



ESnet

ENERGY SCIENCES NETWORK

Transatlantic Networking EEX & ANA

LHCOPN Meeting
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U.S. DEPARTMENT OF
ENERGY
Office of Science



Transatlantic Networking

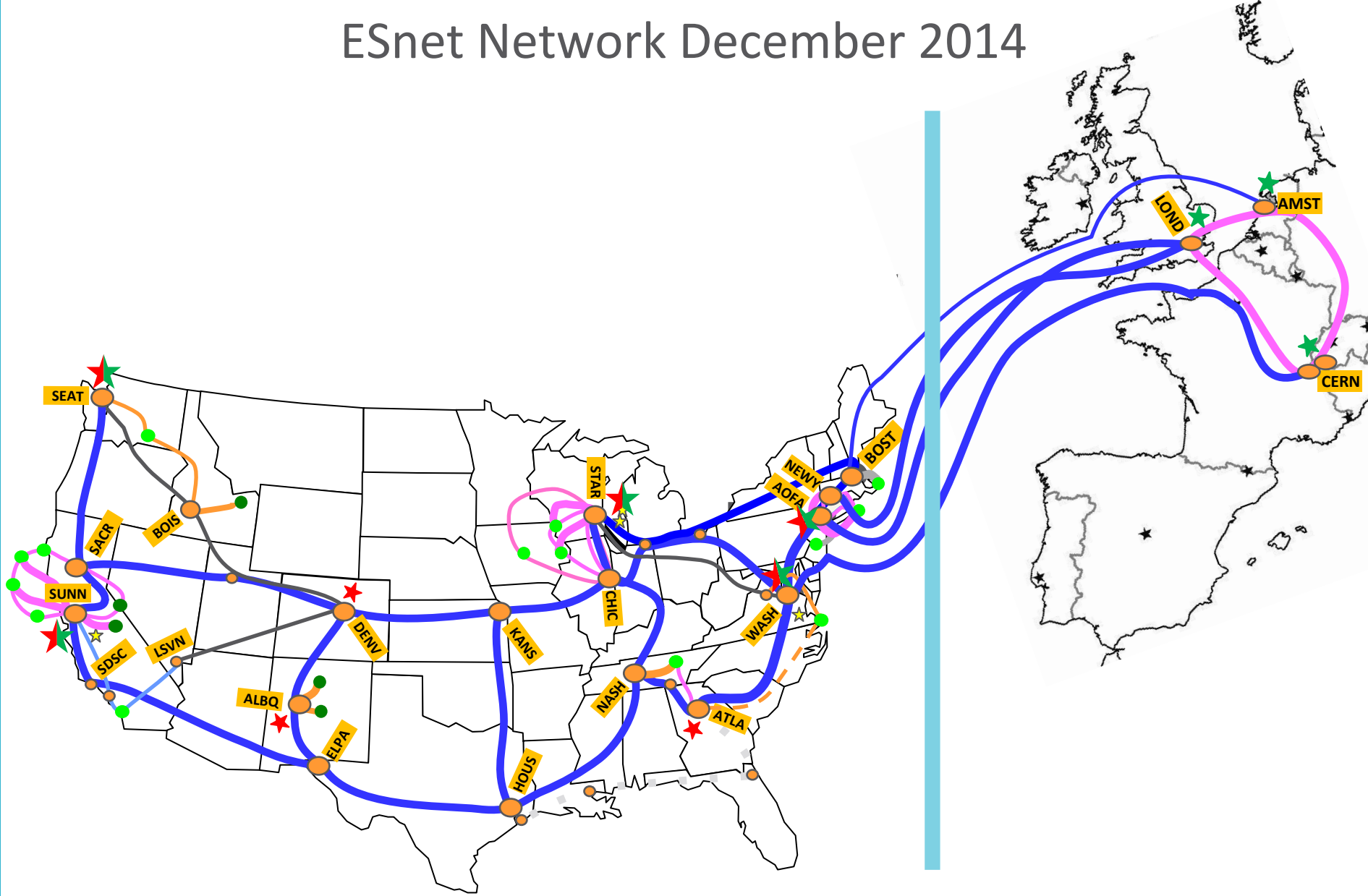
ESnet

- EEX was a project to Extend ESnet's network across the Atlantic
 - The project is done.
 - The EEX name is done.
 - It is now just part of the ESnet backbone

ANA

- ANA 100G [Pilot](#) is done
- ANA 200G [Production Network](#) is operational

ESnet Network December 2014



SUNN ESnet PoP/hub locations

100 ESnet 100G routers

★ R&E network peering locations – US (red) and international (green)

★ commercial peering points

Geography is only representational

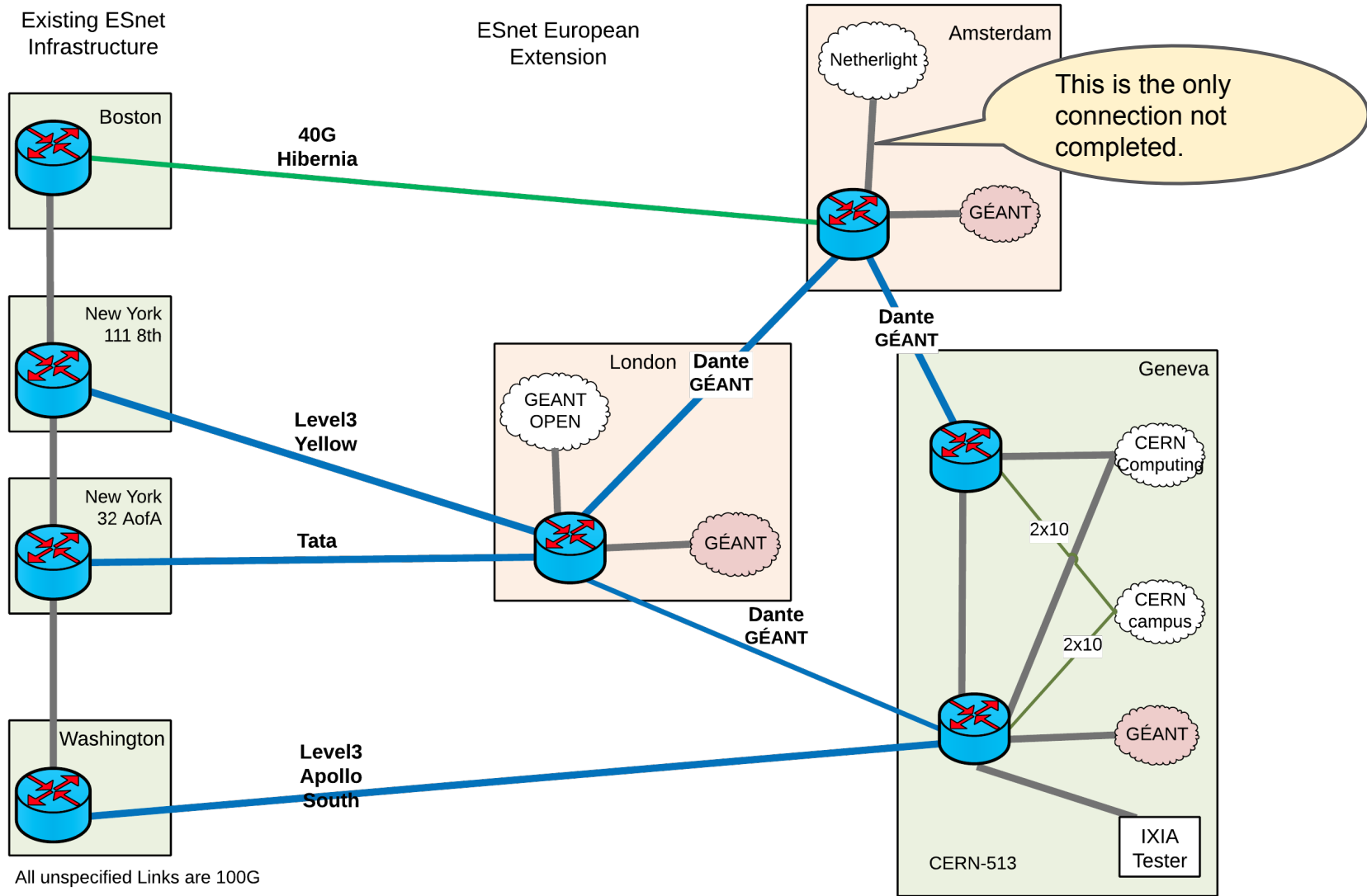
100 Gb/s

40 Gb/s

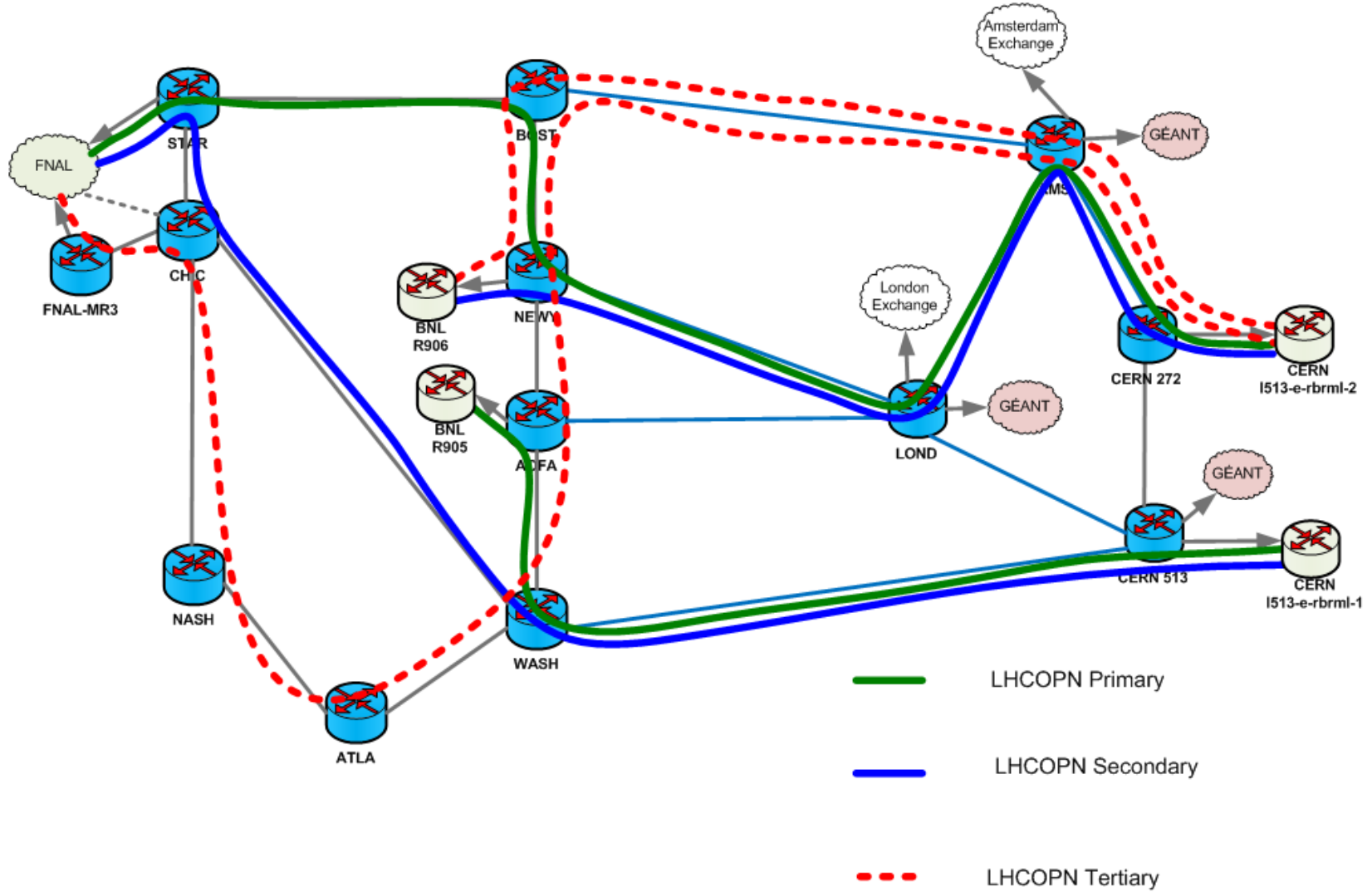
Express / metro / regional



Architecture



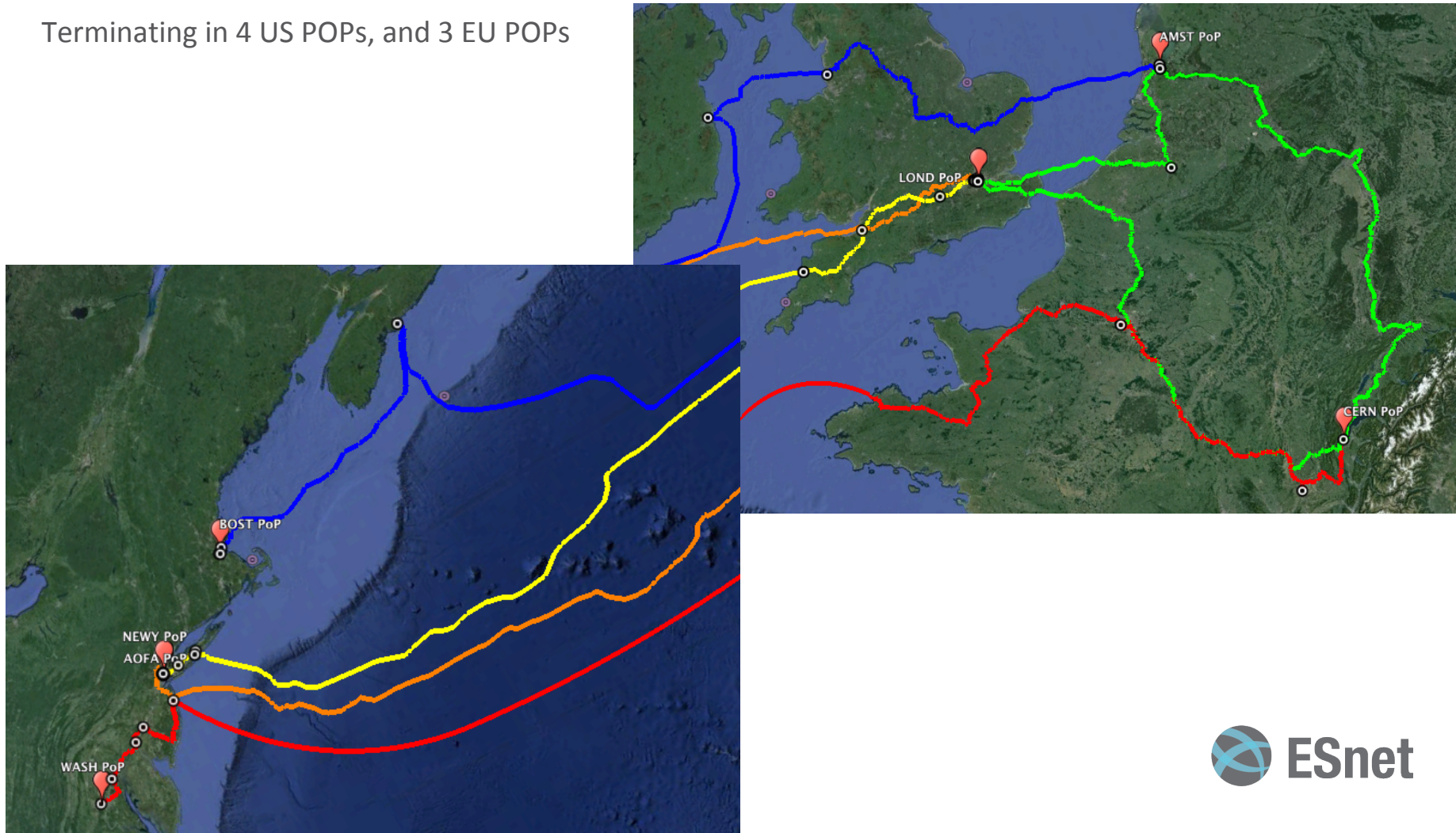
LHCOPN Overlay for BNL & FERMI



Reliability/Diversity is a Key Driver of the ESnet Architecture

4 TA circuits with ~ 5km of common right of way

Terminating in 4 US POPs, and 3 EU POPs



Transatlantic Circuit Availability

TA circuit uptime over last 2 months		
Circuit	Jan 2015	Dec 2014
BOST - AMS	92.700%	98.700%
LOND - NEWY	99.949%	99.999%
LOND - AOFA	99.998%	99.999%
WASH - CERN	99.986%	98.305%

Not sure what will be typical yet.

LOND-AOFA in January

- Duration Start Date/Time
- 000:00:02(h:m:s) Mon Jan 5 11:01:26 2015 (US Pacific)
- 000:00:01(h:m:s) Wed Jan 7 13:21:09 2015 (US Pacific)
- 000:01:03(h:m:s) Tue Jan 13 17:36:13 2015 (US Pacific)
-

BOST-AMS in January

- 150 outages < 30 seconds
- 5 outages ranging from 38 seconds to 43 hours

LOND-NEWY

- 6-day outage planned starting February 6th.

ESnet Services across the Atlantic

- LHCOPN Services
 - Transit from BNL and FERMI to CERN and other LHC Tier1s
- Standard ESnet Network Services
 - Routed services for our existing user base (DOE Laboratories)
 - OSCARS virtual circuits
- LHCONE Services
 - To FERMI, BNL & now CERN
 - ESnet will be turning up services to some US Universities providing the ability for them to transit HEP traffic across ESnet:
 - Between US Universities
 - Between US Universities, and European Labs/Universities

Current ESnet LHCONE Service Status

Currently Active

- 3 100G LHCONE peerings turned up with GEANT
- 1 100G LHCONE site connection turned up with CERN-Light

Near Term (days)

- 2x100G LHCONE peering with CERN
 - Shared physical interfaces with LHCOPN
- 100G LHCONE site connection to AGLT2
- 100G LHCONE connection to UCSD

Next Steps for ESnet

Turning up & tuning LHCONE peering sessions

- Rationalize local-pref and/or meds with GEANT (currently hot-potato)
- Turning up additional peerings with Nordunet & then rationalize.

Adding more US Universities

- US Atlas and US CMS have provided a prioritized list
- Will start working 3-4 in parallel
- Up next:
 - University of Chicago, University of Illinois, Indiana University, University of Nebraska Lincoln

Refining our processes as we go

- ESnet LHCONE Service Description
- ESnet LHCONE Service Turn-up Template

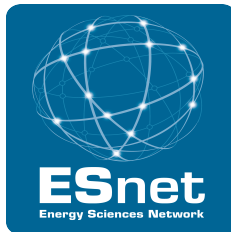
ANA-200G and beyond

Joe Metzger

(slides provided by Erik-Jan Bos)

LHCONE meeting – February 9, 2015

ANA-100G Pilot



ANA-200G Overview

ANA-200G: 100G Production Ring across North Atlantic for R&E

Open Exchange Points & Links

- MAN LAN
- WIX
- NetherLight
- GEANT Open London
- Internet2
- TGN-Atlantic South
- NORDUnet/SURFnet
- Hibernia Atlantic

ANA-100G Production Network: A 100 Gbit/s production quality ring across the North Atlantic for Research and Education. Collaborators: Internet2, NORDUnet, CANARIE and SURFnet.



ANA-200G European side

ANA-200G: 100G Production Ring across North Atlantic for R&E

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ANA-200G North American side

ANA-200G: 100G Production Ring across North Atlantic for R&E


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The way forward for ANA

- Six original partners agreed to continue to closely work together on trans-Atlantic R&E Networking
- Open Exchanges are a cornerstone of ANA **system**
- Sound and simple principles for cost sharing
- Work on getting GEANT back into the collaboration (ANA-300G?)
- ESnet remains fully aligned with ANA, with a backup agreement between ANA and ESnet  ESnet

GÉANT

- GÉANT is turning up a 100G from Paris to NYC.
- The GÉANT and ACE 10Gs are also being realigned
 - Further details from audience members...

Comments & Questions?