

## LHCONE In Europe

Mian Usman  
DANTE

# Agenda



- What is LHCONE Network?
- LHCONE in GEANT Network.
- LHCONE setup in European NRENs

# What is LHCONE?

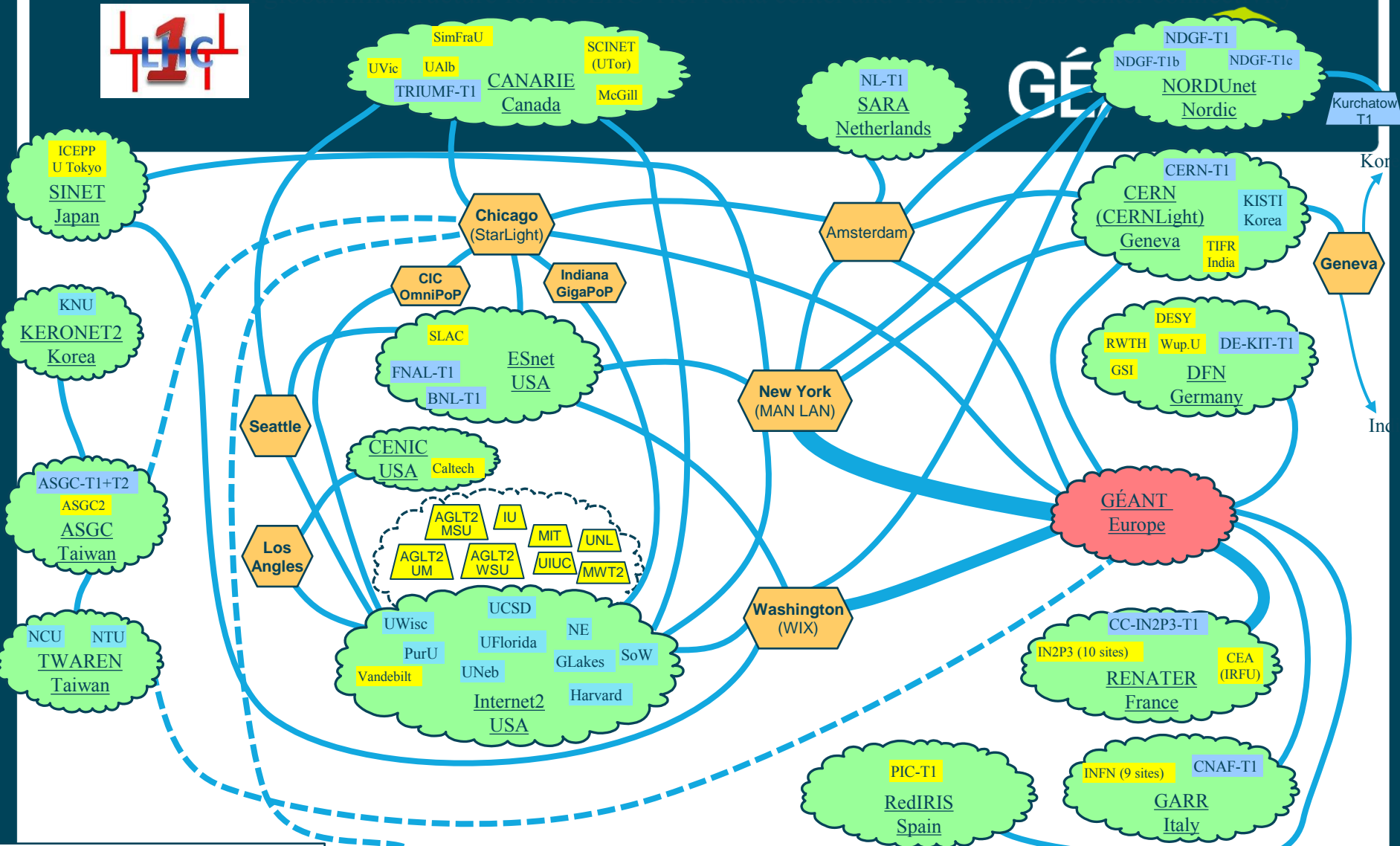


- LHCONE is an overlay network supported by
  - Over 15 national and international RENs
  - Several Open Exchange Points including NetherLight, StarLight, MANLAN and others
  - Trans-Atlantic connectivity provided by ACE, GEANT, NORDUNET and USLHCNET
- Over 50 end sites connected to LHCONE
  - 45 Tier 2s
  - 10 Tier 1s

[https://twiki.cern.ch/twiki/bin/view/LHCONE/LhcOneVRF#Connected\\_sites](https://twiki.cern.ch/twiki/bin/view/LHCONE/LhcOneVRF#Connected_sites)



GÉANT

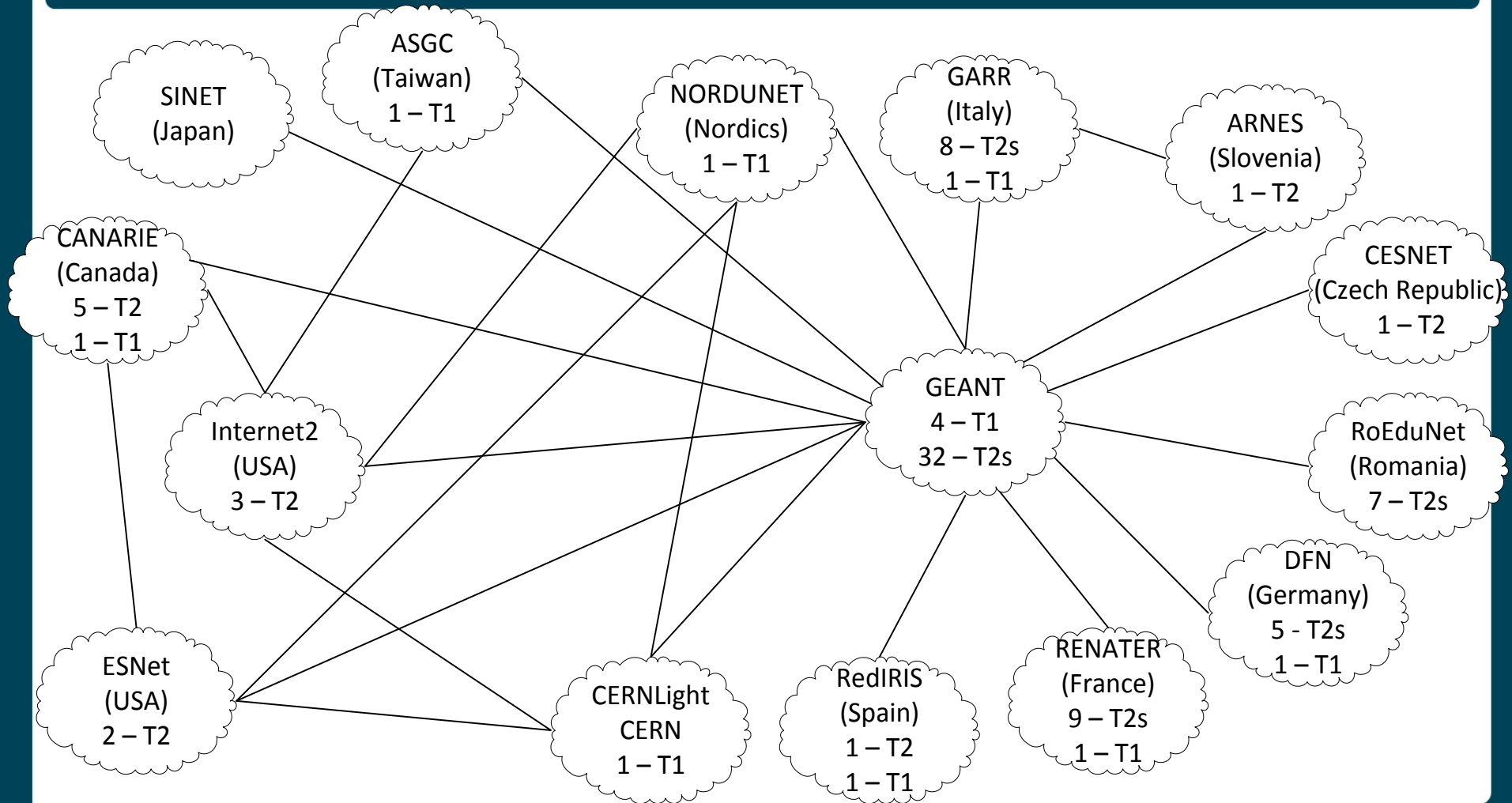


UNAM  
CUDI  
Mexico

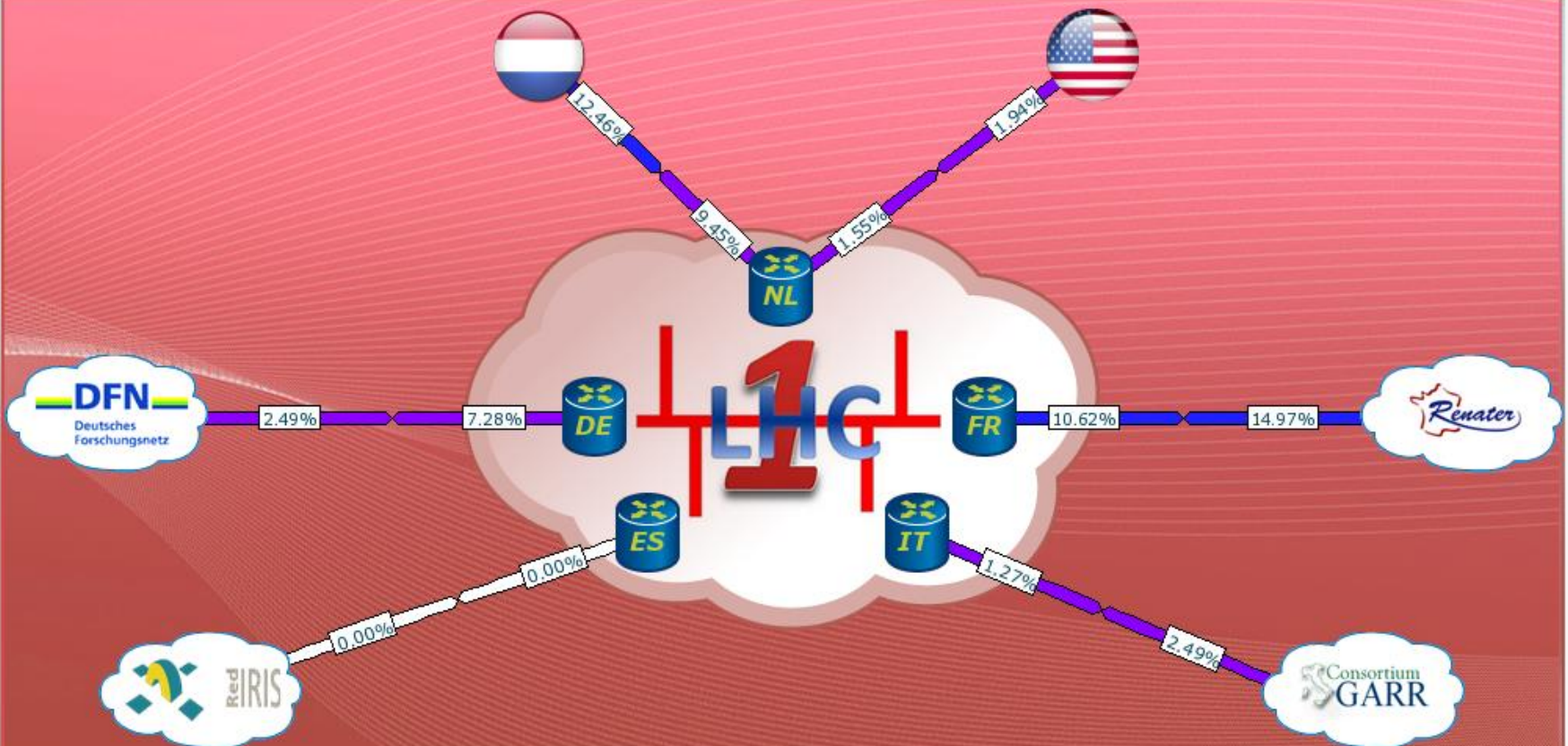
- LHCONE VRF domain
- End sites – LHC Tier 2/3 unless indicated as Tier 1
- Regional R&E communication nexus
- Communication links, 10, 20, 30, and 100Gb/s
- LHCONE VRF aggregator networks
- Sites that are standalone VRFs

2014 see <http://lhcone.net> for details.

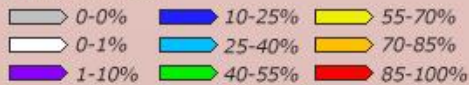
# LHCONE Overlay Network



# LHCONE in Europe GEANT



### Traffic Load

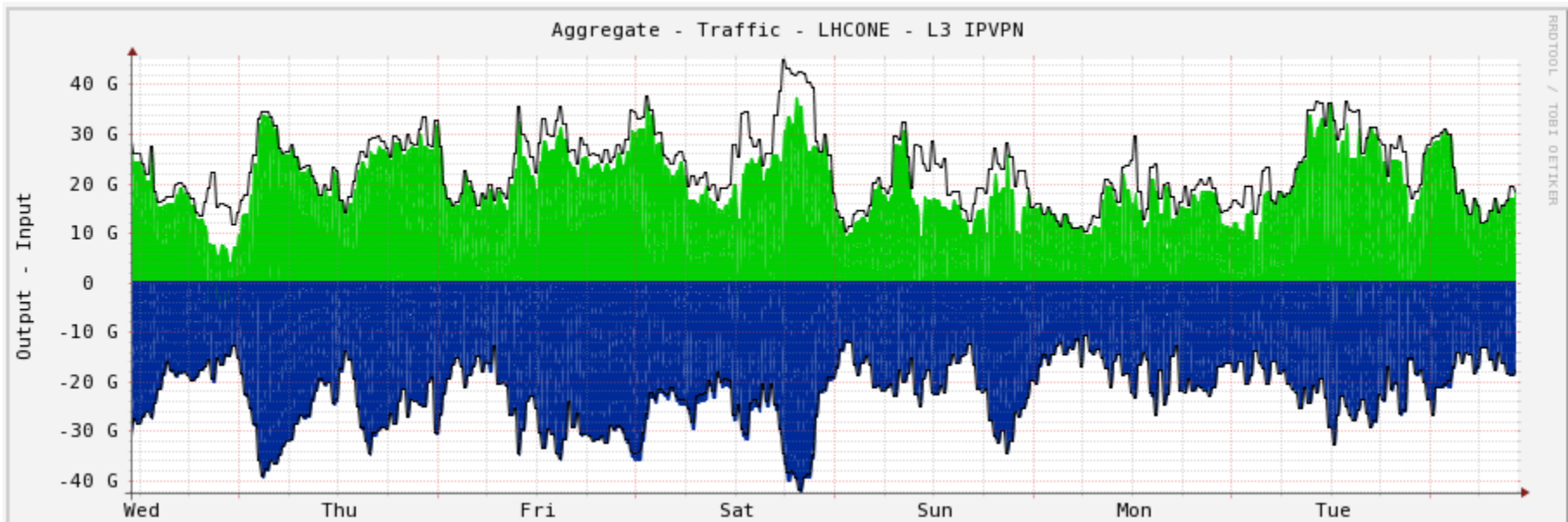


Updated: Dec 06 2011 11:46:11

# LHCONE in Europe GEANT

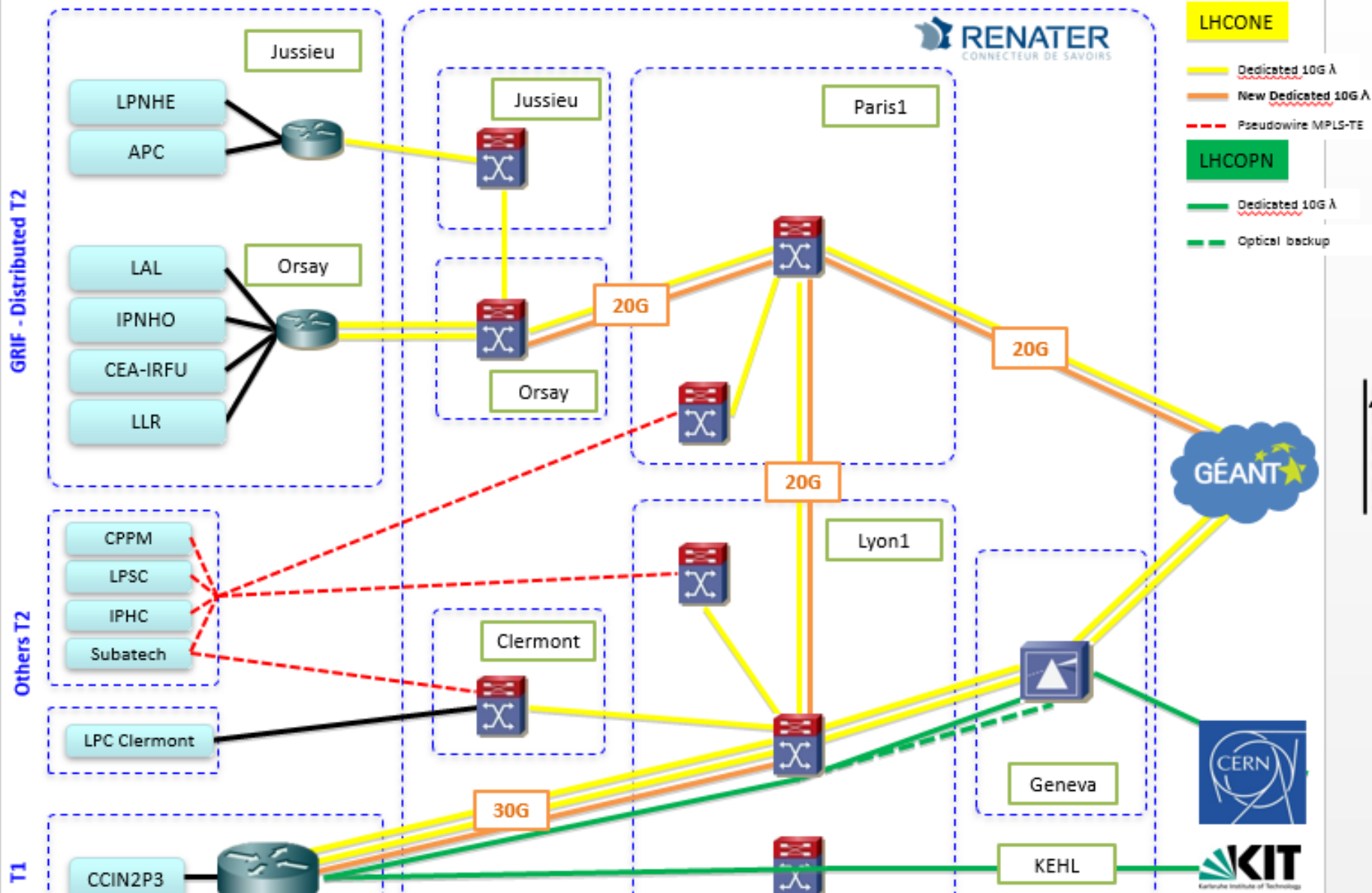


- Aggregate LHCONE traffic from all the NRENs and Peers
  - Average traffic ~25Gbps
  - Sustained Peaks ~35Gbps
  - Trans-Atlantic Traffic ~ 15Gbps (Peak)



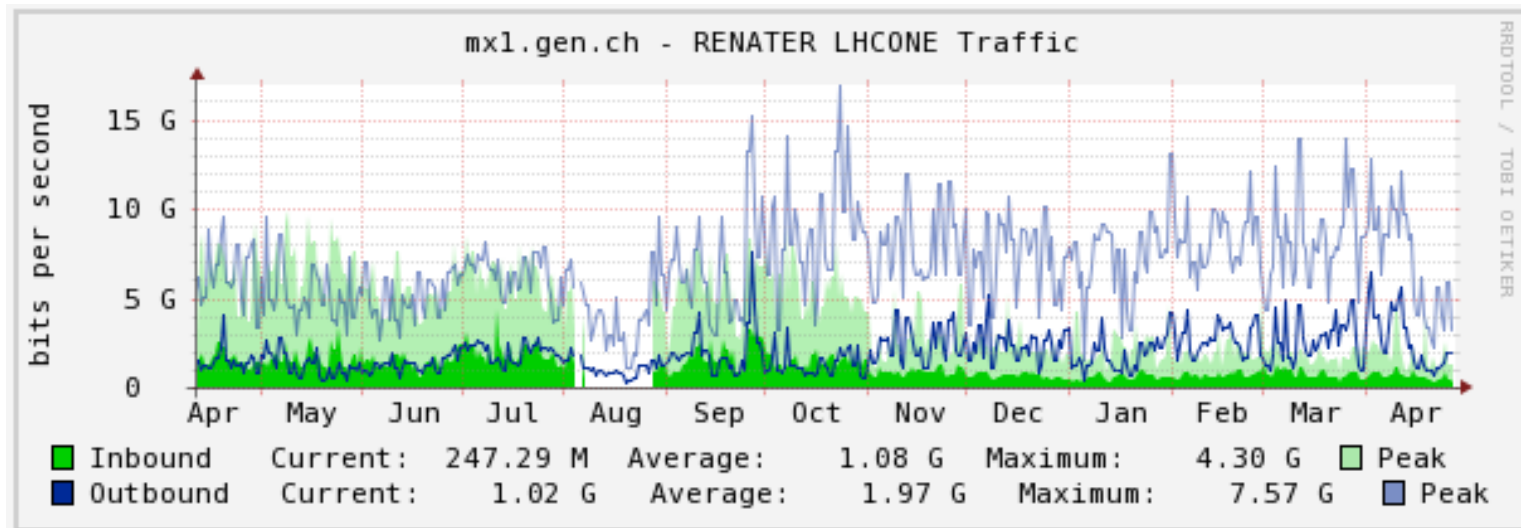


# LHCONE in Europe RENATER (French NREN)

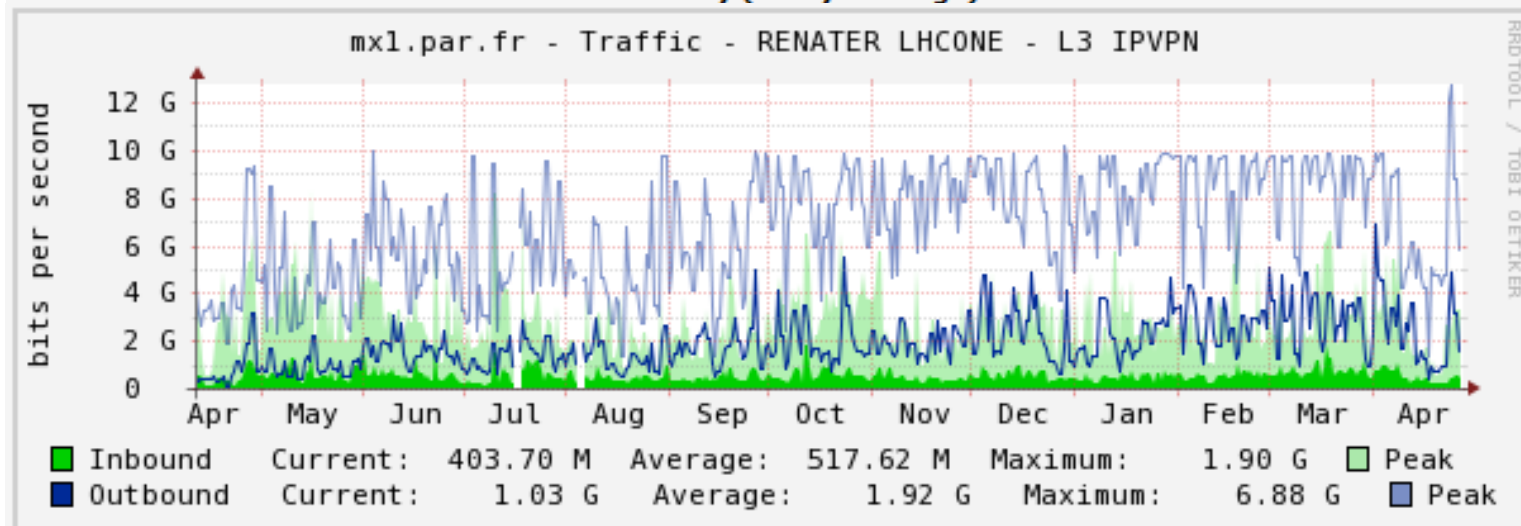




# LHCONE in Europe RENATER (French NREN)

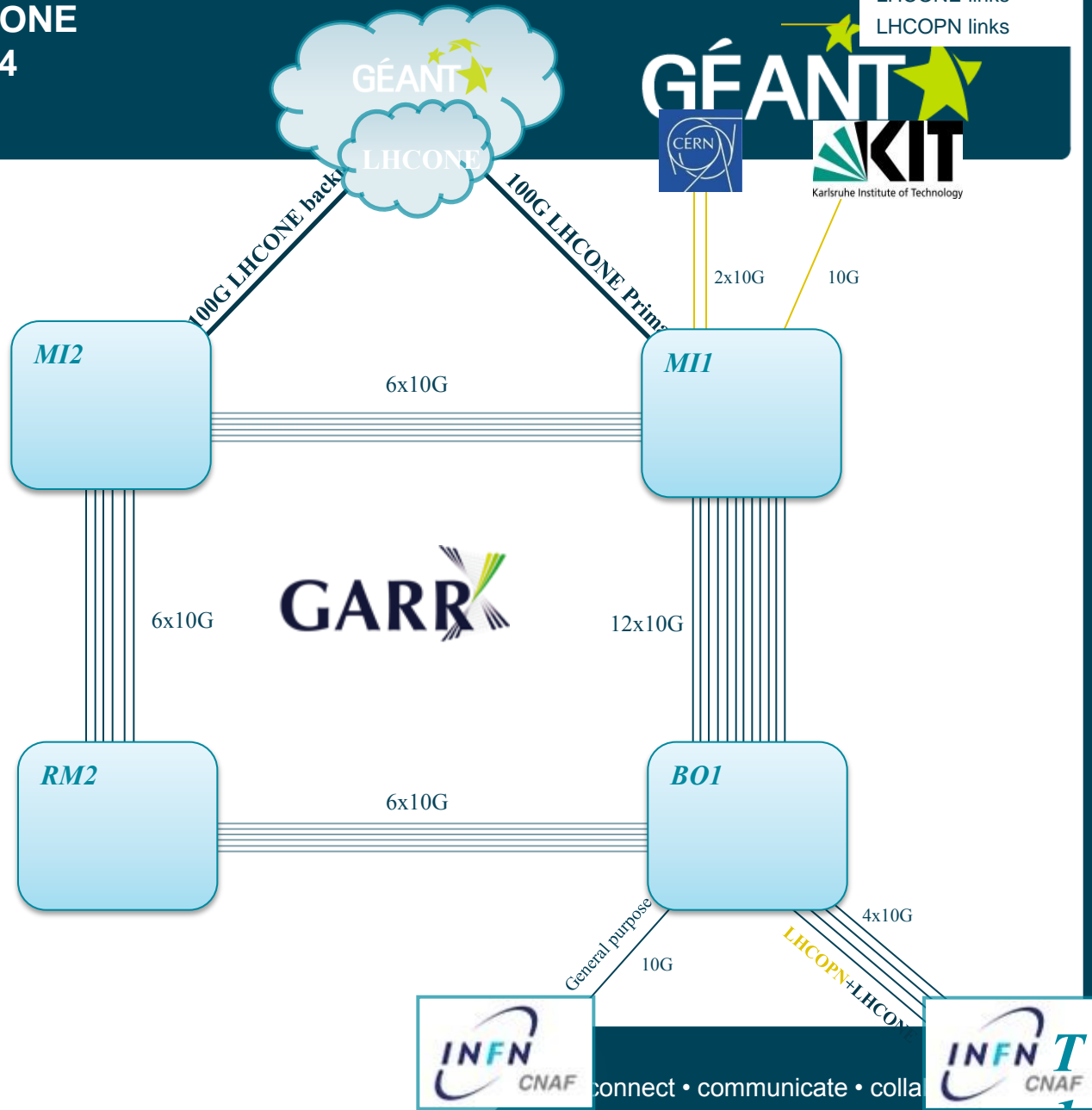


Yearly (1 Day Average)



Yearly (1 Day Average)

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



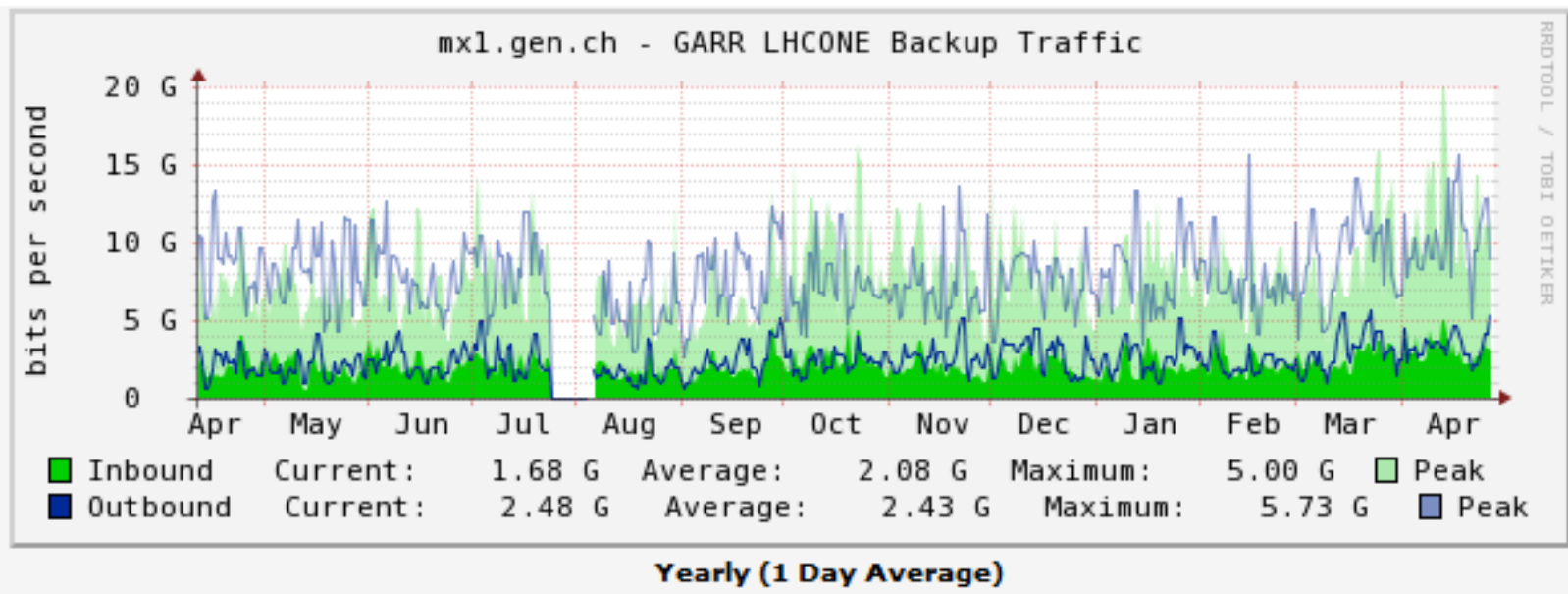
connect • communicate • collab



# LHCONE in Europe GARR (Italian NREN)



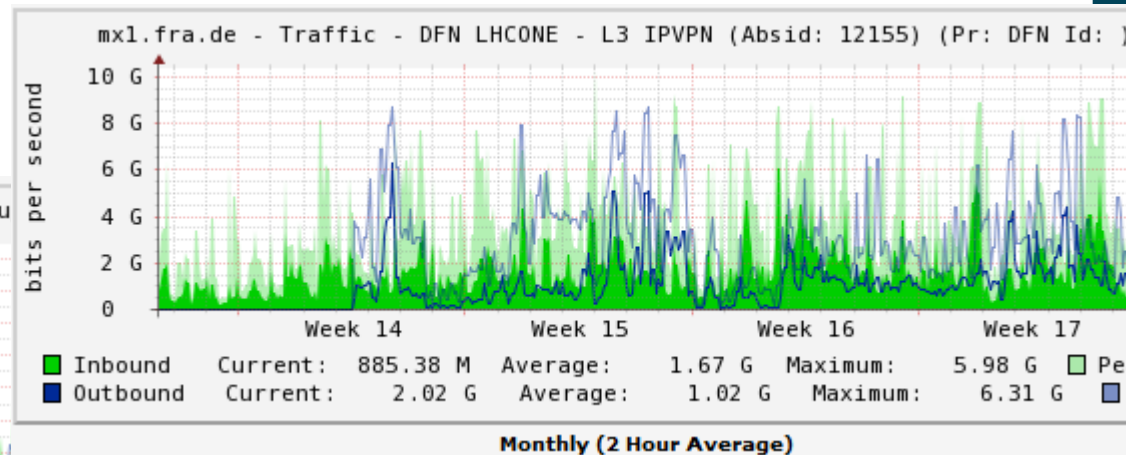
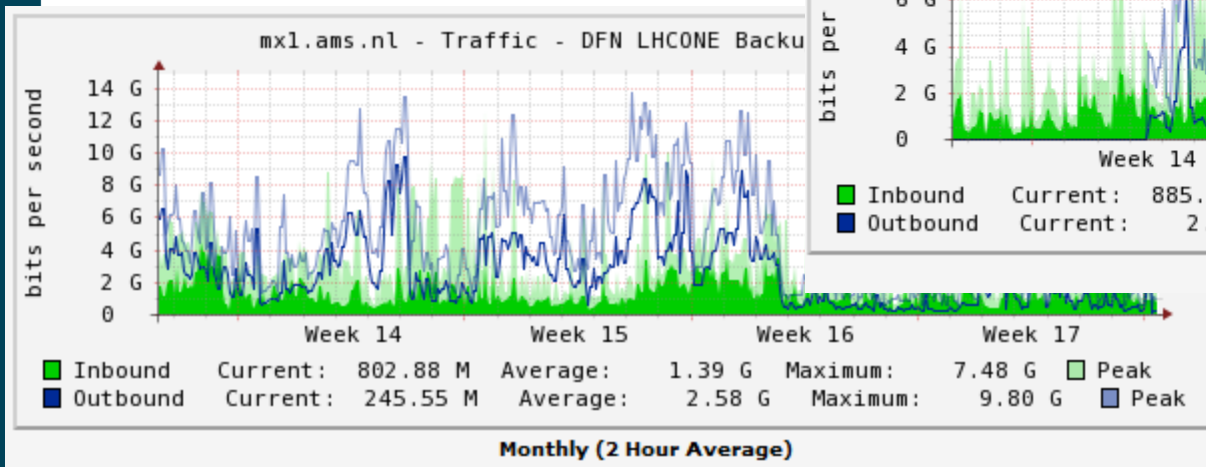
- Link to GEANT 100G primary and 100G backup (Shared)
- CNAF T1 connected at 40G (4x10G)
- The T2s might be upgraded to 2x10G in 2014



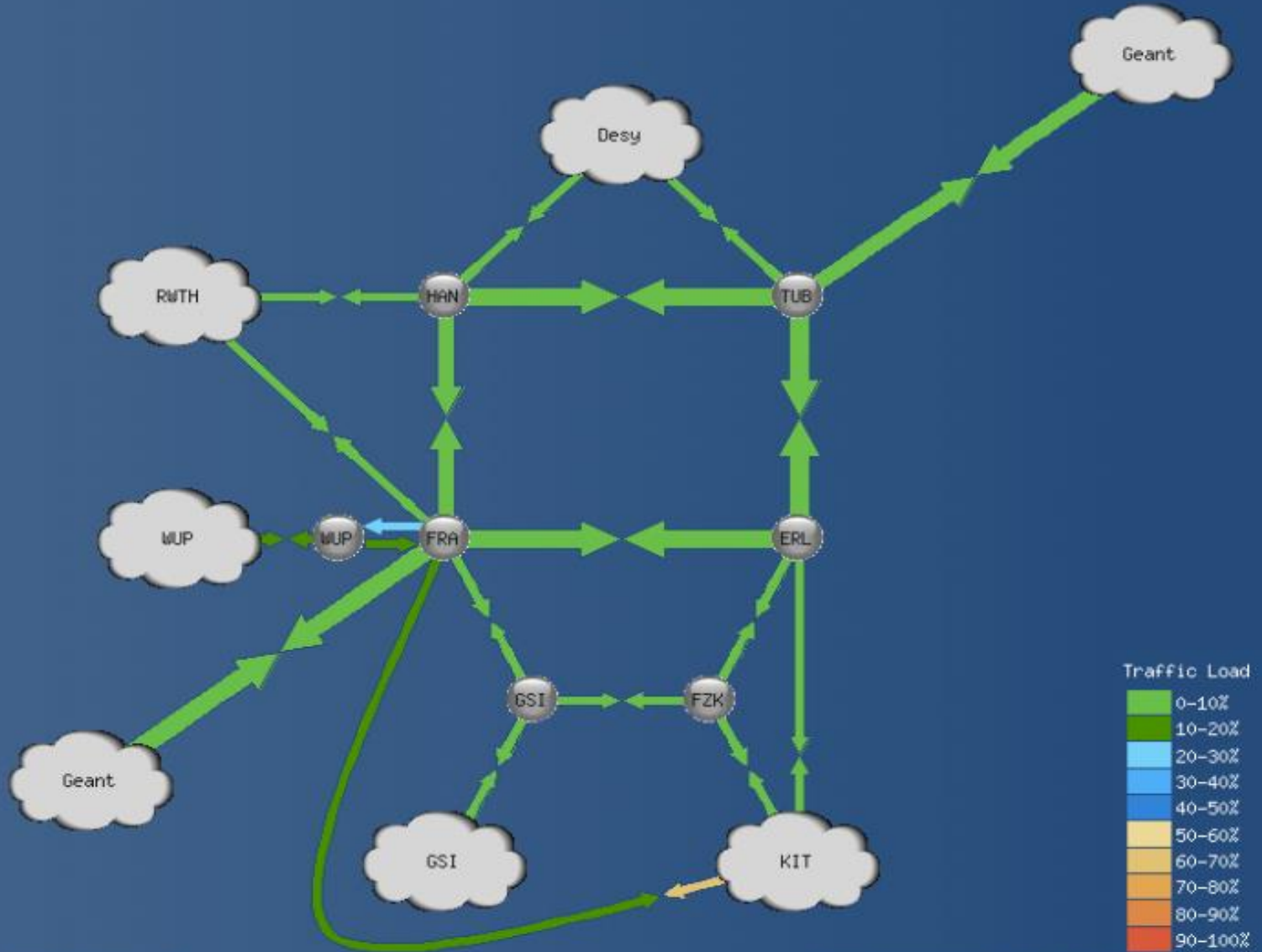
# LHCONE in Europe DFN (German NREN)



- 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)



VPN LHCONE, Load (1min avg)

Last Measurement: Sat 26.04.2014 08:04:00

Map Created: Sat 26.04.2014 08:04:48

# LHCONE in Europe RoEduNet (Romanian NREN)

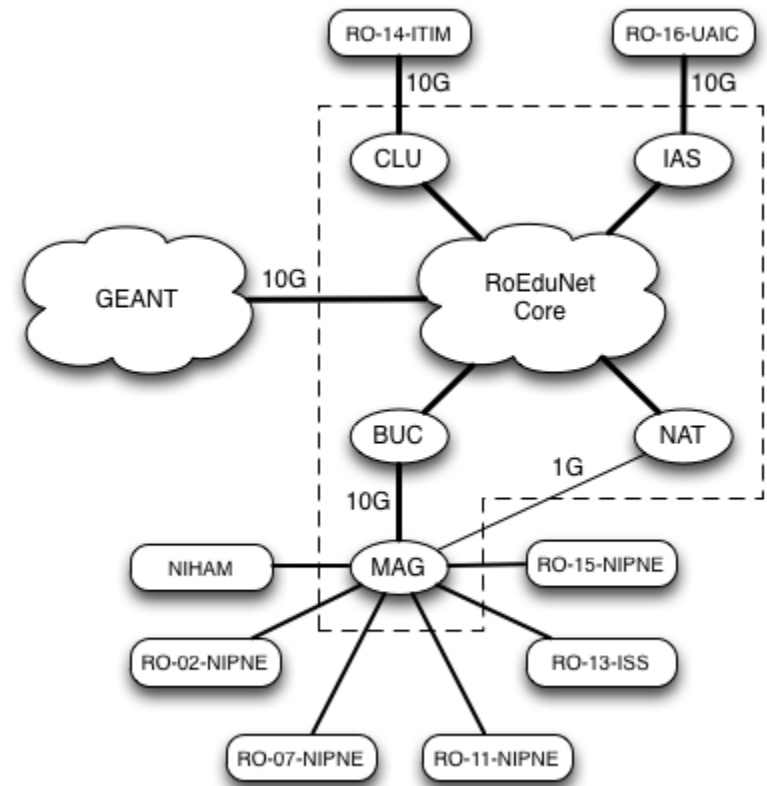


- Configured as separate VRF on RoEduNet

- 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

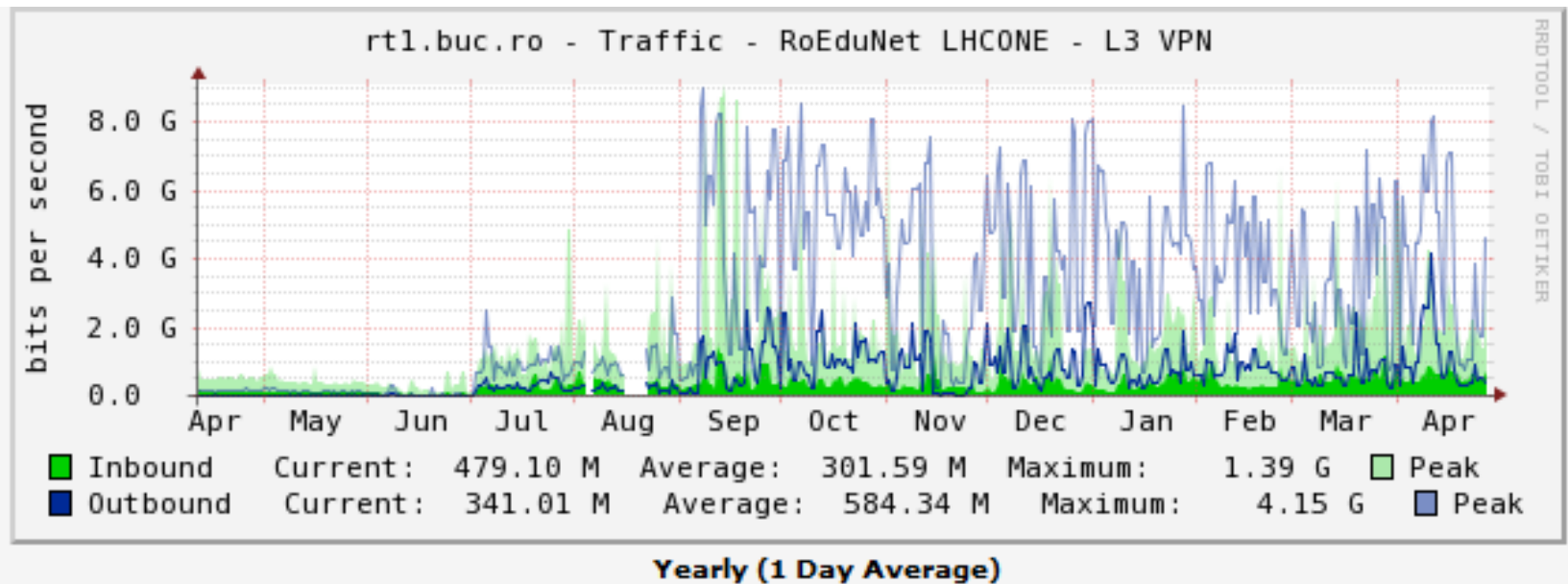




# LHCONE in Europe RoEduNet (Romainian NREN)



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



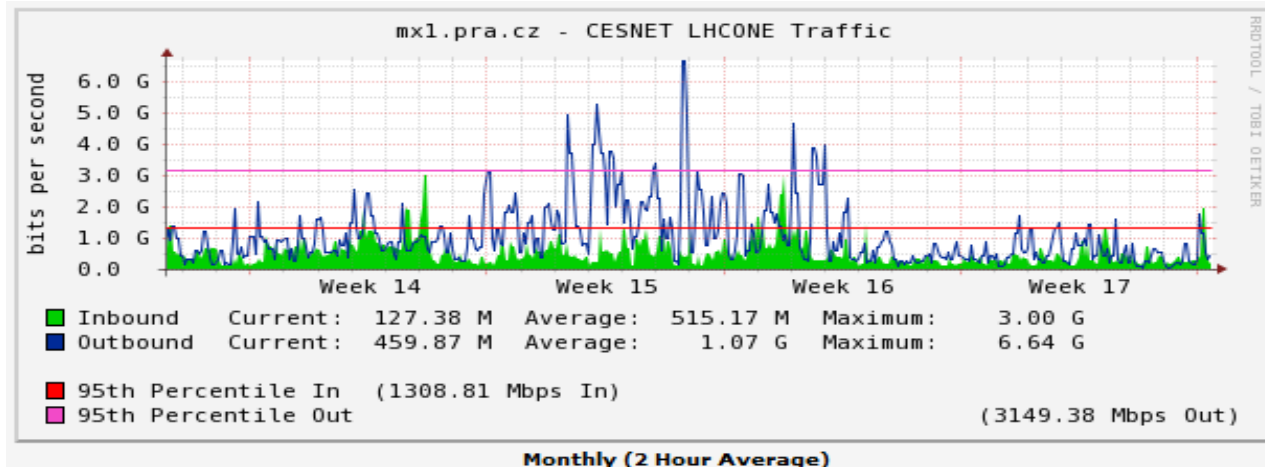


# LHCONE in Europe

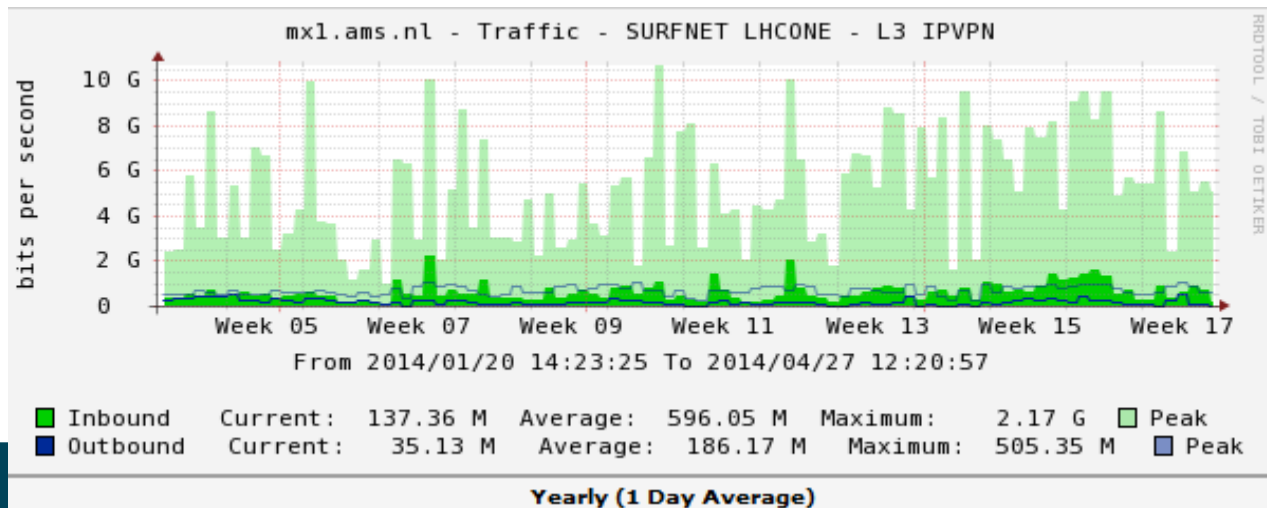
## CESNet (Czech Republic), NL-T1



- Link between CESNet and GEANT 10G dedicated:



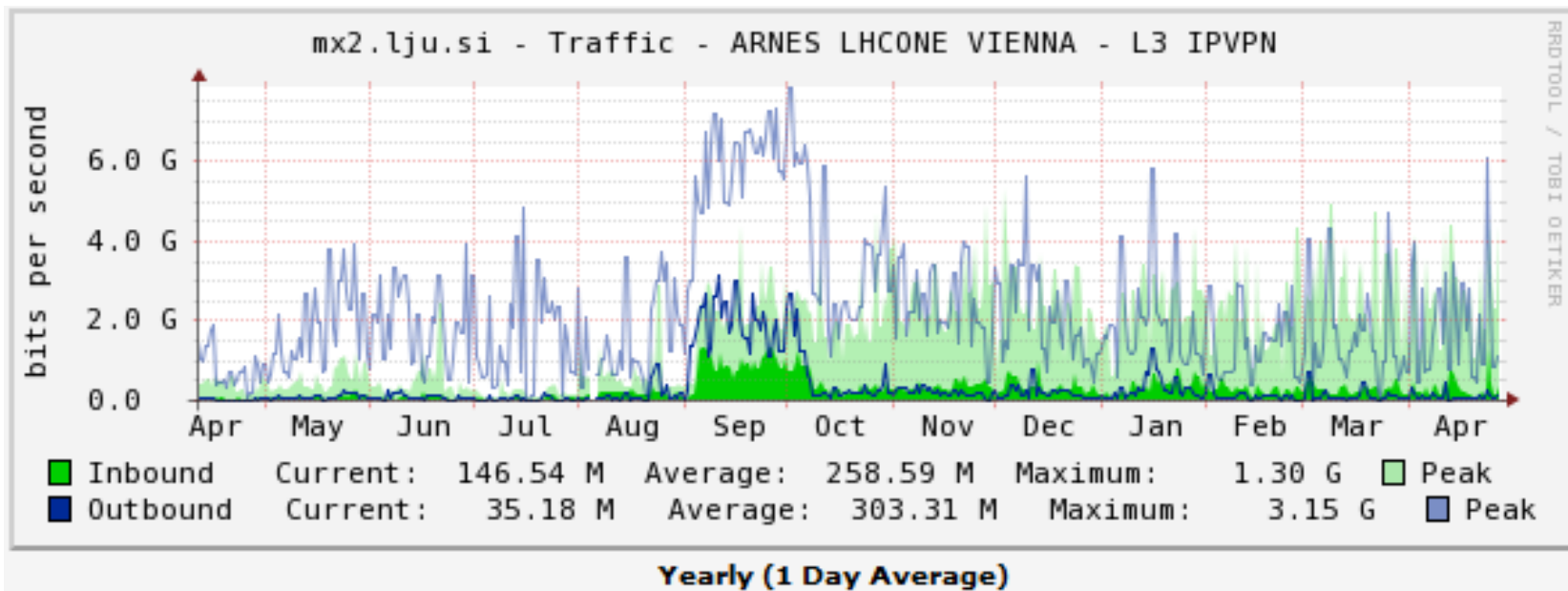
- NL-T1 now connected to LHCONE via SURFNet in Amsterdam:



# LHCONE in Europe ARNES (Slovenian NREN)



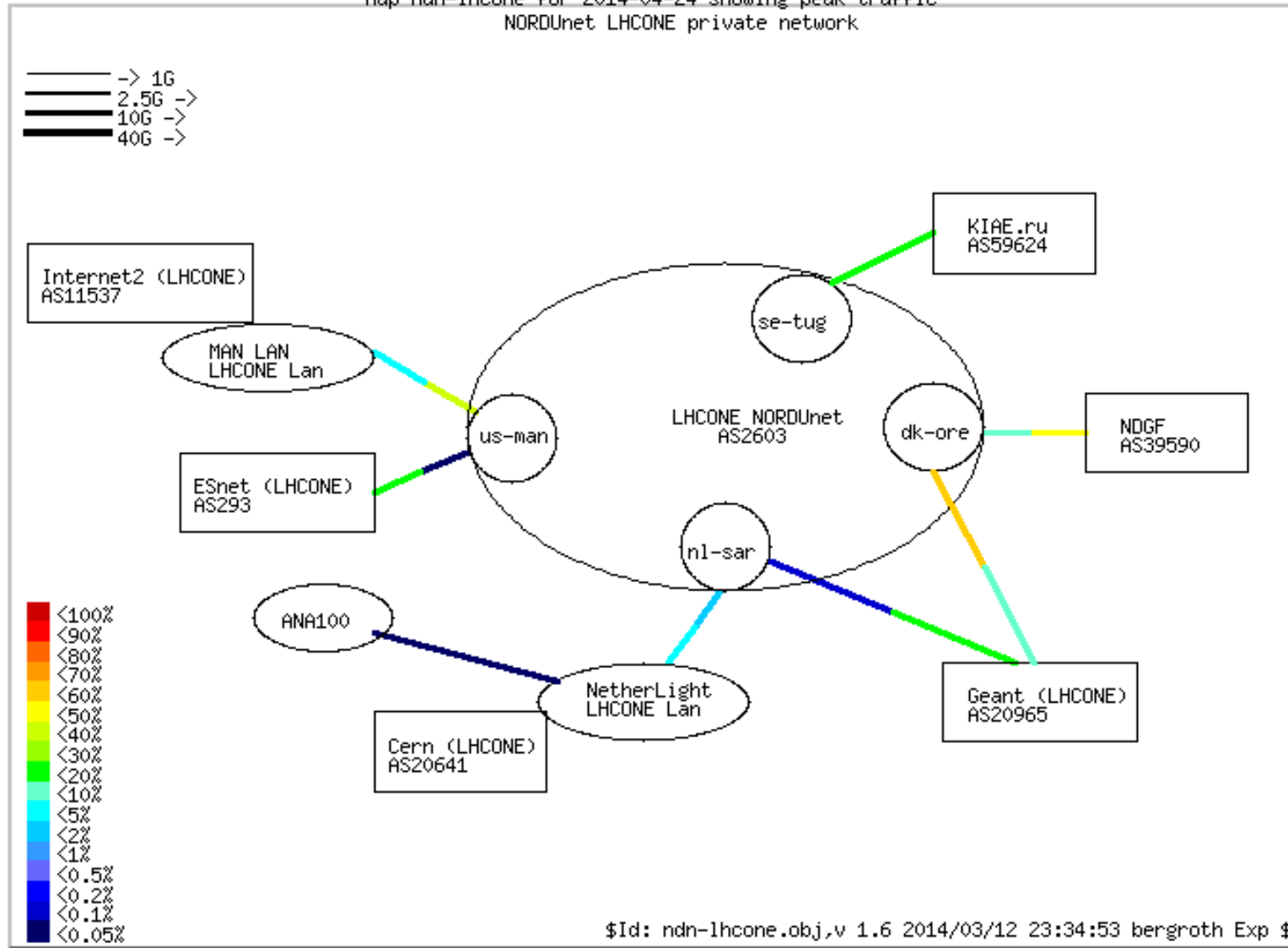
- Configured as separate VRF on ARNES network and peers with GEANT and GARR (Italian) VRF
- Connects Slovenian T2
- Traffic to/from GEANT VRF average ~2.5Gbps and peaks at ~7Gbps



# LHCONE in Europe NORDUNet



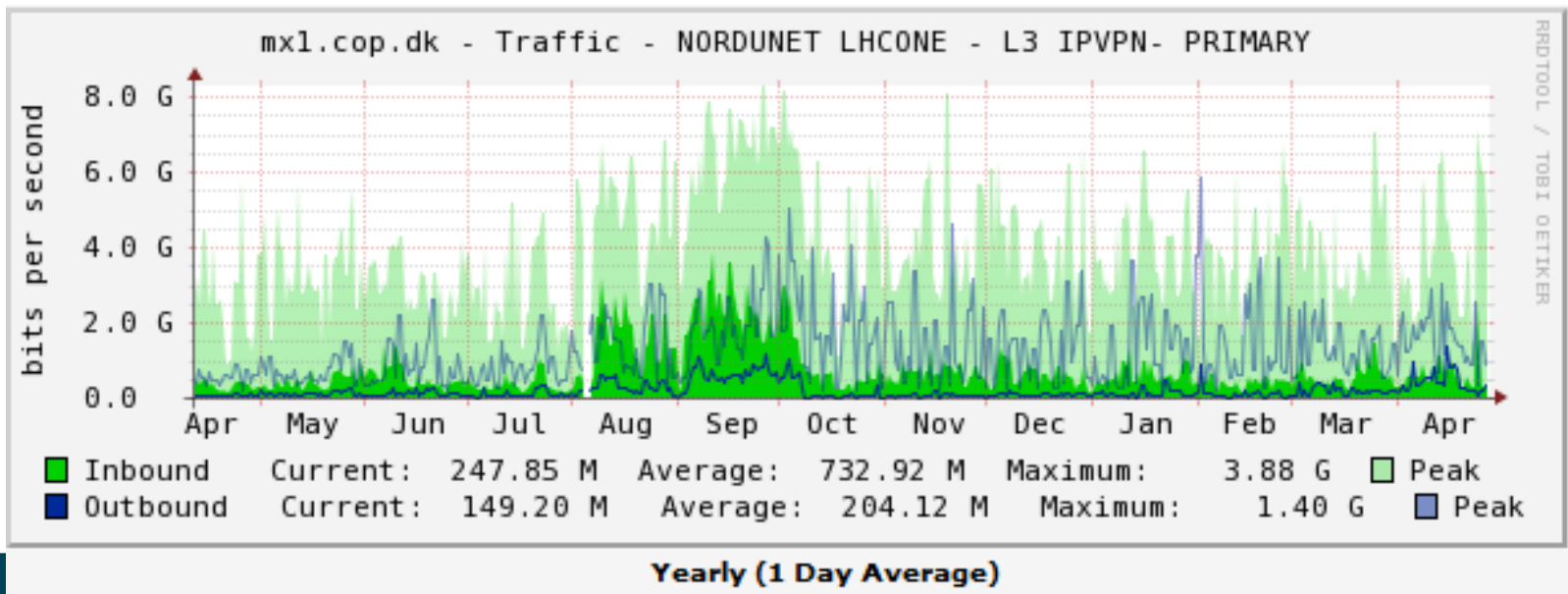
Map ndn-lhcone for 2014-04-24 showing peak traffic  
NORDUnet LHCONE private network



# 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



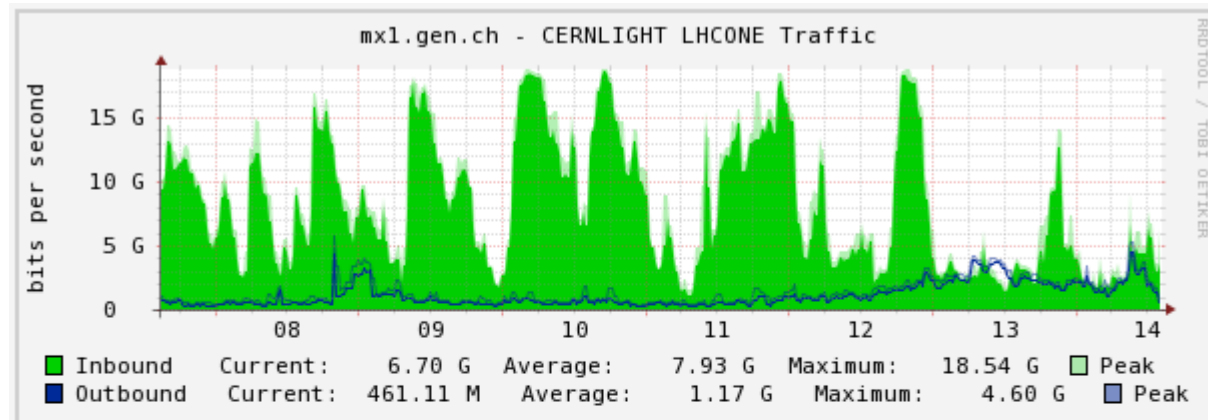
# LHCONE in Europe CERNLight



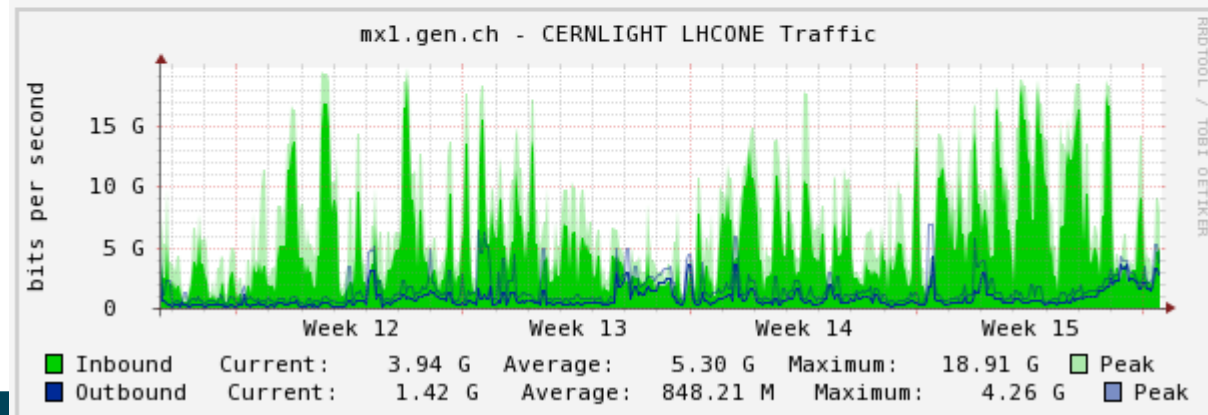
- Configured as L3VPN VRF on CERN Brocade MLXe
- CERNLight VRF peers with GEANT, NORDUNet, ESNet and Internet2 VRF

- Connects 2 Sites:
  - CERN T1
  - TIFR (Indian T2)

- Upgrade required



Weekly (30 Minute Average)



Monthly (2 Hour Average)

# LHCONE in Europe Summary



- LHCONE 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

- Questions?



- Questions?
- [Mian.usman@dante.net](mailto:Mian.usman@dante.net)