

March 2005 Progress Report -- Lambda Station -- Caltech

Project Progress Report:

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Project Title: Lambda Station

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Institution: FNAL, Caltech

Students and postdocs at Caltech: 0

Project Website: <http://www.lambdastation.org>

Summary of report

Our team jointly worked with Cisco and CENIC/NLR to provision a dedicated 10 Gbps wave between Pasadena and Sunnyvale, to directly connect the Center for Advanced Computing Research (CACR) at Caltech to the UltraScience Net testbed at Sunnyvale. Today, the lambda station testbed in California is operational and consists in a 10 Gbps local loop connecting Caltech Campus to downtown Los-Angeles and a 10 Gbps wave connecting Los-Angeles to Sunnyvale. The testbed is also extended to CERN from Chicago via the LHCnet using L2VPN as shown on the figure below.

In parallel, we made many improvements to the JClarens core to improve the quality and ease of use of the Clarens server code. These improvements were release to SourceForge on March 5 as JClarens 0.5.4 (<http://sourceforge.net/projects/clarens/>).

Detailed Report

o Downtown L.A. to Sunnyvale 10 Gbps wave:

In collaboration with CENIC/NLR, a dedicated wave from downtown L.A. to SNV via NLR has been provisioned. The wave is operational since March 7. Since we lack information concerning the topology of the testbed and the precise UltraScience Net deployment date, a flexible setup has been deployed at Sunnyvale that should accommodate any types of technologies and speeds. For example, if the access to the UltraScience Net testbed is limited to N x 1 Gbps, our equipment installed in SNV has 24 GE ports. We can also connect at 10 GE (which we consider the technically preferable solution). Later this year, we should also support an OC192 interface. Today, the only missing part is the local connection to the UltraScience Net PoP in Sunnyvale. This issue should be resolved as soon as the UltraScience Net testbed becomes available.

In our SNV PoP, we have installed a Cisco 6509E and a few powerful end-systems equipped with both 1 GE and 10 GE network cards. This adds a new site to the LambdaStation testbed.

o Local loop from Caltech campus to downtown L.A.:

A second 10 Gbps local loop from Caltech campus to the NLR PoP in LA downtown has been deployed. We have taken advantage of the existing fiber that carries Caltech's Internet traffic by multiplexing an

additional 10 Gbps wave on it. The HEP team at Caltech now has two 10 Gbps waves from the Caltech campus to the NLR PoP in LA dedicated to Research and Development. The first one will mainly be used by the UltraLight Project and the second one will be used for connections to UltraScience Net. Cisco donated the 10 Gbps Transponders and Multiplexers to the project.

To manage the two waves and the connection to transcontinental NLR waves, a Calient photonic switch has been purchased to transparently cross-connect local loops to NLR waves. It should give a transparent access to the UltraNet testbed. MonALISA software services are being written to monitor and manage the photonic switch remotely.

- o Extension to CERN:

In order to extend the UltraScience Net testbed to CERN, Layer 2 VPNs have been implemented and tested between CERN and Starlight to guarantee a transparent access to the testbed from CERN. In the future, it will be possible to provision those L2 paths via the LambdaStation. Later this year (in the Fall), a second 10 Gbps link will be deployed between CERN and Chicago. At the beginning, this new link will be dedicated to research and developments and should add a new dimension to our testbed allowing the provisioning of an entire 10 Gbps transatlantic wave. The deployment of a LambdaStation unit at CERN in the "Datatag" environment also is being studied. Extension across UKLight and NetherLight are being considered, since our equipment at Starlight is directly connected to those research networks.

- o MPLS and GMPLS

Since MPLS is an important feature of the LambdaStation project, all network equipment deployed in California and at StarLight is MPLS capable. We have setup MPLS tunnels across the UltraLight testbed connecting FNAL to Caltech because the UltraScience testbed was not available. MPLS tunnels have manually been configured, but the provisioning of MPLS paths should be automated in the future and interfaced with Lambda stations software.

Since January 2005, we are considering the use of GMPLS as a control plane. GMPLS is a natural extension of MPLS to the optical plane that may address some issues related to light paths provisioning. In a first step we will study and deploy GMPLS in collaboration with Cisco and Calient. If this first step is successful, we will interface the GMPLS provisioning with our Monalisa software and LambdaStation.

- o Network management and monitoring

All our systems in California are also reachable via conventional IP backbone (CENIC and Abilene). This out-of-band access is particularly useful to the control plane that has to exchange signaling messages to setup dedicated light paths. The out-of-band access is also used to monitor and manage systems. Remote power management is available at each site.

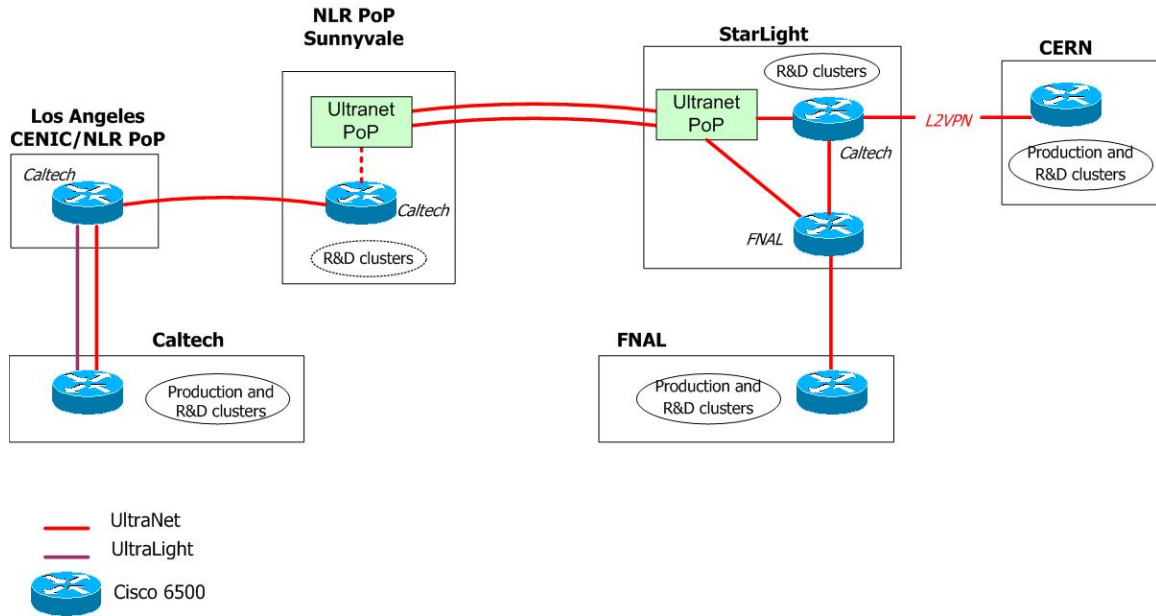
- o Improvements to the JClarens core

Since the previous reporting period, both Python and Java-based prototype Clarens services were deployed by the Lambdastation team with support from the Clarens developers at Caltech. The Lambdastation team

provided invaluable feedback on service development and deployment by third parties, helping to improve the quality and ease of use of the Clarens server code. This feedback was incorporated in new server releases, resulting in a direct benefit to all Clarens server users and administrators. These changes include: a new universal xmlrpc binding layer that can be used by all new services; improved compatibility with between the python and java clients and servers; improved client side security; and an internal API for the shell service so that other services can build on its functionality.

Current personnel assignments, Caltech

Yang Xia	Server development, network performance tests
Xun Su	MonALISA monitoring integration
Sylvain Ravot	Project management, network design and configuration
Iosif Legrand	MonALISA services and monitoring integration
Dan Nae	Cisco configuration, network support and performance tests
Conrad Steenberg	Clarens services integration and support
Frank Van Lingen	Services architecture, interface with UltraLight application services
Michael Thomas	JClarens integration and support



LambdaStation testbed: