

# Inter-domain advance reservation of coordinated network and computing resources over the Pacific

## A G- **lambda** & EnLIGHTened Computing Collaboration

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# The Enlightened Computing Project

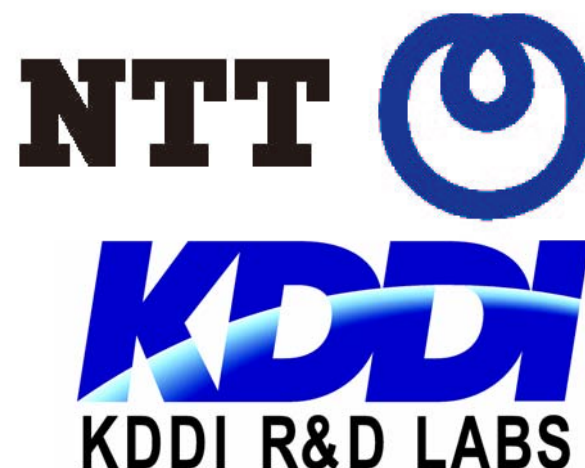
- Joint project between MCNC, LSU/CCT, RENCi, NCSU and industry support from Cisco, IBM, Calient, AT&T
- Kick-Off Meeting in October, 2005
- Goal: To build a **vertically integrated** framework that allows adaptive applications to drive Grid Resources.



<http://www.enlightenedcomputing.org/>

# The G- **lambda** Project

- Joint project of KDDI R&D labs., NTT, NICT and AIST.
- G-lambda project has been started in December 2004.
- Goal: to establish a **standard web services interface (GNS-WSI) between Grid resource manager and network resource manager** provided by network operators.



<http://www.g-lambda.net/>



# Highlights

- G- **lambda**'s **Grid Network Service / Web Services Interface (GNS-WSI)** between the Grid Resource Scheduler (GRS) and the Network Resource Manager (NRM)
- Enlightened's **Highly-Available Robust Co-Allocator (HARC)** solves the distributed transaction problem in a Grid -> open source, developed by CCT/LSU

Note:

- G- **lambda** does **not own** their network they use JGNII
- EnLIGHTened has its **own** testbed

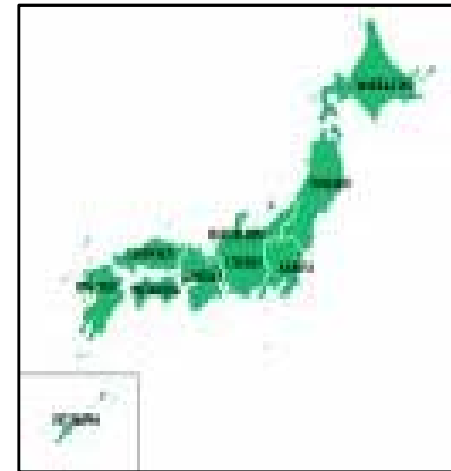
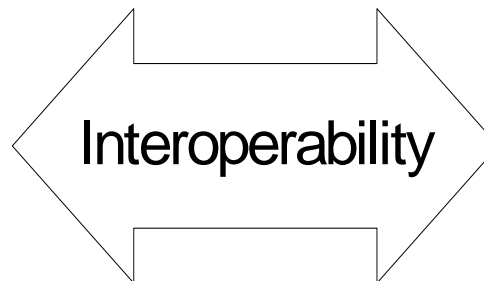
➡ Collaboration began in March, 2006

# EnLIGHTened/ G- **lambda** Demos

- 6th Annual Global Lambda Workshop, GLIF, 11-12 September 2006, Tokyo
- Supercomputing 2006, Tampa, FL



**EnLIGHTened Grid**

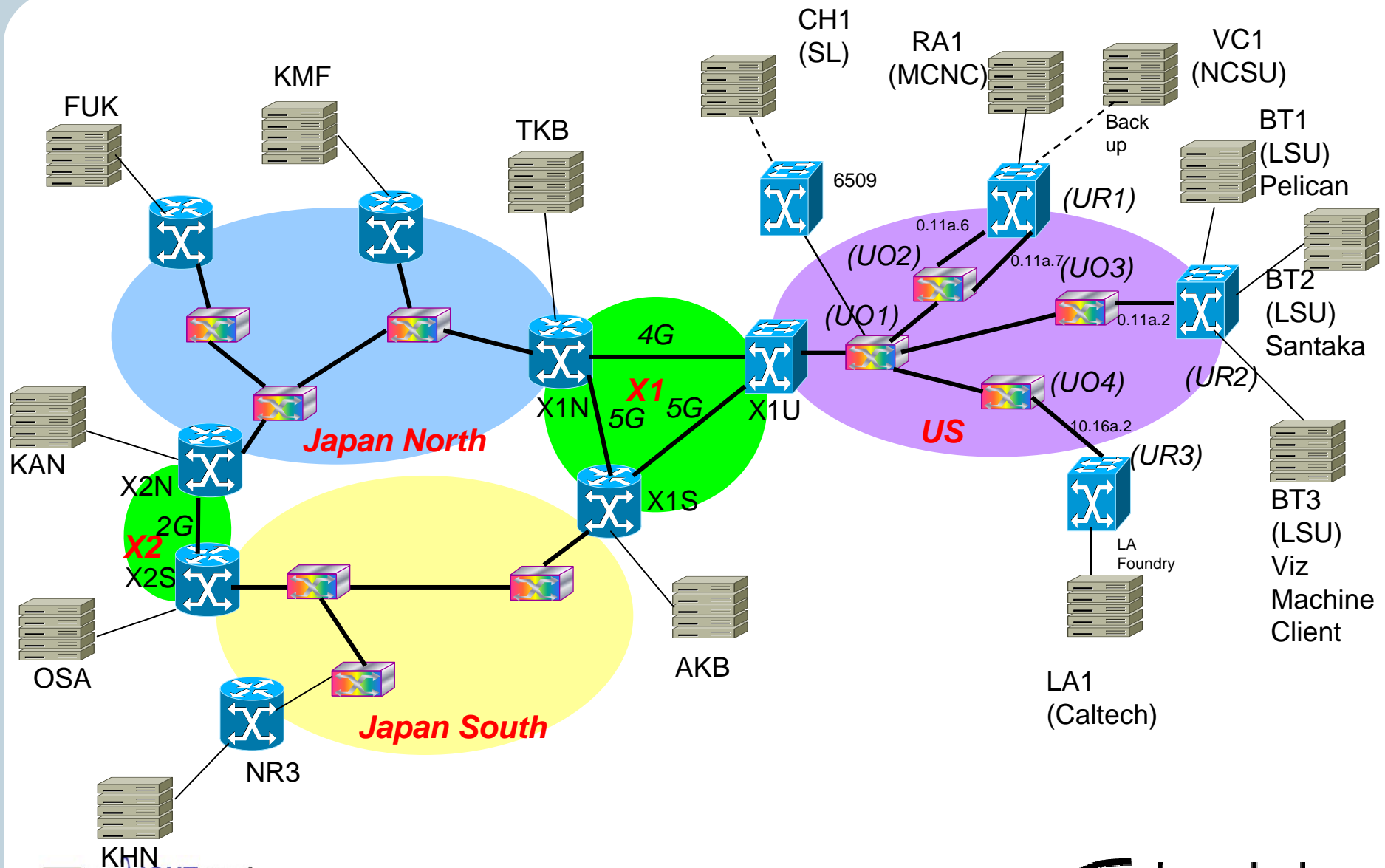


**G-Lambda Grid**

# Overview of Collaboration

- Simultaneous in-advance reservation and coordination of computing resources and the necessary lightpaths between Japan and the US
- World's first inter-domain coordination of resource managers for in-advance reservation of this scale
  - Resource Managers have different I/F and are independently developed
- “Automated” interoperability between network and computing resources in two countries' grid computing research testbeds

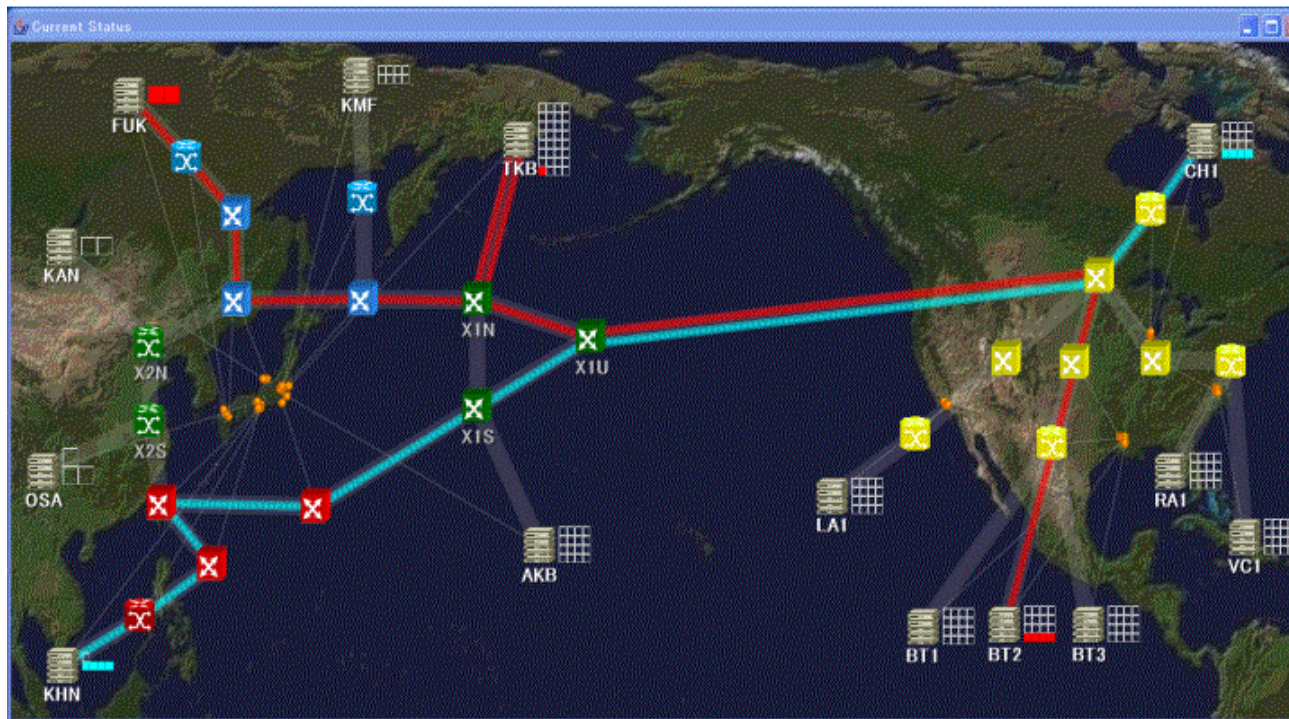
# Testbeds and Compute Resources





# What we are able to do

- Make **advanced** reservations requesting both compute and network resources from either G-Lambda or Enlightened Computing
- When the reserved time arrives, lightpaths are setup and the applications start running.

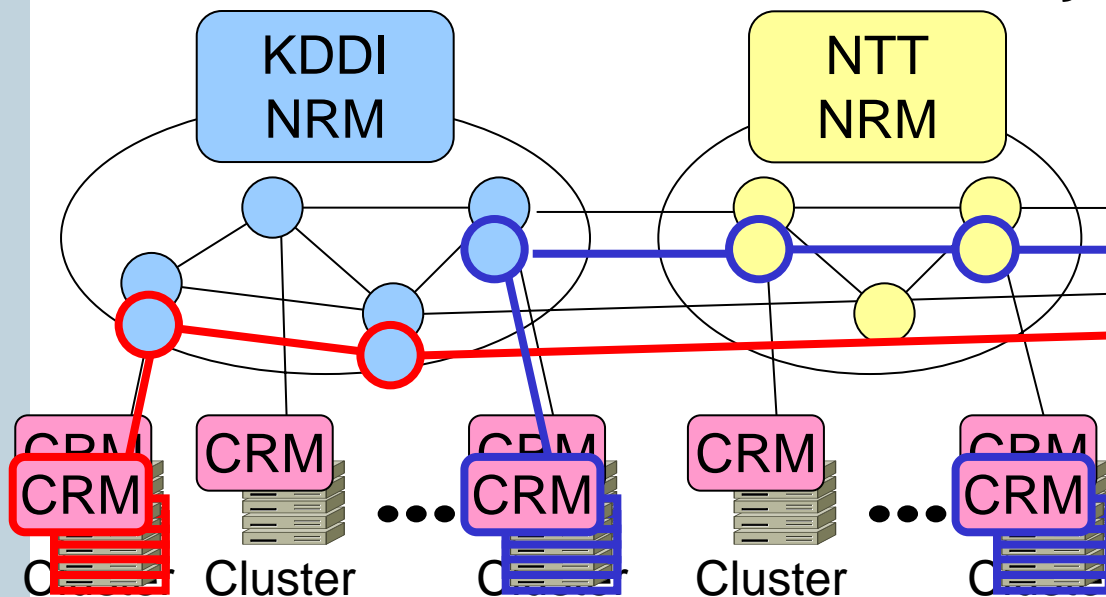




## G-Lambda Application

Request Network  
bandwidth  
and Computers

Reservation  
From xx:xx to yy:yy



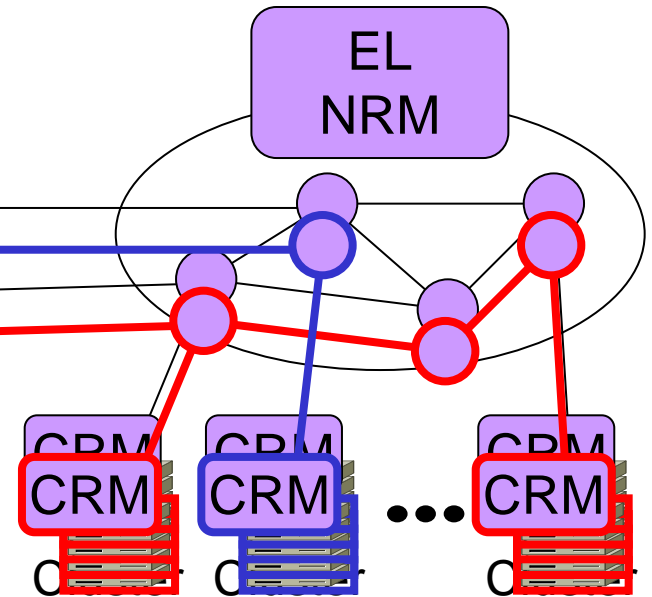
## EnLIGHTened Application

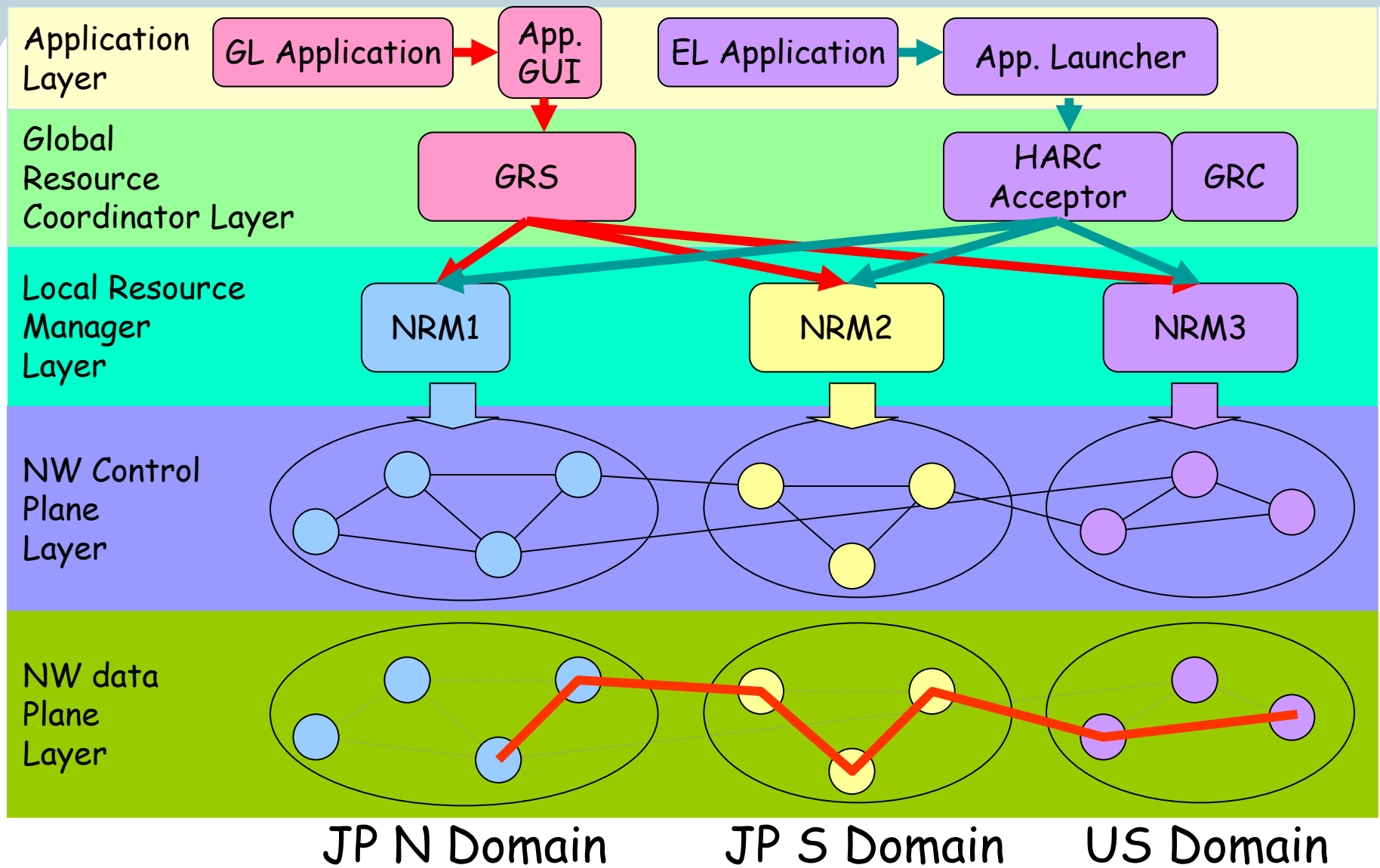
Request Network  
bandwidth  
and Computers

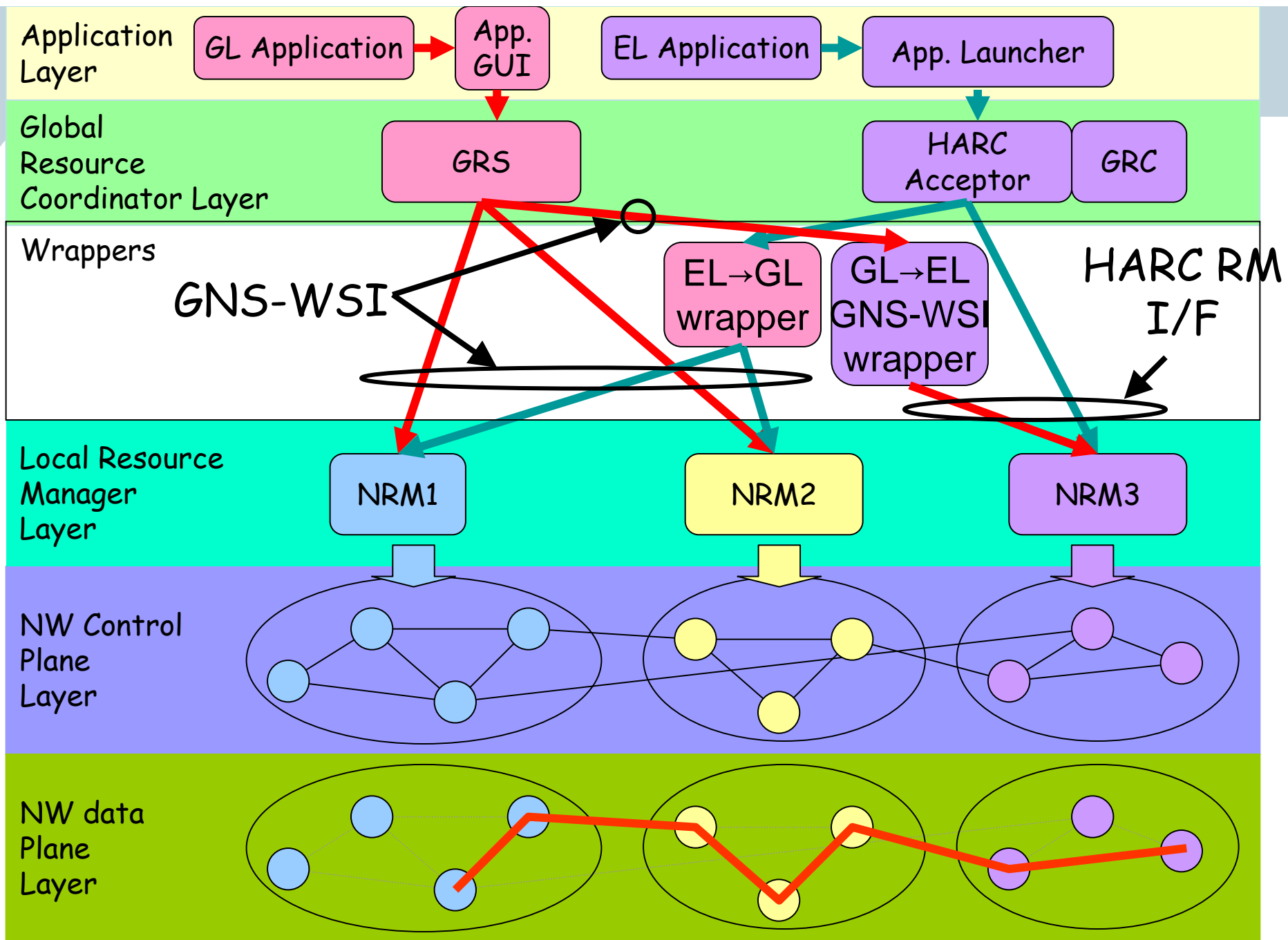
Reservation  
From xx:xx to yy:yy

JAPAN

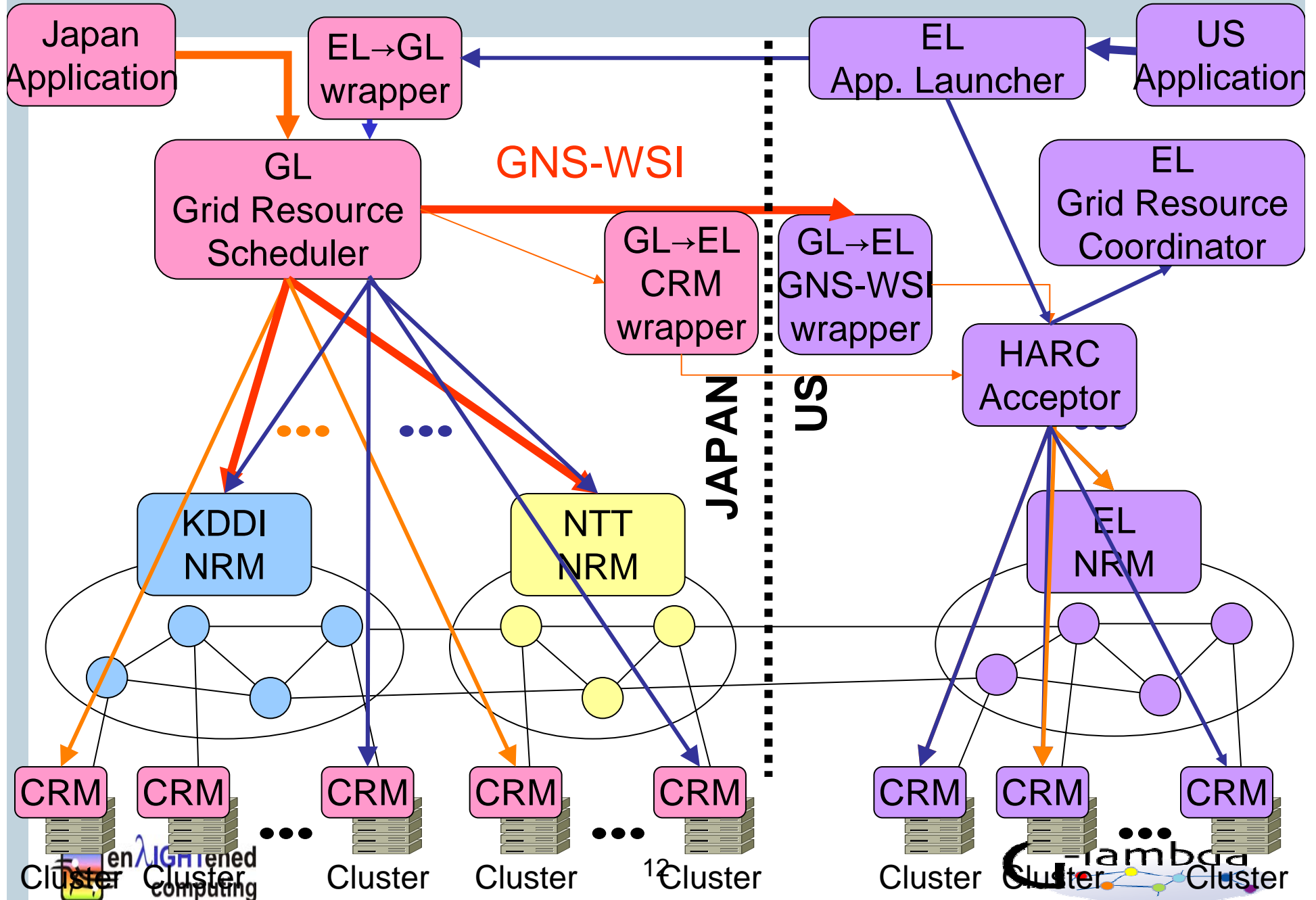
US







# G-lambda/Enlightened middleware coordination diagram



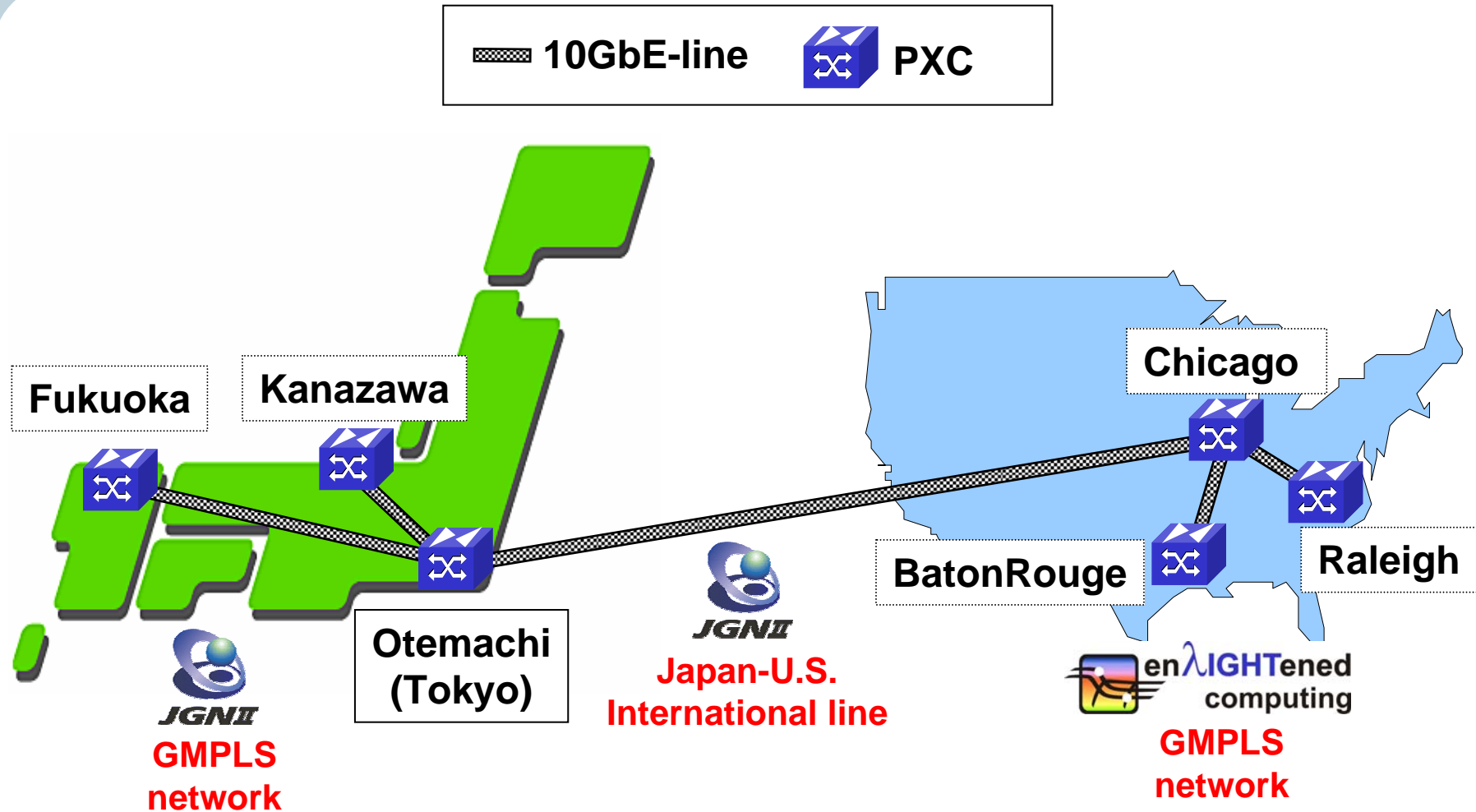
# Movie that shows Advanced Reservations

- Application Details
  - G-lambda: Scientific computation using MPI
  - Enlightened: Data visualization
- Activated paths and computing resources will be shown on G- **lambda's** RNDS.

# Standardizing Interfaces

- Q: Where / how / can / should we work to further standardize interfaces?
  - To minimize the dreaded NxN wrapper nightmare
  - E.g. when there is soon an EL/GL/PH interop demo, things may(!) be getting more complicated
- Collaboration of the 3 Continents Meeting

# GMPLS E-NNI Experiments





**Thank You!**  
**Any Questions?**