

Introduction

HEPnet/Canada is responsible for national and international network connectivity for the subatomic physics community

Established in 1990

Funded with an NSERC MRS award until 2017

HEPnet Director

Ogg 1990-1994

Karlen 1994-2004

Sobie 2004-present

Technical Manager

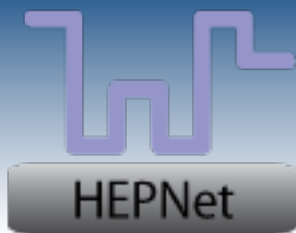
Gable (2006-present)

IPP Advisory Committee

Tafirout, Warburton, Virtue

Web site

hepnetcanada.ca



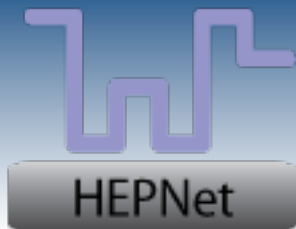
Outline

Canadian research network and international links

LHC network

Network R&D

Other activities



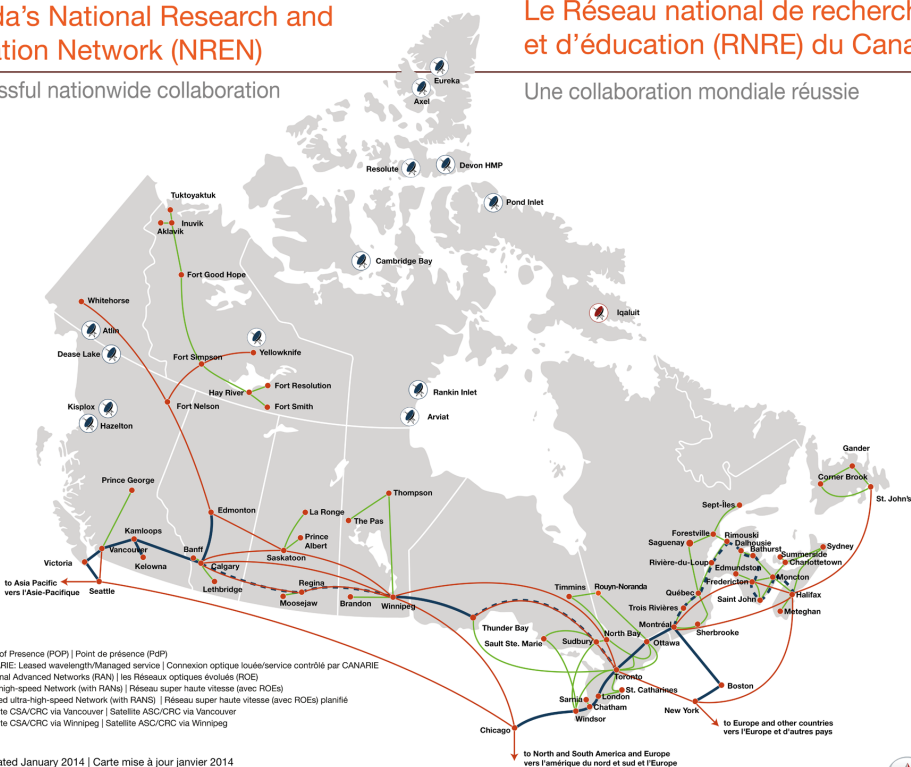
Research Network

Canada's National Research and Education Network (NREN)

A successful nationwide collaboration

Le Réseau national de recherche et d'éducation (RNRE) du Canada

Une collaboration mondiale réussie



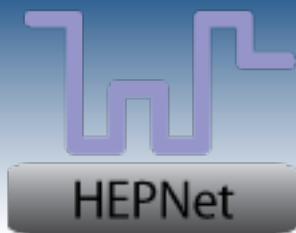
CANARIE
National research network

ORANs
Optical Regional Advanced Network
Provincial network

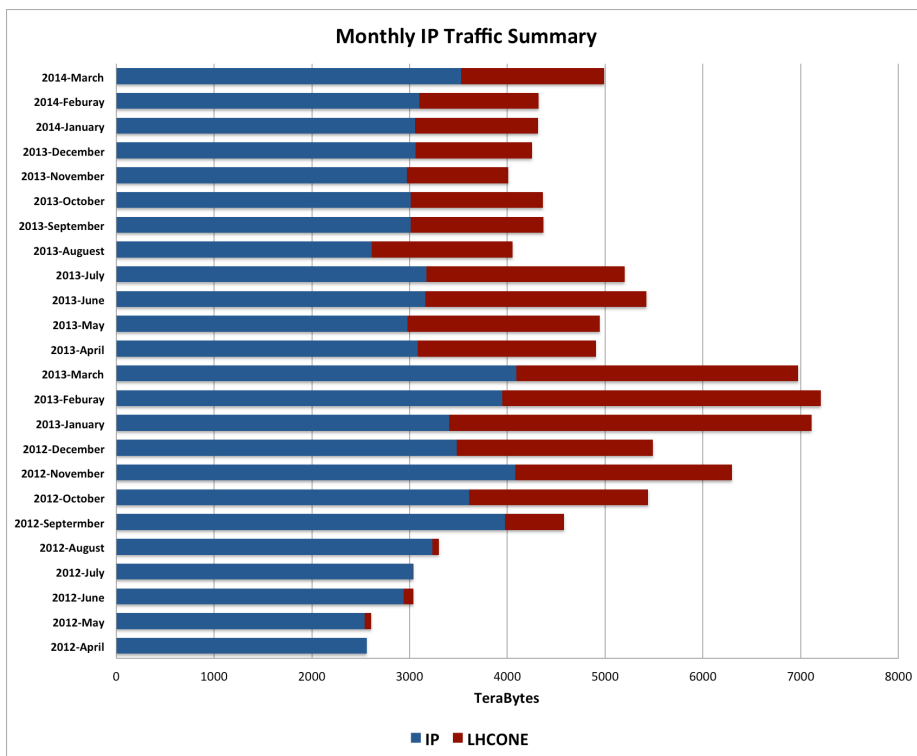
CANARIE is currently
deploying a 100G backbone
Expected to be completed end-2014

US and Europe have 100G networks

CANARIE pays for the TRIUMF-CERN link



HEP Network Traffic



In Sept 2013 we turned on the LHCONE network

HEP accounts for 50% of all the research network traffic in Canada

We are near full capacity on our links.

We need to transition to 100G networks in 1-2 years

Requires an investment by our institutions and Compute Canada

CERN has three 100G links

US Tier 1 (BNL/FNAL) are 100G capable

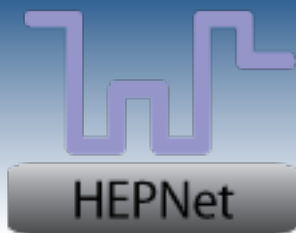
US Tier 2 sites will be 100G by end-2014



HEPNet



CANARIE visits CERN May 22 2014

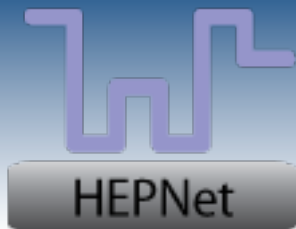


LHC Network

LHC network has two elements: LHCOPN and LHCONE

LHCOPN – LHC Optical Private Network

LHCONE – LHC Open Network Environment



LHCOPN

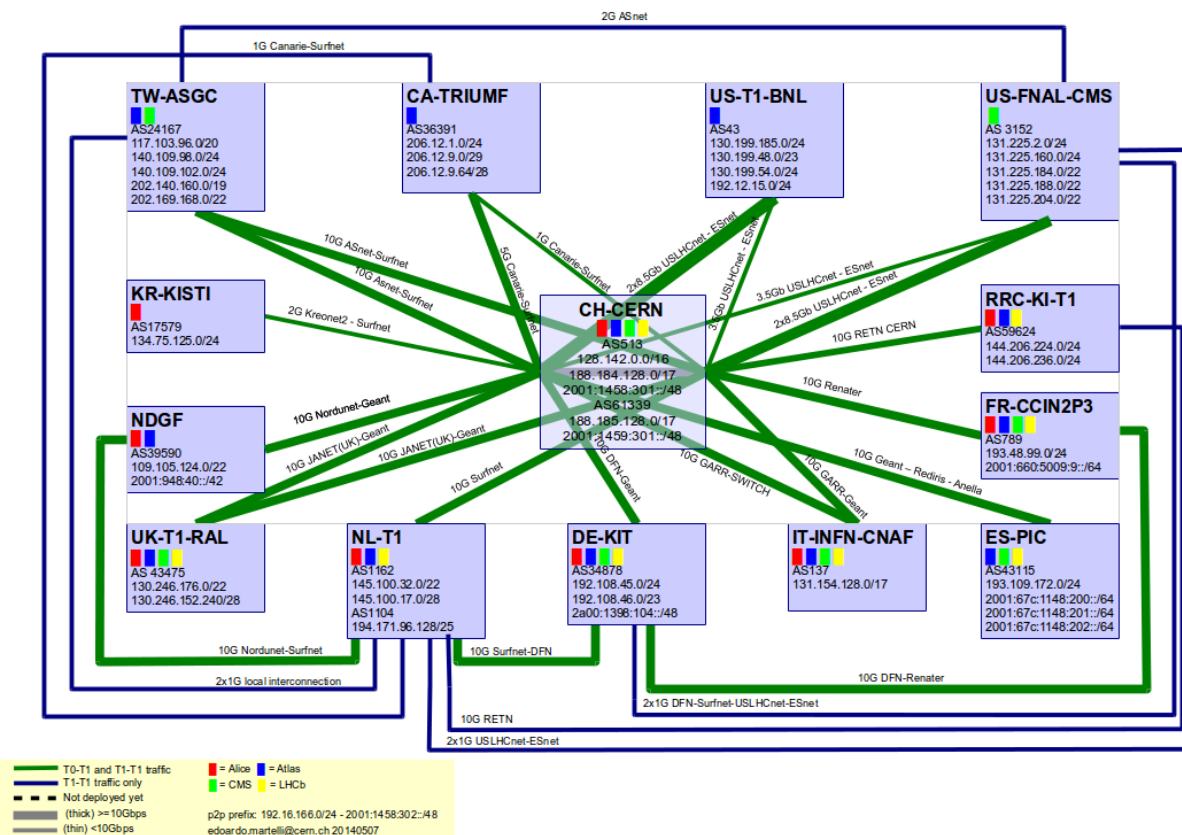
LHCOPN

Private IP network that connects the Tier0 and the Tier1 sites.

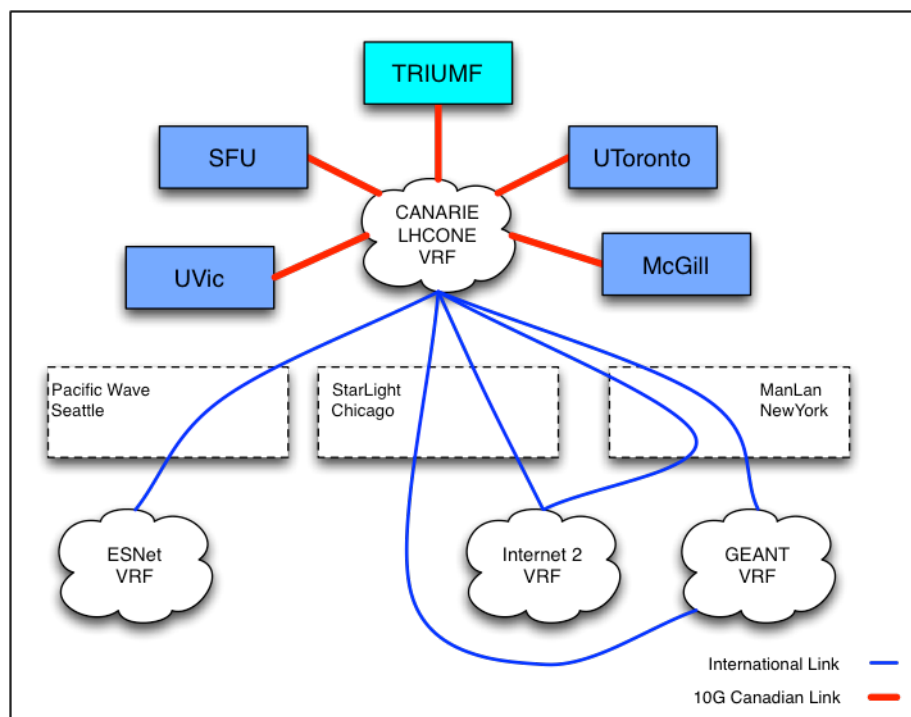
Dedicated to the transport of WLCG traffic.

Restricted to the Tier0 and the Tier1s.

9 Organizations in TRIUMF-CERN link
 TRIUMF UBC BCNET CANARIE Internet2
 MANLAN/NYC SURFNET GEANT CERN



We had 1G dedicated network connections between TRIUMF and Canadian T2s
 Decommissioned when the LHCONE network became operational



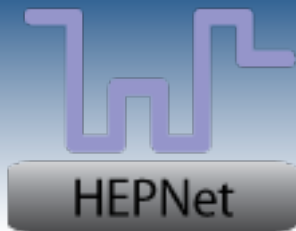
10G virtual private network linking all T0, T1s and T2s

Shift from the “Monarc Model” of a tiered structure
Can-T2 could only connect to TRIUMF

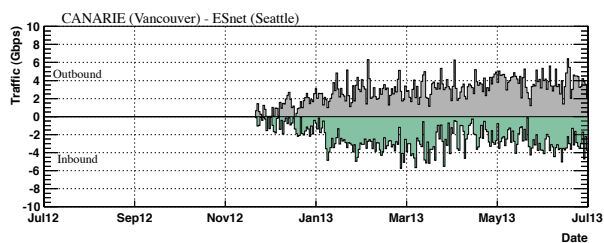
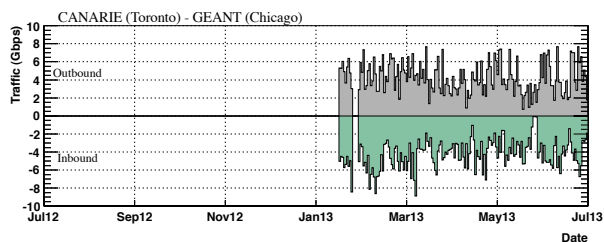
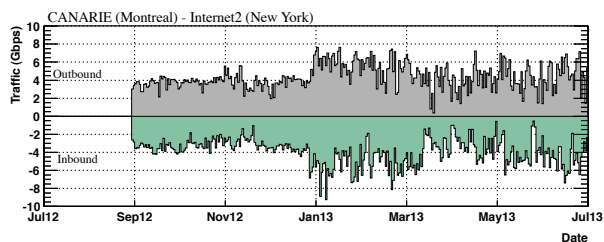
Now all sites are equal

TRIUMF
5G LHCOPN link
2x10G LHCONE links

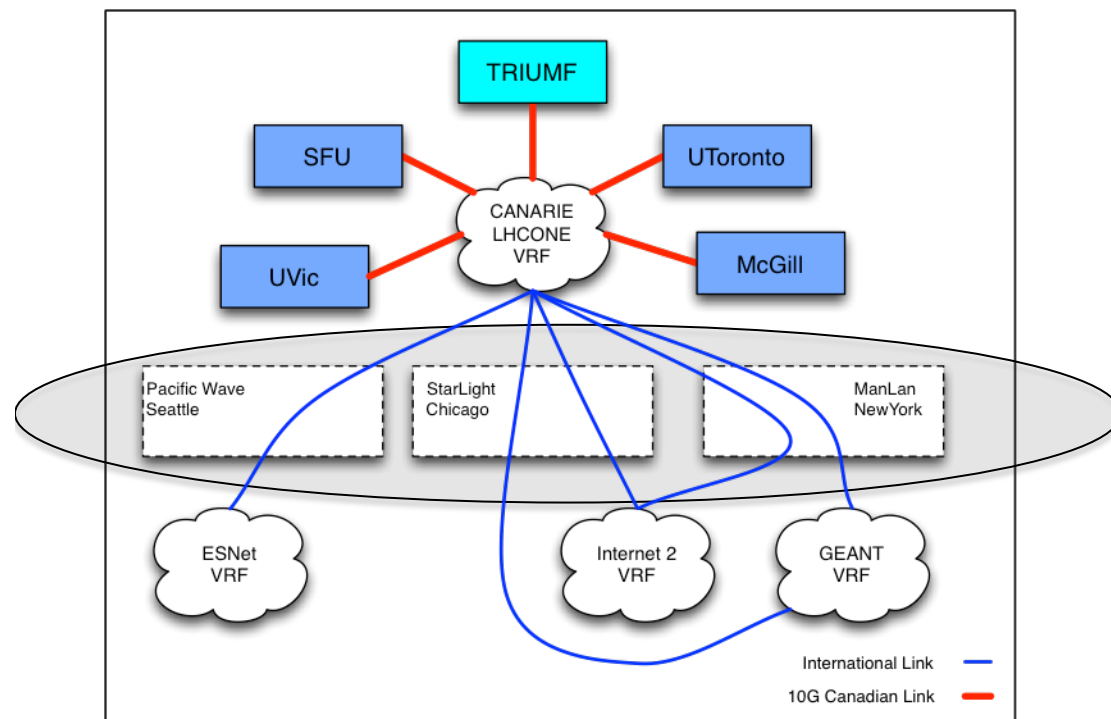
Tier2s
10G links

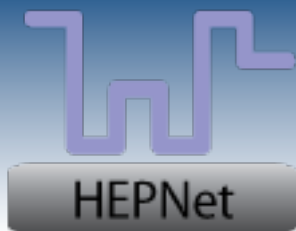


Instant utilization



Traffic on our three international links
(NYC, Chicago and Seattle)





Future plans

Global plans:

100G networks in most countries
Sites typically take 12-24 months to connect at 100G speeds
100G test transatlantic link
4x100G transatlantic links in 2015

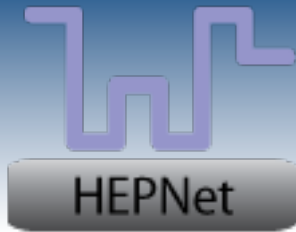
Discussion about allowing BelleII traffic on LHCONE

Most BelleII computing centres are WLCG sites (except KEK and PNNL)

Canadian plans:

Upgrade LHCOPN link 5G to 10G
TRIUMF has infrastructure that can be upgraded to 100G

Tier2 operate with 10G
Multiple 10G circuits are difficult to manage
Need to get sites and CC to recognize the urgency for 100G
Richard Mount said 10G is now marginal for ATLAS Tier2s



Network R&D

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Scientists break world record for data transfer speeds



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International team demonstrates intercontinental OpenFlow network at Super Computing 2013



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11/21/2012

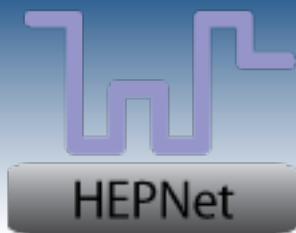
High-Energy Physicists Smash Records for Network Data Transfer

New methods for efficient use of long-range networks will support cutting-edge science



Canadian physicists achieve 100 gigabit/second transatlantic transmission, enabled by CANARIE and its global partners

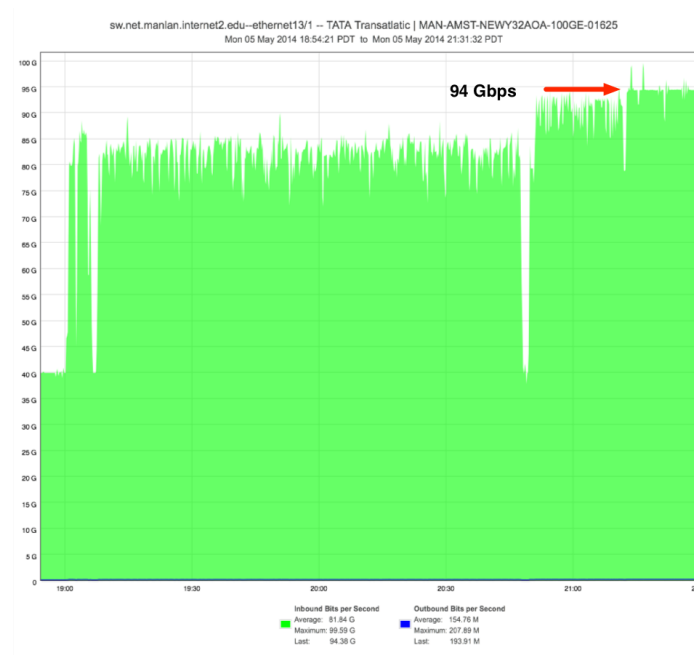
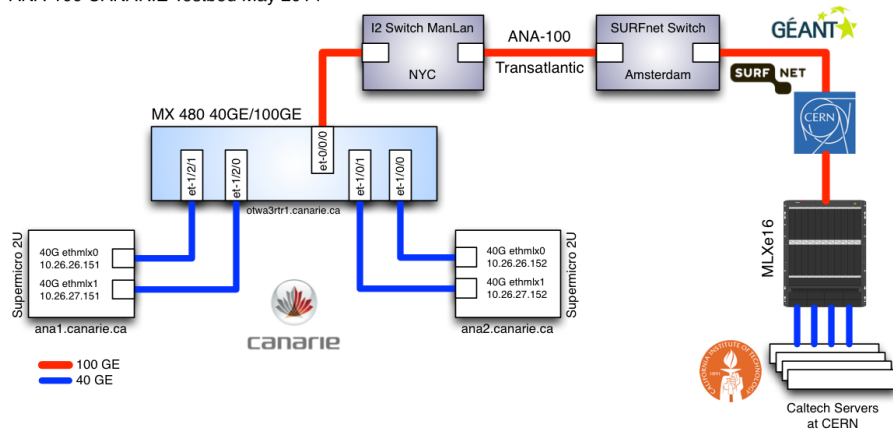
Preparing plans for SC 2014 in New Orleans

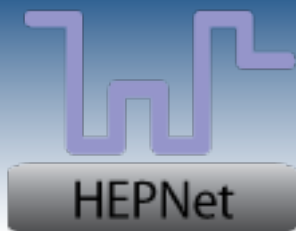


100G Transatlantic tests

HEPNET/CANARIE/Caltech had exclusive use of the 100G link for one week
Ottawa-CERN tests
The link is supported in part by CANARIE

ANA-100 CANARIE Testbed May 2014





Other activities

HEPNET provides support for site connections

Port charges, optical transducers and other items

SNOLAB connection to regional network

Network monitoring systems at T1/T2 sites

Non-traditional funding support

CANARIE, BCNET, UVIC, Cybera, Amazon, Google, NRC

Includes cloud computing projects

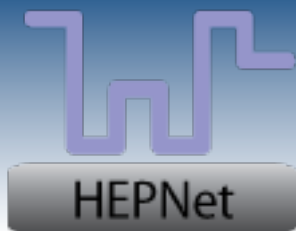
In-direct (equipment loan)

Ciena, Juniper, Brocade, Xyratex, IBM, Dell, Scalar, Fusion IO

HQP

50 undergraduates (engineering, CSC and physics)

14 staff (7 currently)



Summary

HEPNet/Canada has a important role for Canadian HEP
Recognized by the recent NSERC MRS award

Networks are enabling the transition to an on-demand environment
Data and computing will not longer be co-located

100G networks are becoming the new standard
Expect terabit/second networks by end-decade

HEPNet is fortunate to be working in an area of wide interest
We will continue to leverage funds from other sources

<http://hepnetcanada.ca>

<http://supercomputing.uvic.ca>

<http://heprc.phys.uvic.ca>