

CANARIE

ONT3 - Panel D:

**early deployments of innovative advanced optical networking services
& infrastructure, and int'l exchange facilities**

CAnet 4

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talk outline

> 4th generation of CAnet

- - objectives, design, and infrastructure
- - services
- - network innovation

> CAnet post March 2007

- - objectives, design, and infrastructure
- - services
- - network innovation

> international exchange points

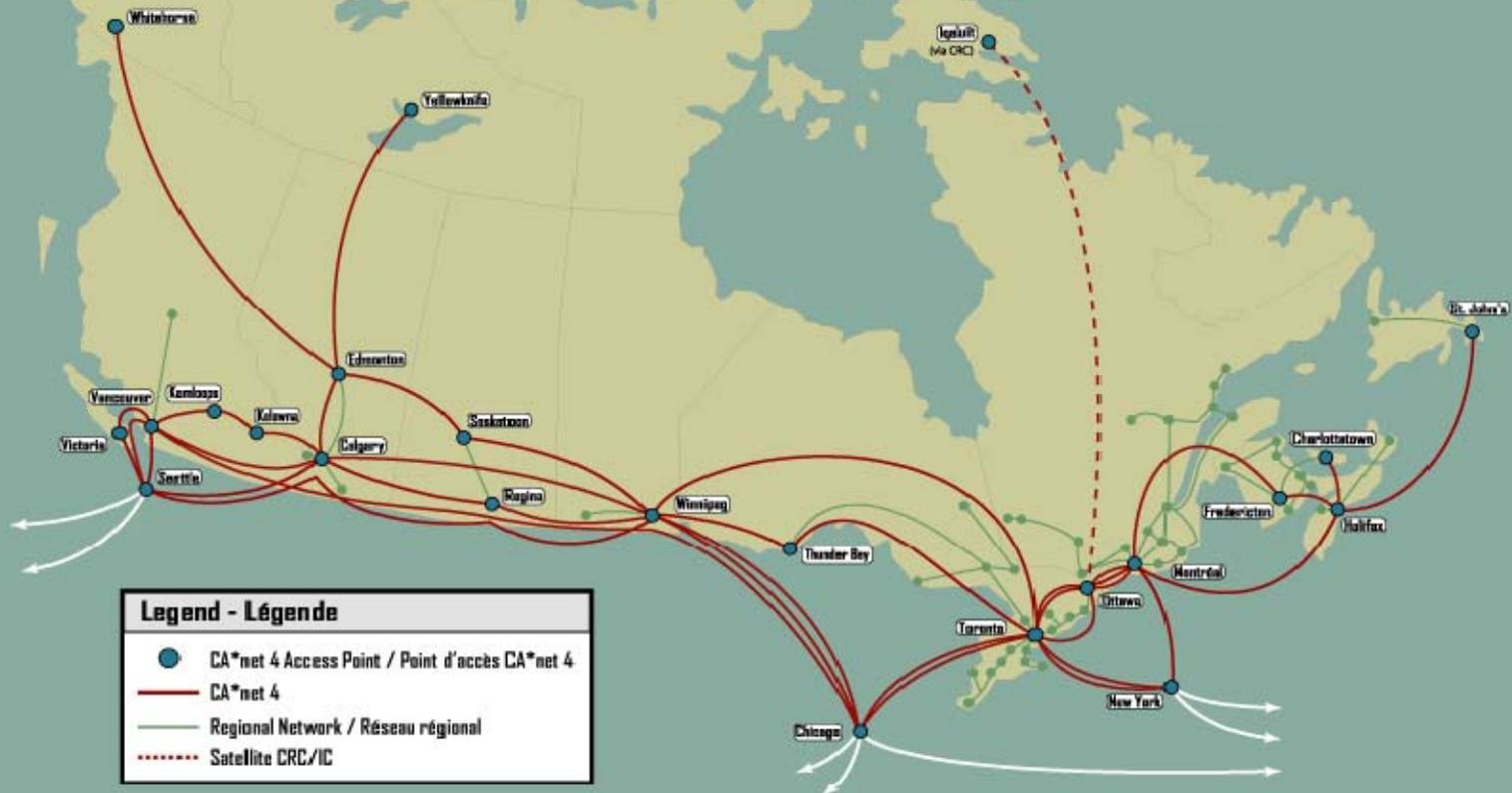


CAnet 4 infrastructure (1/2)

- > infrastructure, not a network
- > supports many networks including testbeds as required by Users
- > was operational in 2002 – old by Internet time standards
- > consists of OC-192 wavelengths leased from carriers and SONET line-terminated on CANARIE operated SONET cross-connect switches
- > designed to support many independent IP networks
- > network innovation: to empower Users to manipulate network elements through software abstraction of network elements

CA*net⁴

Canada's Research and Education Network
Réseau canadien pour la recherche et l'éducation





CAnet 4 services

> offerings: L1, L3, and UCLP

- L1: sub and 1 GbE, and 10GbE LightPaths (over OC-12c, OC-24c, and OC-192c) to Users
 - exceptionally support OC-12 and OC-48 for R&E network peer terminations
- L3: 1 GbE connections to ORAN Users
- UCLP: permits Users to provision and re-engineer LightPaths at will

> service philosophy: best efforts

- - 7/24 engineer available through pager
- - 4 hour response from carriers
- - NBD parts replacement in case of infrastructure failure



CAnet 4 network innovation

> UCLP

- Service Oriented Architecture network capacity provisioning tool built over Web Service workflow technologies
- network elements are software objects (Guru mentioned by Bob Khan thinking along similar lines)
-

> SOA and Web Services are key

- creation of ITC lego blocks for building custom ICT solutions
- abstraction of Network Management and Control Plane capabilities (i.e. don't care what they are)



CAnet 4 extensions / CAnet 5 foundation

> 72 lambda 10G multi-degree (or mesh) ROADMs capability between

- - Seattle-Victoria-Vancouver-Kamloops-Kelowna-Calgary
- - Chicago-Windsor/Detroit-Toronto-Ottawa-Montréal-Albany-Boston-NYC

> objectives:

- - meet continuing growing 10G demand of large-scale e-science
- - mesh with ORAN DWDM systems
- - co-management of the optical infrastructure
- - enable deployment of 10G to the desktop through partnership and DWDM interconnect with ORANs in BC, Alberta, Ontario and Québec



CAnet 5 plans

> hybrid infrastructure

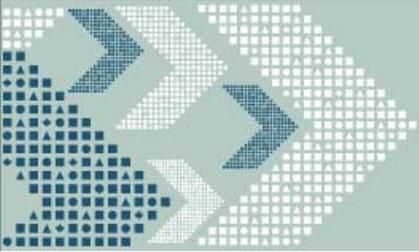
- not talking about L1+L3
- ROADM/fibre and carrier OC-192 wavelengths

> services

- - lambda: 10GbE and OC-192
- - L1 SONET: GbE and 2x, 3x, 4x, 5x, and 10GbE over LAN Phy port and VCAT (over one or two diverse paths using VCAT+LCAS)
- - L3: 10GbE router upgrade in 2008-2009?
- - UCLP expanded to support private (virtual) routing services

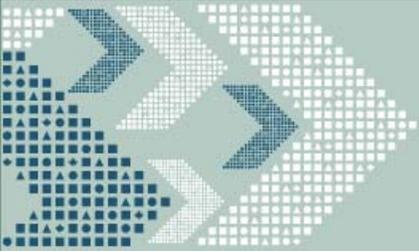
> network innovation:

- - web services of large-scale instruments and any scale sensors
- - working with Cdn industry to advance adoption of SOA technologies



international exchange points

- > **CANARIE committed to GLIF Open LightPath Exchange model**
 - - facilitate international interconnections
 - - minimize quantity of colo, equipment and cards req'd
 - - minimize call blocking probability at exchange points
- > **Operator of GOLEs in partnership with**
 - StarLight in Chicago
 - PNWGP in Seattle
 - co-managed HDXc
 - UCLP, local partner, or CANARIE
- > **User of GOLEs**
 - CAnet 4 trans-Atlantic wave terminating on
 - Internet2 MAN LAN and SURFnet NetherLight GOLEs



future is about choice

- > network will be abstracted into reusable ICT lego blocks
- > User can pick and choose web service components (software processes, different middleware blocks, network elements, sensors and instruments) to make up complete ICT solution
- > web service workflow tools will bind ICT web service lego blocks into a custom solution