RENATER LHCOPN-LHCONE
mi 2015

Journées LCG-FR
18 juin 2015

Nicolas Garnier

Agenda

- LHCONE international – L3VPN
  - LHCOPN Update
  - LHCONE Update
- LHCONE France
  - Evolutions réseau mi 2015
  - Projets en cours
  - Statistiques d’utilisation
  - Exploitation, incidents, monitoring

International

LHCONE/LHCOPN Meeting – Cambridge 02/2015
Berkeley 06-2015

http://indico.cern.ch/event/342059/

https://indico.cern.ch/event/376098/

LHCOPN Update

- KR-KRISTI-T1
  - new 10G link (was 2G)
- IT-INFN-CNAF
  - Activated IPv6 in the Tier1 network, dual-stack perfSONAR.
- CA-TRIUMF
  - New 10G (5G+5G) LHCOPN link. Old 5G and 1G links dismantled. Backup via LHCONE
- DE-KIT
  - Second 10G LHCOPN link
  - removed all T1-T1 links

http://indico.cern.ch/event/342059/

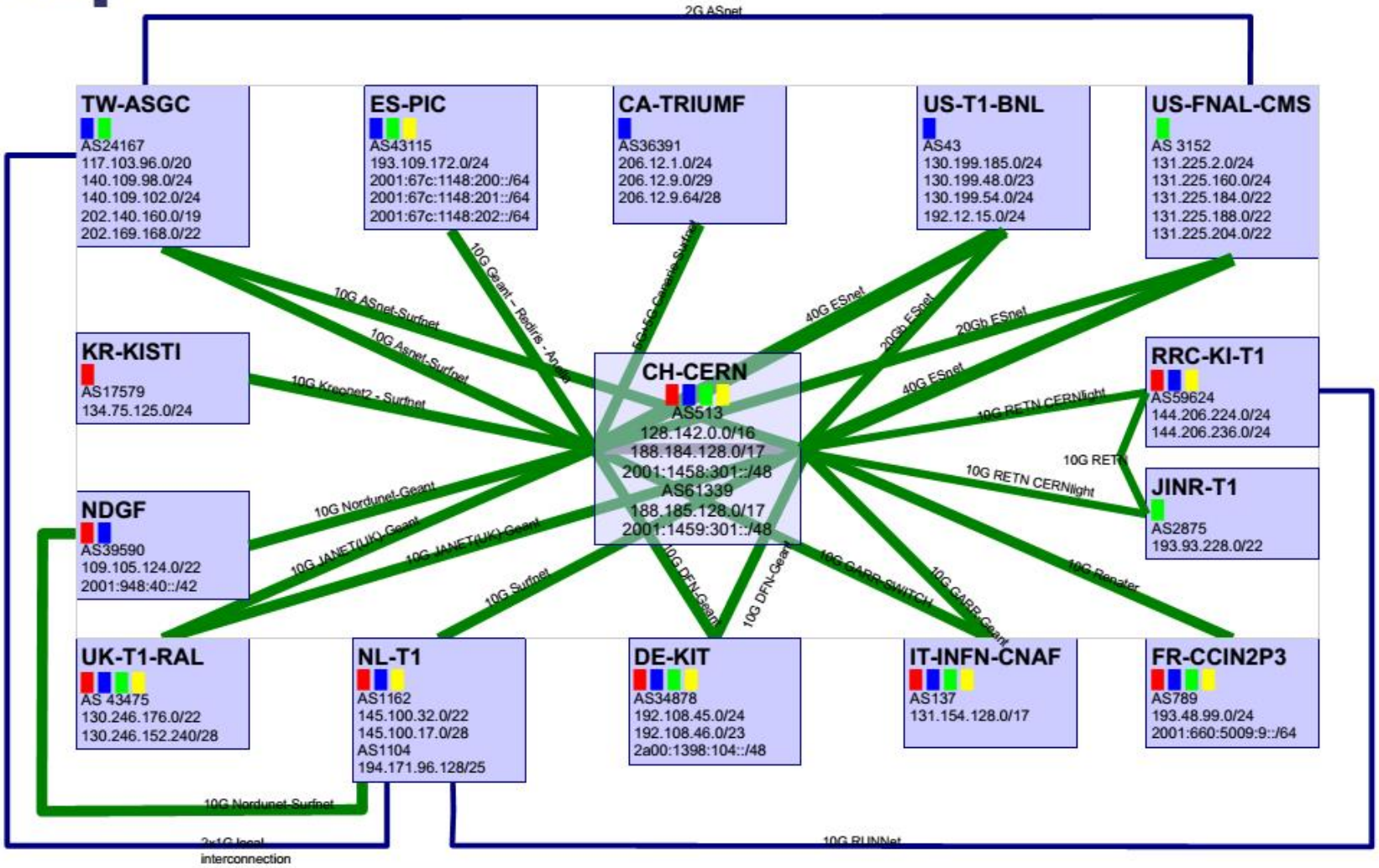
https://indico.cern.ch/event/376098/

LHCOPN Update

- Dismissal of T1-T1 links:
  - Not many T1-T1 links left
  - Backup functionalities moved to LHCONE

Map

LHCOPN



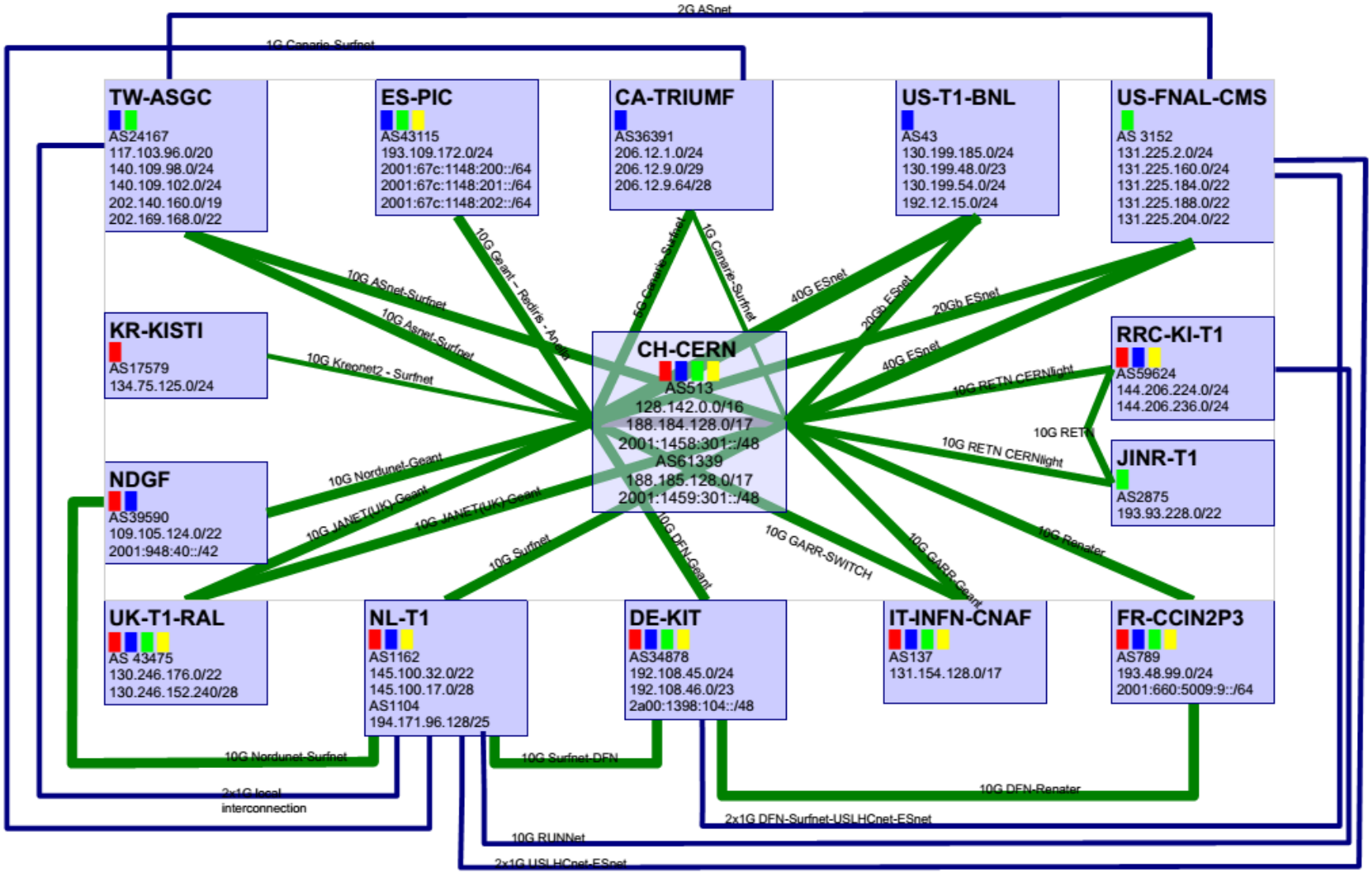
T0-T1 and T1-T1 traffic
T1-T1 traffic only
Not deployed yet
(thick) >=10Gbps
(thin) <10Gbps

= Alice = Atlas
= CMS = LHCb

p2p prefix: 192.16.166.0/24 - 2001:1458:302::/48
edoardo.martelli@cern.ch 20150515

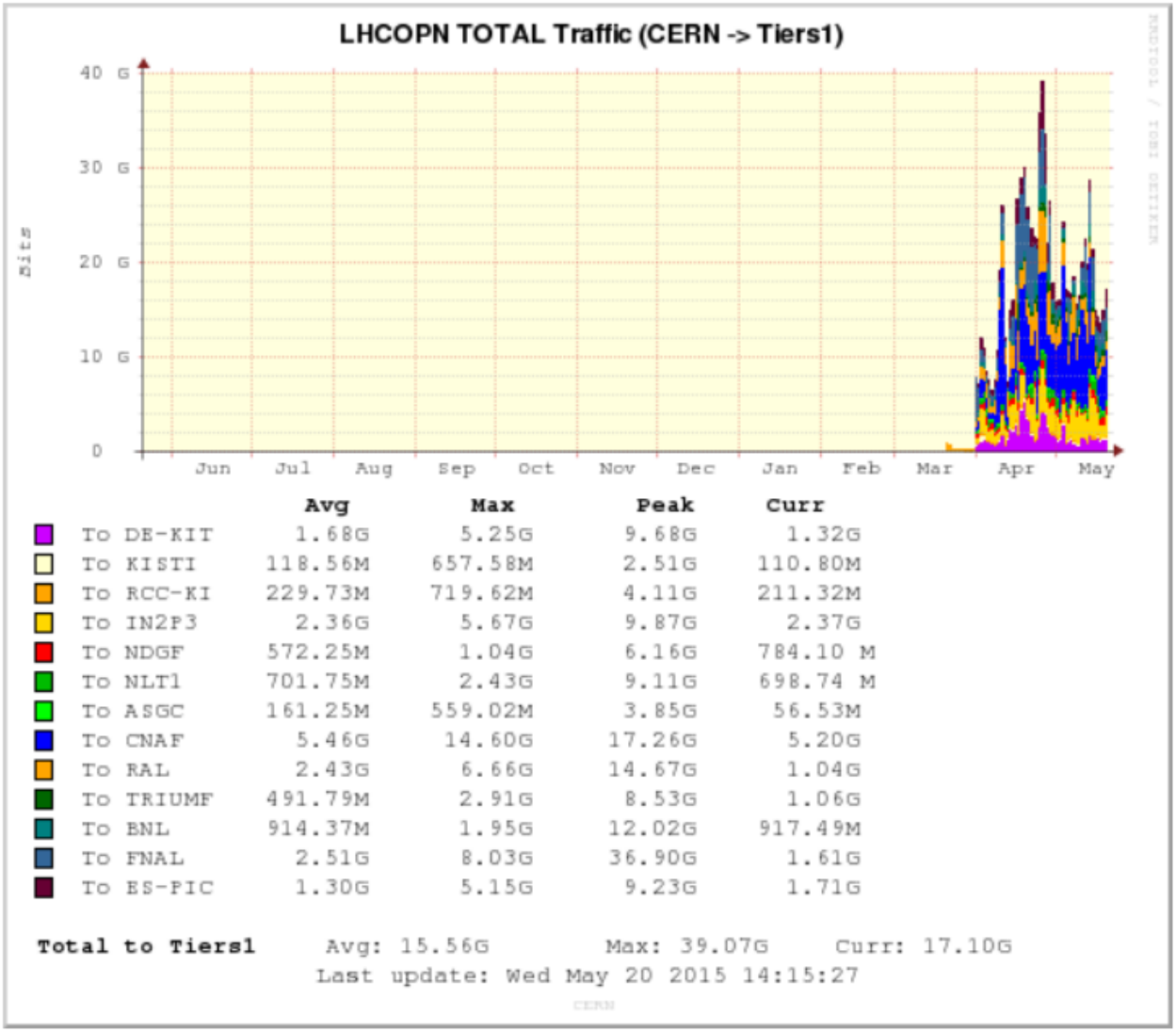
Previous

LHCOPN



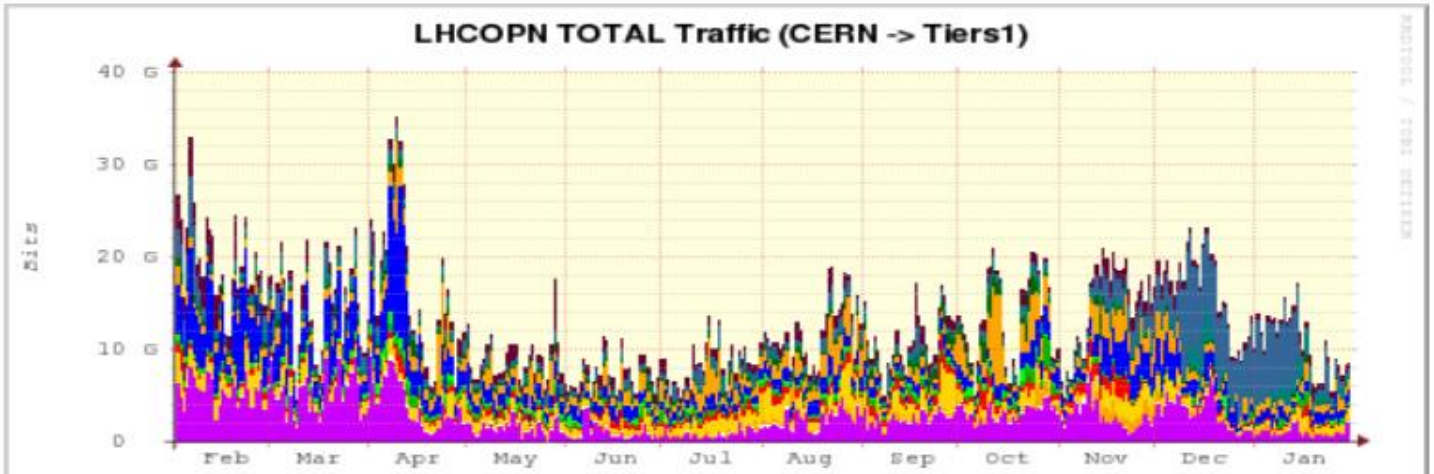
RENATER
CONNECTEUR DE SAVOIRS

Trafic



RENATER
CONNECTEUR DE SAVOIRS

Trafic période précédente →Fév. 2015



	Avg	Max	Peak	Curr
To DE-KIT	2.88G	9.40G	10.97G	2.22G
To KISTI	132.78M	1.08G	1.84G	144.11M
To RCC-KI	261.63M	2.44G	9.01G	273.02M
To IN2P3	1.20G	5.05G	10.02G	1.09G
To NDGF	561.38M	3.91G	9.72G	276.50 M
To NLT1	344.43M	3.42G	10.00G	217.61 M
To ASGC	327.72M	2.29G	8.85G	169.91M
To CNAF	2.24G	16.28G	18.34G	1.35G
To RAL	1.53G	9.83G	20.04G	1.08G
To TRIUMF	466.45M	3.09G	4.82G	243.94M
To BNL	630.69M	5.05G	13.68G	245.72M
To FNAL	1.45G	11.68G	58.08G	798.31M
To ES-PIC	968.21M	5.51G	10.59G	523.18M

Total to Tiers1 Avg: 12.96G Max: 35.16G Curr: 8.63G

Last update: Fri Jan 30 2015 10:04:08

RENATER
CONNECTEUR DE SAVOIRS

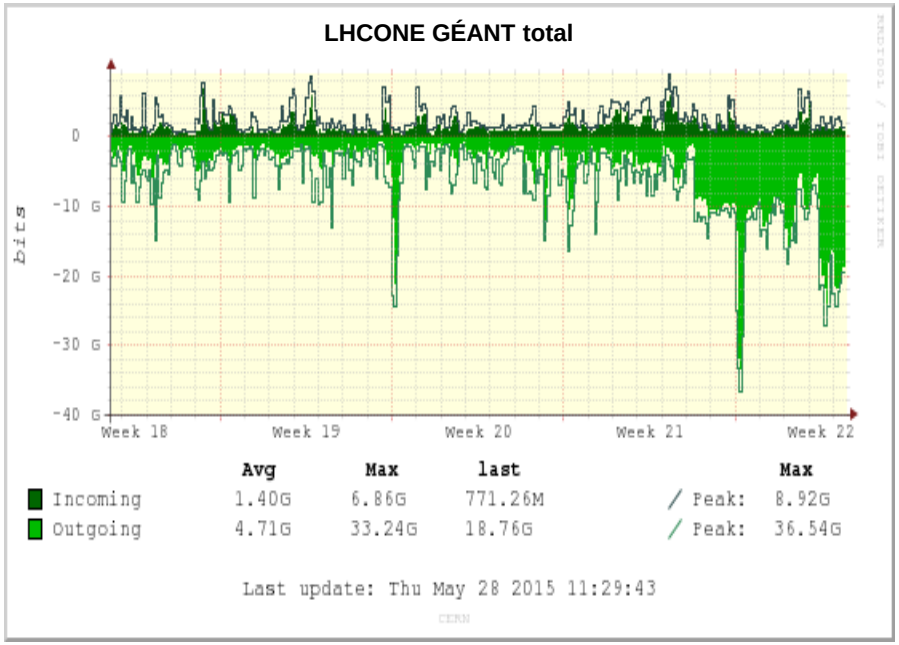
LHCONE in Europe

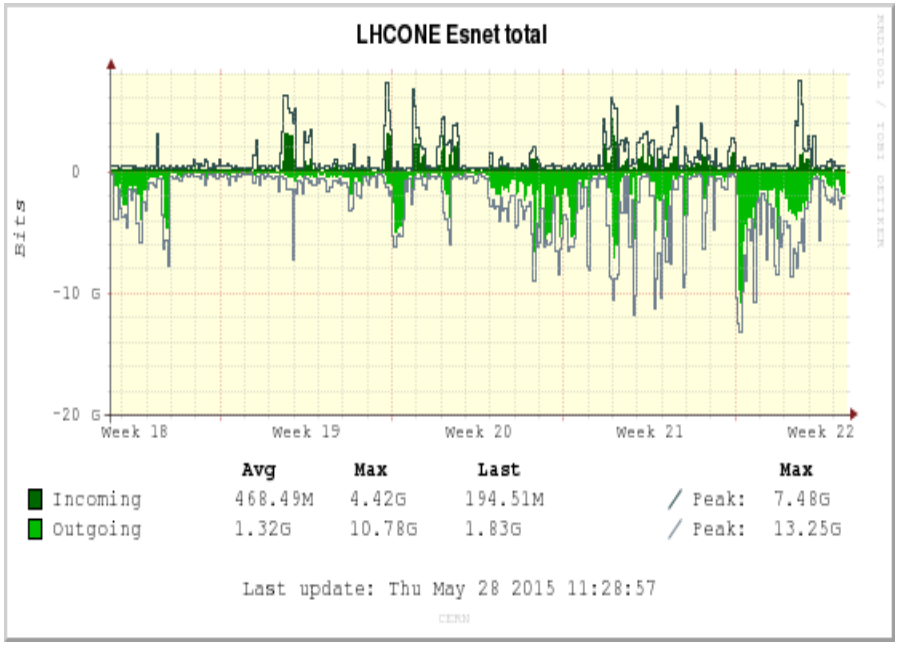
GÉANT

- LHCONE IP Service in Europe is deployed in:
  - ARNES (Slovenia)
  - CERN/CERNLight (Switzerland)
  - CESnet (Czech Republic)
  - DFN (Germany)
  - GARR (Italy)
  - GÉANT
  - JISC (UK)
  - NORDUnet
  - RENATER (France)
  - RoEduNet (Romania)
  - SURFnet (Netherlands)
- NRENs in these countries connect:
  - Six Tier 1s in Europe to LHCONE
  - 30 Tier 2s in Europe to LHCONE
  - Indian T2
  - Russian T2s (only to NORDUNet/CERN)

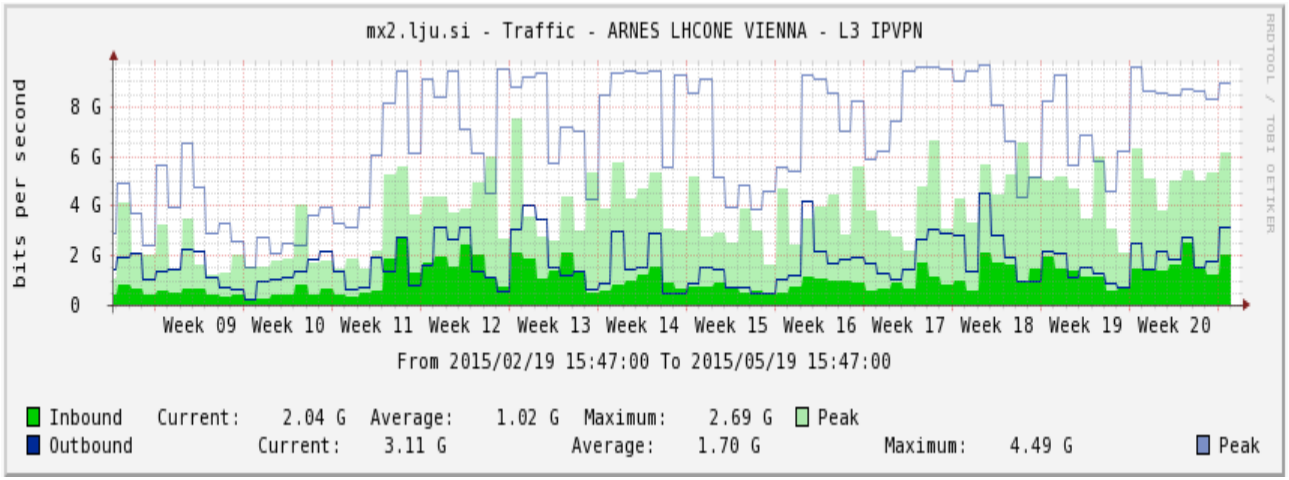
CERN

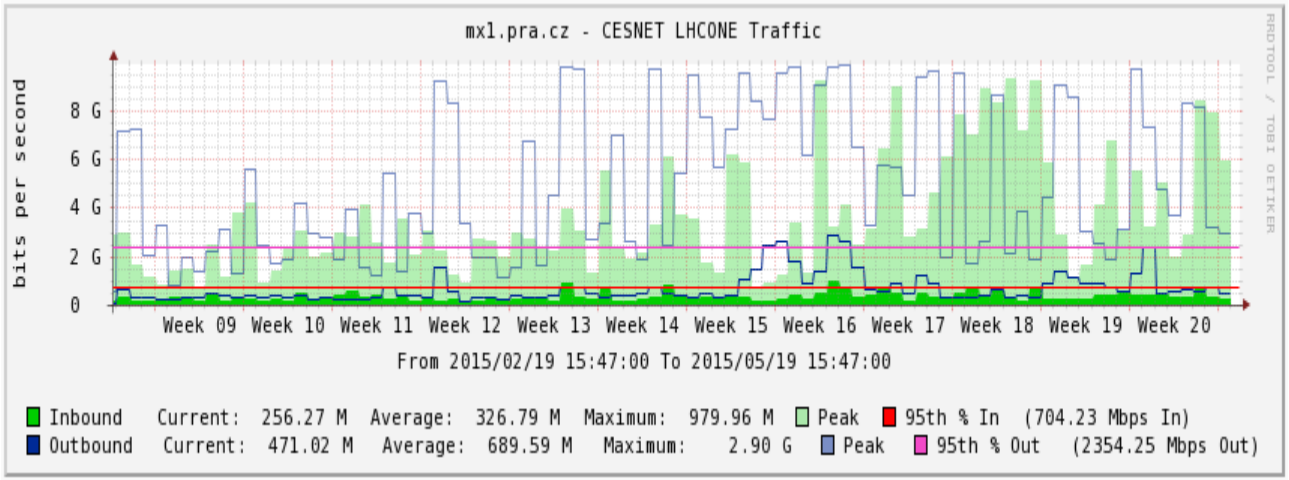
- Tier1 is now directly connected to GÉANT and ESnet with 100G interfaces
  - 1 x 100G GEANT
  - 2 x 100G ESnet
- The peering with GÉANT is now direct, not through CERNLight
- CERNLight now peers with PSNC (Polish NREN)



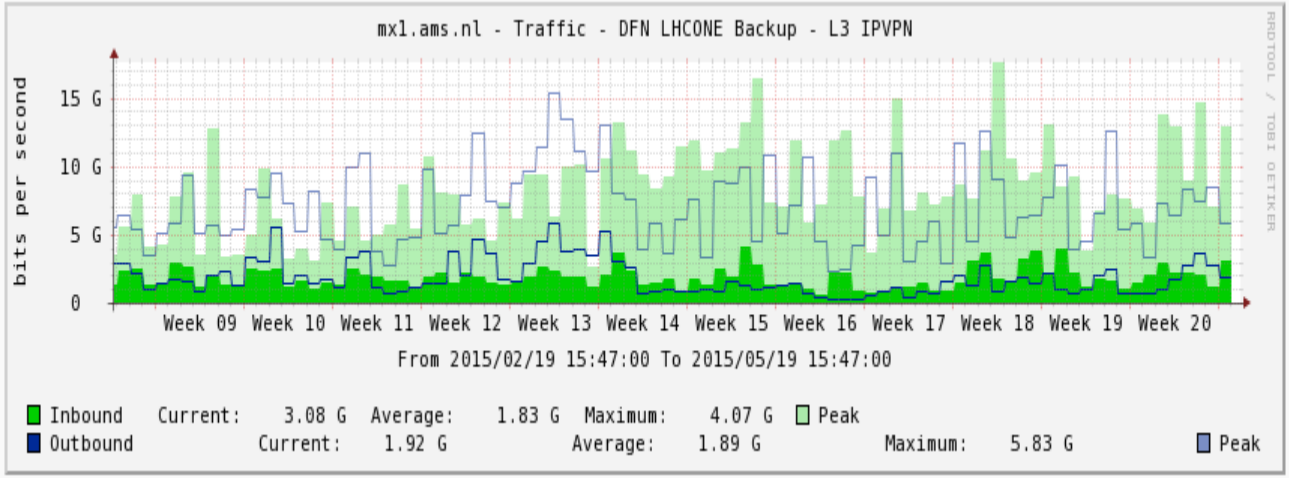


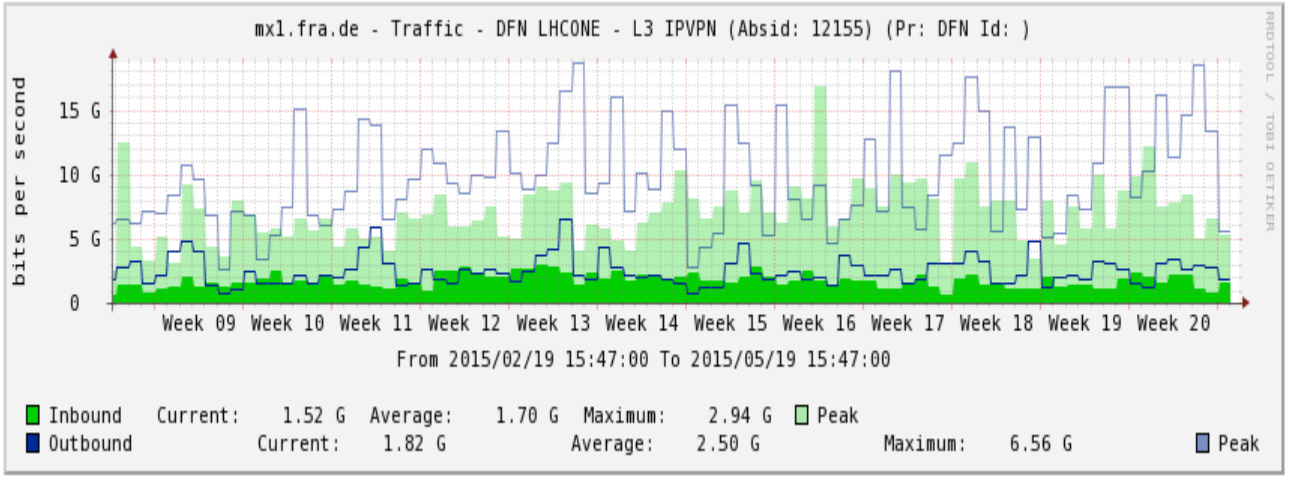
ARNES - CESNET



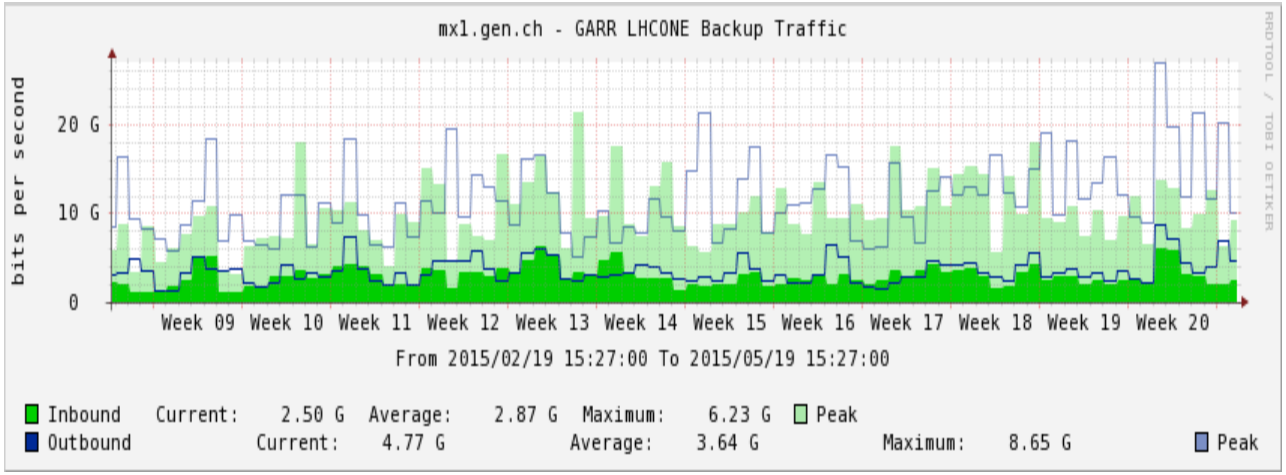


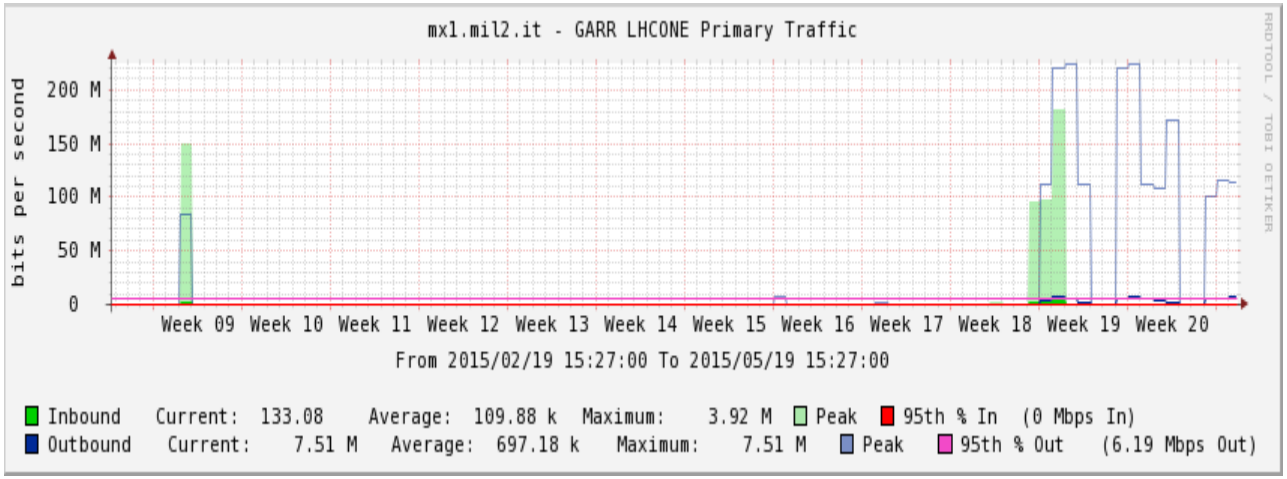
DFN


mx1.ams.nl - Traffic - DFN LHCONE Backup - L3 IPVPN
bits per second
15 G
10 G
5 G
0
Week 09 Week 10 Week 11 Week 12 Week 13 Week 14 Week 15 Week 16 Week 17 Week 18 Week 19 Week 20
From 2015/02/19 15:47:00 To 2015/05/19 15:47:00
Inbound Current: 3.08 G Average: 1.83 G Maximum: 4.07 G Peak
Outbound Current: 1.92 G Average: 1.89 G Maximum: 5.83 G Peak
RRDTOOL / TOBI OETIKER


mx1.fra.de - Traffic - DFN LHCONE - L3 IPVPN (Absid: 12155) (Pr: DFN Id:)
bits per second
15 G
10 G
5 G
0
Week 09 Week 10 Week 11 Week 12 Week 13 Week 14 Week 15 Week 16 Week 17 Week 18 Week 19 Week 20
From 2015/02/19 15:47:00 To 2015/05/19 15:47:00
Inbound Current: 1.52 G Average: 1.70 G Maximum: 2.94 G Peak
Outbound Current: 1.82 G Average: 2.50 G Maximum: 6.56 G Peak
RRDTOOL / TOBI OETIKER

GARR


mx1.gen.ch - GARR LHCONE Backup Traffic
bits per second
20 G
10 G
0
Week 09 Week 10 Week 11 Week 12 Week 13 Week 14 Week 15 Week 16 Week 17 Week 18 Week 19 Week 20
From 2015/02/19 15:27:00 To 2015/05/19 15:27:00
Inbound Current: 2.50 G Average: 2.87 G Maximum: 6.23 G Peak
Outbound Current: 4.77 G Average: 3.64 G Maximum: 8.65 G Peak
RRDTOOL / TOBI OETIKER

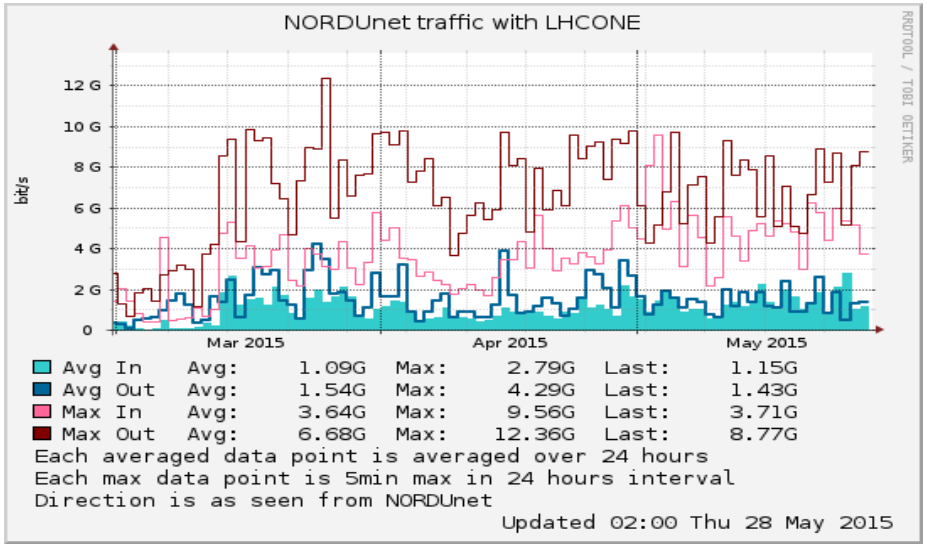

mx1.mil2.it - GARR LHCONE Primary Traffic
bits per second
200 M
150 M
100 M
50 M
0
Week 09 Week 10 Week 11 Week 12 Week 13 Week 14 Week 15 Week 16 Week 17 Week 18 Week 19 Week 20
From 2015/02/19 15:27:00 To 2015/05/19 15:27:00
Inbound Current: 133.08 Average: 109.88 k Maximum: 3.92 M Peak 95th % In (0 Mbps In)
Outbound Current: 7.51 M Average: 697.18 k Maximum: 7.51 M Peak 95th % Out (6.19 Mbps Out)
RRDTOOL / TOBI OETIKER

JISC

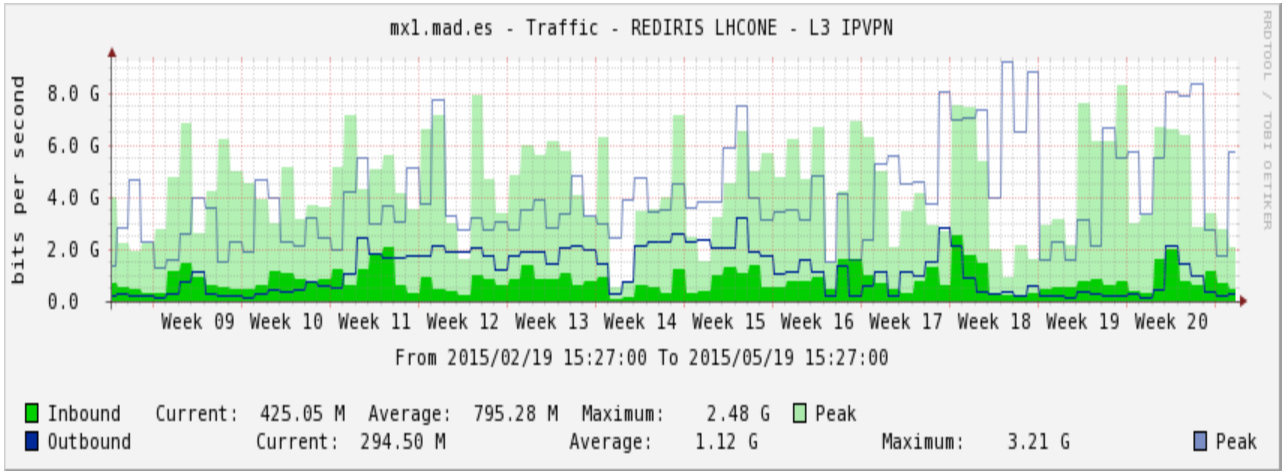
- VRF established on the JANET network
- Configuration completed during April/May ‘15
- Imperial College is the first site to connect
  - Currently under test
  - Not in production, yet

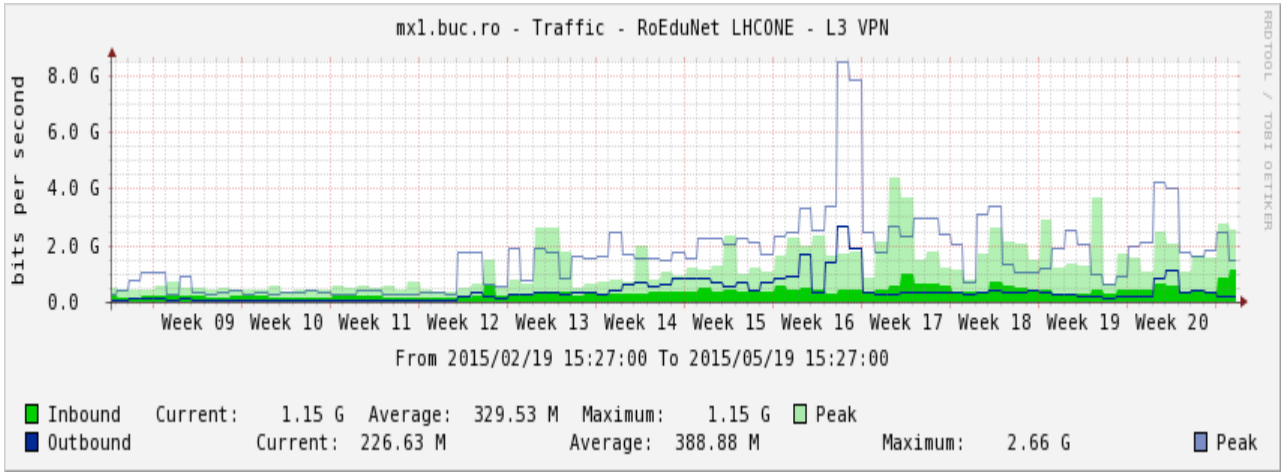
NORDUNet

- Will move the LHCONE connection to GÉANT from Copenhagen to London
  - In a few weeks, to a 100G port
- The LHCONE connection to ESNet and Internet2 is at MANLAN via ANA-200G
  - The peering is on the NORDUNet router in MANLAN

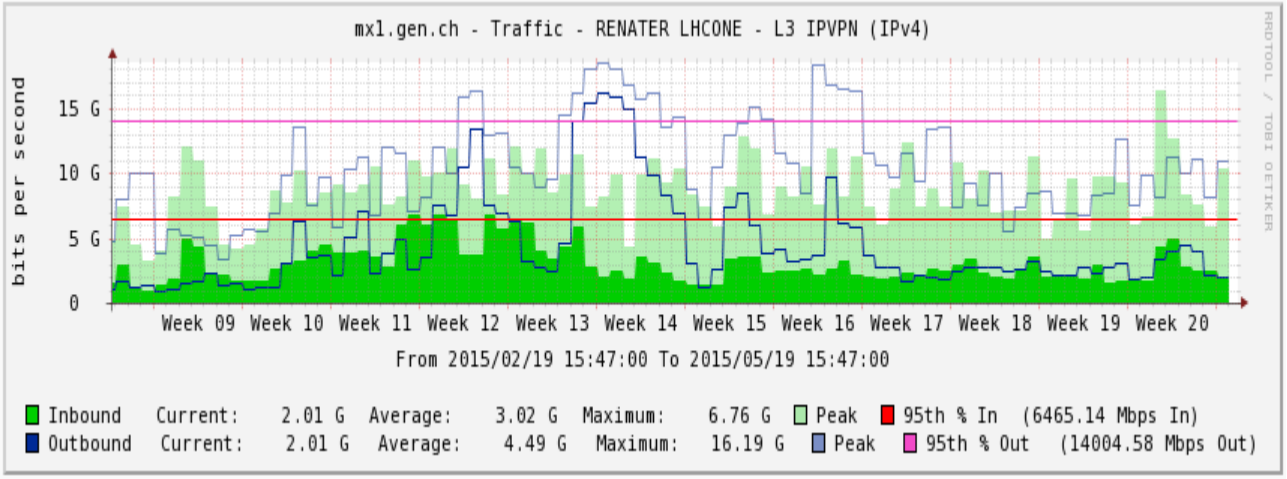


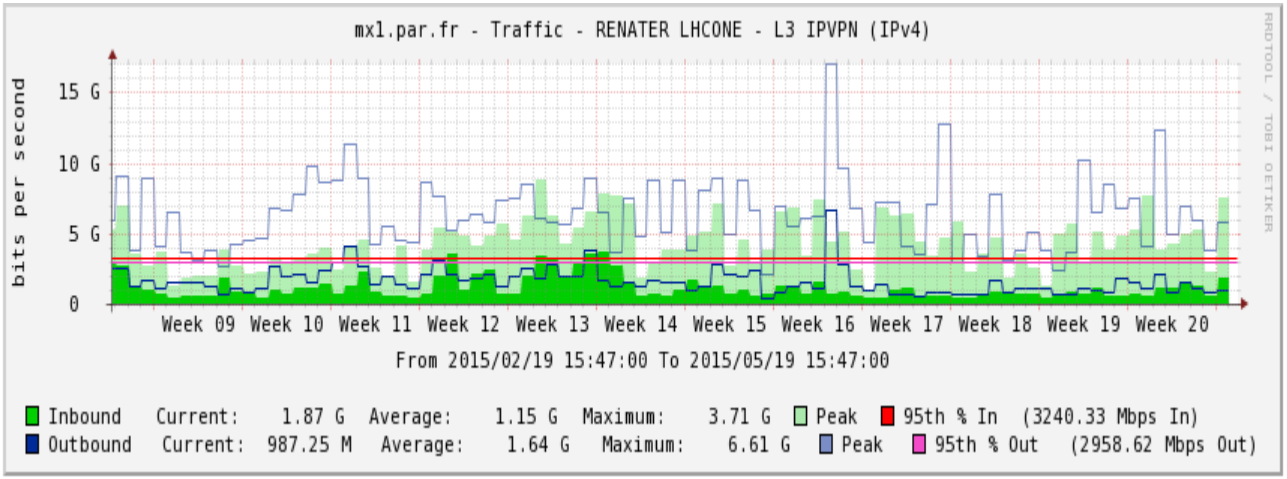
RedIRIS - RoEduNet





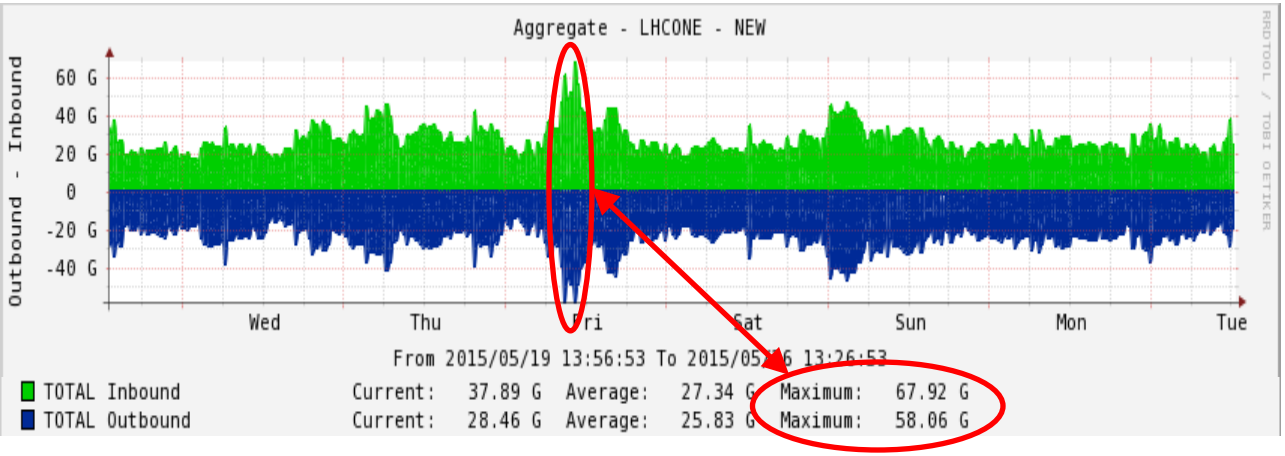
RENATER


mx1.gen.ch - Traffic - RENATER LHCONE - L3 IPVPN (IPv4)
bits per second
15 G
10 G
5 G
0
Week 09 Week 10 Week 11 Week 12 Week 13 Week 14 Week 15 Week 16 Week 17 Week 18 Week 19 Week 20
From 2015/02/19 15:47:00 To 2015/05/19 15:47:00
Inbound Current: 2.01 G Average: 3.02 G Maximum: 6.76 G Peak 95th % In (6465.14 Mbps In)
Outbound Current: 2.01 G Average: 4.49 G Maximum: 16.19 G Peak 95th % Out (14004.58 Mbps Out)
RRDTOOL / TOBI OETIKER

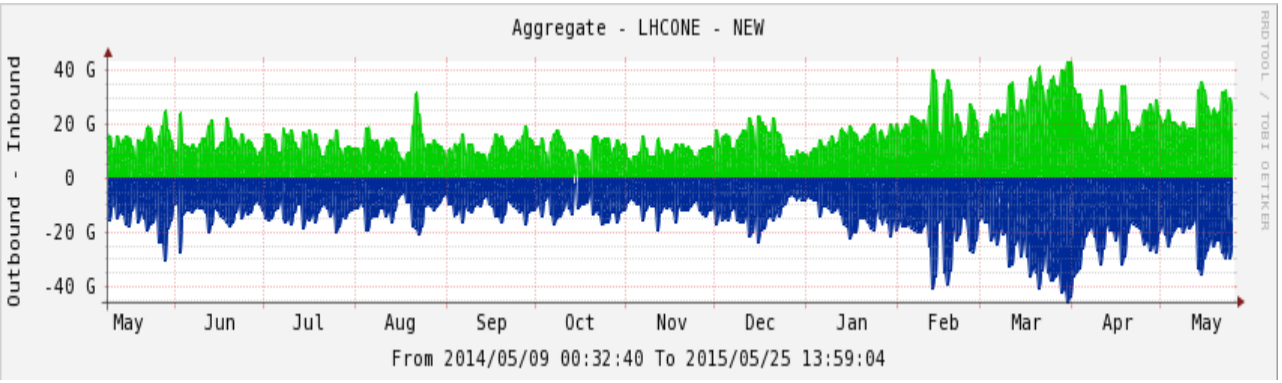

mx1.par.fr - Traffic - RENATER LHCONE - L3 IPVPN (IPv4)
bits per second
15 G
10 G
5 G
0
Week 09 Week 10 Week 11 Week 12 Week 13 Week 14 Week 15 Week 16 Week 17 Week 18 Week 19 Week 20
From 2015/02/19 15:47:00 To 2015/05/19 15:47:00
Inbound Current: 1.87 G Average: 1.15 G Maximum: 3.71 G Peak 95th % In (3240.33 Mbps In)
Outbound Current: 987.25 M Average: 1.64 G Maximum: 6.61 G Peak 95th % Out (2958.62 Mbps Out)
RRDTOOL / TOBI OETIKER

GÉANT overall

Weekly

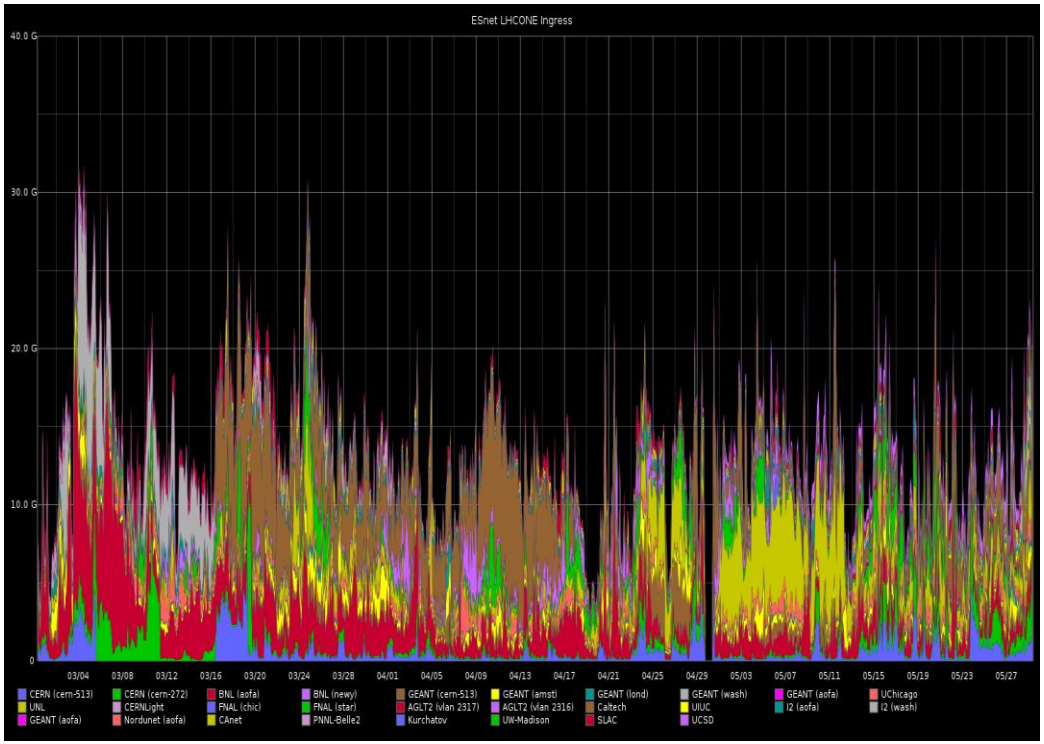


Yearly



ESnet

- Now peering with GÉANT in the new ESnet PoPs in Europe
  - LON, AMS, GVA
  - 3 x 100G
- Peering with CERN in GVA
  - 2 x 100G
- New sites connected
  - AGLT2 (MSU and UM)
  - Caltech
  - UCSD
  - University of Chicago
  - University of Nebraska Lincoln



CANARIE

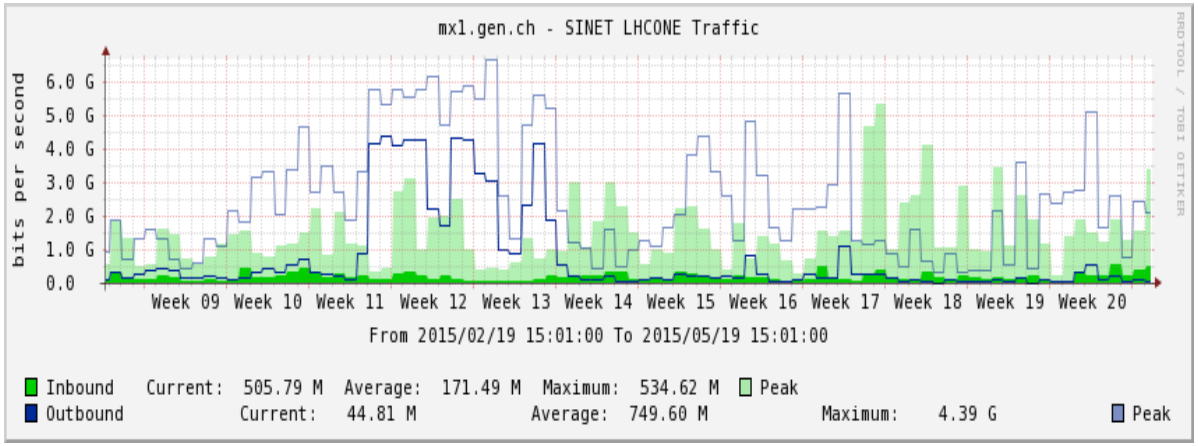
- Upgraded to 100G to PacificWave Seattle
- Upgraded to 100G to MANLAN
- Sites news:
  - T2 at University of Victoria upgraded to 100G
  - T2 at University of Alberta decommissioned
    - Resources absorbed by Univ. Victoria and SFU

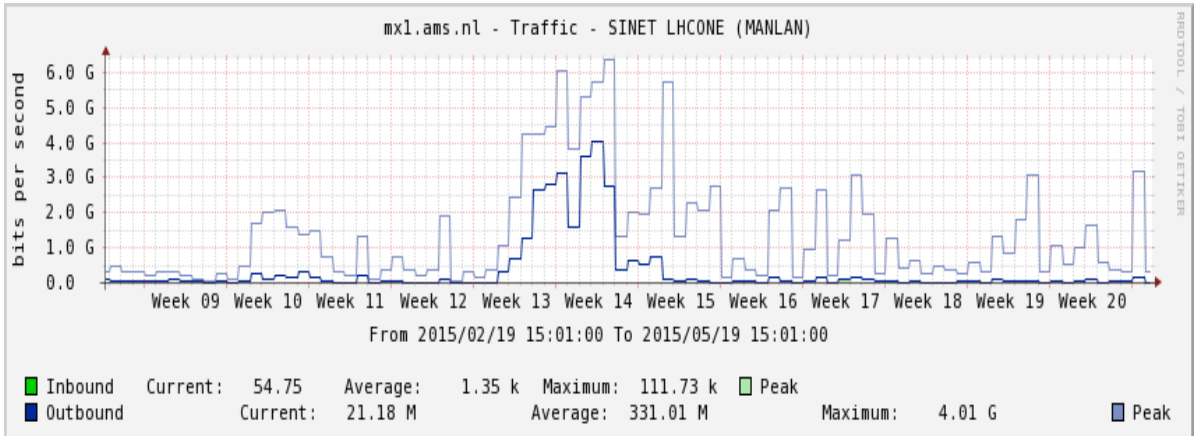
Latin America

- Configuration of the peering from GÉANT VRF to RNP VRF completed
  - Peering point in London, both IPv4 and IPv6
- No VRF in RedCLARA for the time being
  - Just delivering the L2 circuit from GÉANT to RNP
  - VRF creation will be investigated if more NRENs in L.A. request to connect
- Circuit and BGP peering established in May ’15
  - Waiting for RNP/RedeRio/CBPF to complete the local configuration

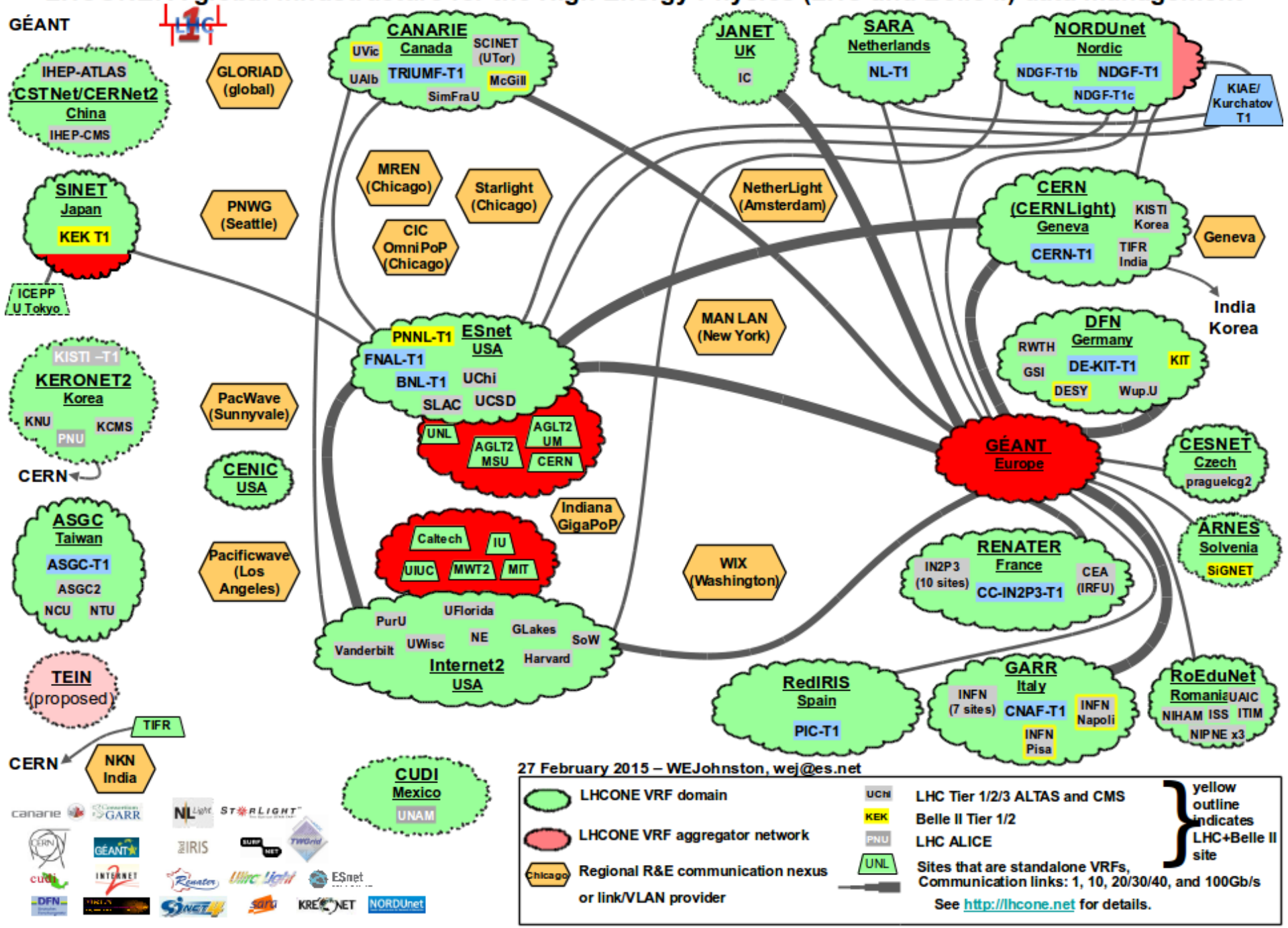
Asia-Pacific

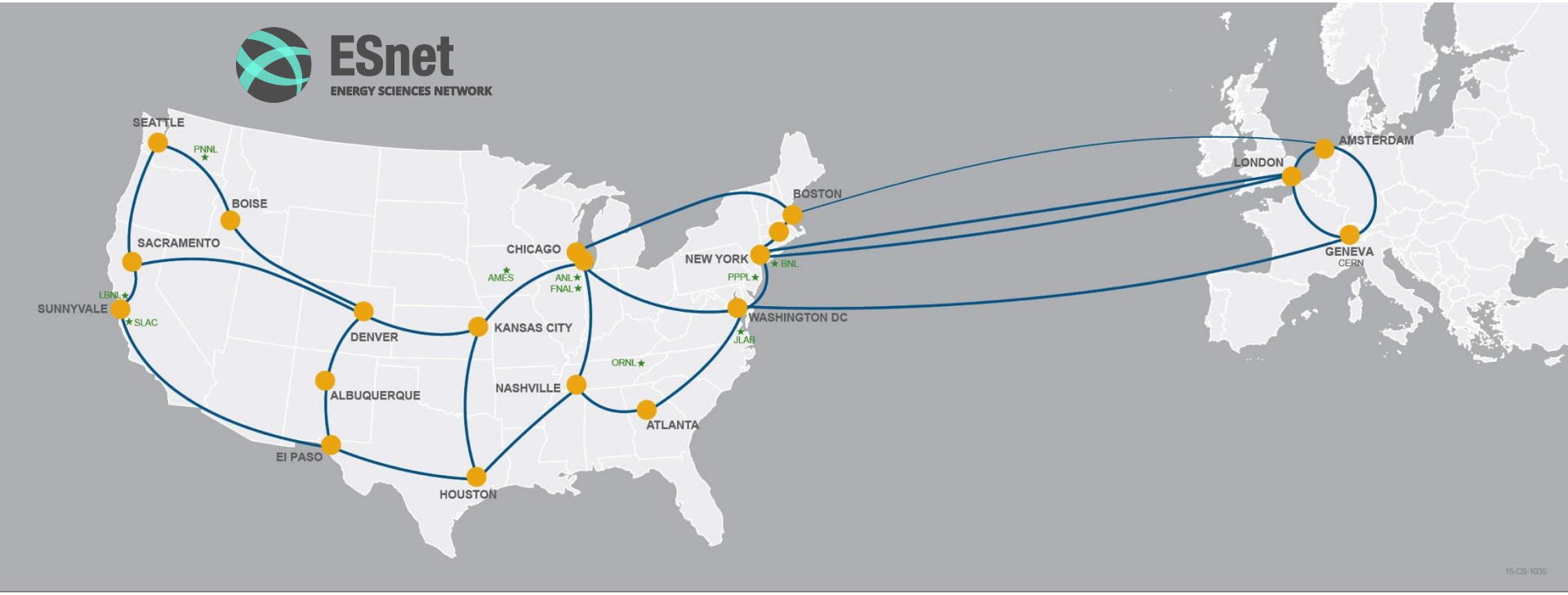
- TEIN
  - …still no news ☹
  - Waiting for PERN (Pakistan NREN) to complete the procurement for the upgrade to TEIN

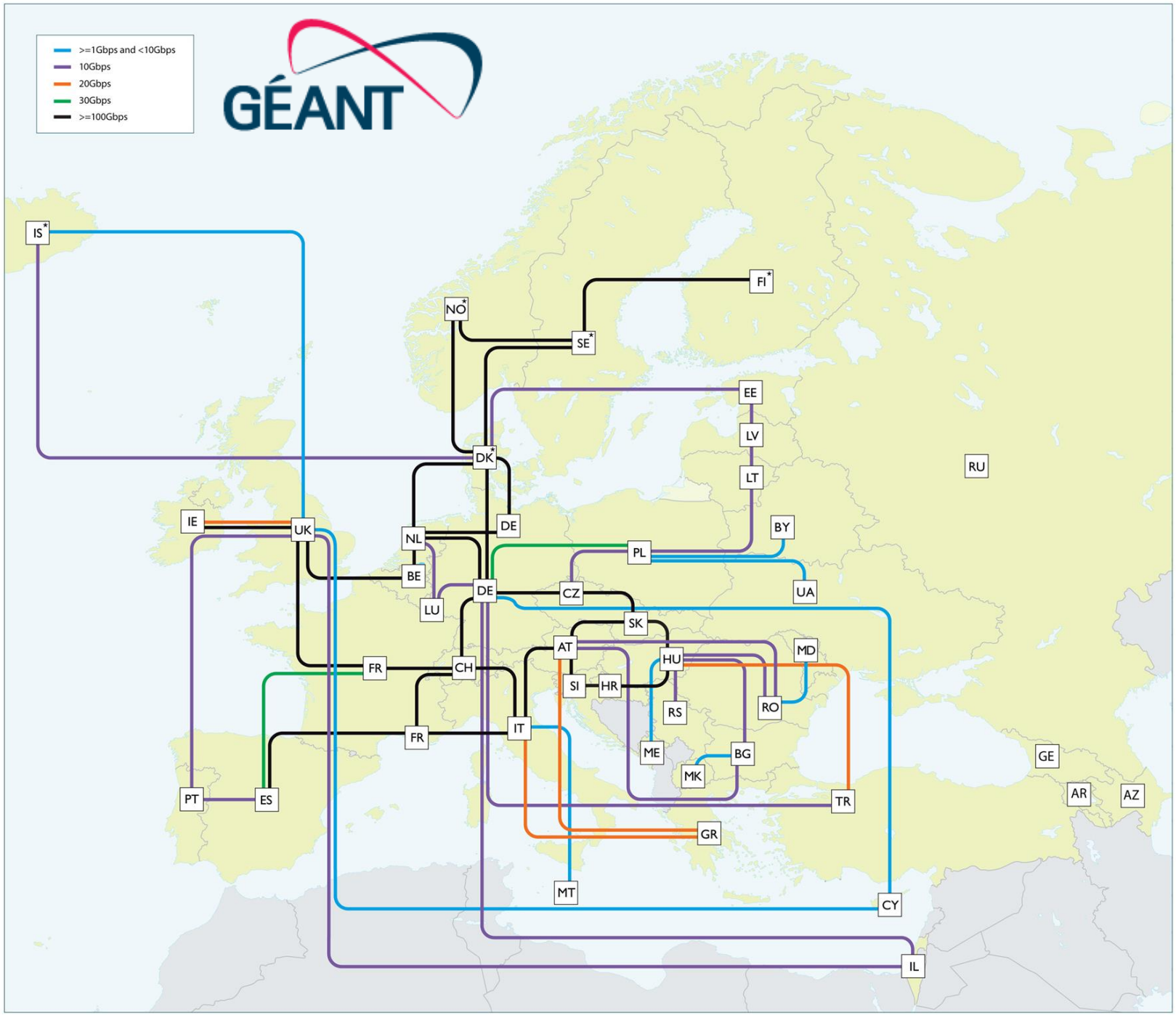




LHCONE: A global infrastructure for the High Energy Physics (LHC and Belle II) data management




ESnet
ENERGY SCIENCES NETWORK
SEATTLE
PNNL
BOISE
SACRAMENTO
LBNL
SUNNYVALE
SLAC
DENVER
ALBUQUERQUE
EI PASO
HOUSTON
KANSAS CITY
CHICAGO
AMES
ANL
FNAL
NASHVILLE
ORNL
ATLANTA
BOSTON
NEW YORK
BNL
PPPL
WASHINGTON DC
JLAB
AMSTERDAM
LONDON
GENEVA
CERN
15-CS-1035


>=1Gbps and <10Gbps
10Gbps
20Gbps
30Gbps
>=100Gbps
GÉANT
IS*
NO*
SE*
FI*
EE
LV
LT
DK*
RU
IE
UK
NL
DE
BY
PL
BE
LU
DE
CZ
UA
SK
AT
HU
MD
FR
CH
SI
HR
RS
RO
IT
FR
ME
BG
MK
GE
PT
ES
TR
AR
AZ
GR
MT
CY
IL

LHCONE International

LHCONE/LHCOPN Meeting – Chicago sept. 2014

- **Communautés de service LHCONE,**
  - https://twiki.cern.ch/twiki/bin/view/LHCONE/LhcOneVRF#BGP_communities
  - Implémentées pour test par ESNET et GEANT en septembre 2014 / validées par l'AUP en juin 2015

Community	Type	Meaning	Notes
65001:XXXX	Operational	prepend 1x to ASxxxx	Mandatory
65002:XXXX	Operational	prepend 2x to ASxxxx	Mandatory
65003:XXXX	Operational	prepend 3x to ASxxxx	Mandatory
65010:XXXX	Operational	do not announce to ASxxxx	Mandatory
65011:0000	Operational	do not announce to any Tier-1	Mandatory
65012:XXXX	Operational	do not announce except to ASxxxx	Optional
(tierx-org-as):65101	Informational	Prefix originated by a Tier-1	Mandatory, set by the VRF
(tierx-org-as):65102	Informational	Prefix originated by a Tier-2	Mandatory, set by the VRF
(tierx-org-as):65103	Informational	Prefix originated by a Tier-3	Mandatory, set by the VRF
(tierx-org-as):65151	Informational	Prefix originated by a TierX in Europe	Mandatory, set by the VRF
(tierx-org-as):65152	Informational	Prefix originated by a TierX in Asia	Mandatory, set by the VRF
(tierx-org-as):65153	Informational	Prefix originated by a TierX in America	Mandatory, set by the VRF
(tierx-org-as):65201	Informational	Tier-X supporting ALICE	Optional, set by the Tier-X

LHCONE International

LHCONE/LHCOPN Meeting – Chicago sept. 2014

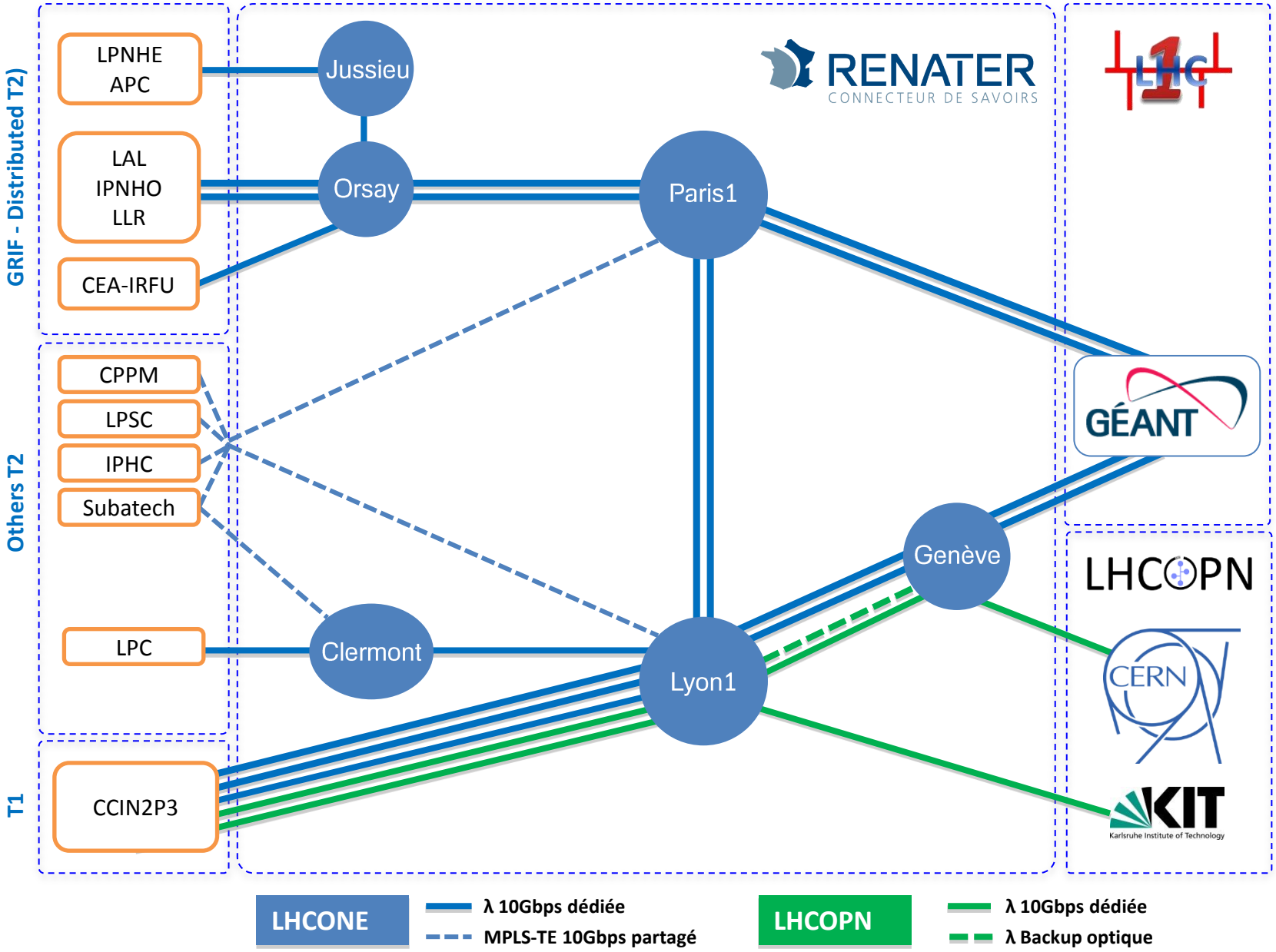
- Recently the LHCONE community has finalised the LHCONE Acceptable Use Policy (AUP). The AUP can be found here: https://twiki.cern.ch/twiki/bin/view/LHCONE/LhcOneAup

LHCONE France

Evolutions architecture 2015

- **Remplacement de l'équipement d'Orsay**
  - Cisco 6509 → 6506-E

- **rappel**
  - **Nouvelles capacité dédiées déployées – 70G en 2014**
  - 10G Lyon-Clermont ; LPC et Subatech
  - 10G CC-IN2P3 – Lyon (total 3*10G)
  - 10G Lyon – Paris (total 2*10G)
  - 10G Paris – Orsay (total 2*10G)
  - 10G Lyon – Genève (total 2*10G)
  - 10G supplémentaire vers GEANT à Genève (total 2*10G)
  - 10G supplémentaire vers GEANT à Paris (total 2*10G)
  - Le passage en Port-Channel permet une montée en capacité sans coupure.

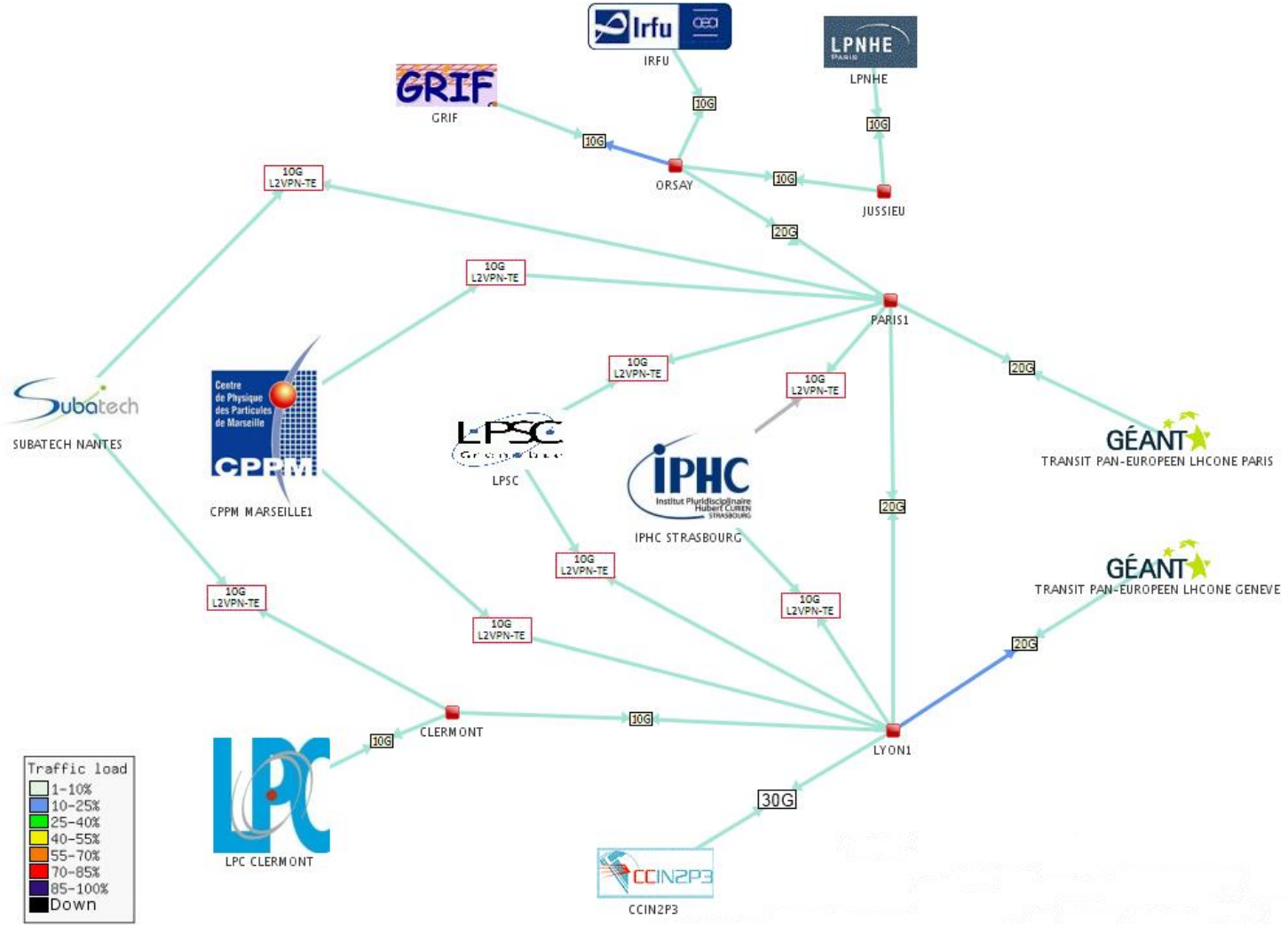

GRIF - Distributed T2)
LPNHE
APC
LAL
IPNHO
LLR
CEA-IRFU
Jussieu
Orsay
Paris1
RENATER
CONNECTEUR DE SAVOIRS
Others T2
CPPM
LPSC
IPHC
Subatech
LPC
Clermont
Lyon1
Genève
GÉANT
LHCOPN
CERN
KIT
Karlsruhe Institute of Technology
T1
CCIN2P3
LHCONE
λ 10Gbps dédiée
MPLS-TE 10Gbps partagé
LHCOPN
λ 10Gbps dédiée
λ Backup optique

LHCONE France

- **IPv6**
  - 08/14 : VRF IPv6 RENATER et peering v6 CC-IN2P3
  - 10/14 : VRF IPv6 GEANT et peering v6 GEANT
  - 03/15 : peering v6 avec le CEA
  - Liste des sites IPv6 sur LHCONE https://twiki.cern.ch/twiki/bin/view/LHCONE/LhcOneVRF#Connected_sites
  - La Weathermap actuelle présente les débit sur les interfaces physique, indifféremment d'IPv4 ou IPv6.

LHCONE France

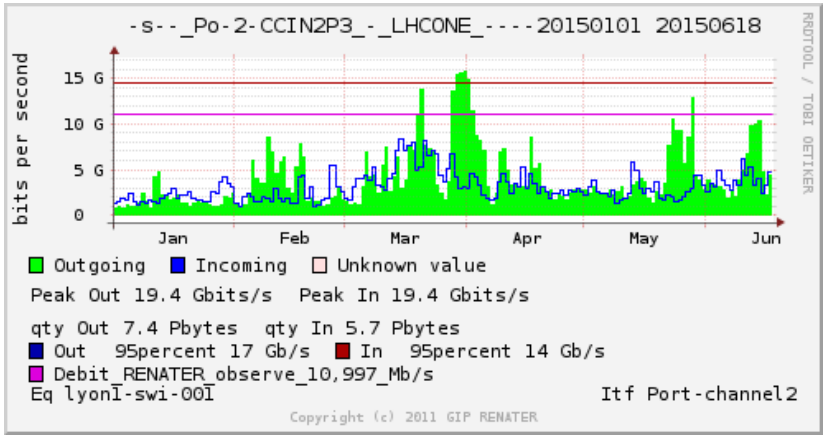
- Weathermap https://pasillo.renater.fr/weathermap/weathermap_lhcone_france.html



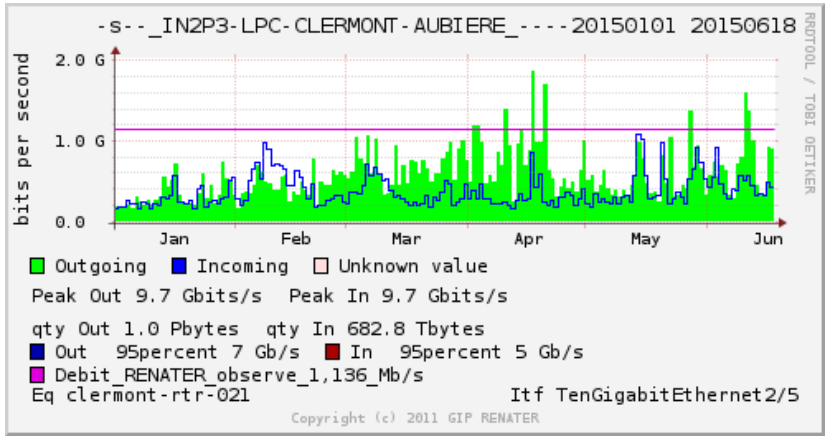
LHCONE France

Statistiques Sites

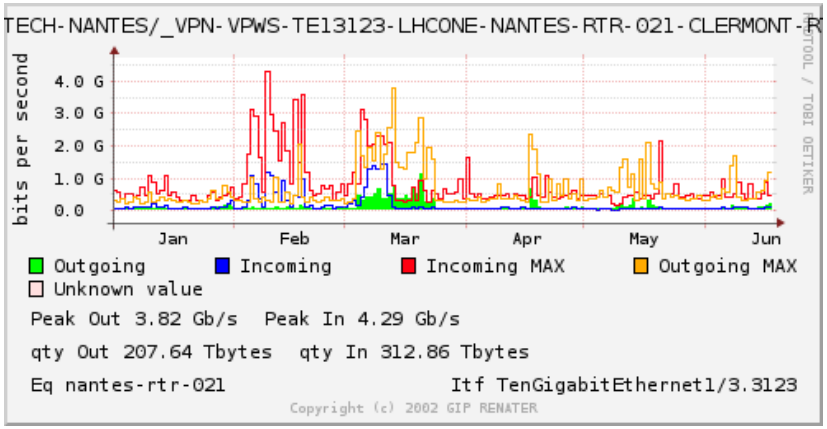
- **CC-IN2P3**



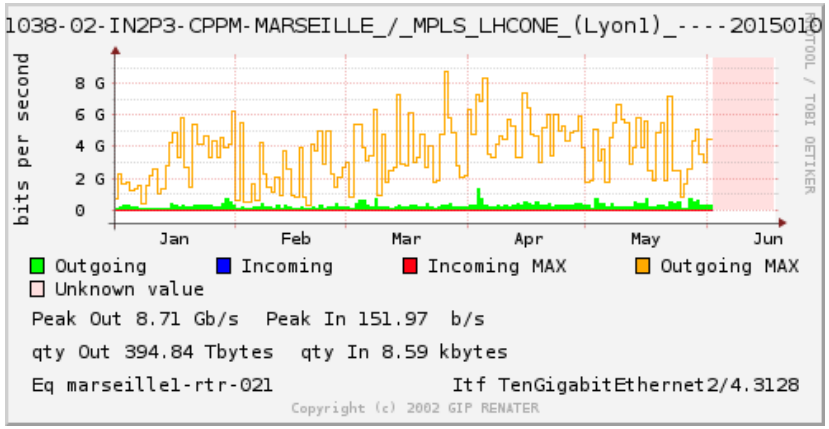
- **LPC**



- **Subatech**



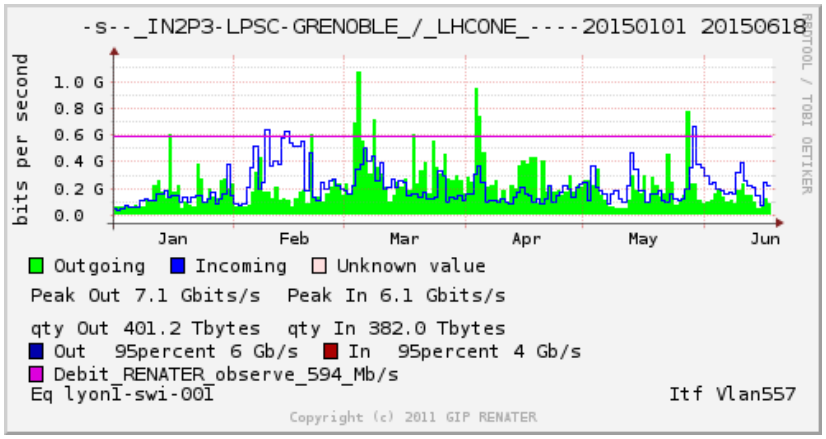
- **CPPM**



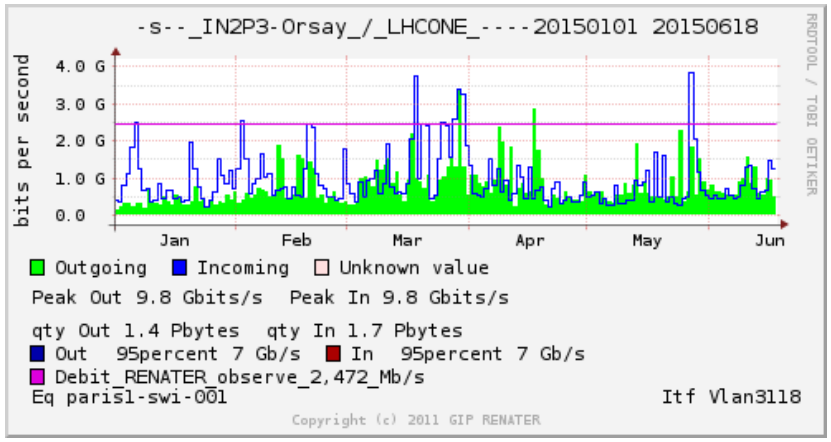
LHCONE France

Statistiques Sites

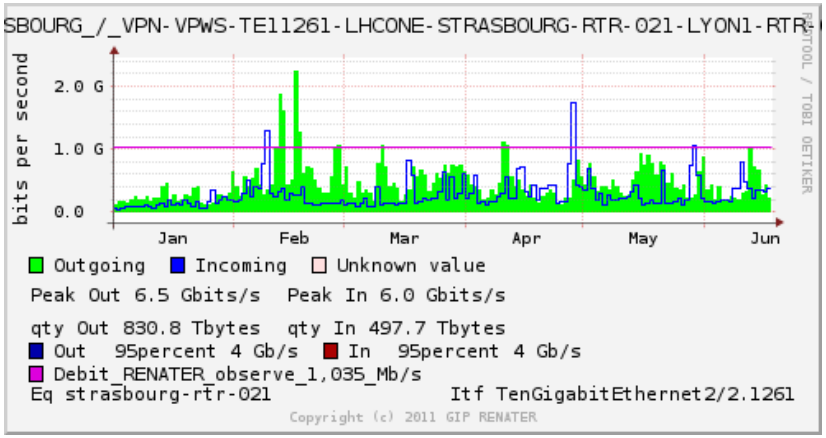
- **LPSC**



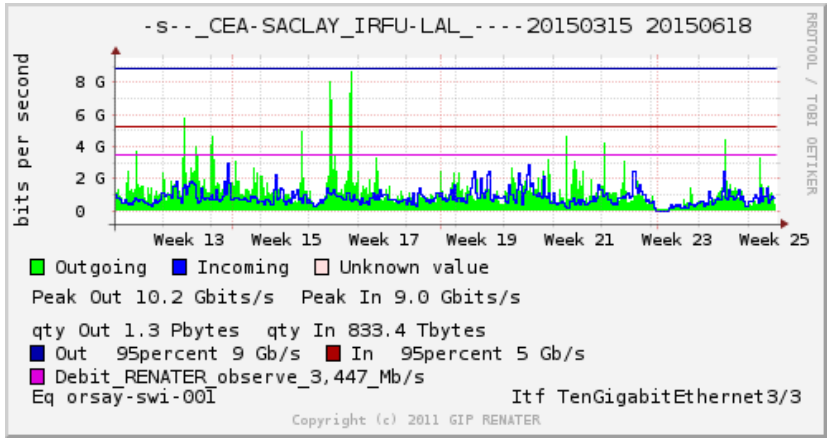
- **GRIF LAL**



- **IPHC**



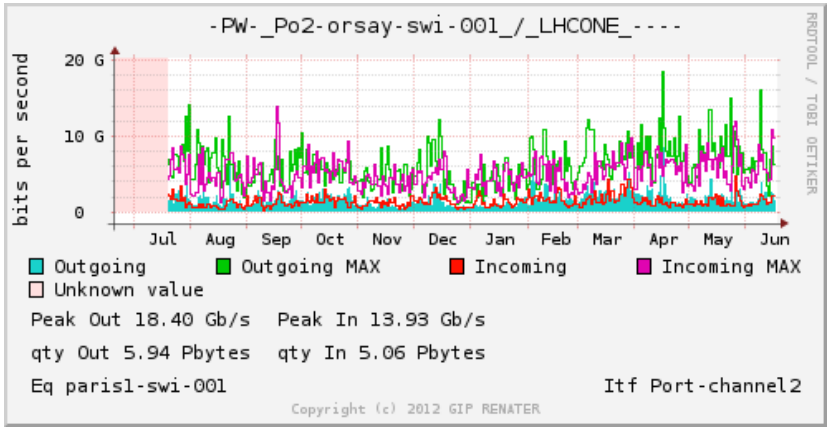
- **IRFU**



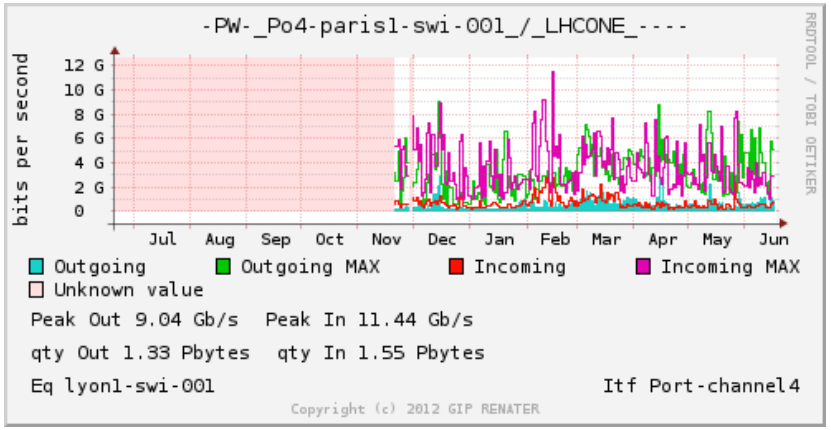
LHCONE France

Statistiques Backbone

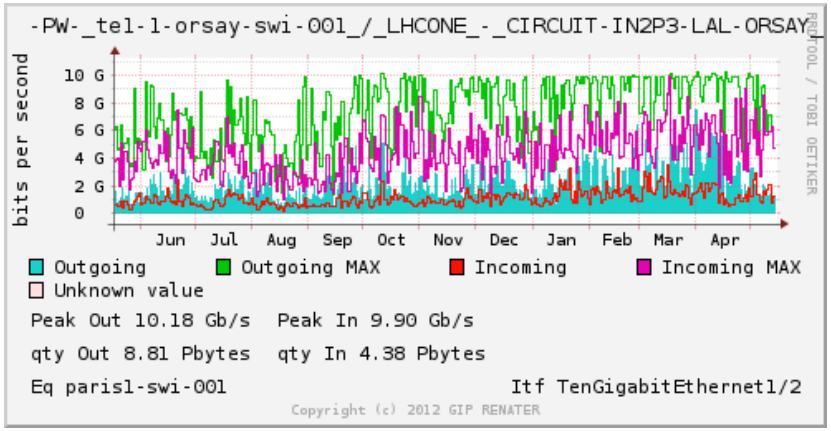
- **Paris - Orsay**



- **Paris – Lyon**



- **Paris – Orsay (avant upgrade 2014)**



LHCONE France

Exploitation et Monitoring

- **Incident réseaux**
  - 04/15 : Asymétrie de trafic vers le LHCONE dans certains cas. Règles d'AS prepend corrigées sur le routeur de Paris1.

- **Maintenances à venir**
  - Gel Réseau pour les examens.
  - Retrait de la liaison CC-IN2P3 – KIT
  - Déplacement de la liaison dédiée LHCOPN entre deux équipement de Lyon1 pour éviter le SPOF LHCONE/LHCOPN.

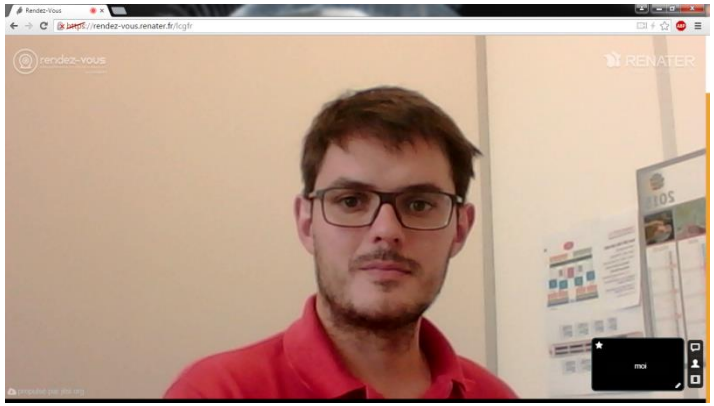
LHCONE France

Projets 2015

- **Communautés BGP LHCONE**
  - Mise en service prévue au 2nd semestre 2015

- **Optimisation**
  - Réseau Jussieu/Orsay/Paris → Cette partie du réseau RENATER IDF va être complètement modifiée par RENATER6 et les équipements optiques 100G. (fin 2015)
  - Les besoins du LHCONE en IDF sont pris en compte.

Questions

Rendez-Vous

- https://rendez-vous.renater.fr/
  - Officiellement lancé en mars 2015
  - Accessible via la fédération d'identité RENATER et **eduGAIN**
  - Visio conférence en 1 clic
  - Dans le navigateur
  - multi-point
  - partage d'écran
  - notes partagées