

LHCOPN-LHCONE meeting

Guest of HEPiX Fall 2017 meeting

KEK Tsukuba, Japan

16th October 2017

edoardo.martelli@cern.ch



LHCOPN and LHCONE

- *Origin*

- *Milestones*

- *This meeting*



First was LHCOPN

First meeting on January 2005 at SARA, Amsterdam

- Tier0/1 network meeting chaired by David Foster and Kors Bos

Set design principle for connectivity of WLCG Tier0 and Tier1s

- first Tier1s connected with 10G links already in 2005

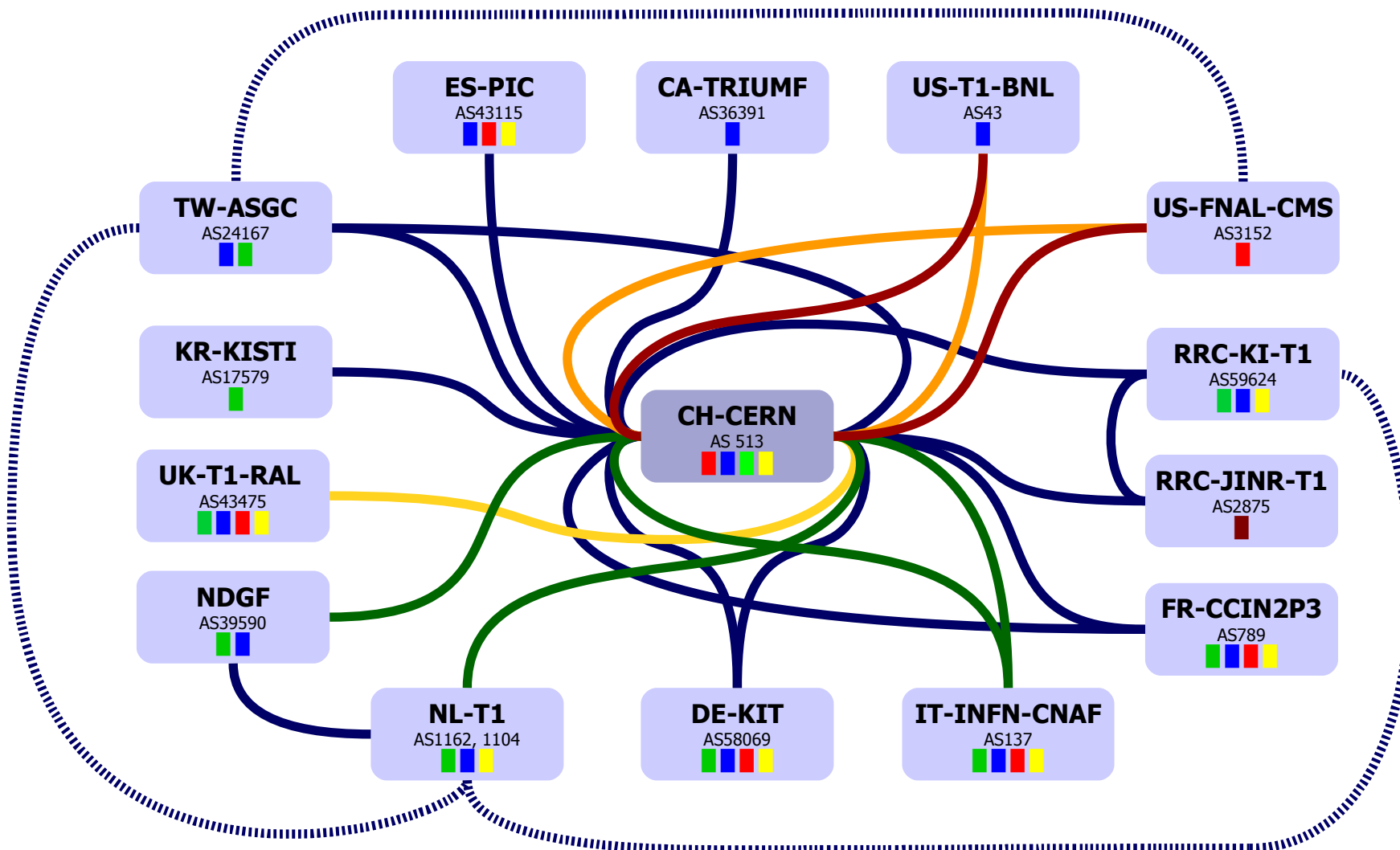
Forum to discuss operations and progresses

- for WLCG site operators, LHC Experiments, R&E network operators

Regularly meeting every 6 months since

LHCOPN

LHCOPN



— T0-T1 and T1-T1 traffic
- - - T1-T1 traffic only
■ = Alice ■ = Atlas ■ = CMS ■ = LHCb
 edoardo.martelli@cern.ch 20170927

— 10Gbps
— 20Gbps
— 30Gbps
— 40Gbps
— 100Gbps

<https://twiki.cern.ch/twiki/bin/view/LHCOPN/OverallNetworkMaps>

Numbers

- 14 Tier1s + 1 Tier0
- 12 countries in 3 continents
- Dual stack IPv4-IPv6
- 410 Gbps to the Tier0
- Moved ~160 PB in the last year

... then LHCONE

First meeting on June 2010 at CERN

- workshop on [Transatlantic Networking for LHC Experiments](#)

Design of Tier1/2/3 network for a changing computing model

- including advanced services and end-to-end monitoring
- implementation of services started already in 2011, ready for LHC Run2

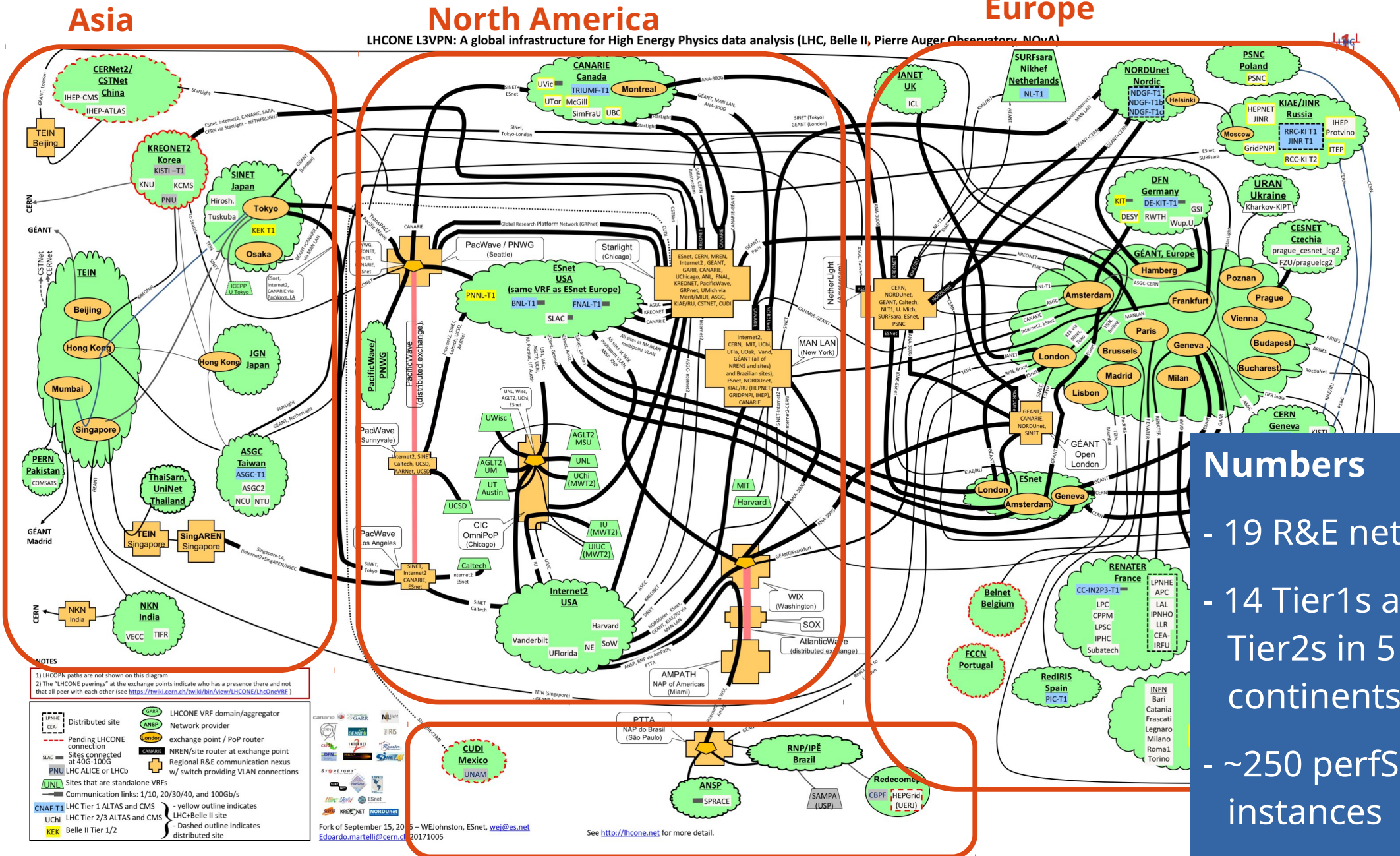
Joined LHCON + LHCOPN meetings every 6 months



L3VPN Current topology

North America

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



- ### Numbers
- 19 R&E networks
 - 14 Tier1s and ~66 Tier2s in 5 continents
 - ~250 perfSONAR instances
 - 5 collaborations

NOTES

1) LHCONE paths are not shown on this diagram
 2) The "LHCONE peerings" at the exchange points indicate who has a presence there and not that all peer with each other (see <https://twiki.cern.ch/twiki/bin/view/LHCONE/LHCONEVRF>)

	Distributed site		LHCONE VRF domain/aggregator
	Network provider		exchange point / PoP router
	Pending LHCONE connection		NREN/site router at exchange point
	Sites connected at 40G-100G		Regional R&E communication nexus w/ switch providing VLAN connections
	SLAC		Sites that are standalone VRFs
	PNU		Communication links: 1/10, 20/30/40, and 100Gb/s
	LHC ALICE or LHCb		Yellow outline indicates LHC+ Belle II site
	UNL		Dashed outline indicates distributed site
	CNAF-T1		
	LHC Tier 1 ALTA5 and CMS		
	UChi		
	LHC Tier 2/3 ALTA5 and CMS		
	KEK		
	Belle II Tier 1/2		

Fork of September 15, 2015 - WEJohnston, Esnet, wei@es.net
 Edoardo.martelli@cern.ch 20171005

See <http://lhcone.net> for more details.

South America

LHCOPN and LHCONE Milestones

- 2005, January: First LHCOPN meeting at SARA, Amsterdam
- **2007, July: all Tier1s connected to the Tier0 in LHCOPN**
- 2010, June: LHCONE meeting at CERN
- 2010, October: all LHCOPN links backed up
- 2011, June: First prototype of LHCONE implemented
- **2012, May: LHCONE L3VPN implemented in Europe and North America**
- **2013, January: LHCONE reaches ASIA**
- 2014, July: BelleII joins LHCONE
- 2015, February: LHCONE AUP agreed
- **2015, June: LHCONE reaches South America**
- 2016: Pierre Auger, NOVA, XENON joins LHCONE
- **2017, August: LHCONE reaches Australia**

This meeting

Common session with HEPiX today Monday afternoon:

<https://indico.cern.ch/event/637013/timetable/#20171017.detailed>

Parallel sessions later this Monday morning and tomorrow

Tuesday morning:

<https://indico.cern.ch/event/646629/>

(the sessions are open to everyone)

On the agenda:

- Development of LHCONE in Asia
- Use of LHCOPN by other collaborations

**THANKS to
HEPiX and KEK
for hosting us here**

