LHCOPN-LHCONE meeting Taipei 13-14 of March 2016
- *Summary Report -*

GDB, 13th of April 2016
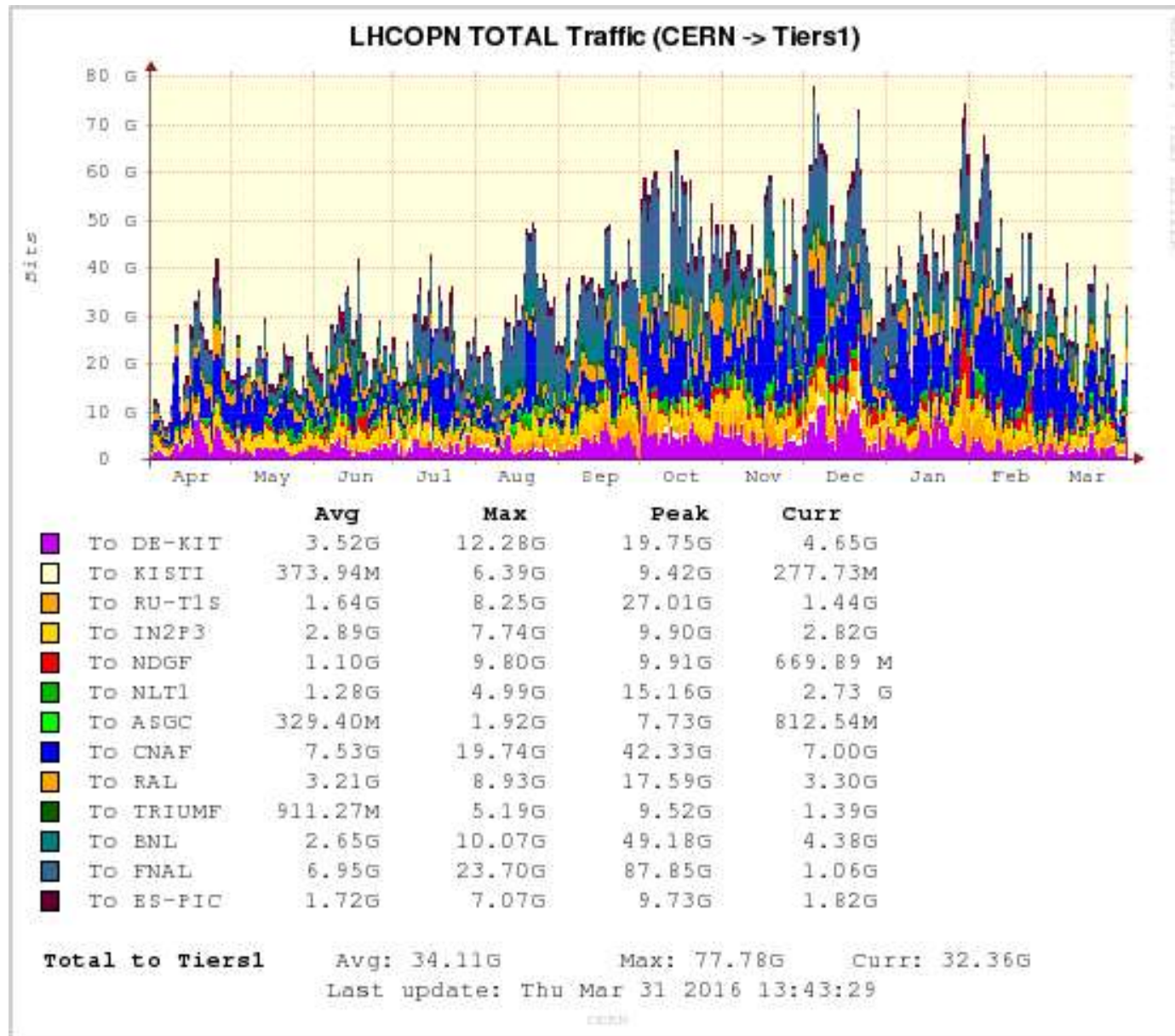edoardo.martelli@cern.ch
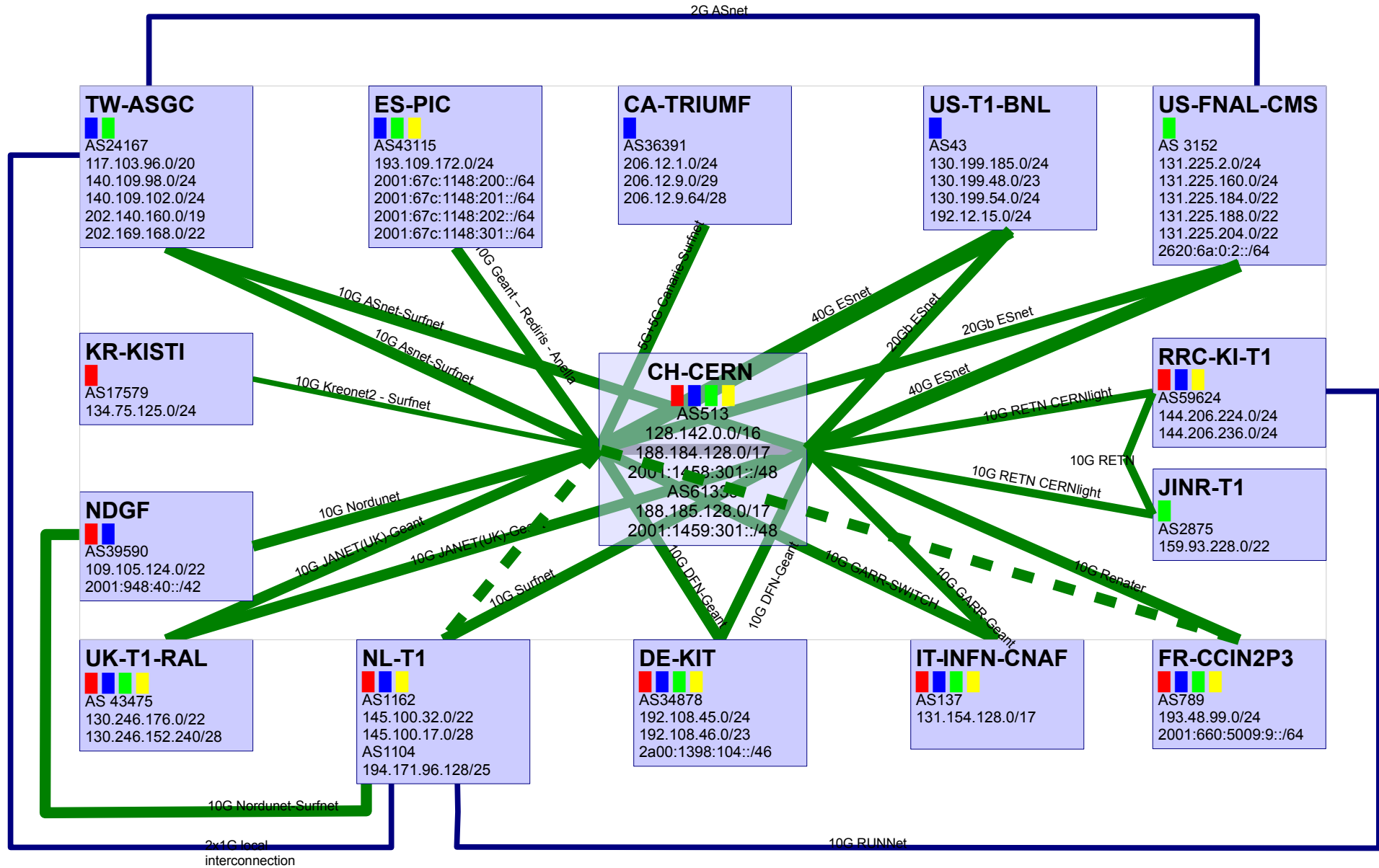
LHC♦PN

LHCOPN

LHCOPN

- Stable situation

- Traffic volume constantly growing during Run2

- CH-CERN didn't reduce the size of its LHCOPN prefixes
   eventually

- NL-T1, FR-CCIN2P3 and UK-T1-RAL are in the process of
   adding additional 10G links to CERN

- No major progresses on IPv6 deployment

LHCOPN traffic volume

LHCOPN TOTAL Traffic (CERN -> Tiers1)

		Avg	Max	Peak	Curr
🟪	To DE-KIT	3.52G	12.28G	19.75G	4.65G
⬜	To KISTI	373.94M	6.39G	9.42G	277.73M
🟧	To RU-T1S	1.64G	8.25G	27.01G	1.44G
🟨	To IN2P3	2.89G	7.74G	9.90G	2.82G
🟥	To NDGF	1.10G	9.80G	9.91G	669.89 M
🟩	To NLT1	1.28G	4.99G	15.16G	2.73 G
🟩	To ASGC	329.40M	1.92G	7.73G	812.54M
🟦	To CNAF	7.53G	19.74G	42.33G	7.00G
🟧	To RAL	3.21G	8.93G	17.59G	3.30G
🟩	To TRIUMF	911.27M	5.19G	9.52G	1.39G
🟦	To BNL	2.65G	10.07G	49.18G	4.38G
🟦	To FNAL	6.95G	23.70G	87.85G	1.06G
🟥	To ES-PIC	1.72G	7.07G	9.73G	1.82G

Total to Tiers1   Avg: 34.11G   Max: 77.78G   Curr: 32.36G

Last update: Thu Mar 31 2016 13:43:29

Current topology

LHCONE

LHCONE L3VPN service

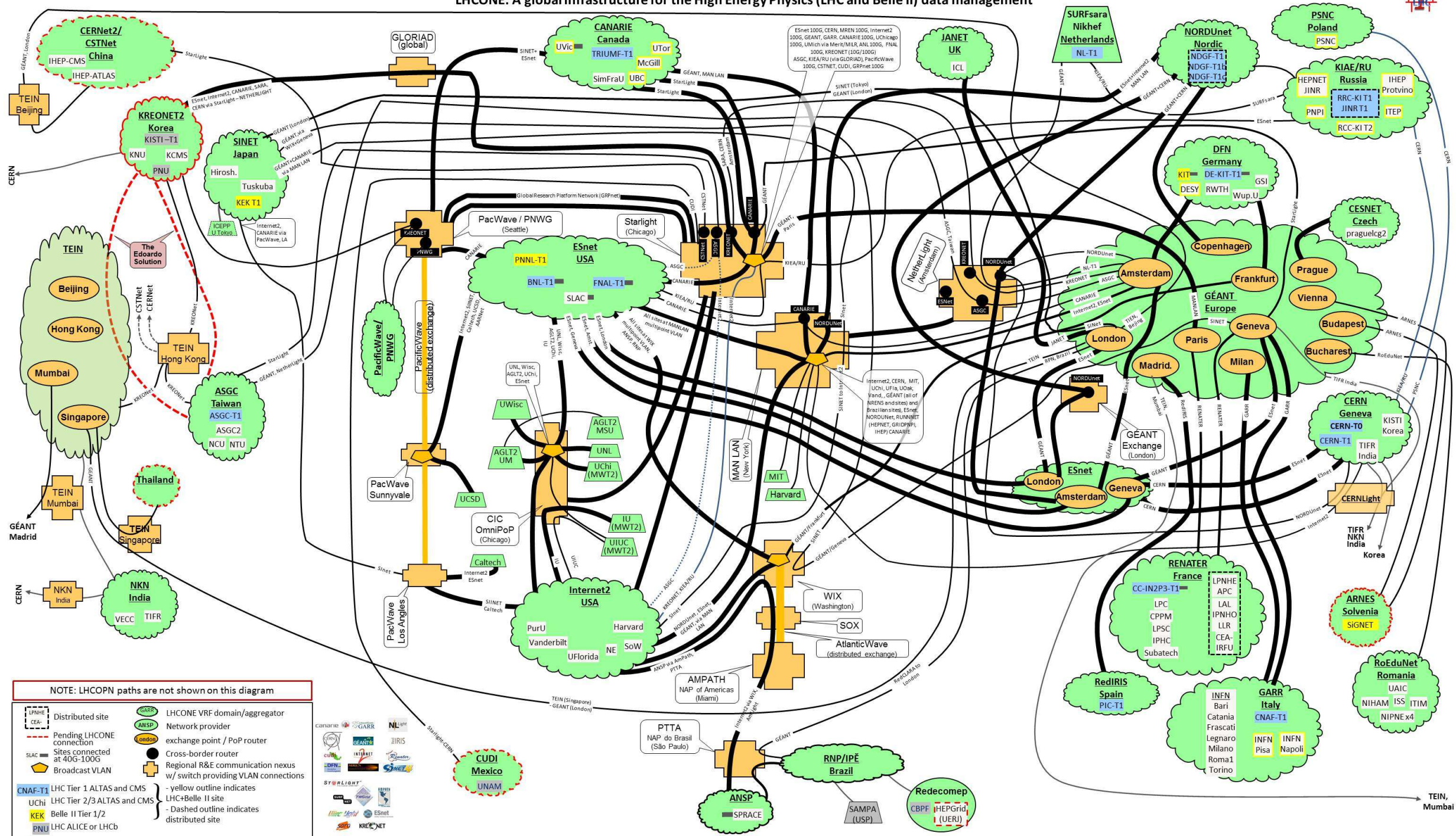The LHCONE L3VPN is expanding:
- Brazil is now a stable partner, Chile is interested to join
- Also growing in Asia: SINET (JP), ASGC (TW) already present, TEIN
   is ready to start
- Belgium and Portugal are working to join in Europe
- Russia and Poland have connected their VRFs
- First contacts with South Africa

Traffic within LHCONE is steadily growing:
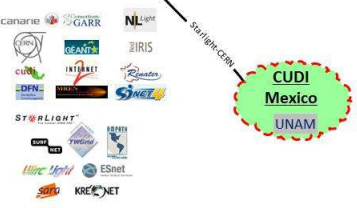- Some NRENs and sites need to upgrade their connection

ESnet has produced tools to analyze the LHCONE routing table

LHCONE: A global infrastructure for the High Energy Physics (LHC and Belle II) data management

March 2016 — WEJohnston, ESnet, wej@es.net

See http://lhcone.net for more detail.

LHCONE Point-to-Point service

Working on demonstrating a working implementation/solution of the LHCONE Point2Point service

Two different approaches realized:
- OpenFlow-based solution by Caltech
- BGP-based solution by SURFnet and NORDUnet. SURFnet demonstrated an implementation with AutoGOLE. NORDUnet demonstrated the use of circuit-aware Route Servers.

ATLAS is pursuing the use of SDN and OpenVSwitches to improve the ability of the LHC experiments to manage, utilize, and optimize the global infrastructure. Looking for site interested in participating in the effort

Network Providers update

- 693 Pbytes of unique data per year, peak of over 300Gbps on busy days, average of 180Gbps. LHCONE traffic accounts for almost 1/3 of the overall IP average traffic

- Extending Asian connectivity: TEIN (Asia), ORIENT+ (CN), SINET5 (JP), TIFR and NKN (IN)

- Collaborations with: HELIOS, BelleII, EUMETSAT

- Future collaborations: SmartFIRE (Interconnections of network tetsbeds), JAXA-ESOC joint mission control, InfiniCortex (InfiniBand on the WAN)

- 39,3 PB transferred per month

- Planning for ESnet6 upgrade in 2018

- Testing high speed connection to AWS (Amazon cloud)

Enlarging service portfolio:
- video
- e-learning
- cloud solutions

Projects:
- Danish Weather Service

LHCONE
- moved connection to GEANT from Copenhagen to London on 100G
- connections to Esnet and Internet2 at MANLN over ANA-200G

Serving a very densely populated region

Connecting a very diverse region: links to countries varies from few Mbps to 10Gbps

Research, Education and Societal Benefits:
Agriculture, Earth Systems and Sensing, Culture and Arts, Astronomy, HEP, Bioinformatics, Medicine, Education, Disaster Management (natural, medical, etc.), …
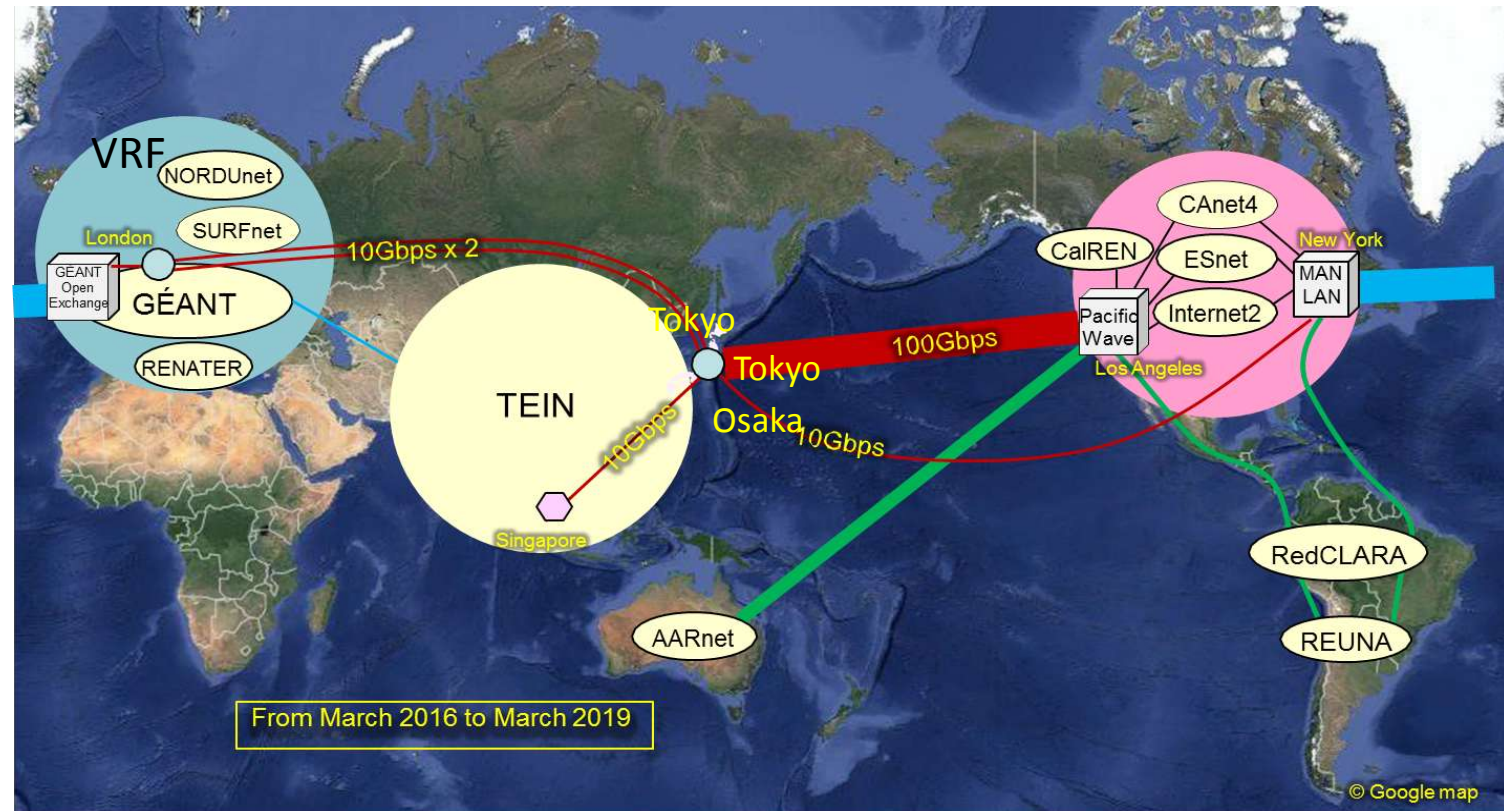
Not present due to ongoing upgrades

LHCONE VRF implemented. Peering with GEANT VRF

Soon peering with KISTI (KR) and ASGC (TW) in Hong Kong

Most of the backbone links being upgraded to 10Gbps

- Transitioning from SINET4 to SINET5
- LHCONE VRF for KEK and ICEPP part of SINET5 implementation

Asian Sites update

Belle II

Accelerator / Detector
- phase1 detector (BEAST2) was installed and new data is coming
- First beam turn achieved

Computing
- started distributed computing operations
- entire KEK datacentre will be replaced in the summer

Network
- Waiting for the upgrade of SINET5 and implementation of LHCONE
- LHCONE necessary to fullfill KEK-PNNL network requirements

100% reliability in the last 6 months

KREOnet has already started the implementation of LHCONE

The connection with TEIN in Hong Kong will improve connectivity with other WLCG sites in Asia (currently reached via North America)

ASGCnet international network being upgraded

ASGC LHCONE VRF being implemented:
- Already connected to CERN VRF in Amsterdam
- Soon connecting to ESnet and others at Starlight Chicago
- Soon connecting to TEIN and KREONET in Hong-Kong
- Planned connection to SINET (JP)

Evaluating SDN Openflow

Connectivity for Commercial Clouds
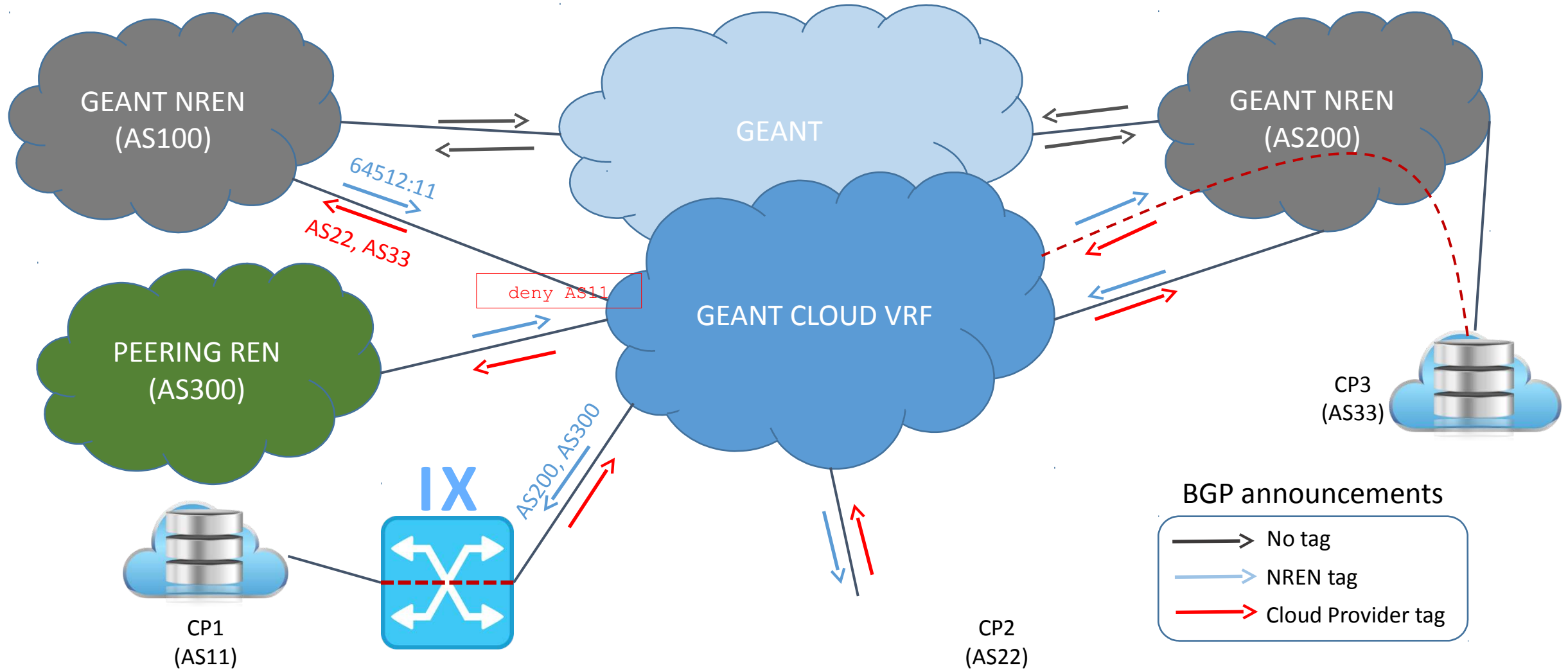
Connectivity for Commercial clouds

Research and Education Networks (REN) are evaluating how to connect commercial cloud providers to their users

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

Three solution presented

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GEANT: dedicated VRF

GEANT NREN (AS100)

GEANT NREN (AS200)

GEANT

64512:11

AS22, AS33

deny AS11

GEANT CLOUD VRF

PEERING REN (AS300)

CP3 (AS33)

IX

AS200, AS300

CP1 (AS11)

CP2 (AS22)

BGP announcements

No tag

NREN tag

Cloud Provider tag

CERN

IT Information Technology Department

ESnet: on-net VPN termination

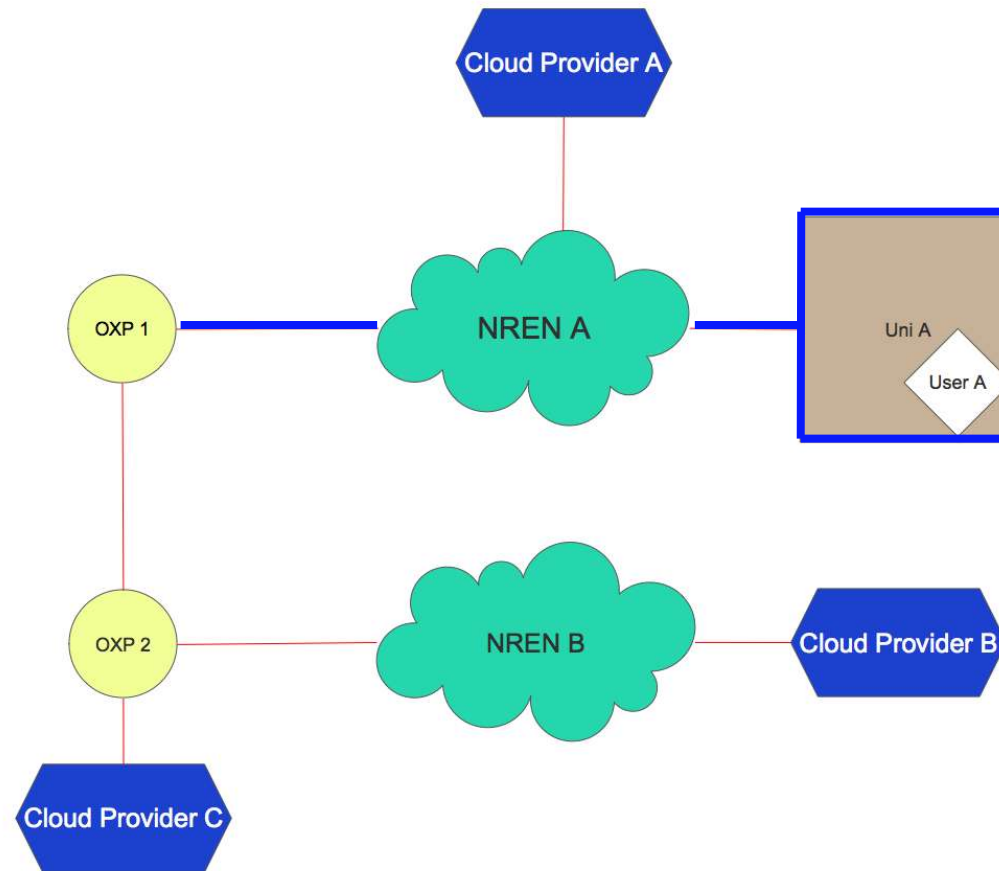## Virtual "Site Router" (VRTR) Service
At the edge of the cloud

Virtual Site Router at AWS Exchange Point
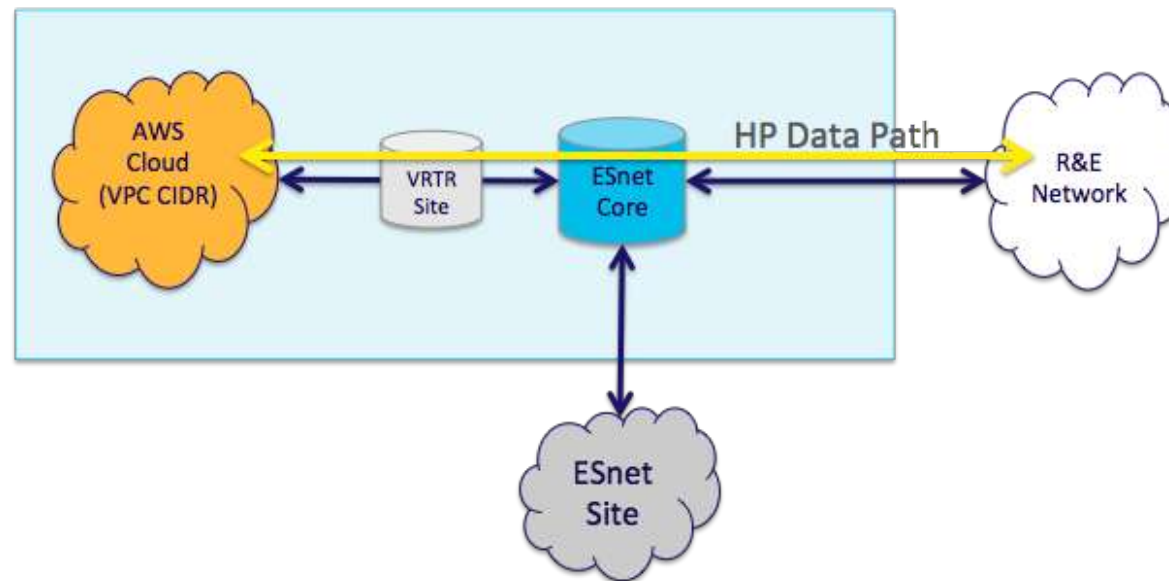
Virtual "Site Router" improves path efficiency and takes pressure off of the site local-loop.

https://indico.cern.ch/event/461511/contribution/33/attachments/1251052/1844657/ESnetOnClouds.pptx

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NORDUnet: transport to eXchange Points

https://indico.cern.ch/event/461511/contribution/12/attachments/1242659/1828442/NORDUnet_and_cloud.pptx
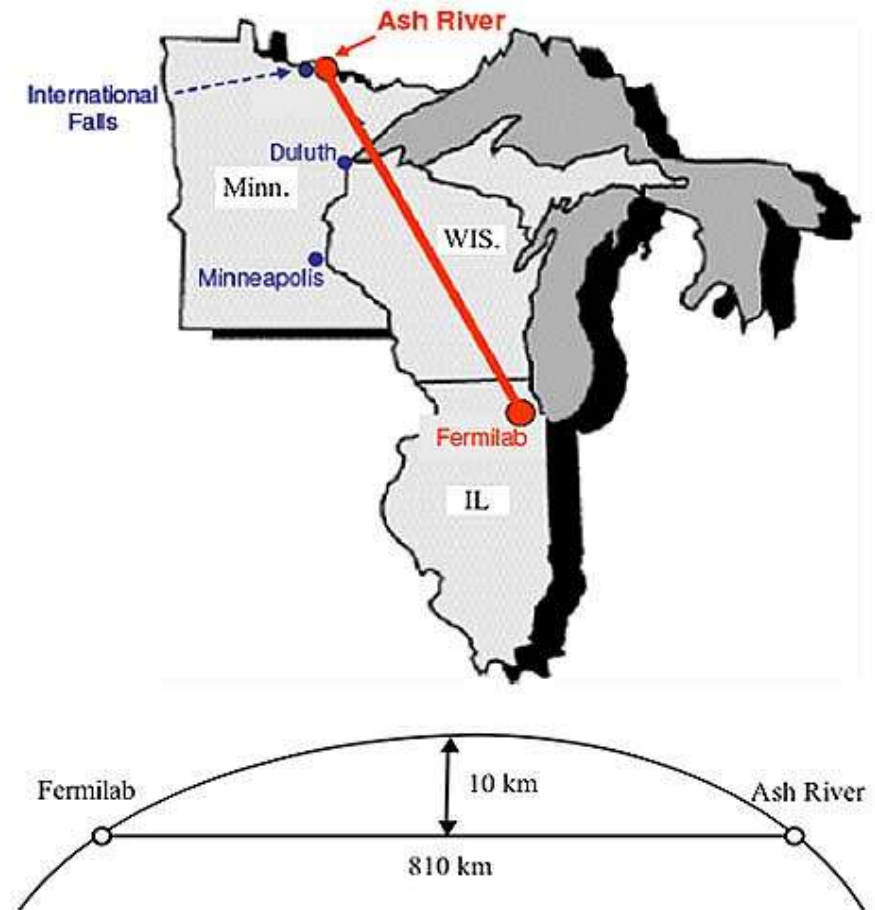
Other matters

NOvA experiment

FZU (CZ) works with FNAL (US) on the NOvA experiment. - They have asked permission to use LHCONE. They will produce more information to support the request

NOvA experiment at FNAL

- NOvA experiment
  Neutrino oscillation accelerator experiment with FD at Ash River
  - Oscillation parameters
  - CP violation

Next meetings

- Next LHCONE meeting: date to be defined (September-November period)

- Second Asia Tier Centre Forum organized by KISTI in Thailand. Most likely in November 2016

Information Technology Department

References

All the presentations at:

https://indico.cern.ch/event/461511/

Questions?