

## Status of LHCONE IP Service

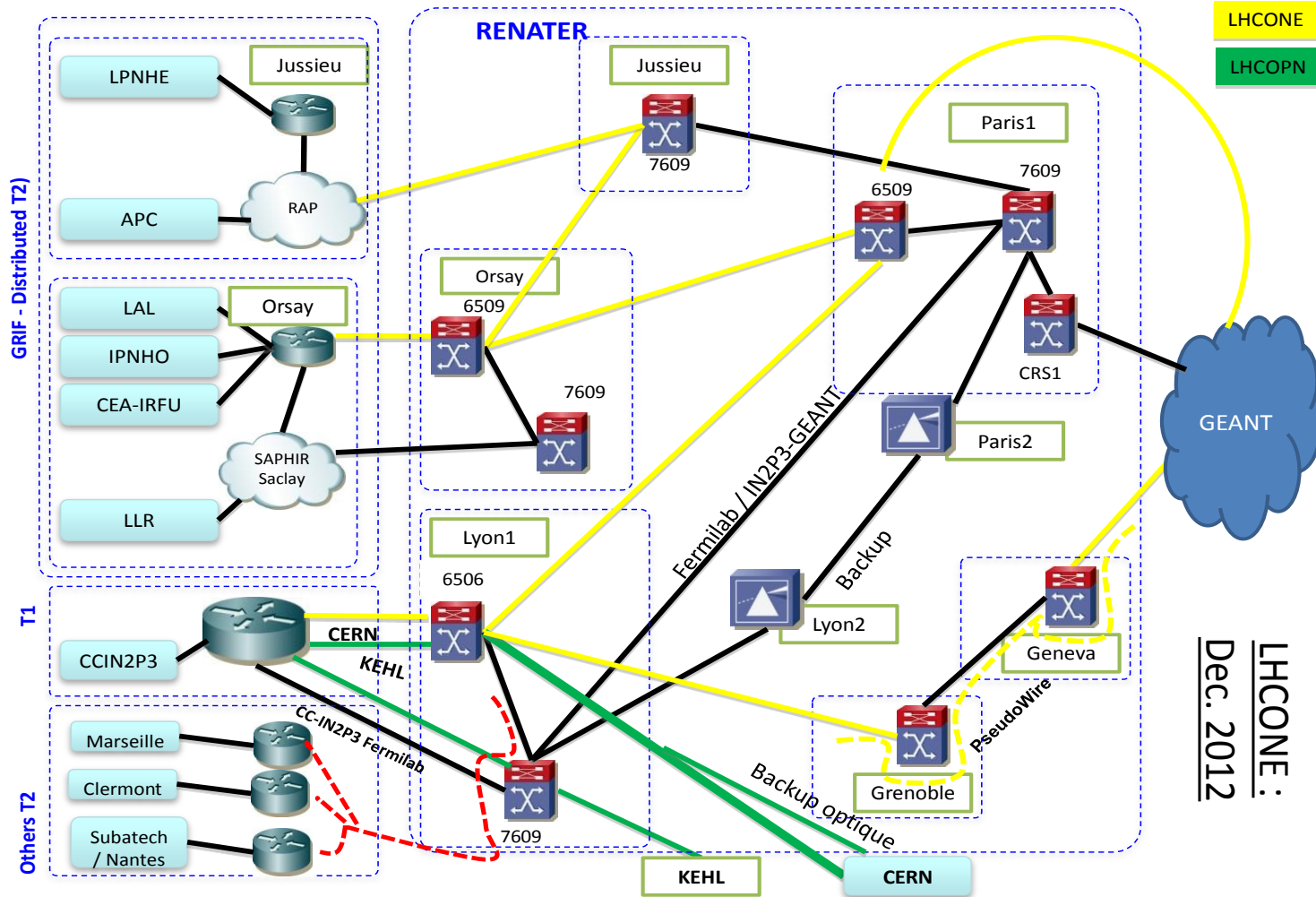
Mian Usman - DANTE

LHCONE Meeting Washington 31<sup>st</sup> Jan 2013

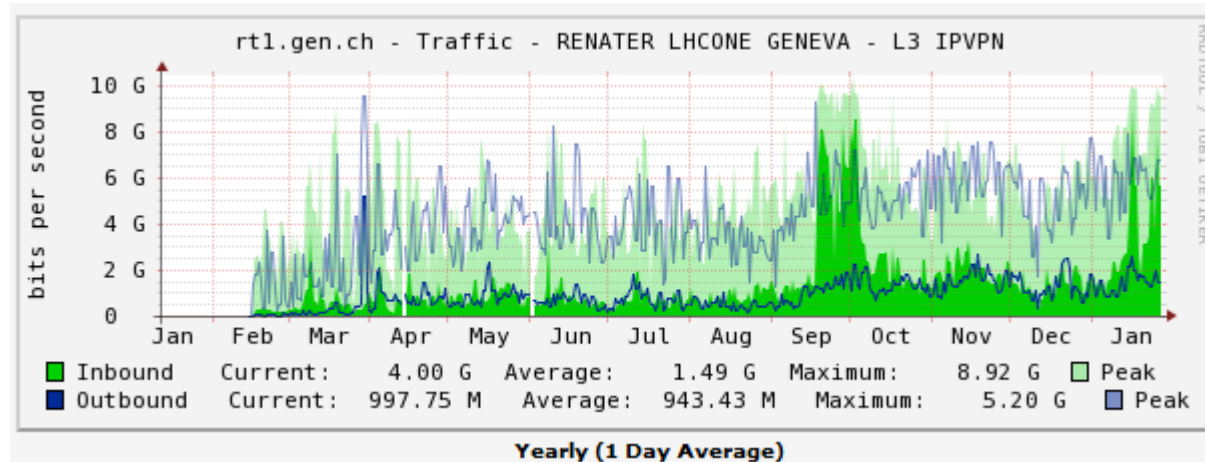
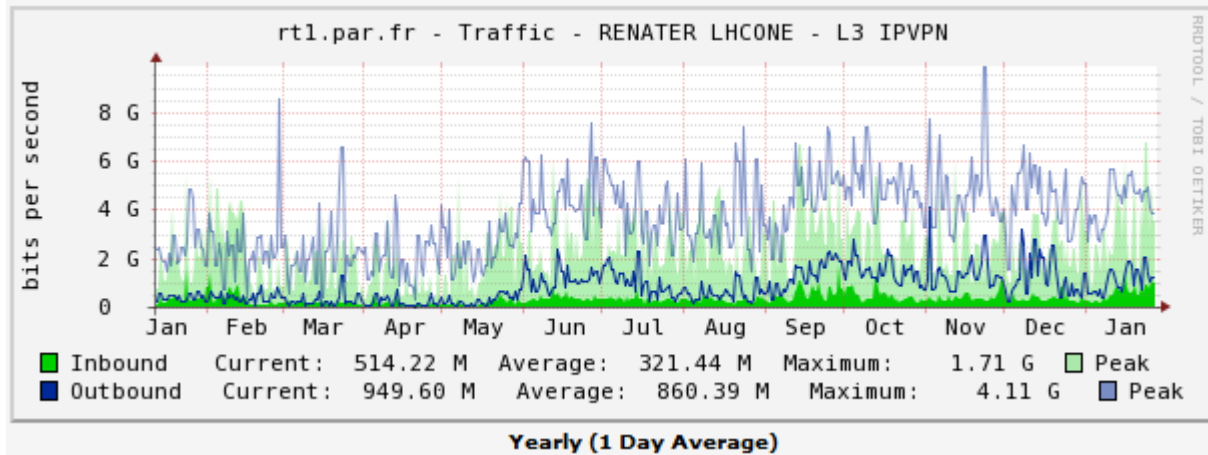
# Agenda

- LHCONE in Europe
  - LHCONE in France, Italy, Germany, Romania, Slovenia, Spain and Czech Republic
  - LHCONE in NORDUnet, CERNLight and GEANT
- LHCONE in North America
  - LHCONE In CANARIE, ESnet and Internet2
- LHCONE in Asia
- LHCONE in Open Exchanges

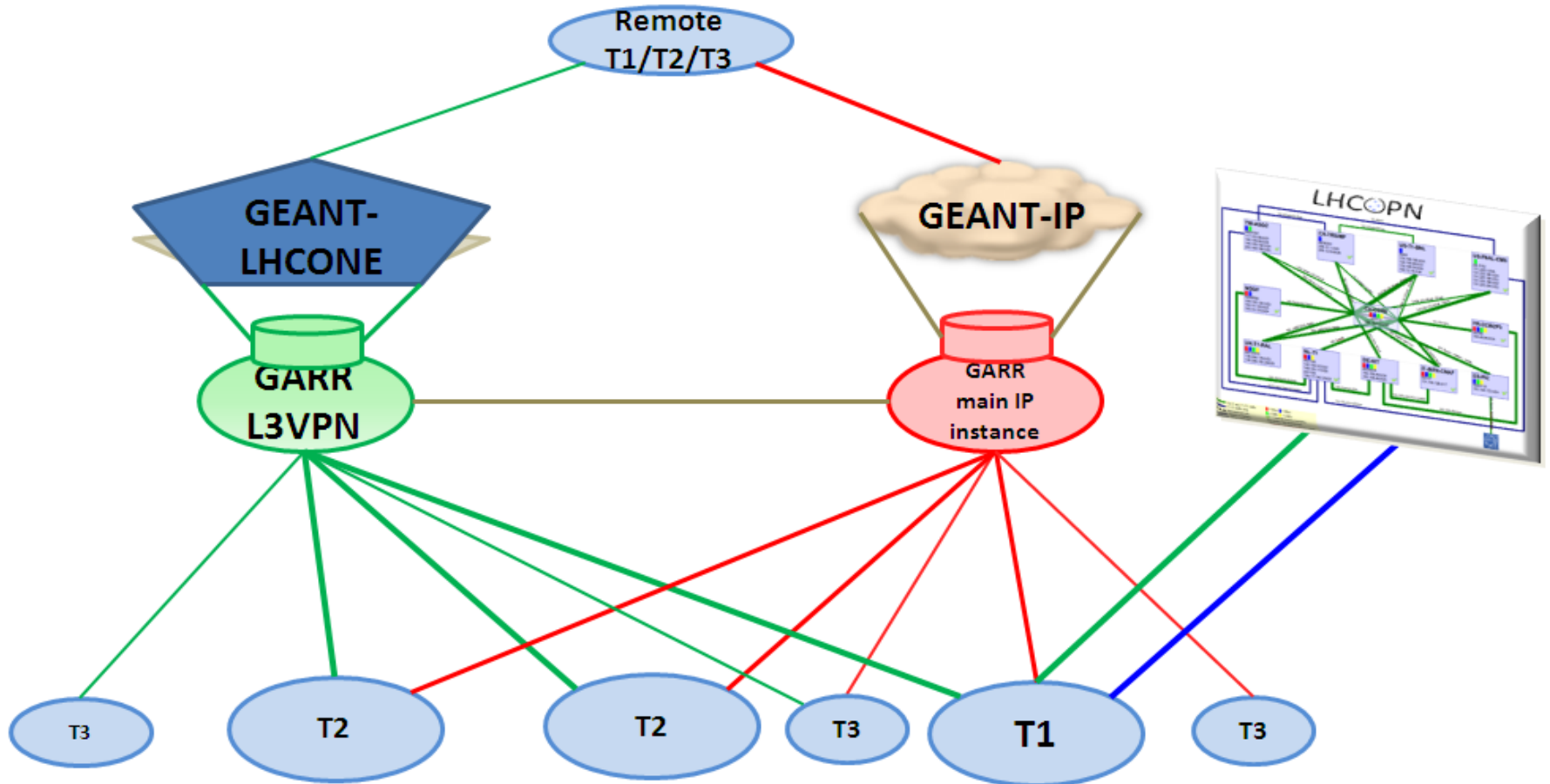
# LHCONE in Europe RENATER (French NREN)



# LHCONE in Europe RENATER (French NREN)



# LHCONE in Europe GARR (Italian NREN)



# LHCONE in Europe

## GARR (Italian NREN)

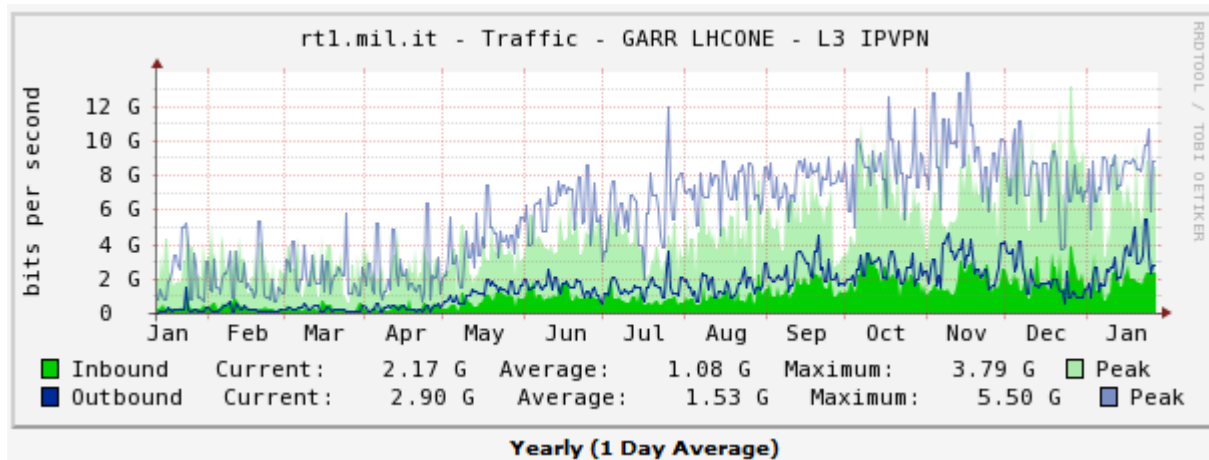


Site	Present physical connection	Future physical connection
INFN-CNAF Bologna (T1)	2x10G	2x10G
INFN-Bari (T2)	10G	10G
INFN-Catania (T2)	10G	10G
INFN-Frascati (T2)	4G	10G
INFN-Legnaro (T2)	10G (shared with general purpose traffic)	2x10G (shared with general purpose traffic)
INFN-Napoli (T2)	10G	10G
INFN-Milano (T2)	10G	10G
INFN-Pisa (T2)	2x1G (shared with general purpose traffic)	2x10G (shared with general purpose traffic)
INFN-Roma1 (T2)	10G	10G
INFN-Torino (T2)	1G (shared with general purpose traffic)	10G

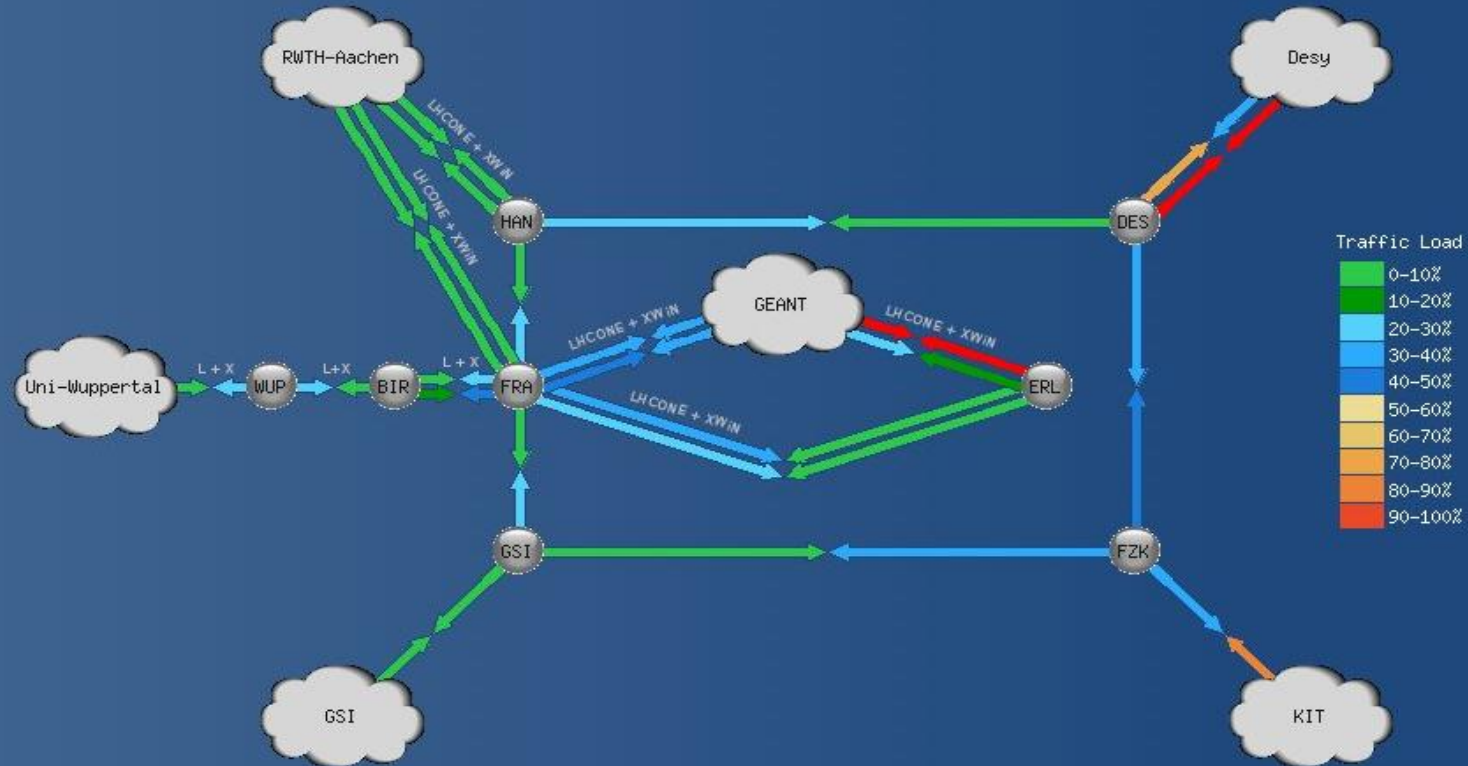
# LHCONE in Europe GARR (Italian NREN)



- Connects one T1 and nine T2 sites
- Peers with GEANT and ARNES VRF
- Traffic to/from GEANT VRF average traffic ~5Gbps, peak traffic over 12Gbps



# LHCONE in Europe DFN (German NREN)



LHCONE2, Physical View, Last 1min Load

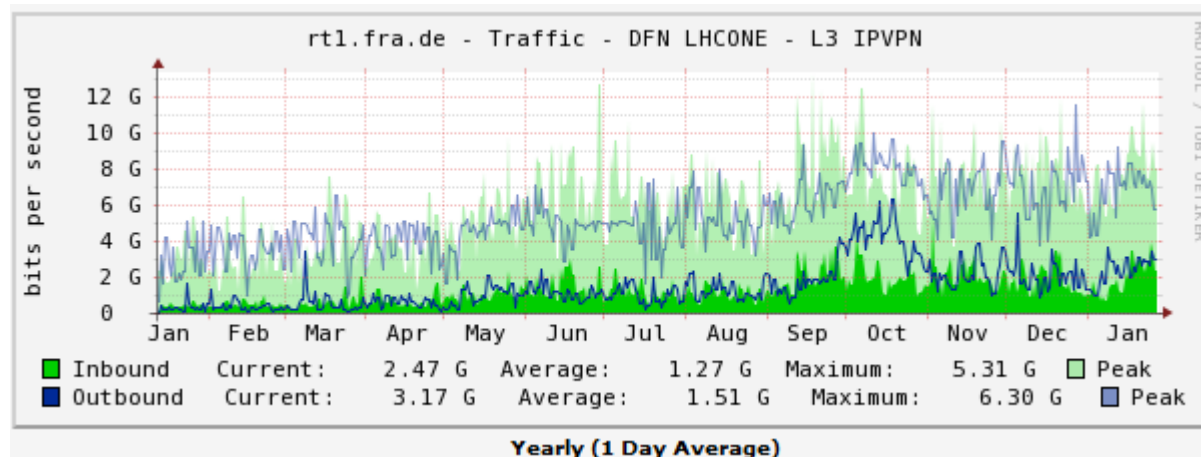
Last Measurement: Thu 24.01.2013 16:06:00  
Map Created: Thu 24.01.2013 16:06:18



# LHCONE in Europe DFN (German NREN)



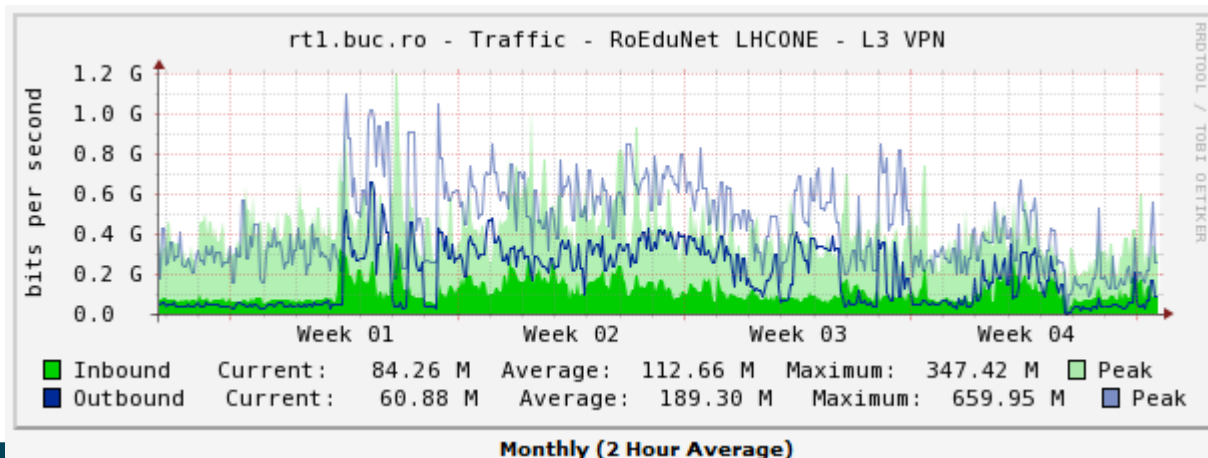
- Inner core of 10 G wavelengths
  - connects KIT, DESY, GSI, RWTH Aachen and Frankfurt
- Peer with GEANT VRF
- Estimated LHCONE traffic
  - 10G peak per end site access
  - 10G peak on the GEANT access



# LHCONE in Europe RoEduNet (Romainian NREN)



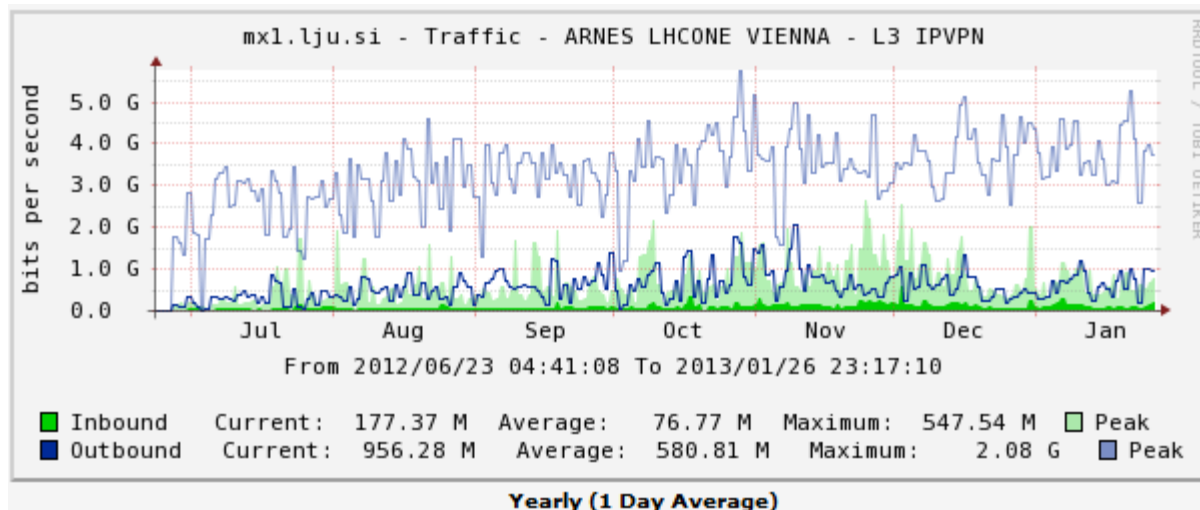
- Configured as separate VRF on RoEduNet network and peers with GEANT VRF since Nov 2012
- Connects following sites:
  - RO-16-UAIC - 85.122.31.0/25 (located in Iasi)
  - RO-14-ITIM - 193.231.25.224/27 (located in Cluj)
- Following sites will be connected soon
  - RO-07-IFIN and
  - RO-11-IFIN (81.180.86.0/24, located in Bucharest -Magurele)



# 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 ~1Gbps and peaks at ~5Gbps



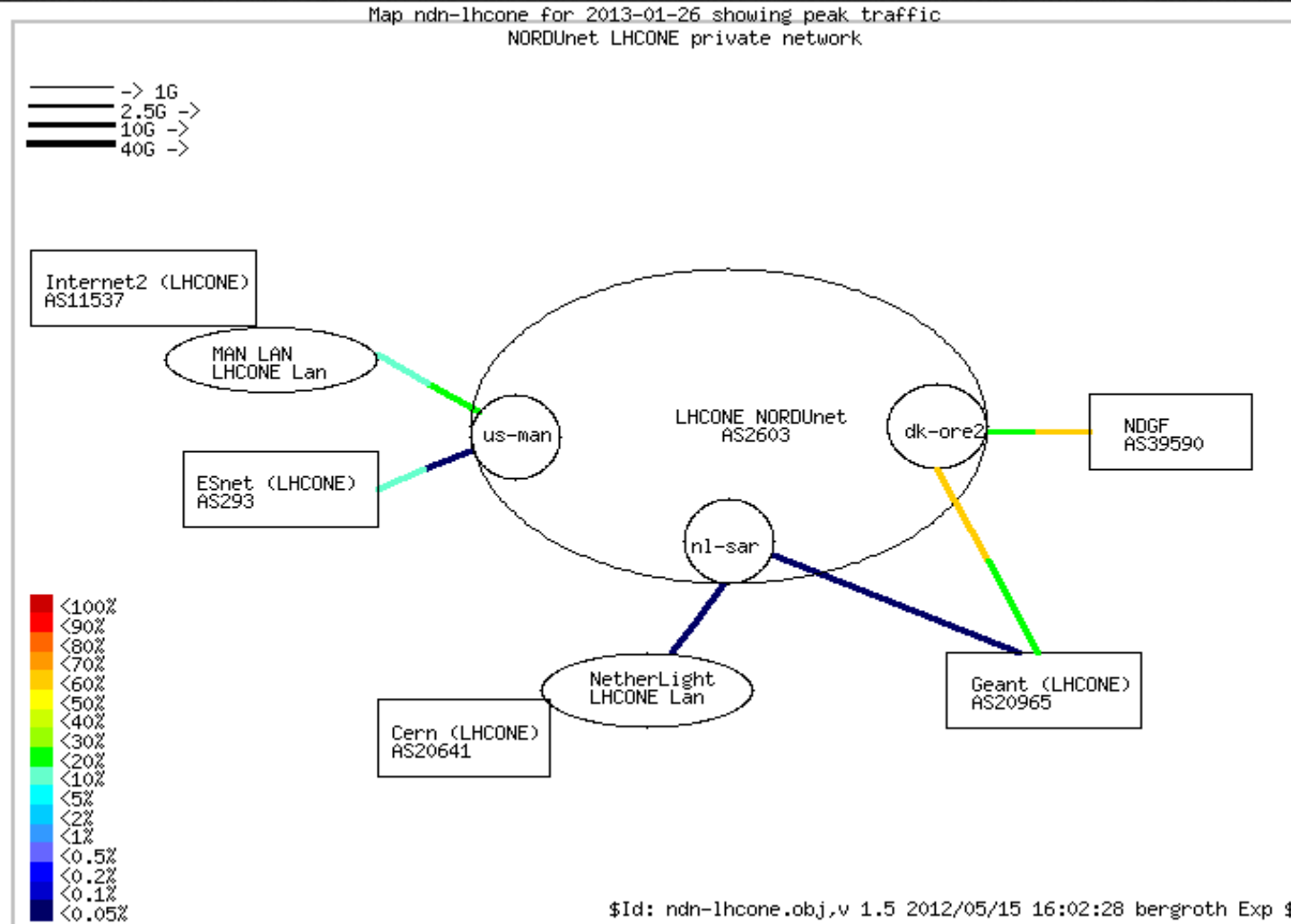
# LHCONE in Europe

## RedIRIS (Spain), CESNet (Czech Republic)



- RedIRIS connects to PIC Spanish T1 and IFAE Spanish T2 site
  - Peering with GEANT expected to be operational again in 3-4 weeks
- Link between CESNet and GEANT physically connected but not operational yet
  - Expected to be live in next few weeks

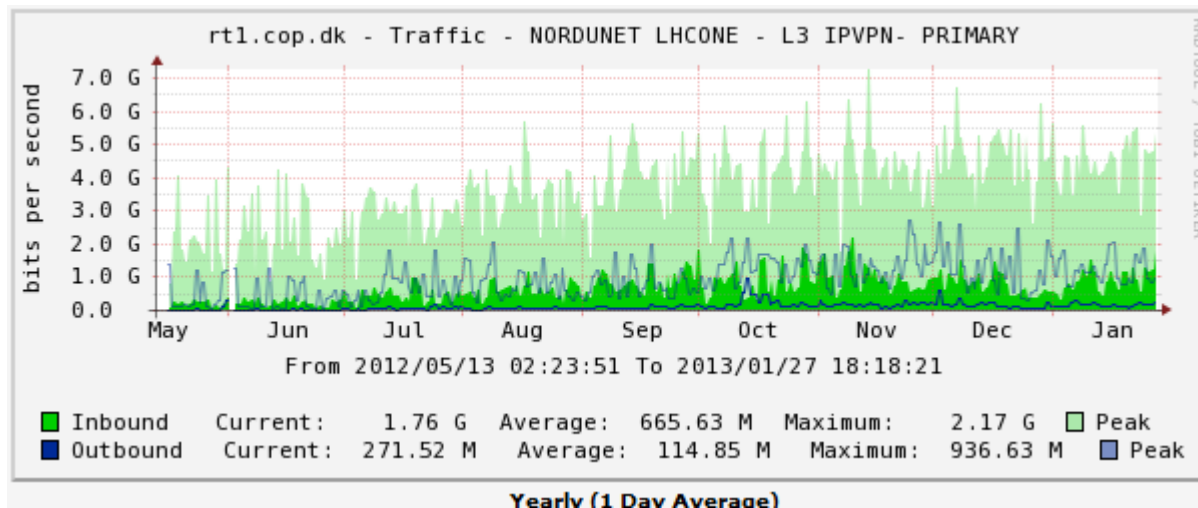
# LHCONE in Europe NORDUNet



# LHCONE in Europe NORDUNet



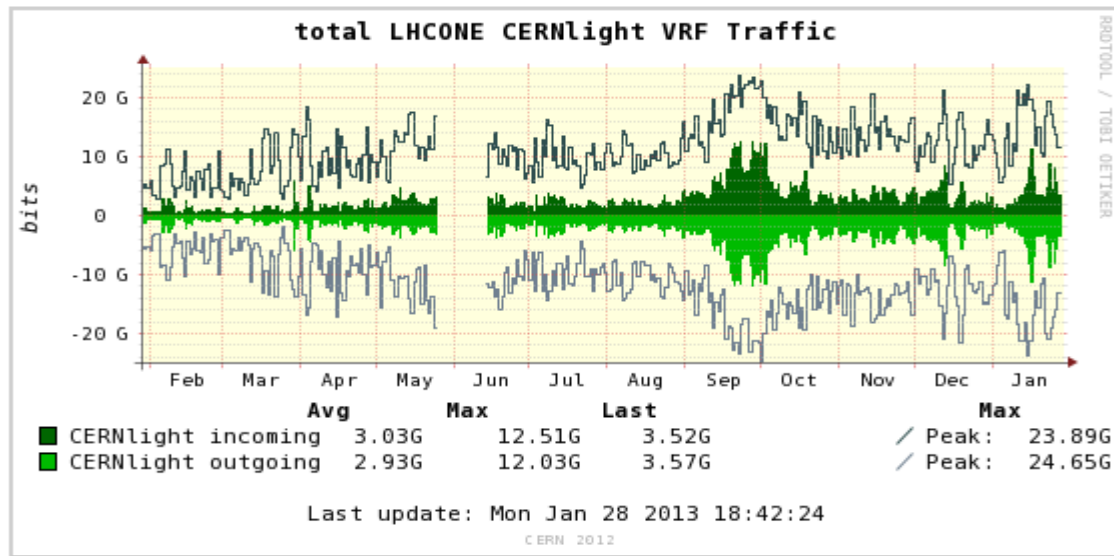
- Configured as VRF on NORDUNet backbone network
- NORDUNet VRF peers with GEANT, CERNLight, ESNet and Internet2 VRF
- Connects one site and plan to connect two more sites this year



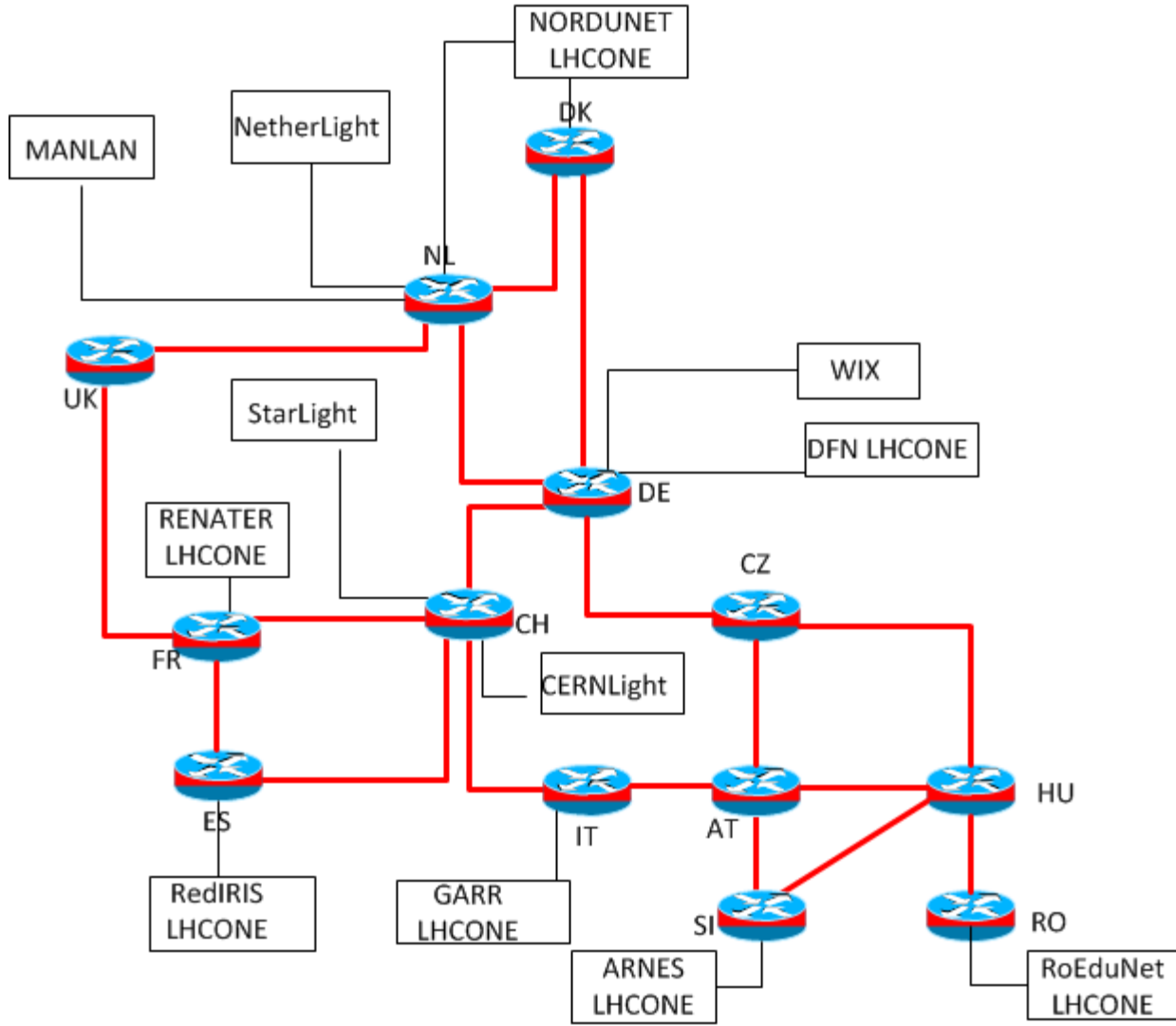
# LHCONE in Europe CERNLight



- Configured as L3VPN VRF on CERN Brocade MLXe
- CERNLight VRF peers with GEANT, NORDUNet, ESNet and Internet2 VRF
- Connects CERN T1 and TIFR (Indian T2)

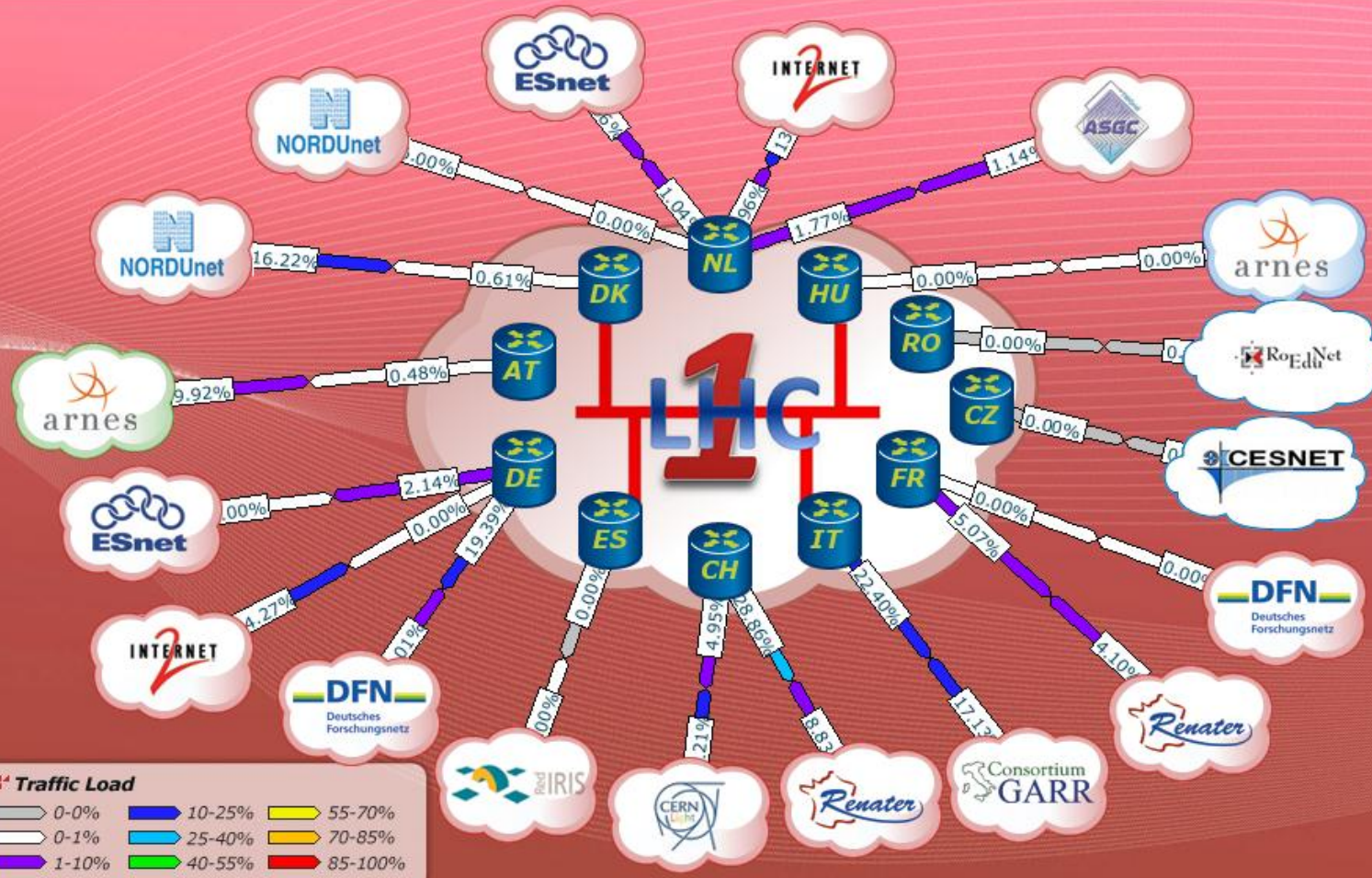


# LHCONE in Europe GEANT





# LHCONE in Europe GEANT

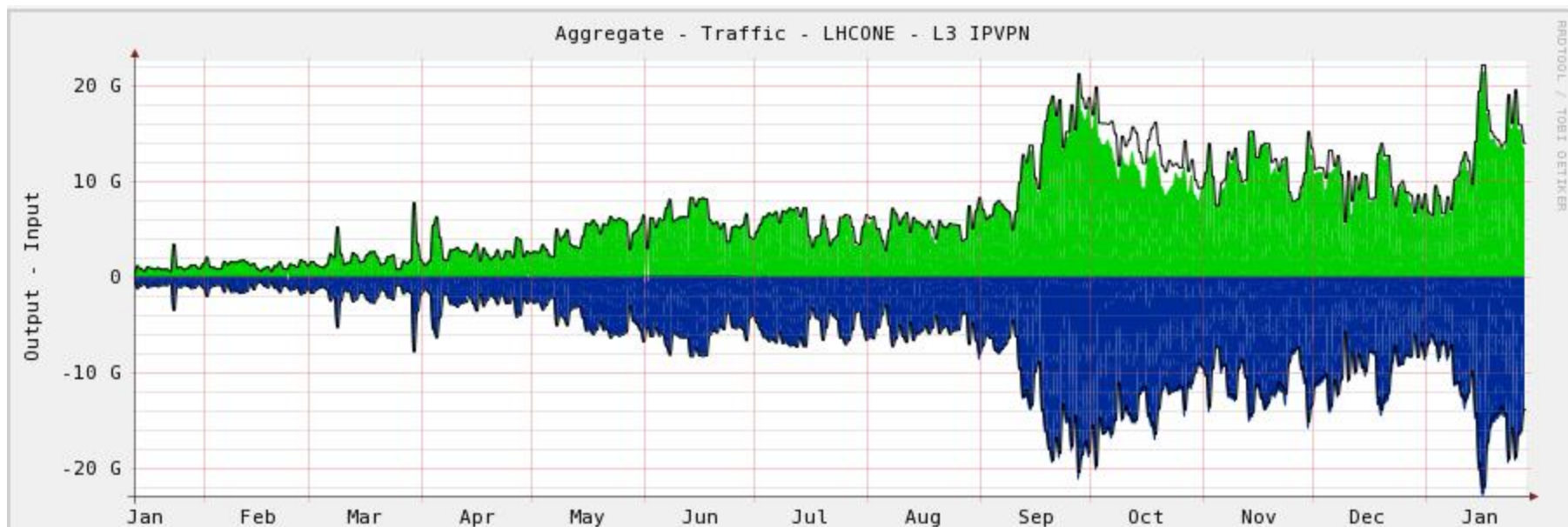


**Traffic Load**

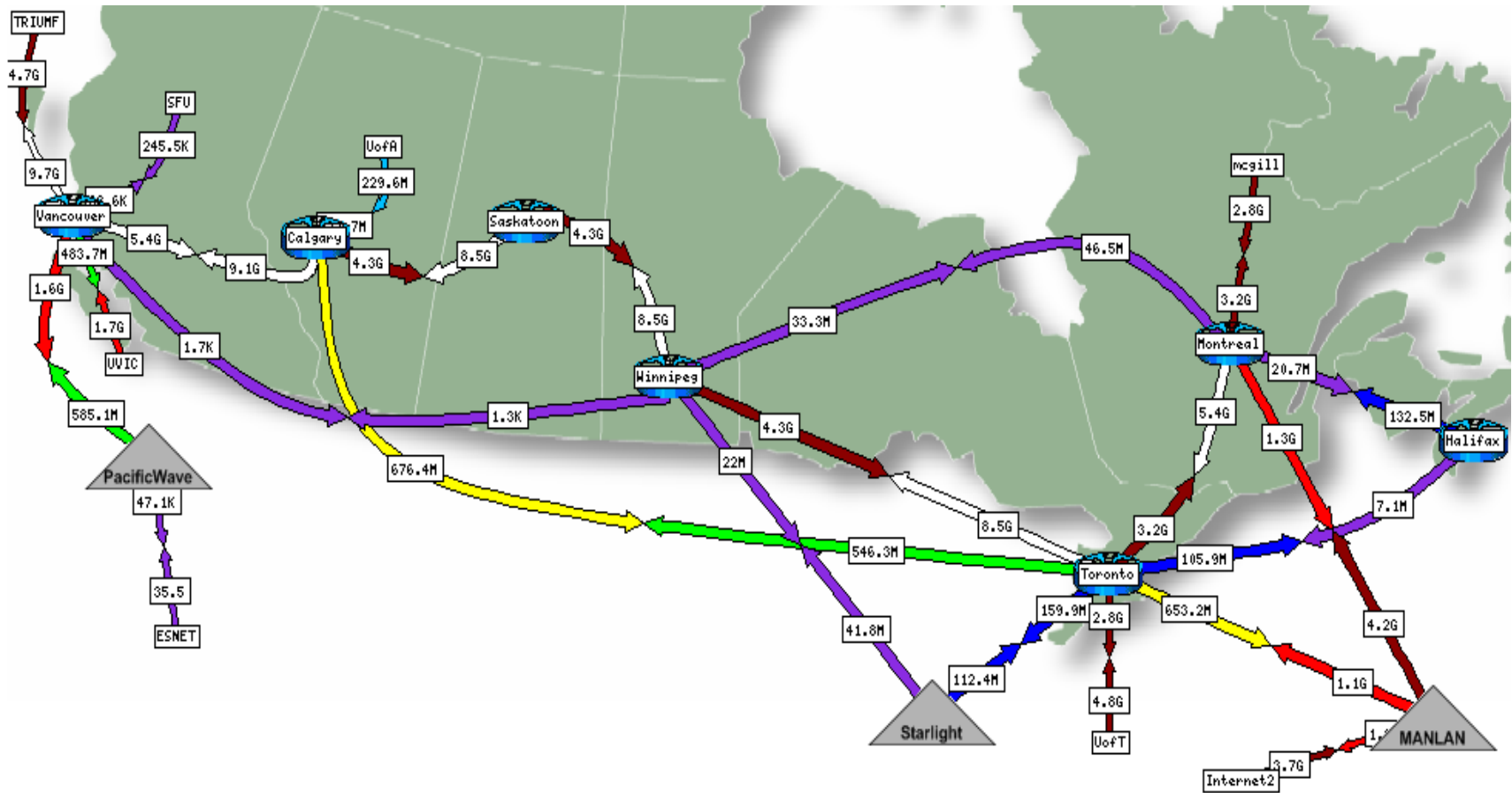
0-0%	10-25%	55-70%
0-1%	25-40%	70-85%
1-10%	40-55%	85-100%

Updated: Jan 28 2013 20:21:23

# LHCONE in Europe GEANT



# LHCONE in North America CANARIE



# LHCONE in North America CANARIE



- Configured as L3VPN VRF and following sites connected:
  - Universities (5) - McGill, UofT, UofA, SFU, UVIC
  - Triumf - Canada's National Laboratory for Particle and Nuclear Physics
- CANARIE LHCONE VRF peers with ESNet and Internet2 LHCONE VRF
- CANARIE is present at StarLight, MANLAN and Pacific Wave
- Aggregate peak traffic in CANARIE LHCONE VRF ~10Gbps

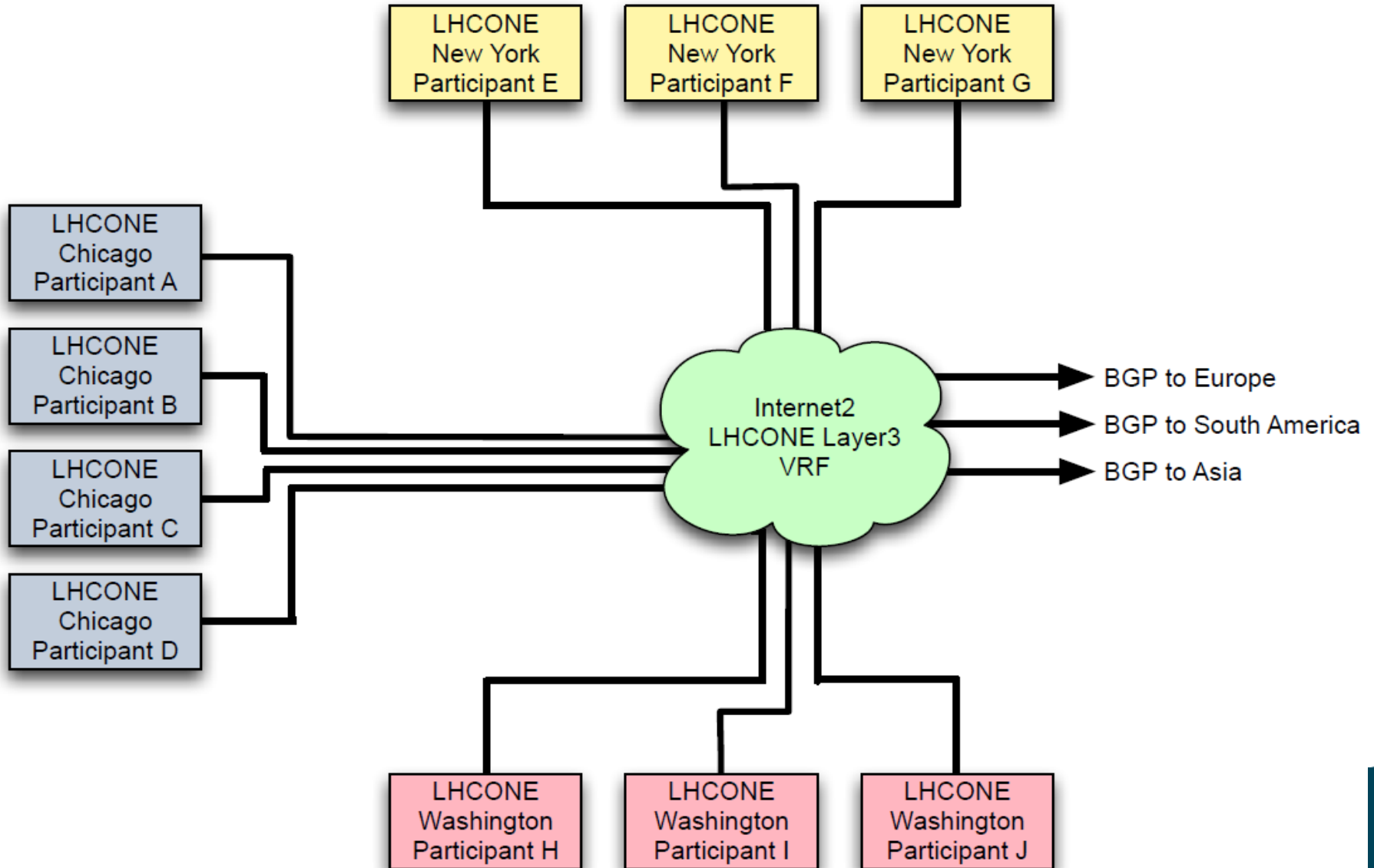
# LHCONE in North America

## ESNet



- Configured as L3VPN VRF and connects following sites:
  - BNL (Atlas T1) FNAL (CMS T1) SLAC (ATLAS T2)
- ESNet LHCONE VRF peers with Internet2, GEANT, NORDUNET 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



# LHCONE in North America

## Internet2



- Configured as L3VPN VRF and connects several sites to LHCONE e.g. MIT
- Internet2 LHCONE VRF peers with ESNNet, GEANT, NORDUNET and CANARIE LHCONE VRF
- Internet2 is present at StarLight, MANLAN, WIX and several other exchange points

- ASGC connected to NetherLight and StarLight and peers with GEANT LHCONE VRF in Amsterdam
- Connects following sites:
  - ASGC-T1+T2: 117.103.96.0/20, 202.169.168.0/22, 202.140.160.0/19
  - ASGC-2: 140.109.102.0/24
  - TWAREN (Tiawan)
  - NCU-T2: 140.115.32.0/24
  - NTU-T2: 140.112.101.0/24, 140.112.102.0/24, 140.112.104.0/24
  - Kyungpook National University Daegu, Korea

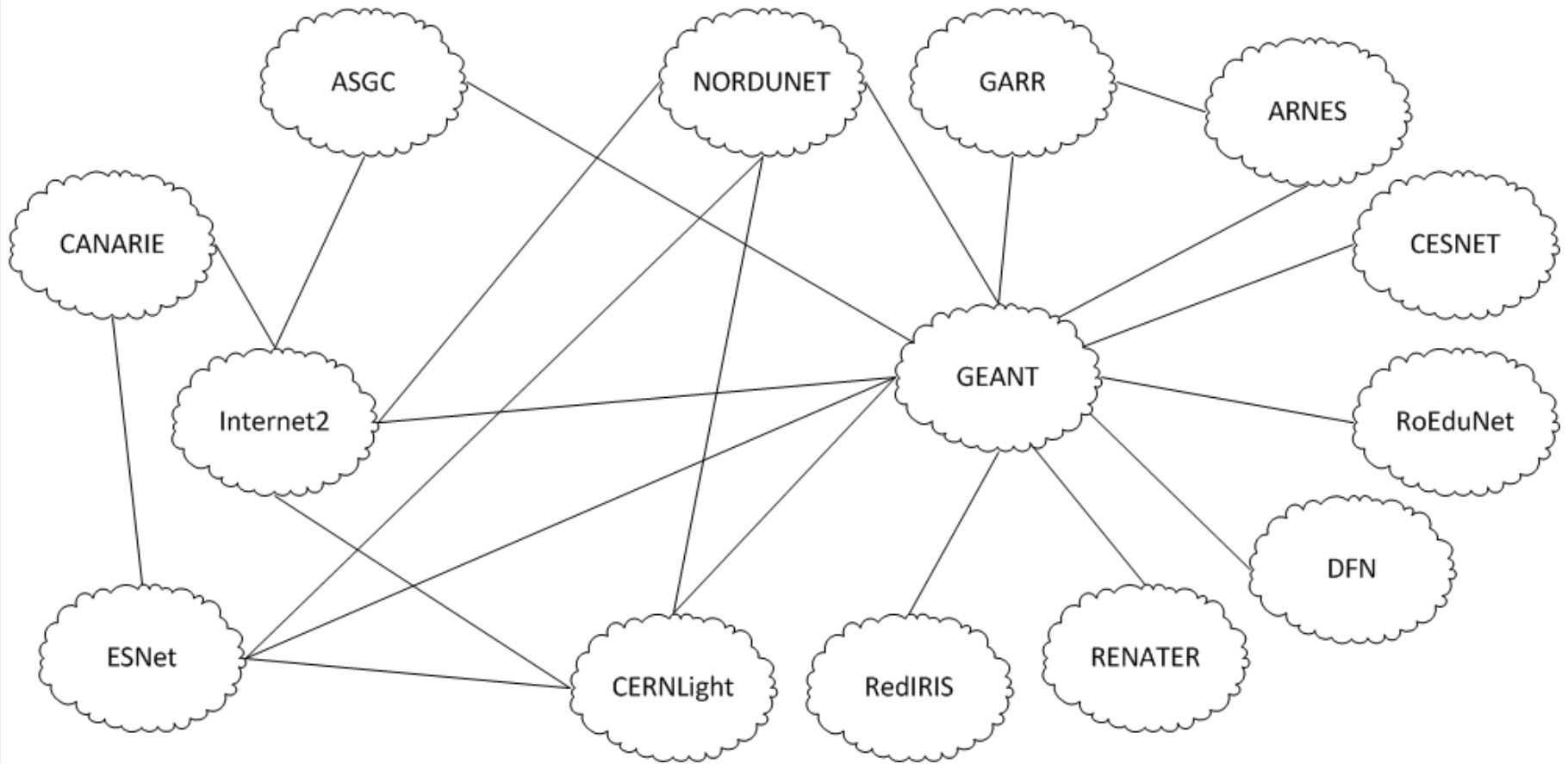


# LHCONE in Open Exchanges



	MANLAN	StarLight	WIX	NetherLight	CERNLight
GEANT	★	★	★	★	★
NORDUnet	★			★	
Internet2	★	★	★		
ESnet	★	★	★		
CANARIE	★	★			
ASGC		★		★	

# LHCONE Logical Topology



- LHCONE backbone supported by
  - Over 15 national and international RENs
  - Several Open Exchange Points including NetherLight, StarLight, MANLAN and several others
  - Trans-Atlantic connectivity provided by ACE, GEANT, NORDUNET and USLHCNET
- Over 40 end sites connected to LHCONE
  - 32+ Tier 2s
  - 8 Tier 1
- Estimated aggregate traffic over 50Gbps

# Questions?

- Questions?