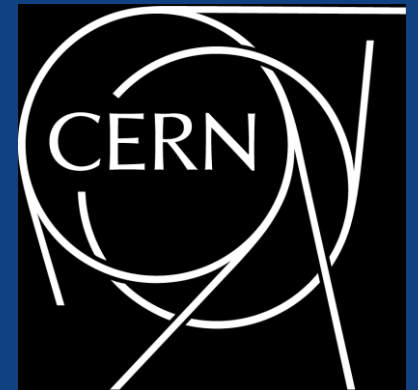


LHCOPN LHCONE update

GLIF meeting - September 2016
Joe Mambretti and Edoardo Martelli



LHCOPN

Latest developments

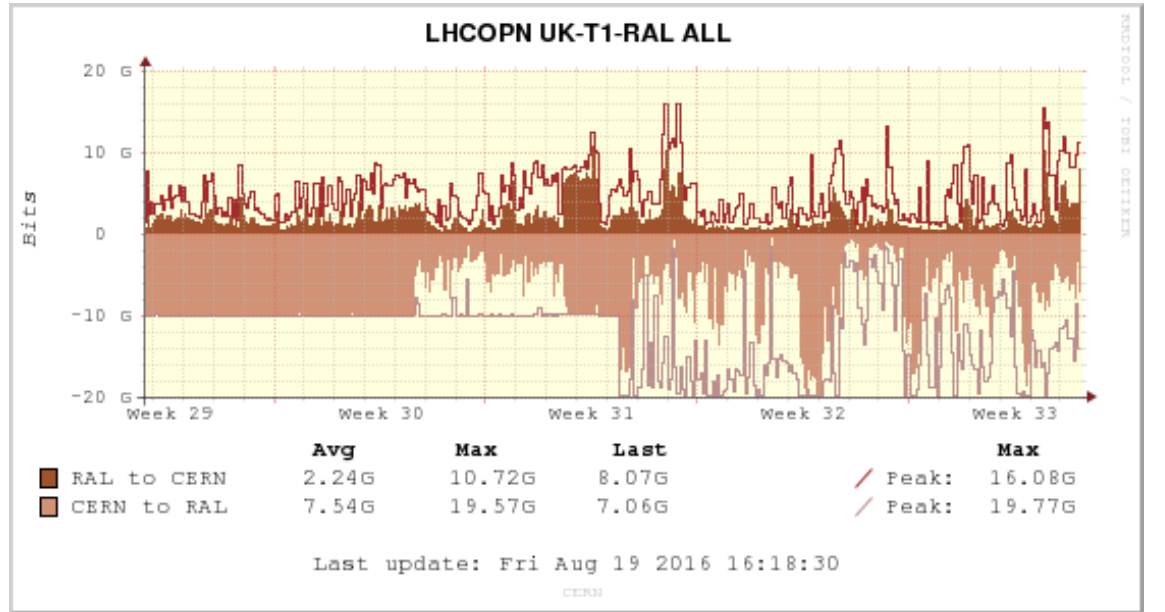
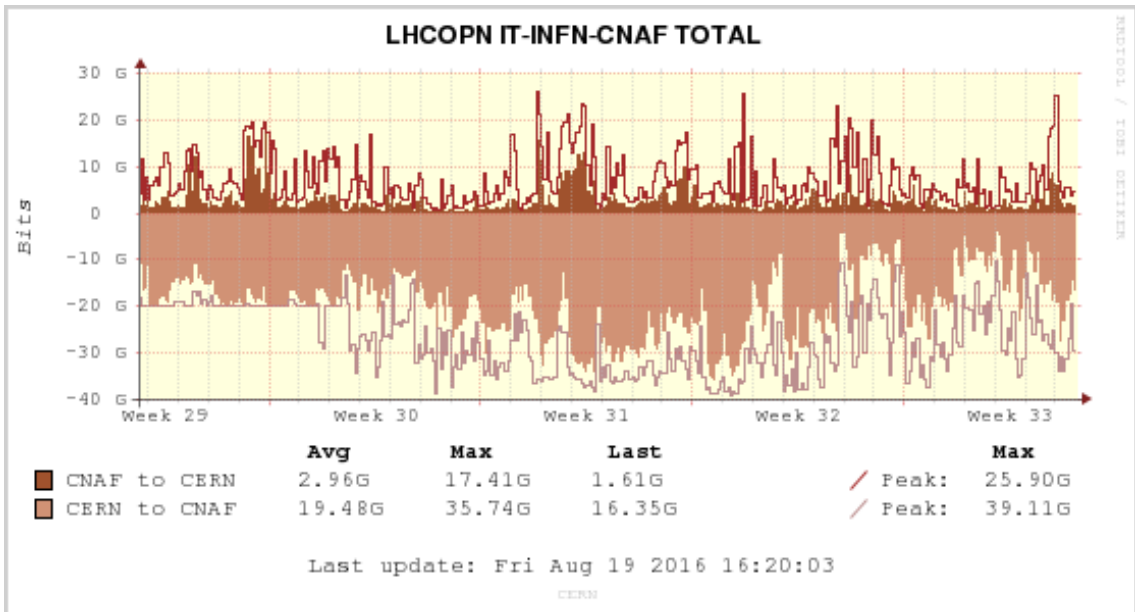
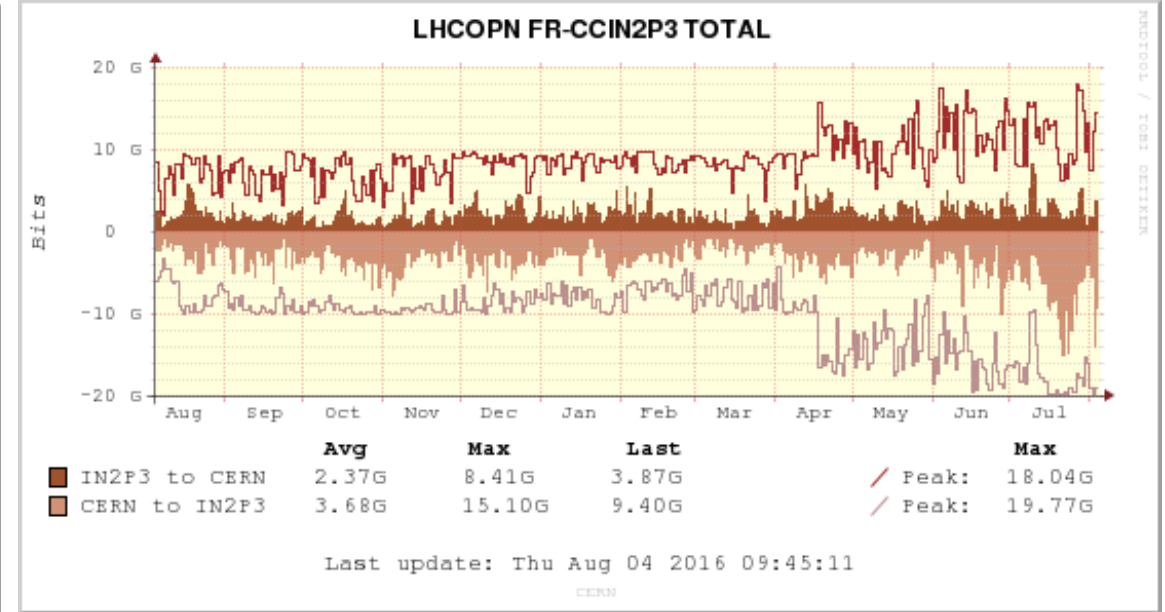
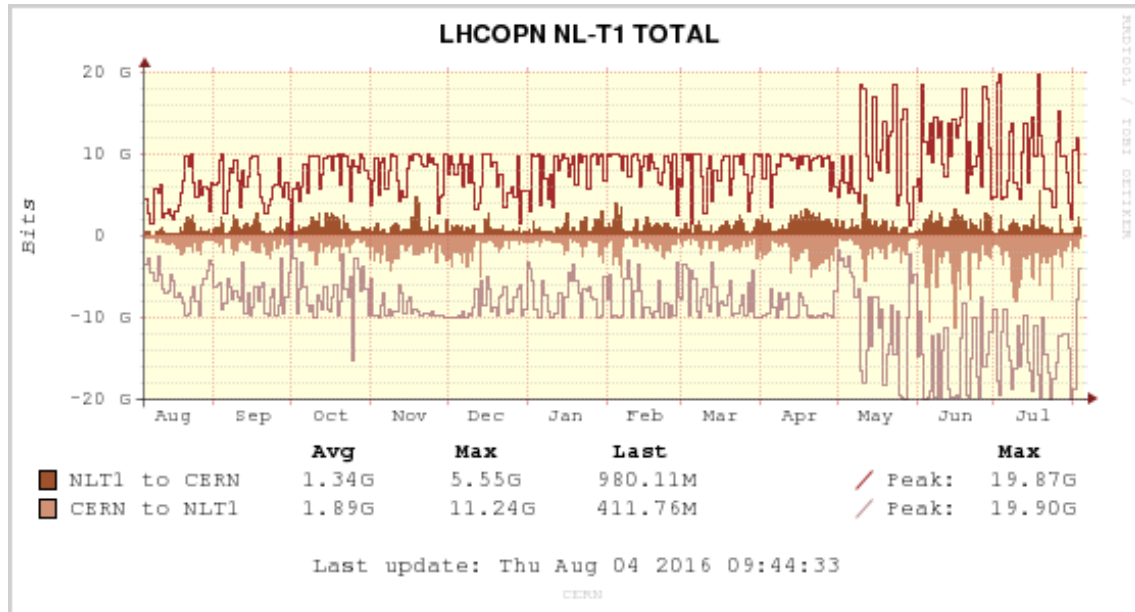
Gearing up IPv6 adoption:

- 9 Tier1s and the Tier0 now have IPv6 connectivity
- dual-stack perfSONAR installed in all of them

5 Tier1s have doubled their link capacity in the last 6 months:

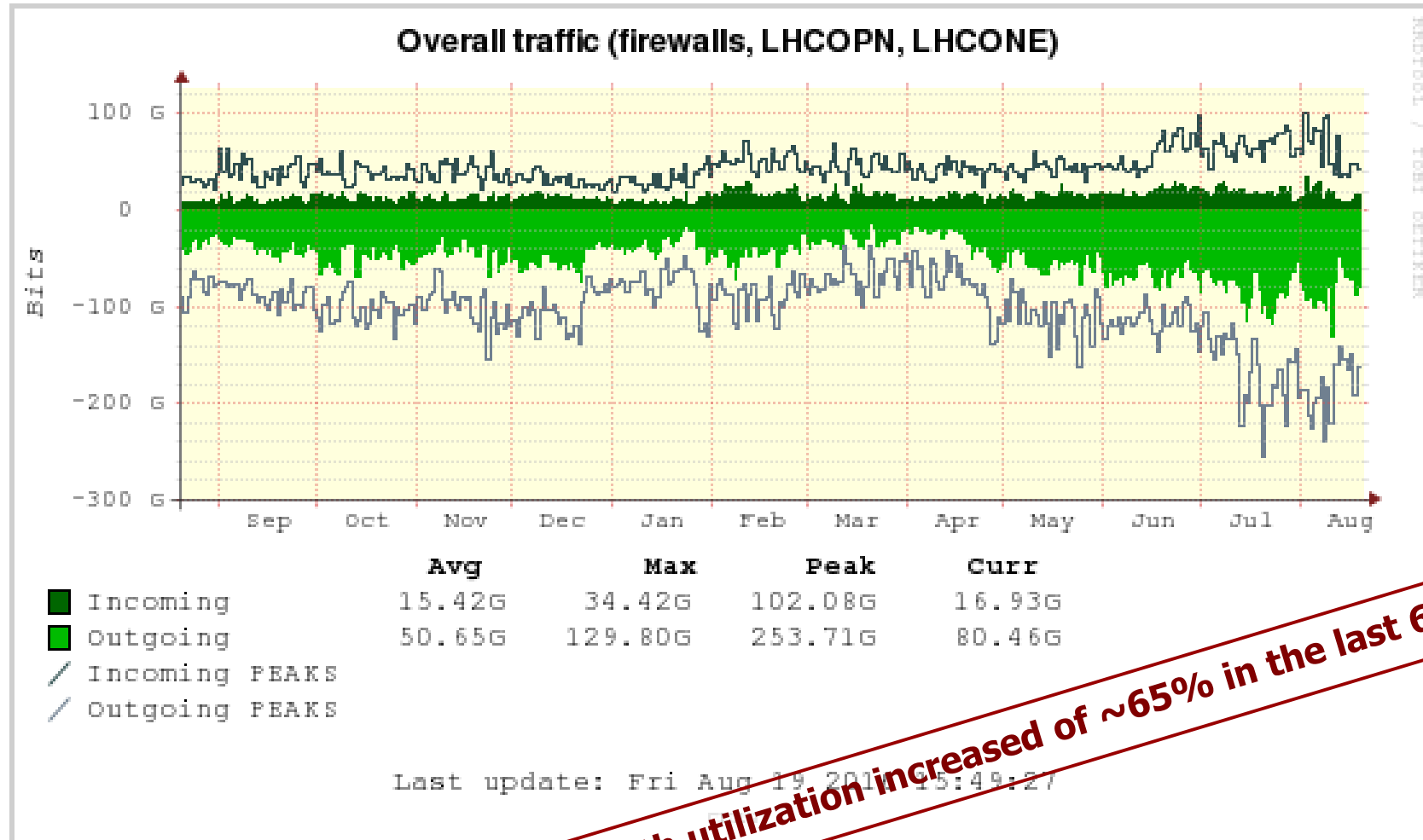
- NL-T1 (2x10G)
- FR-IN2P3 (2x10G)
- NDGF (2x10G)
- IT-INFN-GARR (4x10G)
- UK-T1-RAL (2x10G, load balancing on existing backup link)

Doubled links utilization

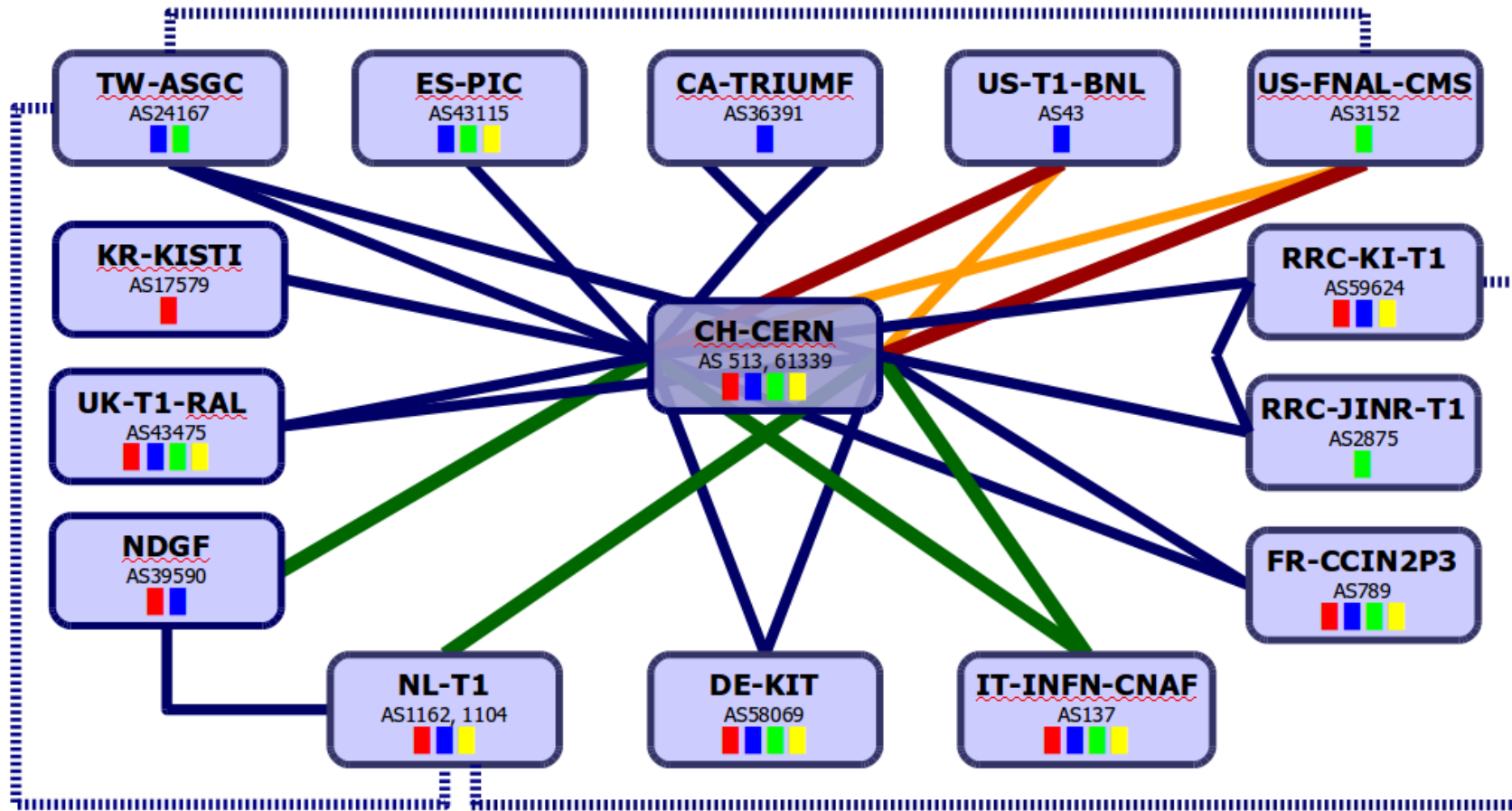


CERN LHCOPN + LHCONE traffic

last 12 months



Current topology



— T0-T1 and T1-T1 traffic
⋯ T1-T1 traffic only
■ = Alice ■ = Atlas ■ = CMS ■ = LHCb
 edoardo.martelli@cern.ch 20160912

LHCONE

LHCONE L3VPN service

The LHCONE network is expanding

- Ukrain and Belgium now connected to LHCONE via GÉANT
- South America is now a stable partner, Chile is interested to join
- Small amount of traffic now being exchange with TEIN (Asia)

Traffic within LHCONE is steadily growing

- GÉANT has seen peaks of over 100Gbps
- Growth of over 65% from Q2 2015 to Q2 2016

Some NRENs and sites need to upgrade their connection

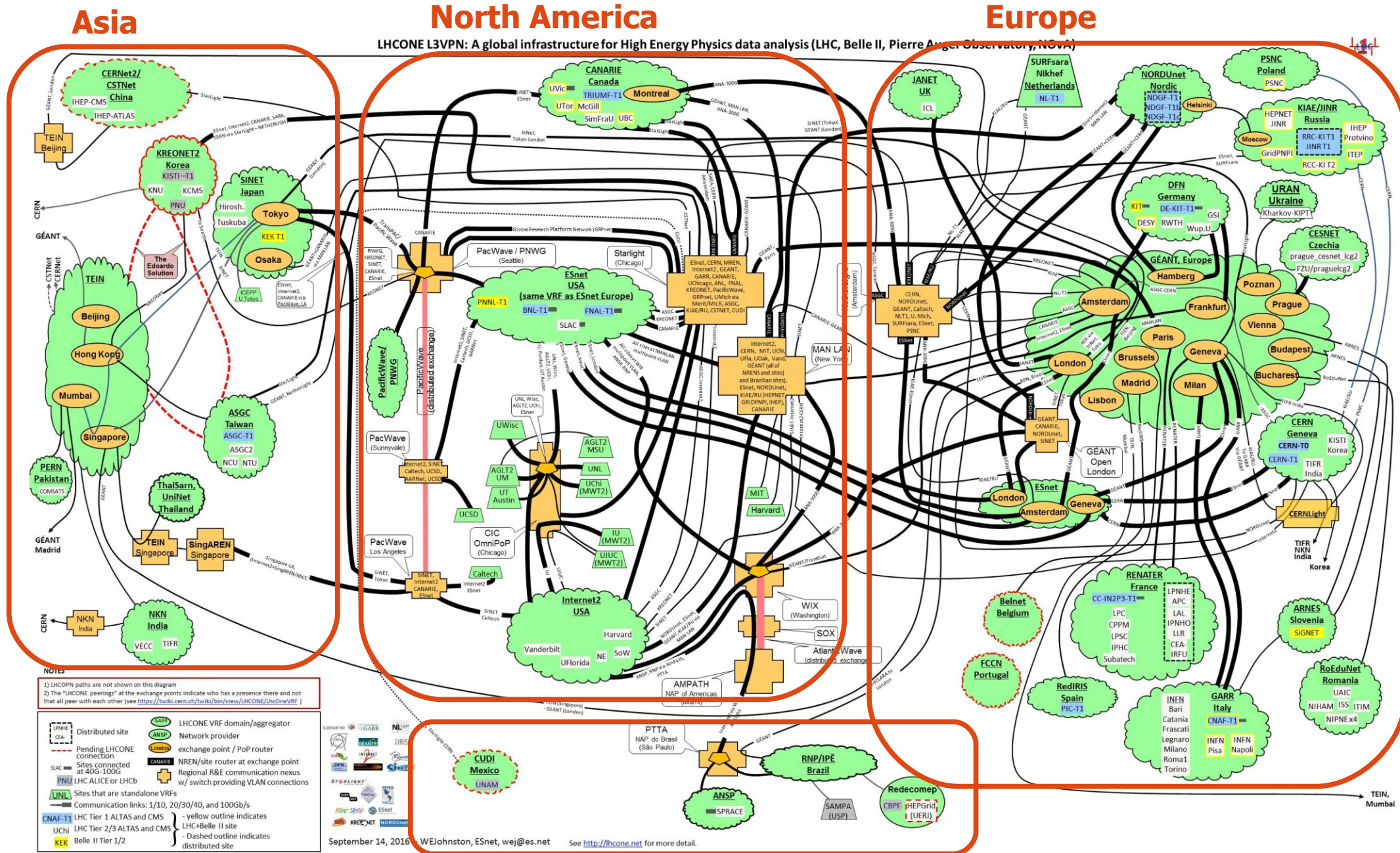
- GÉANT is already working with the NRENs for the upgrades

Expected to see further increases after the upgrades

Full report: https://indico.cern.ch/event/527372/contributions/2158737/attachments/1338766/2015140/LHCONE_L3VPN_Update.pptx

Current topology

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



LHCONE Point-to-Point service

Demonstrated routing over dynamic circuits using BGP Router Servers

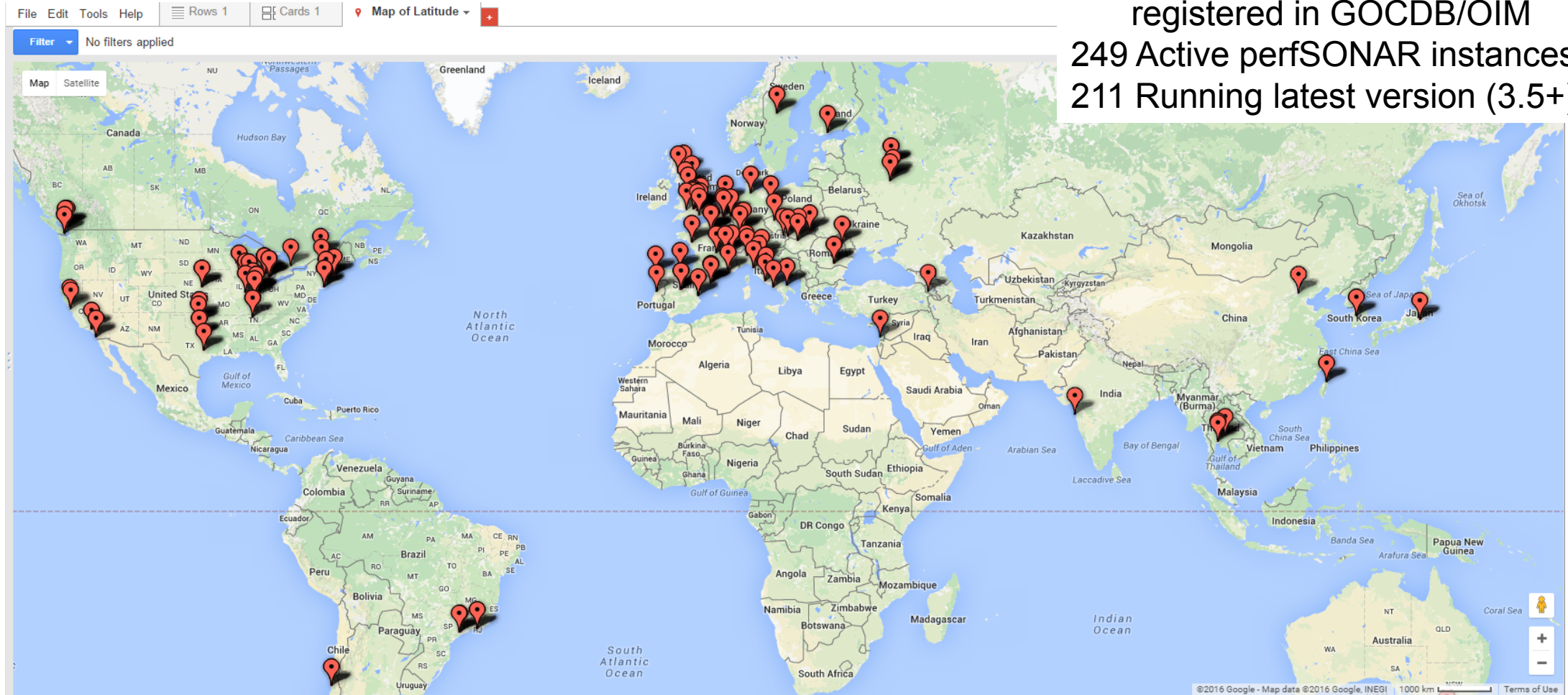
Demonstrated dynamic circuit provisioning using AutoGOLE fabric and NSI [*Network Service Interface protocol*]

Demonstrated high speed data transfer (100G from a single disk server) using DTNs [*high performance Data Transfer Node*]

Looking for contact people in the LHC Experiments to progress with application interfaces

perfSONAR update

278 perfSONAR instances
registered in GOCDB/OIM
249 Active perfSONAR instances
211 Running latest version (3.5+)



<https://www.google.com/fusiontables/DataSource?docid=1QT4r17HEufkvnqhJu24nIptZ66XauYEIBWWh5Kpa#map:id=3>

perfSONAR update

Mesh have been reconfigured/optimized. There are now experiment specific meshes: ATLAS, CMS and LHCb which allow daily bandwidth tests (vs 4-day)

All the LHCOPN and LHCONE data is available in ElasticSearch via OSG (ongoing)

Generally slight improvements noted in the network quality in LHCOPN and LHCONE

New release of perfSONAR coming later this fall (v4.0). Focus is on control and stability. New MaDDash part of this release.

Full report: https://indico.cern.ch/event/527372/contributions/2210680/attachments/1338706/2015183/LHCONE_perfSONAR_update-Helsinki-2016.pptx

New collaborations joining LHCONE

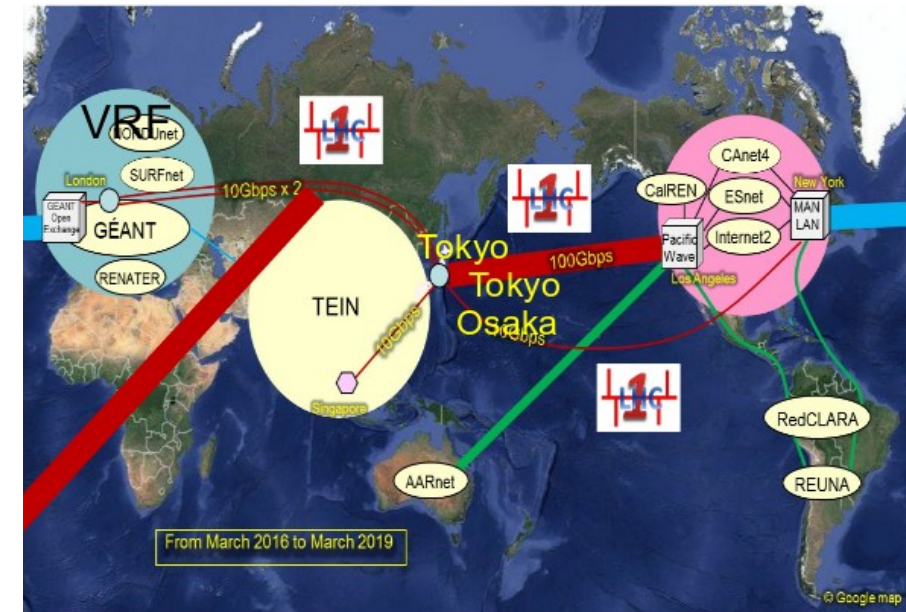
BelleII update



SINET (Japanese NREN) has implemented the LHCONE VRF and connected KEK

Network updates on other Sites will contribute to the general performance improvement.

Very preliminary tests after full LHCONE configuration at KEK and after the setup of the new KEKCC, show very interesting performance improvements.



NOvA Neutrino experiment



The NovA experiment requested to join LHCONE at the previous LHCONE meeting

NOvA was then approved to use LHCONE and added to the AUP

No traffic into LHCONE so far, but:

- FZU negotiating with CESnet on increasing LHCONE b/w
- FNAL completed data center modifications to accommodate NOvA traffic on LHCON

XENON request to join LHCONE

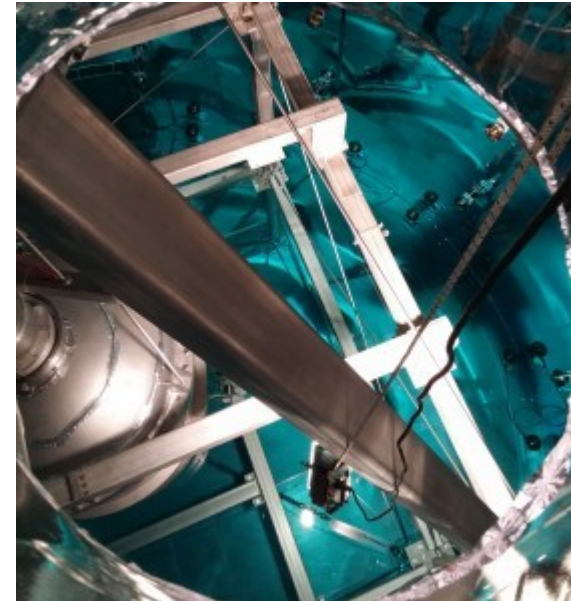


XENON1T: Dark matter search experiment at LNGS (Gran Sasso National Laboratory)

Commissioning started in Spring 2016. Now taking data

21 sites involved. Several of them already in LHCONE

Sent formal request to join LHCONE. Being evaluated.



Commercial Cloud Services

Connectivity for Commercial Clouds

CERN and other academic institutes have been evaluating the use of Commercial Cloud Services

Research and Education Networks (REN) are evaluating how to connect Cloud Service Providers (CSP) to their customers

Main issues:

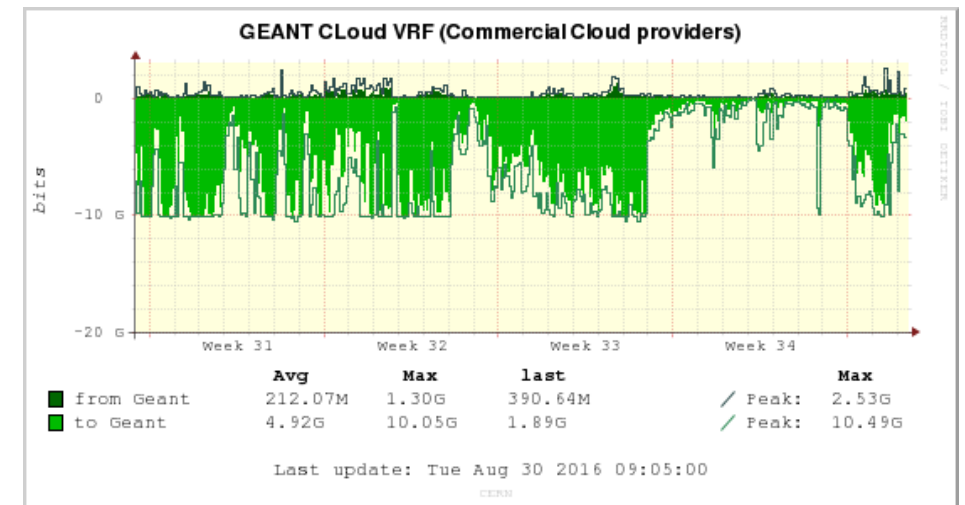
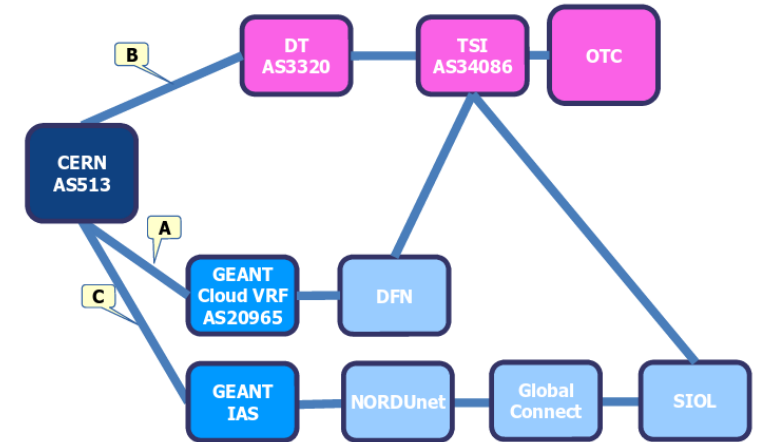
- deliver traffic from cloud datacentres to different continents
- avoid or not cloud-to-cloud traffic
- not all the RENs allow commercial traffic

CERN experiences with CSPs

CERN has recently evaluated IBM Softlayer at T-Systems cloud services

Softlater was already peering with GEANT in Frankfurt and provided good network Performance

T-Systems was asked to connect to the GEANT Cloud VRF and that has guaranteed 10Gbps of bandwidth



Full report:

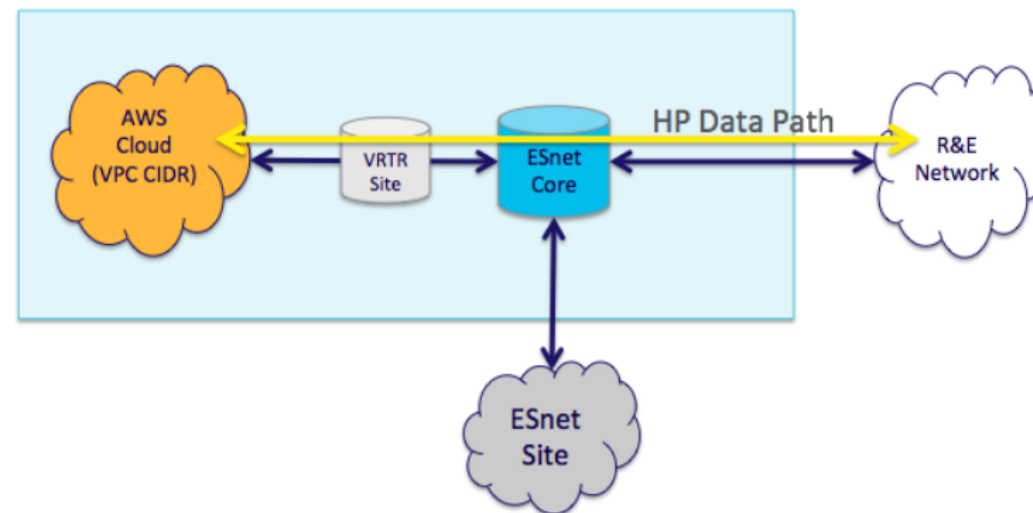
<https://indico.cern.ch/event/527372/contributions/2236895/subcontributions/202031/attachments/1338699/2015047/20160919-Helsinki-CERN-Cloud-services.pdf>

ESnet and FNAL experiences with AWS

ESnet and FNAL evaluated Amazon Web Services

The Cloud machines were made reachable through a tunnel to a virtual router provided by ESnet, to optimize network efficiency

Virtual Site Router at AWS Exchange Point

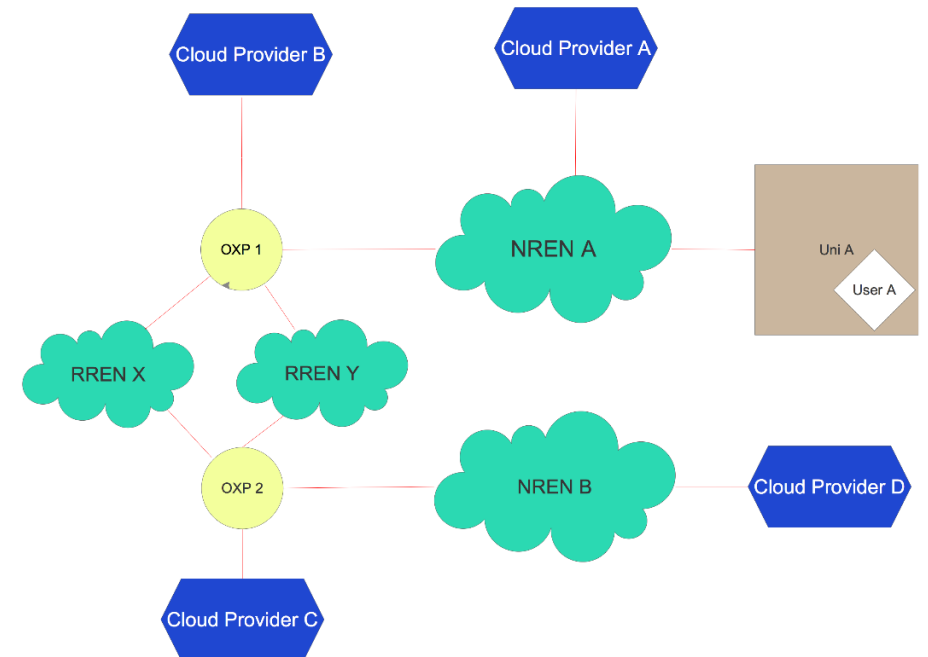


Full report: <https://indico.cern.ch/event/527372/contributions/2236895/subcontributions/202057/attachments/1338769/2015144/AWSandCloud-2.2.pdf>

Best practices for CSP connectivity

NORDUnet presented a document which suggest a way of connecting CSPs and their customers by using Open Exchange Points and connectivity provided by the REN

The document aims to simplify the procurement of the connectivity to CSPs



Full presentation: https://indico.cern.ch/event/527372/contributions/2236895/subcontributions/206270/attachments/1334884/2015982/Cloud_Connectivity_Best_Practice_19-2016.pptx

Document:

https://indico.cern.ch/event/527372/contributions/2236895/subcontributions/206270/attachments/1334884/2007495/Best_Practices_Cloud_Providers_and_OXPs_v2.0.pdf

Network connectivity options for CSPs

CERN IT-CS is writing a document which compare the different connectivity options proposed by the RENs

The document was presented asking for comments and reviews

Data-Intensive Cloud Service Provision for Research Institutes: the Network Connectivity Problem

CERN, August 2016

Tony Cass & Edoardo Martelli

Draft for Review

1 Abstract

Much effort (and money) has been invested to ensure that academic and research sites are well interconnected with high-capacity networks that, in most cases, span national and continental boundaries. In the last years, these academic and research sites have started using commercial cloud services, which may not be able or allowed to benefit of the high speed network infrastructure put in place by the research and education network operators (RENs).

After a brief summary of the issues involved, we describe three approaches to removing the network connectivity barrier that threatens to limit the ability of academic and research institutions to profit effectively from services offered by Cloud Service Providers (CSPs).

2 Problem statement

The growth of data-intensive science over the past 10-15 years has gone hand-in-hand with a growth in the exploitation of remotely located computing resources, initially as a sharing of publically funded, dedicated resources (the "Grid" model) and more recently through the growing use for scientific purposes of commercially provided resources (the "Cloud" model).

In some cases, for example searching for a match in a genome database, the volume of data exchanged between a client and the remote resource may be relatively small. In others, however, effective exploitation of remote computing resources requires high-speed transfer of high volumes of data. The computing needs of the experiments at CERN's Large Hadron Collider are perhaps the best-known example of this latter class of data-intensive computing and it is noteworthy that much effort has been devoted to the provision and management of high-bandwidth network connections between the

Document <https://indico.cern.ch/event/527372/contributions/2236895/subcontributions/208050/attachments/1338702/2015050/connectivity-options-for-clouds-draft.pdf>

Conclusion

Summary

Traffic on LHCOPN and LHCONE steadily increasing due to LHC very good performance

LHCONE has attracted other Particle Physics collaborations. Other sciences may need a similar network

Growing interest in external cloud services, but connectivity to them still not straightforward

Upcoming meetings

2nd Asia Tier Center Forum

30 Nov 2016 → 2 Dec 2016

Nakhon Ratchasima, Thailand

<https://indico.cern.ch/event/558754/>

WLCG pre-GDB meeting on networking

10th January 2017

<https://indico.cern.ch/category/6890/>

Next LHCOPN/ONE meeting

Date TBD: End of March/Beginning of April 2017

Location: BNL New York

Questions?

