Research Infrastructure for SARnet

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Winter 2015

Temps passé en reconnaissance n’est jamais perdu.

-Napoleon Bonaparte
Preparatory Milestones

~ 2001 Ciena established a research network OmniNet in Chicago at Northwestern University

~2008 CANARIE connected Ciena Ottawa research labs to Starlight.

June 4th 2010 Ciena designs “the Flight Cees” a portable Optical transmission demo platform.

October 18th 2010: Ciena-CANARIE link upgraded to 100G,

January 2013: Collaboration agreement signed with University of Amsterdam

June 1st 2013 Ciena and Internet 2 signed MOU called the “Research on demand network” to create a persistent service on a dedicated wave.

June 3rd, 2013: Ciena lead participant in ANA-100 research network

July 2013, Ciena signed an IRU to extend Internet 2 in to Hanover HQ

September 2014: REANZ GLIF trans Pacific 100G demo link.

January 2015 Ciena signs SARnet research project agreement

March 25th 2015: Ciena announces GENI involvement
Ciena’s CENI topology

- Ottawa - Chicago Infrastructure
- Canarie MANLAN link
- ESnet alt route segment
- Link to Ciena Station Ridge HQ
National Science Foundations ExoGENI racks, installed at UvA (Amsterdam), Northwestern University (Chicago) and Ciena’s labs (Ottawa), are connected via a high performance 100G research network and trans-Atlantic network facilities using the Ciena 8700 Packetwave platform. This equipment configuration is used to create a computational and storage test bed used in collaborative demonstrations.
Modified exoGENI hardware configuration

Undertaken in collaboration with University partners, RENCI, iCAIR at Northwestern University, and SNE at University of Amsterdam

Multi-100GE DWDM SDN enabled 2Tb/s switching fabric
Exploring / Validating Software Solutions

Verification On-Demand Network Applications

CENI SDN Visualization
exoGENI, Collaboration
Multi-Layer, Multi-Domain SARnet vehicle

Research on Demand Network

CONNECT USERS TO CONTENT

CONNECT CONTENT TO CONTENT

ExoGeni Resources
Orchestration Control & visualization

Navigate

3rd Party Apps

APP
Ciena SARnet exoGeni

Rack elevation & components

Ciena 3940 Service Delivery switch
Ethernet aggregation platform. high-capacity switching fabric with 24 Gigabit Ethernet (GbE) ports efficient packaging design provides both SFP and RJ-45 connectors

Ciena Packetwave 8700
Ethernet over DWDM, multi-Tb L2 switching Platform. Incorporates WL3 @ 200+Gbps

- 10 Dell Servers
  - 180 Physical Cores -> approx. 330 Virtual Core Machines Running Linux RedHAT 6.0
  - Up to ~ 80 VMs (using 4 Cores each.)
  - 608 GB of Physical RAM -> approx. 1.2TB VRAM
  - 6 TB of HD-> more than 12TB Virtual Disk Capacity
Ciena Environment for Network Innovation (CENI)
(with full credit to our colleagues at NSF GENI)

Collaboration with Internet2, CANARIE, Starlight and SURFnet created a “research on demand” testbed, now enhanced with exoGENI racks as a resource for computer communications research and experimentation.
Thank you
Starlight 8700 Packetwave Node
Network End-Point Flows