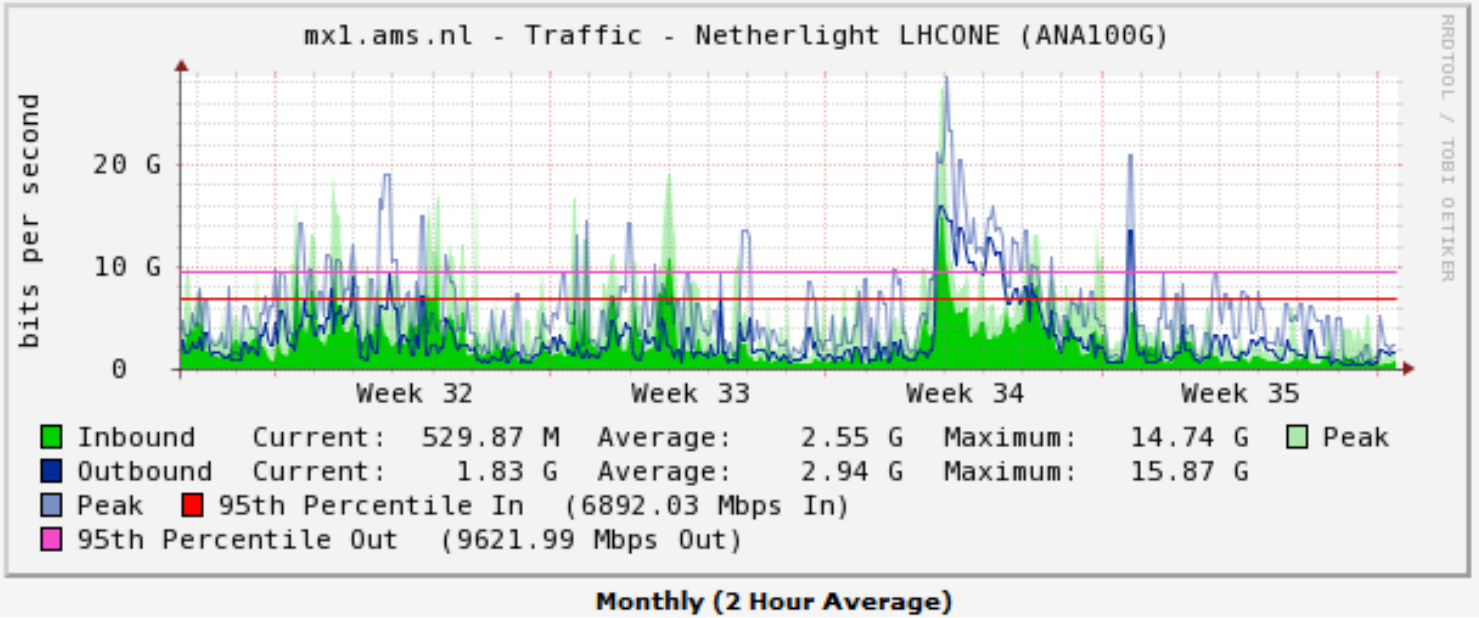
LHCONE in Europe
GEANT

- Aggregate LHCONE traffic from all the NRENs and Peers
  - Average traffic ~25Gbps
  - Sustained Peaks ~35Gbps
  - Trans-Atlantic Traffic ~ 20Gbps (Peak)
- Graphs shows 1 day average traffic over last 12 months the peak traffic is much higher



LHCONE in Europe
GEANT Trans-Atlantic Traffic

- Aggregate GEANT LHCONE Trans-Atlantic Traffic ~ 20Gbps (Peak)
- NORDUnet and CERNLight Trans-Atlantic Traffic is not included in the following graph



LHCONE in Europe Summary

- LHCONE IP Service in Europe is deployed in:
  - ARNES (Slovenia)
  - CERNLight (Switzerland)
  - CESnet (Czech Republic)
  - DFN (Germany)
  - GARR (Italy)
  - GEANT
  - NORDUnet
  - RENATER (France)
  - RoEduNet (Romania)
  - SURFnet (Netherlands)
- RENs in these countries connect:
  - Six Tier 1s in Europe to LHCONE
  - 30 Tier 2s in Europe to LHCONE
  - Indian T2
  - Russian T2

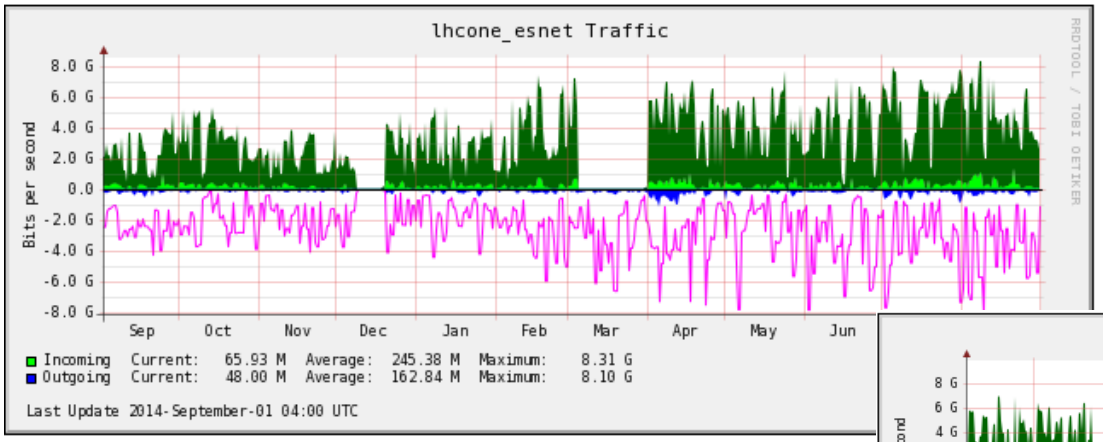
LHCONE in North America
CANARIE

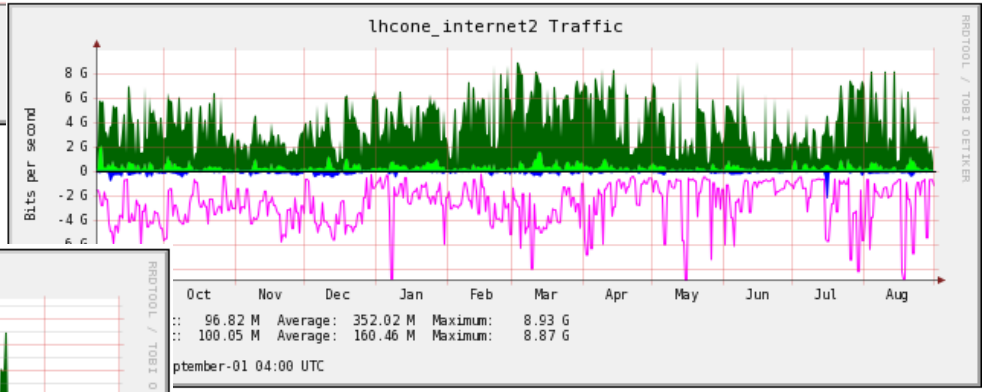
- Configured as L3VPN VRF and following sites connected:
  - T2s - Universities (5) - McGill, UofT, UofA, SFU, UVIC
  - T1 - Triumf - Canada's National Laboratory for Particle and Nuclear Physics
- CANARIE LHCONE VRF peers with ESNet, GEANT and Internet2 LHCONE VRF
- CANARIE is present at StarLight, MANLAN and Pacific Wave
- Peak traffic from T1 is around 10Gbps most other sites have average 3-6Gbps traffic
- Traffic graphs available at

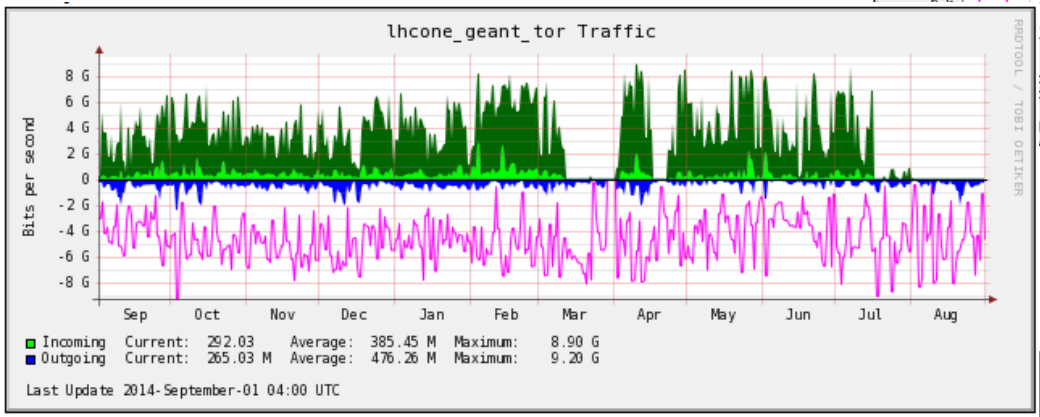
http://weathermap.canarie.ca/lhcone/index.html

LHCONE in North America
CANARIE

- Traffic between CANARIE and Esnet, Internet2 and GEANT LHCONE VRFs peaks at around 8Gbps







LHCONE in North America
ESNet

- Configured as L3VPN VRF and connects following sites:
  - BNL (Atlas T1) FNAL (CMS T1) SLAC (ATLAS T2)
  - KAIE RU, Kurchatov Institute (Limited Connectivity)
- ESNet LHCONE VRF peers with Internet2, GEANT, NORDUNET, CERNLight and CANARIE LHCONE VRF
- ESNET is present at StarLight, MANLAN, WIX and PNWG
- Aggregate peak traffic in ESNET LHCONE VRF ~10Gbps

LHCONE in North America
Internet2

- Internet2 LHCONE VRF peers with ESNet, GEANT, NORDUNET, CERNLight and CANARIE LHCONE VRF
- Internet2 is present at StarLight, MANLAN, WIX and several other exchange points
- Internet2 connects following sites:
  - University of Illinois
  - University of Nebraska
  - MIT
  - University of Michigan
  - MERIT
  - Indiana University
  - University of Chicago
  - Vanderbilt

LHCONE in North America Summary

- Three Tier 1s in North America Connected to LHCONE
  - *BNL (via ESnet)*
  - *FNAL (via ESnet)*
  - *TRIUMF (via CANARIE)*

- 13 Tier 2s in North America Connected to LHCONE
  - *SLAC (via ESnet)*
  - *McGill (via CANARIE)*
  - *UofT (via CANARIE)*
  - *UofA (via CANARIE)*
  - *SFU (via CANARIE)*
  - *UVIC (via CANARIE)*
  - *University of Illinois*
  - *University of Nebraska*
  - *MIT*
  - *University of Michigan*
  - *Indiana University*
  - *University of Chicago*
  - *Vanderbilt*

Summary

- LHCONE backbone supported by
  - Over 15 national and international RENs
  - Several Open Exchange Points including NetherLight, StarLight, MANLAN and others
  - Trans-Atlantic connectivity provided by ACE, GEANT, NORDUNET and USLHCNET

- Over 50 end sites connected to LHCONE
  - 45 Tier 2s
  - 10 Tier 1s

https://twiki.cern.ch/twiki/bin/view/LHCONE/LhcOneVRF#Connected_sites

Thank you!

Questions?

Connect | Communicate | Collaborate

www.geant.net

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