

High Performance Digital Media Network (HPDMnet):
A **Dynamically Provisioned** Inter-Domain
International Network for **High Performance Digital
Media Services**

HPDMnet Consortium



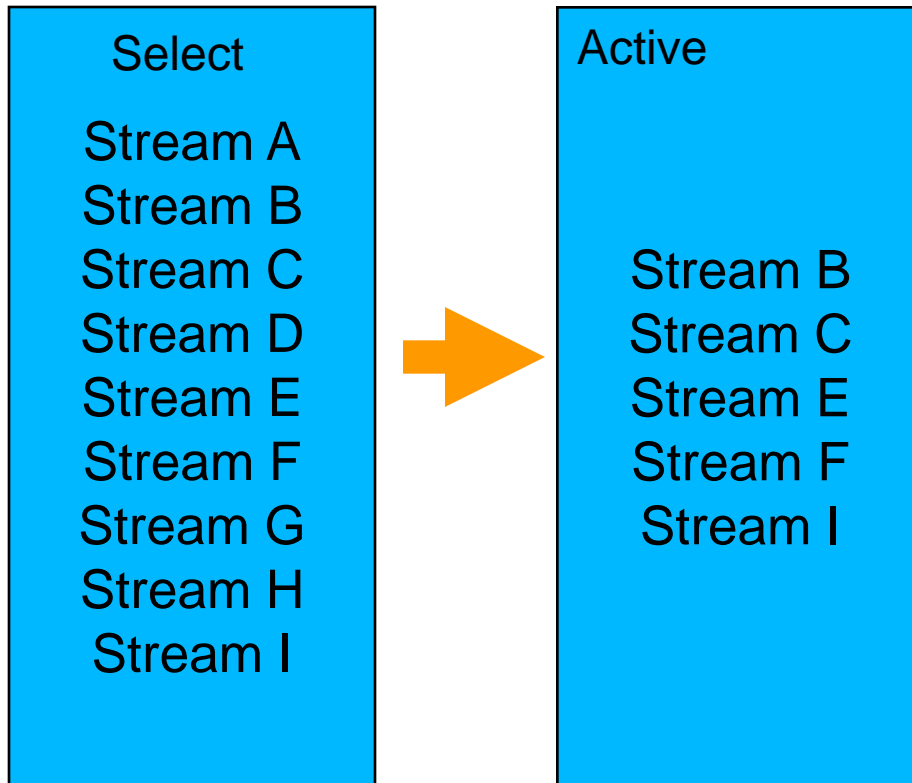
- **An International Consortium of Research Centers Has Formed a Cooperative Partnership To Address Key Challenges and Opportunities Related to Using Dynamically Provisioned Lightpaths for High Performance Digital Media (HPDM)**
- **At the Recent SC08 Conference in Austin, Texas, and at the Annual Global LambdaGrid Workshop in Seattle, Washington, and at the Annual Conference of the American Association for the Advancement of Science, Demonstrations Showcased the Current Project Status (Not Final Results, Products or Services)**
- **Multiple Sites Require High Performance/High Volume/High Definition Digital Media Streaming Simultaneously Among All Locations (Point-To-Multipoint, Multipoint-To-Point, Multi-Point to Multi-Point)**

- **Traditional L3 Techniques Cannot Be Used for Many Types of High Definition Media**
- **Traditional Techniques Were Designed for Many Small Information Flows – Not for Large Scale Flows**
- **This Consortium Is Designing and Developing New L1/L2 Capabilities That Can Provide Large Scale HPDM Services, Which Can be Used for Any Data Intensive Application, Not Just Digital Media**
- **Key Attributes: Capacity, Flexibility, Quality, “Green”**
- **The Consortium Is Designing a Service Specifically for Implementation at GLIF GOLES, and Related Facilities**
- **The Consortium is Working With Others In the GLIF Consortium on A Common Architecture that Is Defining a New Types of Network Service and Related Network Interface**
- **This Connection-Oriented Service Can Be Dynamically Provisioned**

- Design and Development of ***Dynamically Provisioned Specialized Services***
Based on New Services Architecture and Innovative Technology Models – e.g., Connection Oriented Services, Stateful Services
- Meta Context = SOA
Top Layer Services Are Encapsulated Processes -- Software Objects
Mid and Low Layer Processes Also Encapsulated As Software Objects, Including Supplemental Utility Processes and External Processes, Enhanced Virtualization With Much Better Methods for Ad Hoc Integration
- Basic Physical Layer Approach = Infrastructure As a Service (IaaS)
All Physical Resources Are Encapsulated And Integrated As Software Objects

- Create a Permanent International Experimental Testbed Facility
Design, Develop, Implement, and Operate a Permanent International Large Scale Experimental Research Testbed, Based on Optical Channels That Provides for Programmable Capabilities, Including Topologies.
- Highly Distributed Connections Control & Management
Design and Implement Interfaces To Facilitate Creation, Control and Management of Connections/Topologies, Allowing for Highly Distributed Control and Management Processes – *Including Global Topologies Within Desktop Icons Single Click To Instantiate a Global Network!*
- Applications Control & Management
Allow for Interfaces for Adding Functionality, After Connects Are Established (e.g. CHRONOS, Advance Reservations System)

- Create a Permanent Service at GLIF GOLEs That Will Provide Capabilities for Data Intensive Applications Using New Services Architecture and Technology Models (Initially a Prototype Service)
- Create Application-Oriented Services - Specialized Application Clients and Processes That Are Network Path/Topology Aware
- Interconnections With Repositories
Design and Implement Capabilities for Content Resource Discovery and Use



**Note "Stream" – Not Site –
Each Site Can Support
Many-to-Many**

- **Networks Can Be Virtualized – Such That They Appear As a Set of Software Resources That Are Accessed by Grid Services**
- **The Virtual Resources Approach Can Be Used To Partition a Network into Multiple Sub-Networks That Can Be Provisioned and Re-configured Within a Single Domain or Across Multiple, Independently Managed Domains**
- **Import Resources From Other Network Domains To Create End-to-End Solutions**
- **Export Resources To External Environments --**
- **Network Administrators Can Create Subsets of Their Network and Give Control of Those Resources To Other Network Providers Or To Their End users**
- **Users Can Also Join or Divide Lightpaths and Give Control and Management of These Private Sub-Networks to Other Users or Organizations**
- **Using the Virtual Resources, These Networks Can Be Reconfigured By the End-User Without Any Interaction By the Network Manager**

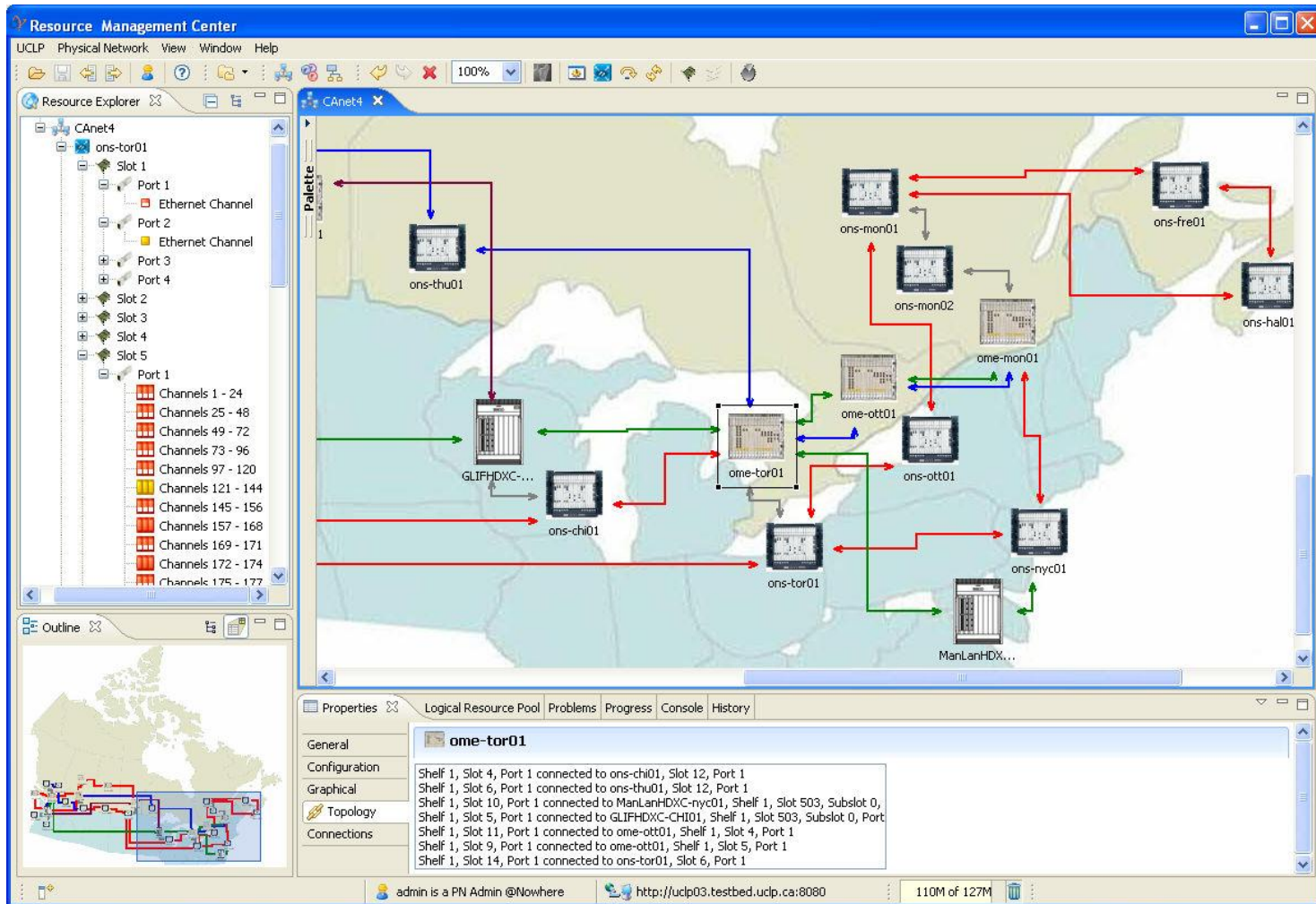
***Does Software Exist That Can Accomplish These Objectives? –Yes
Demonstrated at Multiple Conferences***



- Argia = Production Grade Version of UCLP
- Argia = Middleware Allowing End-Users (People or Applications) to Treat Network Resources as Software Objects and Provision and Re-configure Lightpaths Within a Single Domain or Across Multiple Managed Domains
- Users Can Also Join or Divide Lightpaths and Give Complete Control and Management of Private Sub-Networks to Other Users or Organizations
- Argia Enables the Virtualization of a Network That Can Be Reconfigured By the End-user Without Any Interaction By an Optical Network Manager
- Argia™ Can Be Used for **Virtualization and Control of Optical Networks**
- <http://www.inocybe.ca>

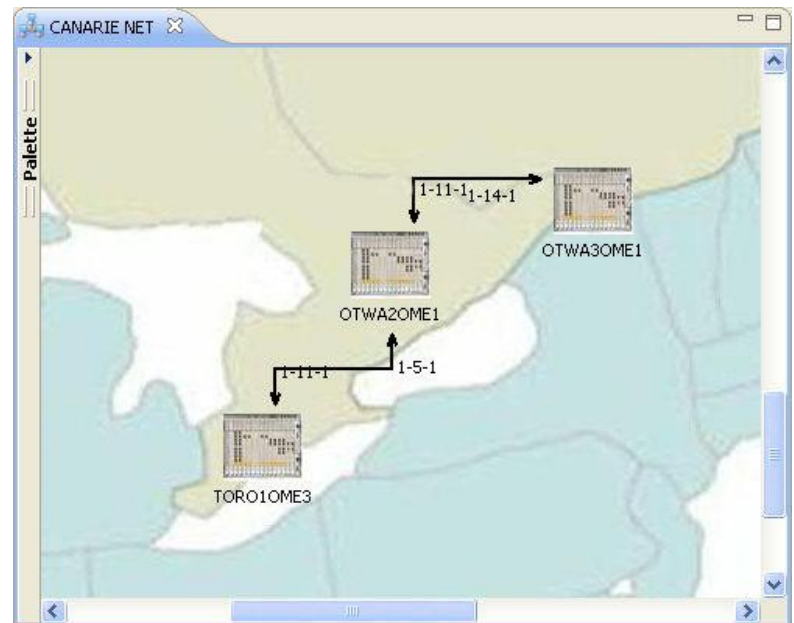


- Manage Networks With Traditional NMS Functionalities



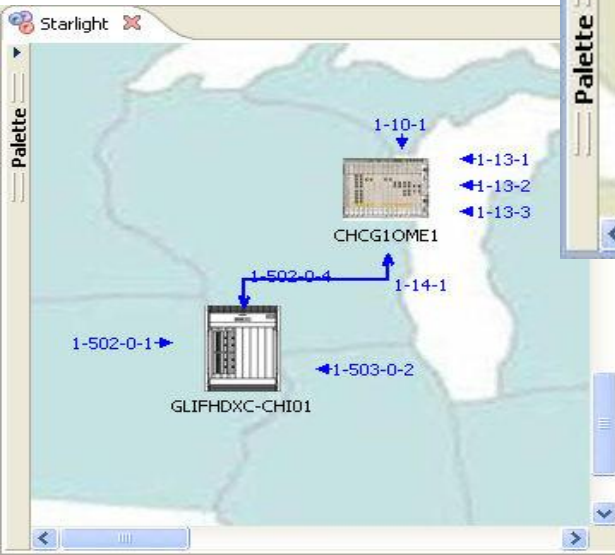
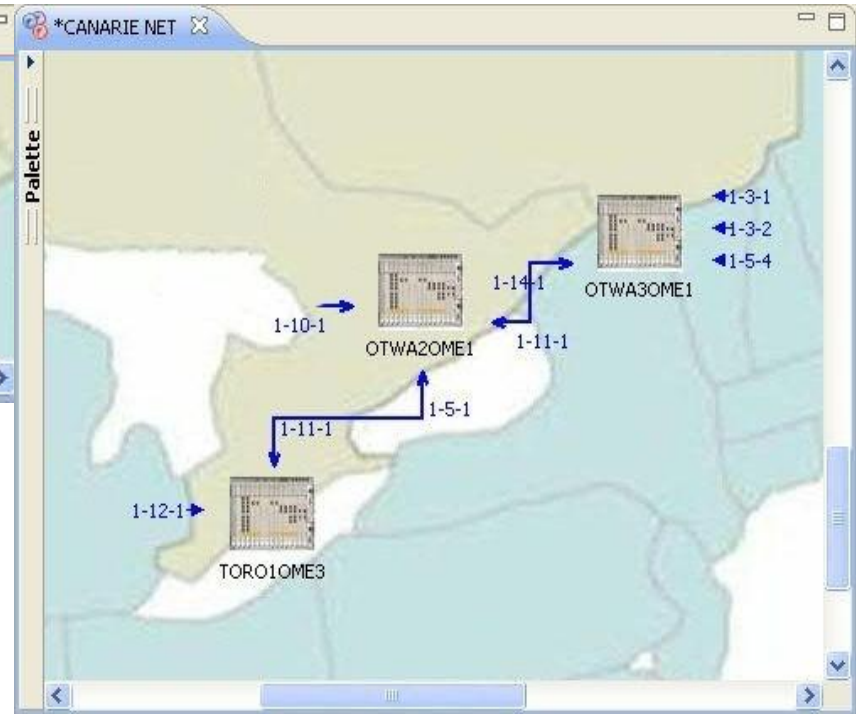
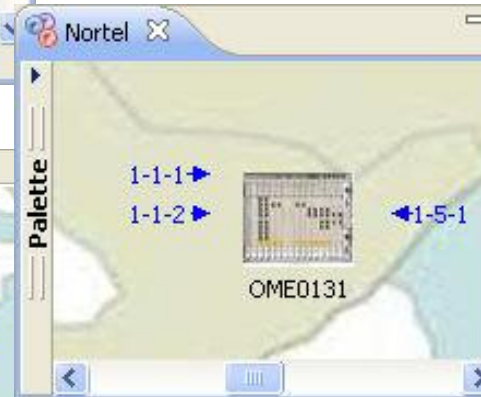
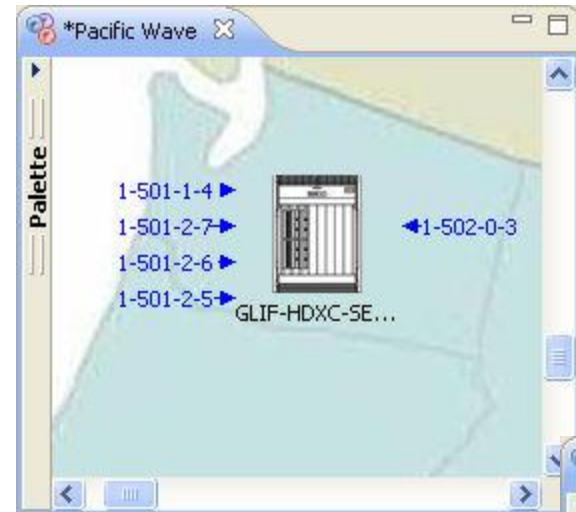
Multi-Domain Control

- The Network Admins First Create Physical Network for Their Domain.
- Today, There Are Four Domains in the HPDMnet under the Control of Argia-- Pacific Wave GOLE, STARLight GOLE, CANARIE Net and Nortel Networks

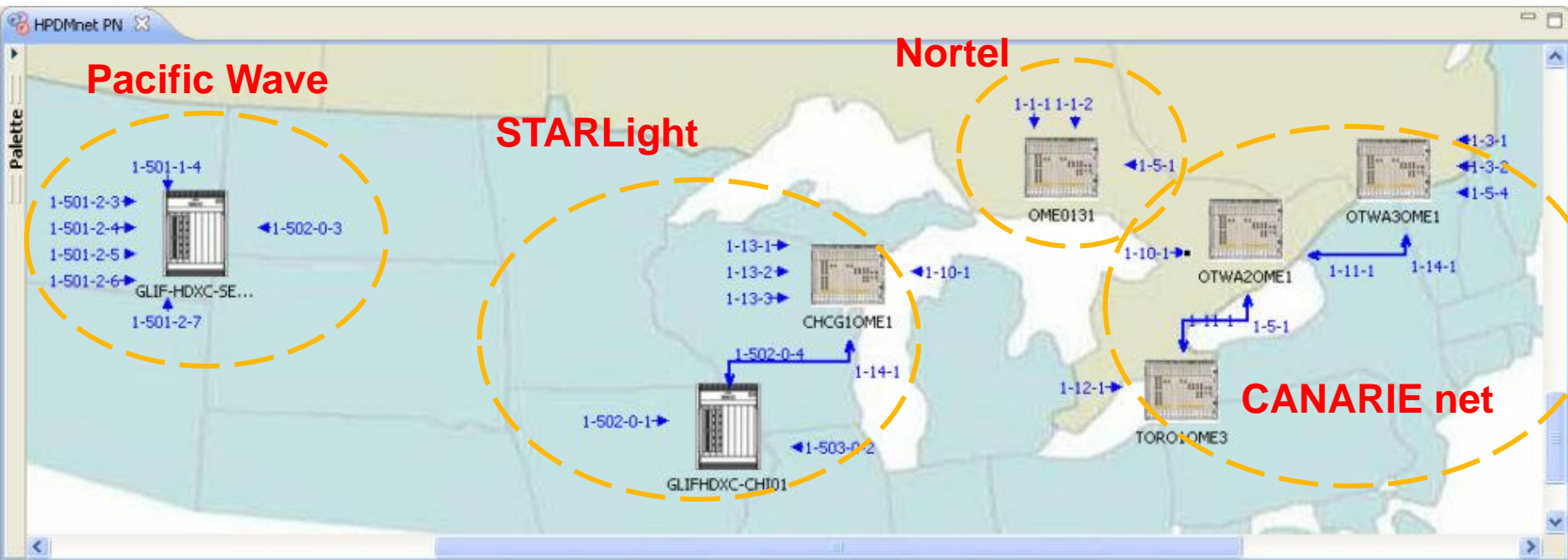


Creating Virtual Resources

- Resources Are Virtualized So They Can Be Given To Other Organizations To Use Completely Under Their Control – W/O a Central Authority
- Resources From Different Independent Domains Are Exported to iCAIR To Be Used To Create the HPDMnet

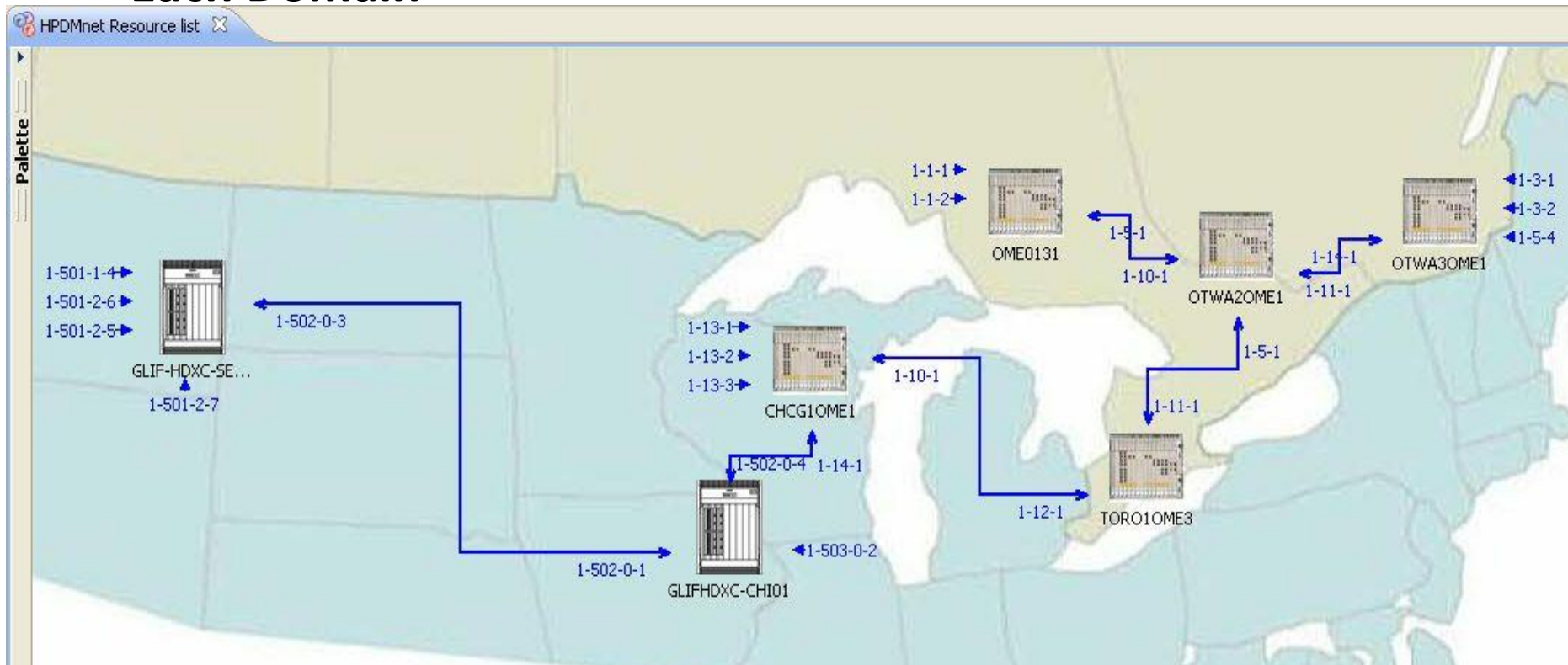


- Resources are imported by the Argia Administrator at iCAIR



Complete the Resource List: The HPDMnet Testbed !!!

- **Links Are Created Between the Edge Interfaces of Each Domain to Create the Final HPDMnet Resource List**
- **Users of the HPDMnet Can Create Connections, Reserve Resources via Chronos, Partition or Bond Resources, etc., All Without a Need To Contact Network Administrators from Each Domain**



- To Start Using Chronos, Login Is Required.



 **Chronos**
Advanced Reservation System

[Homepage](#) [Contact Us](#) [Help](#)

Login	
User Name:	leia
Password:	*****
Host:	deneb.argia.i2cat.net

Remember me on this computer

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Endpoints View

- In this view you can see the list of the endpoints available.

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iaia

5:46 am Central European Time

[Logout](#)[Reservations](#)[Jobs](#)[Draft Reservations](#)[Endpoints](#)**All**

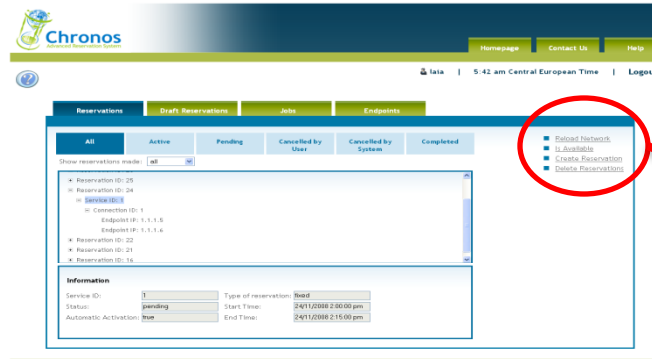
Endpoint IP: 10.0.1.37
Endpoint IP: 10.0.1.36
Endpoint IP: 10.0.1.35
Endpoint IP: 10.0.1.25
Endpoint IP: 10.0.1.48
Endpoint IP: 10.0.1.40
Endpoint IP: 10.0.1.28
Endpoint IP: 10.0.1.11
Endpoint IP: 10.0.1.10

[Reload Network](#)**Information**

Endpoint IP: Interface Type:
Name: Description:

Creating a Reservation

- Click on 'Create Reservation'



- [Reload Network](#)
- [Is Available](#)
- [Create Reservation](#)
- [Delete Reservations](#)

A screenshot of the 'Create Reservation' form. At the top, there is a checkbox 'Is a PRE-reservation' and a 'Job ID' field with a dropdown and an information icon. The form is divided into two main sections: 'Service Constraints' and 'Connection Constraints'. The 'Service Constraints' section includes 'Type of Reservation' (Fixed Reservation and Advance Reservation), 'Start Time' and 'End Time' fields with calendar icons, and an 'Automatic Activation' checkbox. The 'Connection Constraints' section includes 'Directionality' (Bidirectional Tree), 'Endpoint Source' and 'Endpoint Target' (both 'Select Endpoint'), 'Max Delay (ms)', 'Max BW (Mbps)', and 'Min BW (Mbps)' fields. There is an 'Add Connection' button and a close button (X) for the 'Connection Constraints' panel. At the bottom, there is an 'Add Service' button and 'OK' and 'Cancel' buttons.

- This Form Is Opened
- All the Fields Must Be Filled-In
 - Source
 - Target
 - Bandwidth
 - Delay (not used currently)

- In this view you can see the list of the reservations created.



[Homepage](#)

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laia

5:42 am Central European Time

[Logout](#)

Reservations

Draft Reservations

Jobs

Endpoints

All

Active

Pending

Cancelled by
User

Cancelled by
System

Completed

Show reservations made:

- Reservation ID: 25
- Reservation ID: 24
 - Service ID: 1
 - Connection ID: 1
 - Endpoint IP: 1.1.1.5
 - Endpoint IP: 1.1.1.6
- Reservation ID: 22
- Reservation ID: 21
- Reservation ID: 16

Information

Service ID:	<input type="text" value="1"/>	Type of reservation:	<input type="text" value="fixed"/>
Status:	<input type="text" value="pending"/>	Start Time:	<input type="text" value="24/11/2008 2:00:00 pm"/>
Automatic Activation:	<input type="text" value="true"/>	End Time:	<input type="text" value="24/11/2008 2:15:00 pm"/>

- [Reload Network](#)
- [Is Available](#)
- [Create Reservation](#)
- [Delete Reservations](#)

CANARIE

Communications Research Centre (CRC) Canada

Electronic Visualization Laboratory(EVL), University of Illinois at Chicago

I2Cat

Inocybe

Institute of Computer and Network Engineering, Technische Universität

Carolo-Wilhelmina zu Braunschweig

International Center for Advanced Internet Research (iCAIR), Northwestern University

Korea Institute of Science and Technology Information (KISTI)

National Center for High-Performance Computing (NCHC) Taiwan

**National Center for Supercomputing Applications (NCSA), University of Illinois
at Urbana-Champaign**

NetherLight

Nortel

SARA

StarLight

SURFnet

Synchromedia

The Braunschweig University of Art

University of Essex

University Van Amsterdam

For Further Information Ref:

www.hpdmnet.org