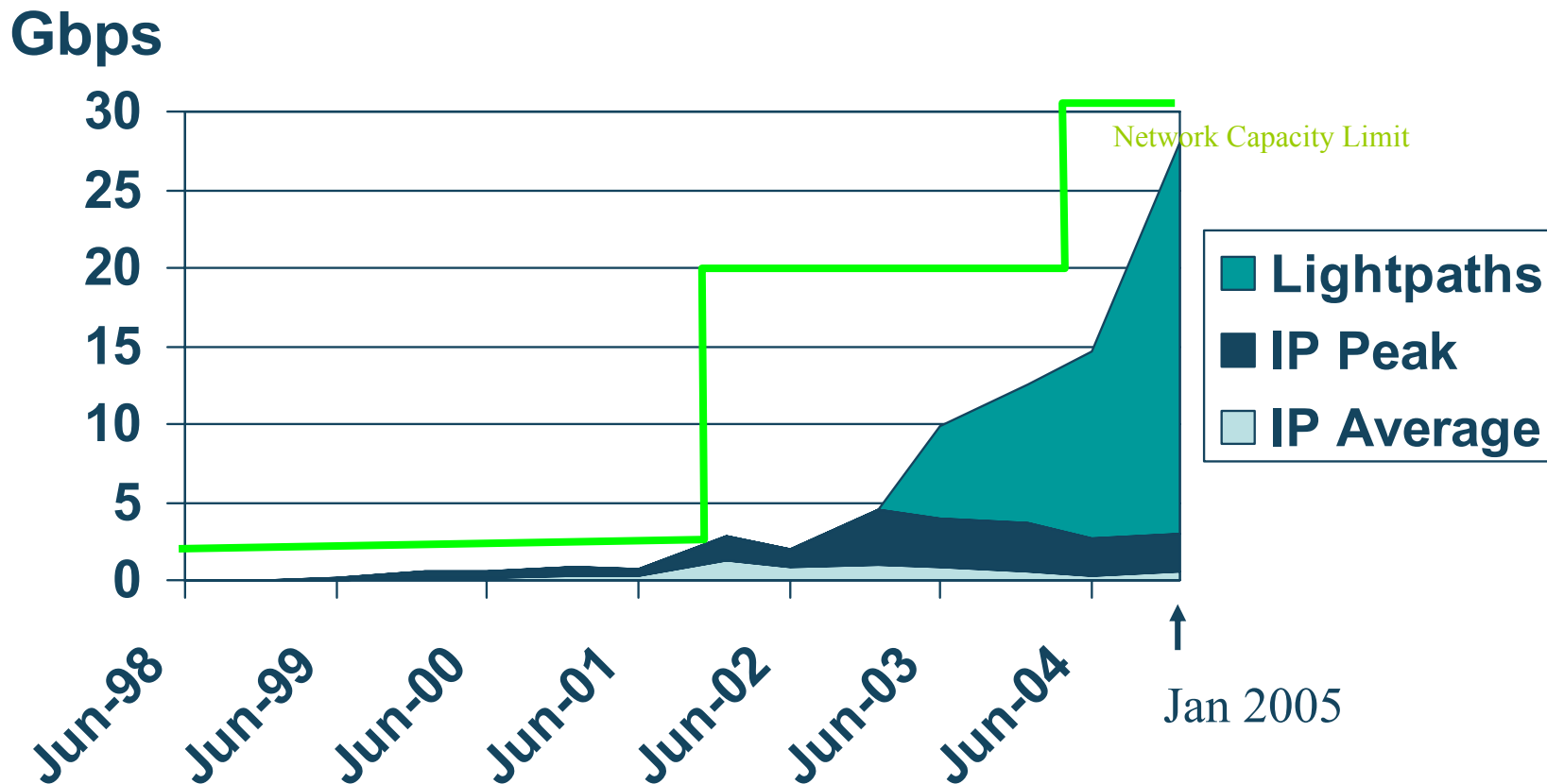


CANARIE

CA*net 4 Update

June 20, 2005

Utilization trends





CA*net 4 IP Utilization

- > **General IP traffic volume flat or slight decline, despite connection of large number of Ontario institutions this year**
 - Universities more effective in limiting video/audio file sharing
 - High end research traffic is moving to lightpaths, e.g. Westgrid, TRIUMF, etc
- > **IP traffic is expected to decline as many organizations move to lightpaths and/or APNs e.g. NRC, NRCan, HEPnet, etc**
 - Significant portion of IP traffic is still video/audio file sharing and Usenet
- > **At some point in future may want to reduce or eliminate general IP traffic as traffic volumes can be easily handled by private sector, or use as a bargaining tool to acquire more wavelengths**



End to end lightpaths -1

1. [TRIUMF-ATLAS Tier1 10G tests](#) (supercedes project #34)
2. [KISTI & KISDI - KREONet2 to StarLight](#)
3. [ATLAS Tier1 preparations](#) TRIUMF Perm Cdn. TRIUMF - CERN STS-24 (1G)
4. [ATLAS High Level Trigger](#) UoAlberta UoAlberta - CERN STS-24 (1G)
5. [RRX Networkworld - 9k APP](#) RRX network Temp UoAlberta - UVic [STS-24 \(1G\)](#)
6. RISQ UQAM - Emily Carr Institue STS-3 (155M)
7. [RISQ-ARTGrid](#) RISQ UQAM - RyersonU STS-3 (155M)
8. [NCHC - TWAREN 2.5G Upgrade](#) NCHC Perm I T < 10G Seattle - StarLight STS-48
9. [HEPnet Canada - LCG 'robust data transfer'](#) HEPnet Canada Temp TRIUMF - CERN STS-192 (10G)
10. 5 Sep '05 33 [AARNet - Titan Huygens probe VLBI](#) AARnet Temp Australia Telescope National Facility (CSIRO) - JIVE (Netherlands) [STS-24 \(1G\)](#)



E2E lightpaths - 2

11. [McGill - Fermilab, CDF and Dzero](#) McGillU Perm Cdn McGillU - Fermilab (thru StarLight) [STS-24 \(1G\)](#)
12. Ireland int'l R&E connectivity HEAnet Perm I T < 10G HEAnet (NYC) - StarLight STS-24 (1G) 7
13. [NRC - NRC private network](#) NRC Perm Cdn NRC institutes - NRC: Victoria, Ottawa, Montréal [STS-24 \(1G\)](#)
14. [Nortel Lab10](#) Nortel Networks Temp Lab 10 (Ottawa) - StarLight [STS-24 \(1G\)](#) and occasional [STS-192 \(10G\)](#)
15. [WestGrid - WestGrid-Fermilab DO experiment](#) WestGrid Perm Cdn BCnet (Van) - Fermilab (thru StarLight) [STS-24 \(1G\)](#)
16. 1 Jan '06 27 [WIDE – I2 Land Speed Record](#) U of Tokyo Temp UoTokyo though PWave (Seattle) - StarLight through to CERN [STS-192 \(10G\)](#)
17. [TRIUMPH & CERN - 10GbE IGT experiments](#) CarletonU Temp TRIUMF - CERN [STS-192 \(10G\)](#)
18. 31 Jan '05 25 [GLORIAD: Chicago-NewYork](#) GLORIAD Perm I T < 10G GLORIAD (NYC) - StarLight [STS-24 \(1G\)](#)
19. RISQ internal Mon-Hull backup RISQ Perm Cdn Montréal - Ottawa [STS-24 \(1G\)](#)



E2E Lightpaths - 3

20. [WIDE - SC2004 demo](#) U of Tokyo Temp UoTokyo though PWave (Seattle) - StarLight through to CERN STS-192 (10G)
21. [Nortel - SC2004 demo](#) Nortel Networks Temp StarLight - MAN LAN and on to UofAmsterdam 2 x STS-24 (1G)
22. WIDE-CERN Carleton U Temp UofTokyo - CERN STS-192 (10G)
23. [Queen's University - Data Mining](#) Queen's U Perm Cdn Queen's U - UoIllinoisChicago (UIC) [STS-24 \(1G\)](#)
24. Jun '07? 18 HDTV demo UPC Temp KREONet2 - UPC (Barcelona, Spain) STS-12 Sep '04 17 Tor-Ott ORANO backup ORANO Perm Cdn Toronto - Ottawa STS-24 (1G) Jun '04
25. [ATLAS remote farms](#) UoAlberta Temp U of Alberta - CERN 2 x STS-24 (1G) July '04
26. UCLP demo to EU delegation CRC Temp CRC - UPC (Barcelona, Spain) STS-24 (1G) 8 Jun '04
27. S. Korea int'l R&E connectivity KREONet2 (S. Korea NREN) Perm I T < 10G Korea - Pacific Wave and StarLight 2 x STS-12 1
28. I2-DANTE lightpath performance testing Internet2 Temp Caltech - CERN STS-24 (1G) Mar '04
29. 12 live demo of UCLP CANARIE Temp TANet2 (Seattle) - HEAnet (NYC) STS-24 (1G) 25 Mar '04 11 HEAnet: Chicago-New York HEAnet (Ireland NREN) Perm I T



E2E Lightpaths - 4

30. Jan '05 10 TANet2: Seattle-Chicago TANet2 (Taiwan NREN) Perm I T < 10G Seattle - StarLight STS-24 (1G) Jan '04
31. SGI+Yotta Yotta - SAN CXFS filesystem transfer demo at SC2003 SGI Canada + Yotta Yotta Temp U of Alberta - SC2003 in Arizona thru Abilene (StarLight) 5 x STS-24 (1G)
32. Carleton University - ITU World demo Carleton U Temp Carleton U - CERN STS-192 (10G) Oct '03 7 SGI+Yotta Yotta - SAN CXFS filesystem transfer SGI Canada Temp U of Alberta - CANARIE STS-24 (1G) Aug '03
33. Distributed backplane WestGrid Perm Cdn Vancouver (BCnet) - UoCalgary STS-24 (1G) Aug '03
34. ATLAS production FCAL data transfer Carleton U Temp Carleton U - CERN STS-24 (1G)
35. CANARIE hosting a National Centre for Data Mining cluster UIC Perm Cdn UoIllinoisChicago (UIC) - Ottawa 5 x STS-12 Oct '02
36. ATLAS Lightpath transfer Carleton U Temp TRIUMF - CERN STS-24 (1G) Sep '02 1 BCnet backbone BCnet Perm Cdn Vancouver - Victoria STS-24 (1G) Jul '02



Upcoming lightpaths -1

1. Taiwan 2.5 GBps TWAREN – Sea-Chi, end of Feb 2005
 - **To be paid for Taiwan**
2. BCIT 9k MTU testing – 1G Edm-Van-Vic, Spring 2005
 - **Short term link**
3. McGill Fermi Lab (UoT to be added) 1G – end of Feb 2005
 - **Long term link**
4. TRIUMF – CERN 1G – mid-March, when 2nd AMS-CERN up
 - **Long term link**
5. TRIUMF – CERN 10G- Summer 2005
 - **Dependent on status of TRIUMF's future**
6. NRC private net – 2G
 - > **starting now**
7. KREONet2 10G – Sea-Chi, May 2005
8. NYSERnet backup – 1G
 - **when we get fibre to Buffalo**



Upcoming Lightpaths-2

9. High Definition Ultra-Videoconferencing (AAP3), McGill+UBC: 3 x GbE or 1 x 10G. June 2005.
 - Can be met with existing 3rd lambda until required by TRIUMF-CERN. Should be able to time share.
10. Real-time remote processing for ATLAS (AAP7), UoA+CERN: GbE to be upgraded to 10G.
 - Share with TRIUMF Tier1 10G requirement in Q4 2005?
11. UWaterloo+Alcatel (AAP10) : spare capacity to test UCLP
12. Tele-Surgery Training (AAP20), Ud'Ott+UoA: GbE
13. Enjeux (AAP2), TéléU+Bell+SFU+UQAM+etc.: VPNs over L3
14. MediaLightPaths (AAP24), SFU-UoA-UoC-TéléU-DalU: STS-12 Van-Cal + STS-12 Van-Edm + STS-12 Edm-Mon + STS-12 Cal-Mon + STS-12 Mon-Hal
15. BEST (AAP25), Teluq+Od'O+UBC: Oct 2005 GbE
16. Lightpaths at synchrotrons (AAP29), CLS-UoA: Edm-Sas Gbe + Cal-Sas GbE
17. Cdn DataGrid (AAP30), UoC+CarletonU: Cal-Ott GbE
18. ARTGrid (AAP33), UQAM+Ryerson+Emily Carr: STS-3



Other Lightpath Requests

- > **Most are informal at this stage**
- > **Many are for demos for iGrid and SC 2005**
- > **More are coming every day**
- > **List as of noon on June 15**
 - Forecast lightpaths on Calgary Vancouver segment long term
 - McGill – UBC 3 channel HDTV – 10 G long term (3 G in January)
 - Canada-China-Real time Earth quake simulator – 1 G?? Long term
 - UCSD- Canada Film Institute collaboration & UBC – 1 G?? Long term
 - Forecast lightpaths on Calgary Vancouver segment short term demos
 - Nortel demo at iGrid and SC 2005 – 10G – short term
 - Nortel demo at iGrid and Sc2005 – 2G – short term
 - CRC – UQAM demo at iGrid – 4G – short term
 - Meriton demo at SC2005 – 2G?? – short term
 - IBM-Heritage Canada demo at iGrid – 1 G?? Short term
 - Forecast lightpaths on other segments
 - NYSErnet swap – 1G permanent
 - PBS- NYSErnet swap – 1G long term
 - Nortel experiments with OMNIInet – 2G long term
 - Nortel experiment with SURFnet & OMNIInet – 10 G short term



Current updates

- > **HDXs in Seattle and Chicago to support GLIF activities and our needs for additional wavelengths**
- > **2 new wavelengths end of this summer**
- > **Maybe 2 more later this fall**
- > **Cost of wavelengths < \$US 2/km/month/10G**
- > **Interface cards more expensive than lightpaths**
- > **Acquiring 10G to CERN through Amsterdam**
- > **Several collaborative lightpath projects with Australia, Taiwan, China, Korea, Spain, etc**



Proposed ROADM network

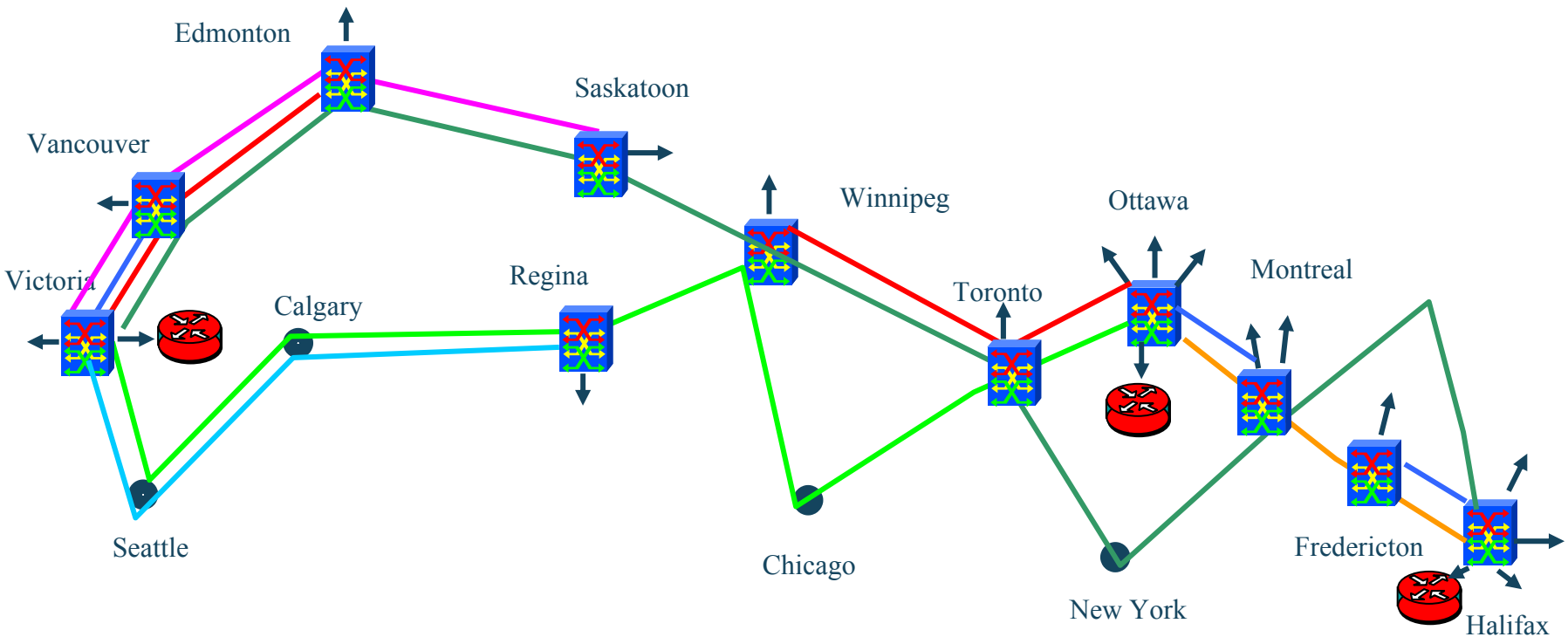
- > **CANARIE, ORANO, RISQ, NYSERnet and others exploring to deploy ROADM network from Chicago to Detroit to Toronto to Montreal to New York**
- > **ROADMs further enable possibility of the customer owning and controlling the network**
- > **With ROADMs all active optical network devices can be at the customer premises**
- > **If university or researcher needs a wavelength they can self provision by purchasing their own line driver card**
 - With UCLP they have complete control of the wavelength in terms of routing, add/drop, termination, etc
- > **Pushes network CAPEX and OPEX costs out to the user**



1.3.2 NRC Lightpath network

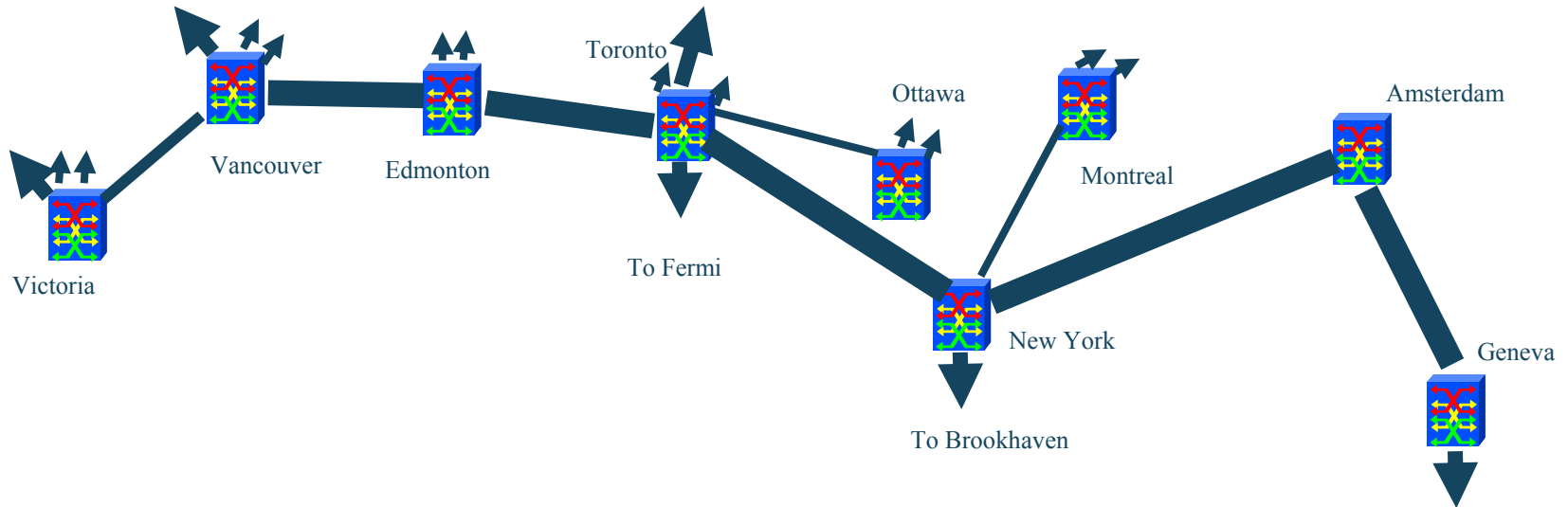
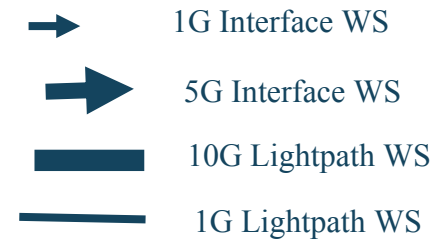
- > **NRC plans to build a private layer 1 network linking all NRC facilities across the country**
 - NRC will use UCLP to configure network as per attached diagram
- > **Will provide NRC with greater security and fewer firewalls**
 - Will allow NRC to integrate all NRC labs into address space and management domain
- > **Likely model for other government departments**
- > **Many of the local loop connections will be funded under CANARIE CCP program**

NRC partitions lightpaths with UCLP



Proposed Lightpath facility for TRIUMF

TRIUMF will use UCLP to partition and manage this set of lightpaths and provide routed lightpath to HEPent





ORANO-NYSERnet- CANARIE Network

- > **NYSERnet & MICHnet has agreed to swap lightpaths with CA*net 4**
- > **CANARIE in discussions with ORANO about building fiber ROADM network from Toronto to St Catherine to Buffalo and St Catherine to Windsor**
 - Would provide 72 lambda network from Buffalo to Windsor and from Buffalo to Toronto
 - Wavelengths would be swapped for wavelength to NYC and Chicago from NYSERnet and MICHnet
 - Would provide long term wavelength/lightpath capacity for CA*net 4
- > **One time cost per wavelength less than \$50K**



Update on Connections Program

- > Budget was \$10 m
- > Sprint has provided the most comprehensive pricing on local dark fibre loops.
- > Big Pipe has also provided some pricing but with the caveat that these loops will only be sold in combination with their wavelength offering.
- > A few regional fiber builders have also provided quotes for a few fiber builds.
- > Total funding for required local loops (based on current list of interested labs) for two year lease is \$6.38m (offered by Sprint).
- > In some cases, we may be able to reduce these prices through arrangements with ORANs and other parties.
- > We are expecting that more labs will apply to the CCP program before July 1, so we will probably have to issue another RFP later this summer to address any new requirements that are defined.



Update on SOA & UCLPv2

- > **23 proposals for linking instruments to CA*net 4 with SOA**
 - Toronto water treatment
 - Synchrotron
 - Undersea video
 - Various grids
- > **Received 4 excellent proposals for UCLPv2**
- > **All based on SOA**
 - CRC/Ottawa U
 - Netera/BCnet
 - Solana Networks
 - UQAM
- > **Propose to fund all 4 submissions**
 - Combine elements where possible
 - Will reduce overall cost to stay within budget



Proposed strategy for handling demand

- > **Critical path issues:**
 - 14 week delivery of 4th wavelength after contract signing
 - Order date of 5th wavelength
 - Testing for iGrid starts Aug 15th
 - Testing for SC starts Sept 30
- > **Propose to do time sharing of existing temporary lightpaths and all new planned lightpaths**
- > **Proposed time sharing administration will be given to the following organizations using UCLP**
 - ORANs for all lightpath projects in which ORAN is a participant
 - HEPnet for all lightpath projects in which high energy physics is a participant
 - CANARIE staff if none of the above
- > **If there is still shortage, then according to Lightpath Policy:**
 - Start to reduce or shut down other temporary lightpaths
 - Permanent and paid for lightpaths are higher priority
 - Initially try to negotiate to a solution, but turn to Executive committee to arbitrate if necessary
- > **Could ask international partners for access to their bandwidth, perhaps by offering to compensate the money they paid to CANARIE**