

Phosphorus activities on Research and Standardization of Grid Network Interface (GNI)

**Georgios Zervas, Eduard Escalona, Reza Nejabati
Dimitra Simeonidou
University of Essex, UK**

Talk Overview



- Need for the Grid Network Interface (GNI)
 - Broad range of Grid and Network Service Provisioning systems
 - Evolution of network infrastructure and technologies to support Grids
 - Interoperability between Grid service layer and Network Service Layer
- GNI Reference Point
- Grid Network Use Cases deploying proprietary GNI
- Current Standardization activities
 - GNI Informational draft in OGF
- Grid Network Interface BoF in OGF23

New Solutions, Architectures, Technologies and Services are Emerging



- Evolving Grid Network Architectures:
 - Consider Grid and network provisioning systems, policy and security standards, applications, users, resources:
 - Grid service provisioning systems (co-allocation services, Brokers, etc.),
 - Network Resource Provisioning Systems (e.g. UCLP, ARGON, DRAC)
 - Control plane (e.g. GMPLS)
 - Transport planes (e.g. OTN, Ethernet, SDH,)
 - L1/2/3 VPNs
 - Policy, security standards.
 - Need interface that can provide generic transactions/procedures between any type of Grid Service/Application Layer and Network Service/Resource Layer.

Need

- Interoperability between Grid and network infrastructures is a critical aspect in the realization of seamless Grid network services.

Scope

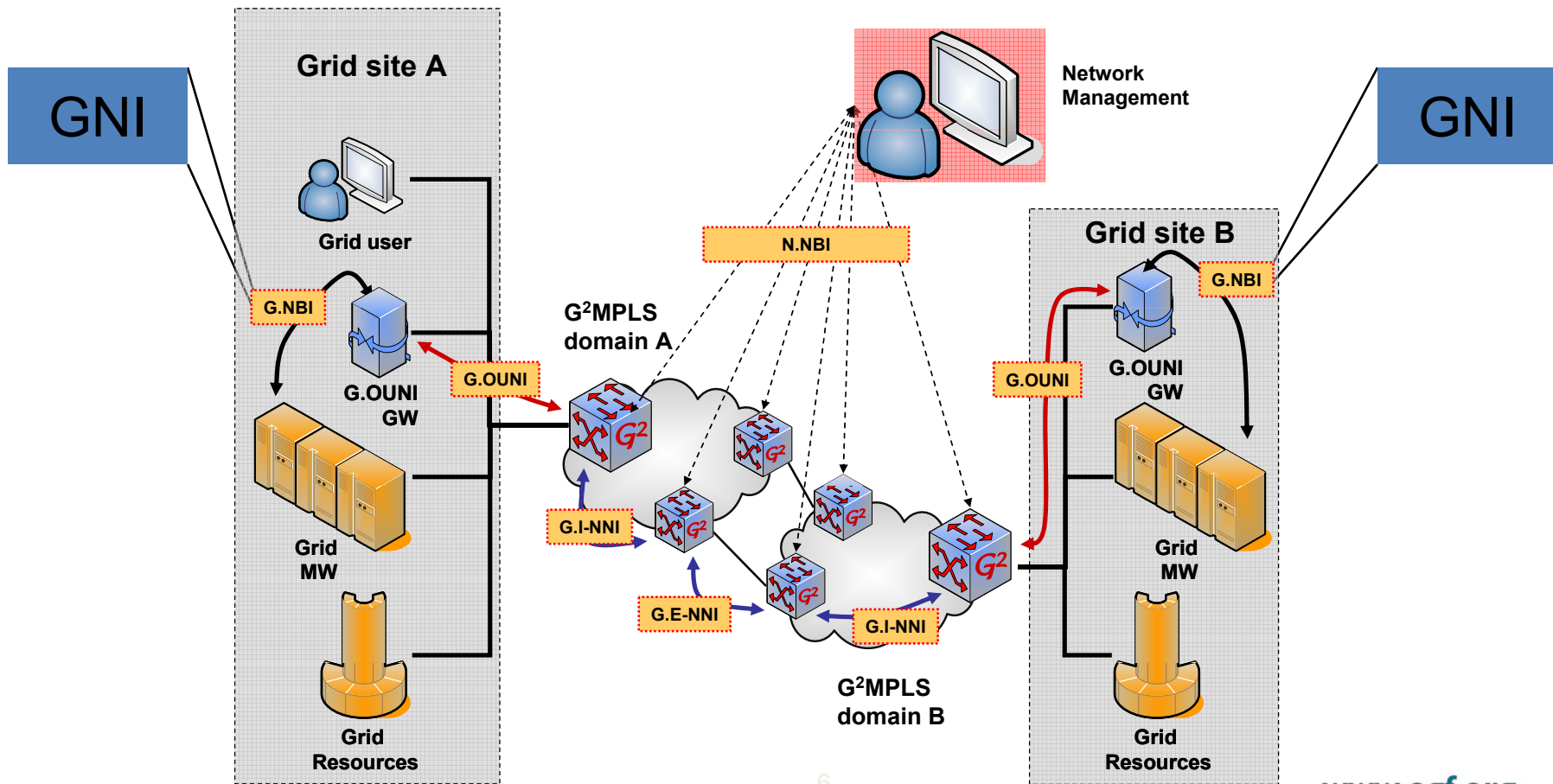
- The Grid Network Interface working group will provide a recommendation for an interface between Grid and Network to establish end-to-end Grid network services.
- The interface will define the set, type and level of information transaction between these two layers as well as procedures and protocols required for it.
- The interface aims to facilitate interoperation between any type of Grid service provisioning system (e.g. middleware, scheduler), application, resource and network service provisioning system (e.g. control plane, management plane), resource.

GNI Activities and Challenges on Grid Network Community

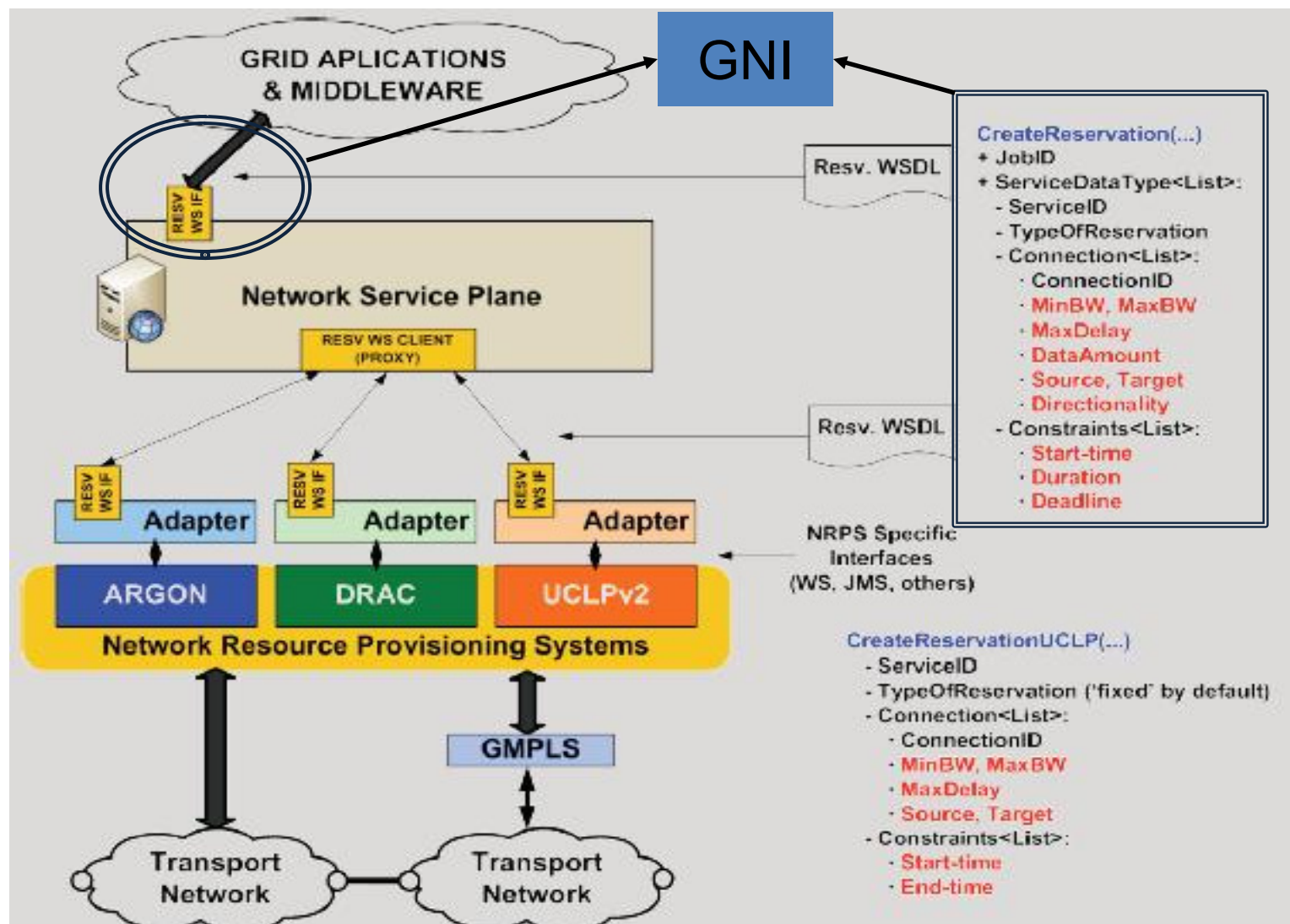
Phosphorus G²MPLS Use Case

G.OUNI, G.E-NNI
NBI
SBI
NMI

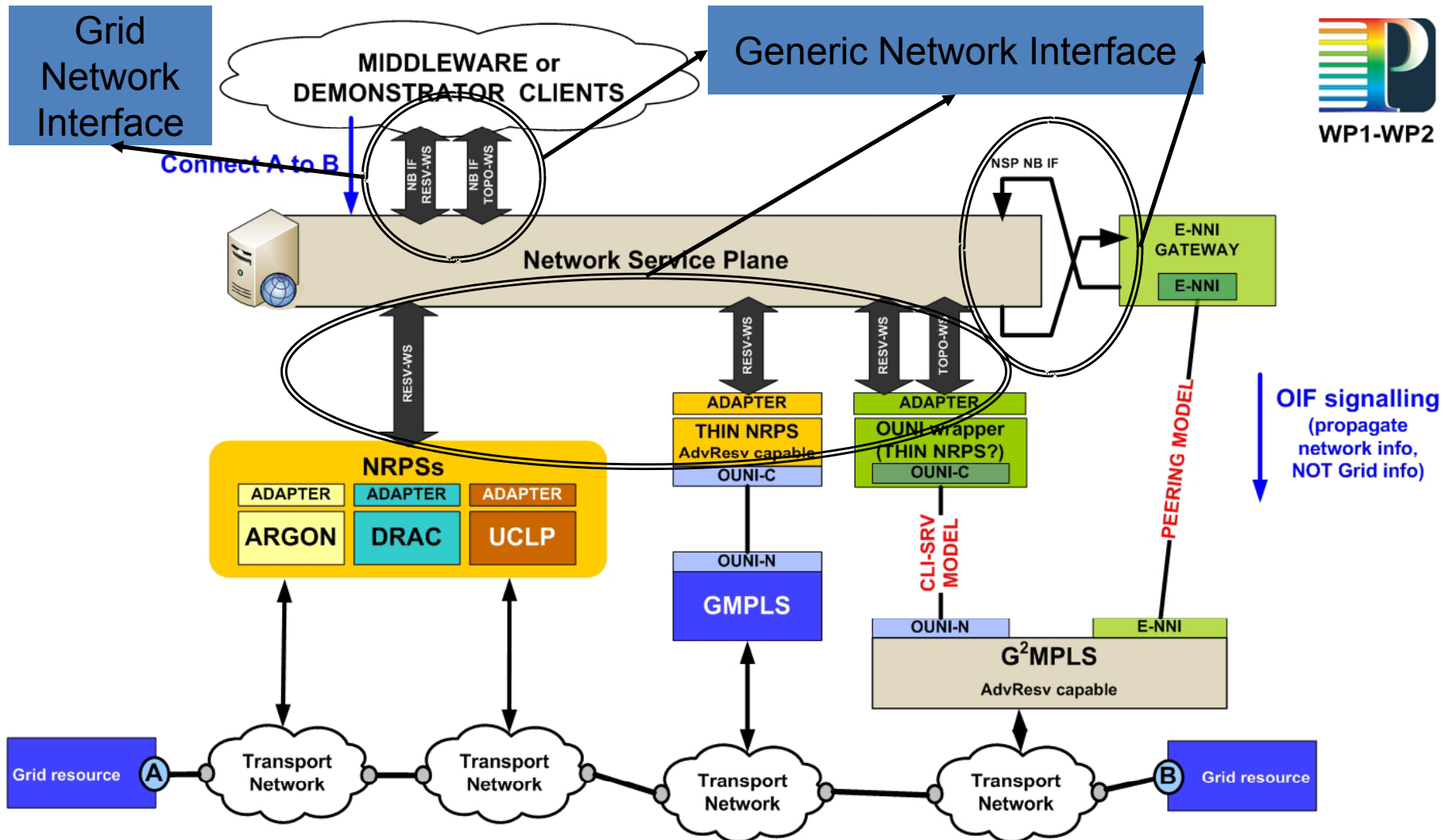
East-West interfaces
North Interface
South Interface
Network Mgmt Interface



Phosphorus NSP GNI

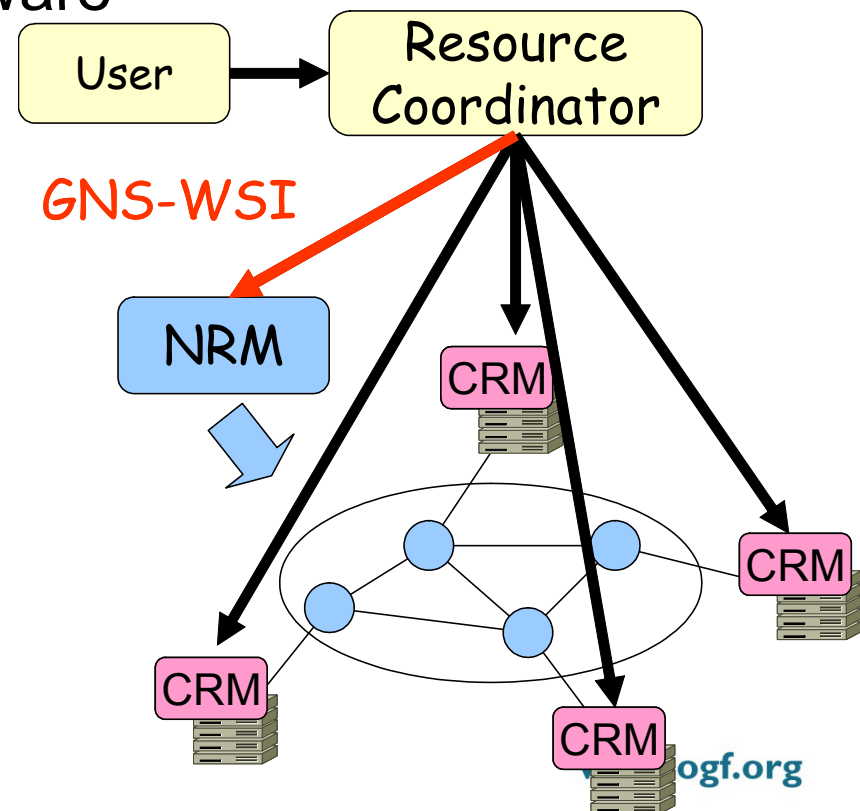


Interfaces for interoperability between different Provisioning systems in Phosphorus

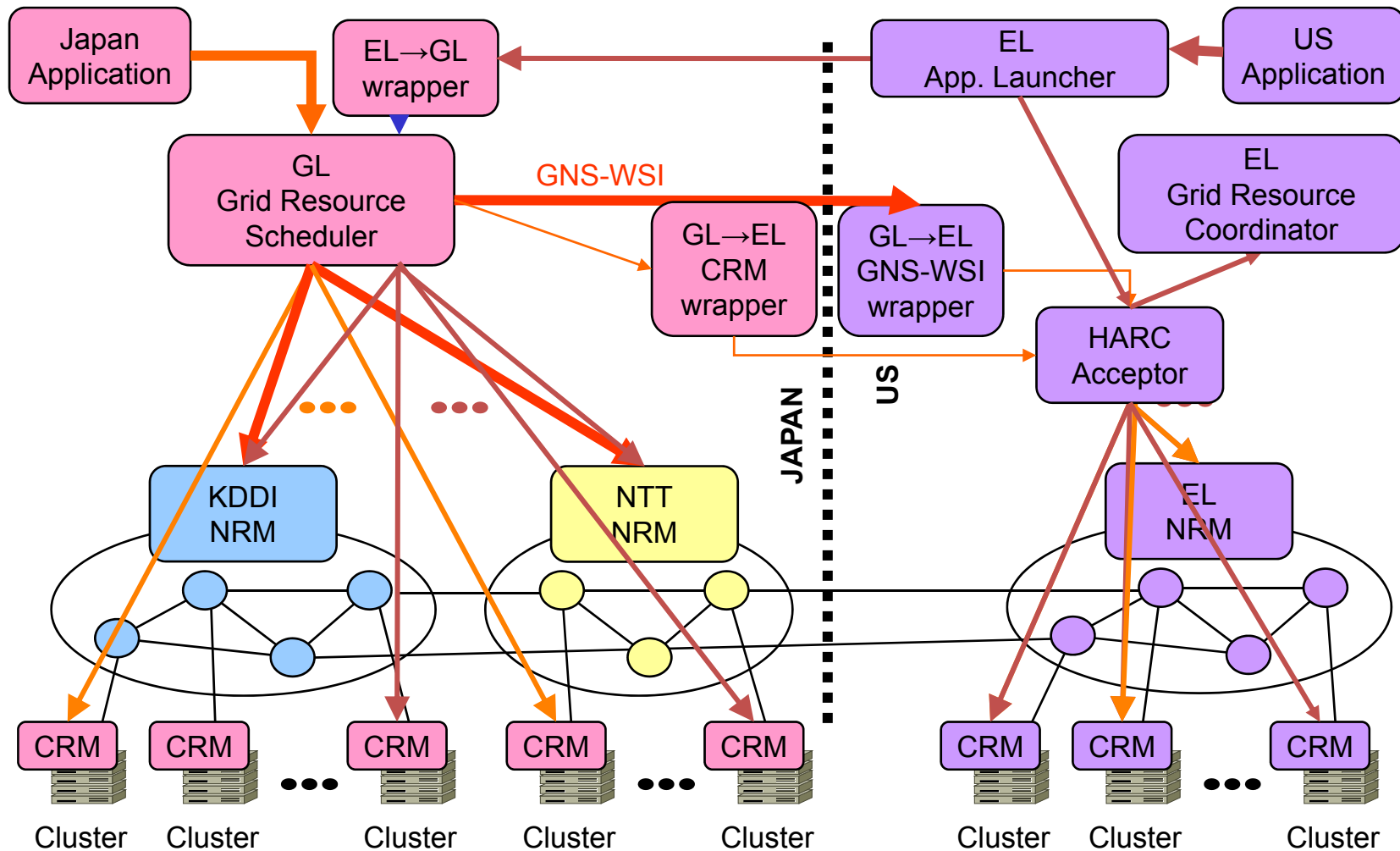


G-Lambda Project: GNS-WSI = GNI

- Grid Network Service - Web Services Interface
- Interface to enable **advance reservation of bandwidth** from Grid applications and middleware
- Polling-based non-blocking operations
 - Advance reservation of a path between end points
 - Modification of reservation
 - Query of reservation status
 - Cancellation of reservation



Enlightened-G-lambda Interoperability



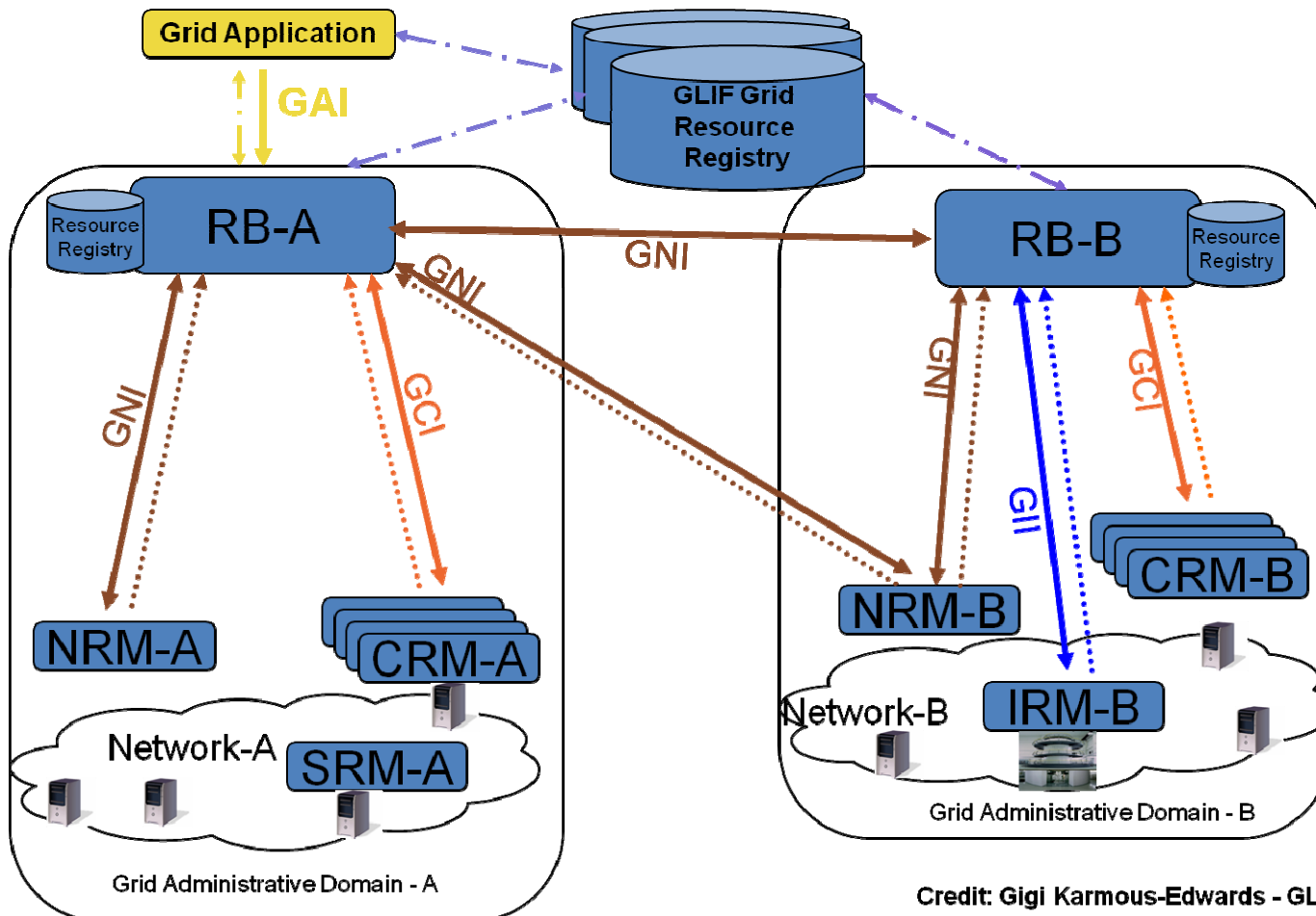
Credit: Tomohiro Kudoh

GL: G-lambda
EL: Enlightened Computing
CRM: Compute Resource Manager

HARC: Highly-Available Resource Co-allocator
GNS-WSI: Grid Network Service-Web Services Interface
NRM: Network Resource Manager

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C3C and GLIF activity on GNI

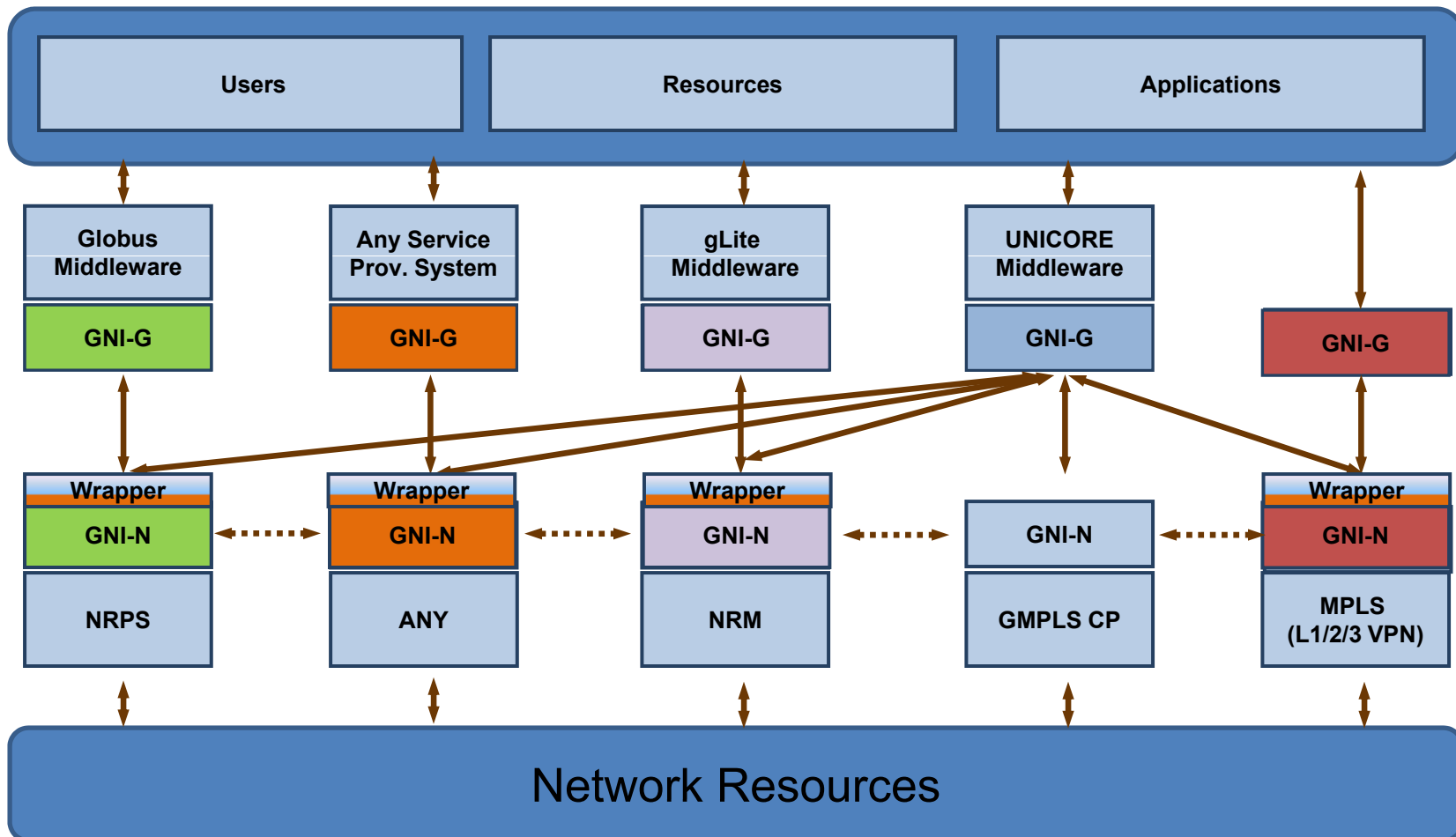


Credit: Gigi Karmous-Edwards - GLIF

RB: Resource Broker	GAI: Grid Application Interface	Publish Resource Information
DNRM: Domain Network Resource Manager	GNI: Grid Network Interface	Publish/Subscribe Broker + Resource
CRM: Compute Resource Manager	GCI: Grid Compute Interface	Information / References
IRM: Instrument Resource Manager	GSI: Grid Storage Interface	
SRM: Storage Resource Manager	GII: Grid Instrument Interface	

GNI Role in Grid Networking environment

Grid Network Interface: Interoperability-Issue



GNI Requirements and Characteristics

Grid application requirements



- Network Capability Discovery Service
 - Grid Service Provider can query the network capabilities like bandwidth, latency between the various end points so it can adjust its send and receiving buffers to smooth out the traffic at the expense of latency.
- Network Resource Allocation Service
 - The GSP might need to allocate the right Quality of Service (QoS) including bandwidth, latency, priority between the different visualization session locations.
- Network Monitoring Service
- Network Advanced Reservation Service
 - This service might be used to monitor the ongoing network QoS and prompt the Grid Service Provider, and in turn the application, in case the SLA negotiated is violated.
- Network Security Service
- Network AAA Service
 - The Grid Service Provider might need Authorization before allocating network

Network Service layer requirements



Network services will be part of bundled service elements

- The need for standardized SLA template to facilitate
 - Automated service management and business level agreements
 - Dynamic combination of service providers selected by Grid Service Providers
- **Interactions between Grid Service Provider and Network Service Provider through a defined Interface (e.g. GNI).**
- To manage network services as elements of Grid Services:
 - **Network service to be combined with IT services (e.g. Grid services)**
 - Datacenter operators and Network operator association.
 - Multi-domain network services

Network Operator Infrastructure information should not be exposed



Network services on shared transport network infrastructures

- Virtual Network configuration exposure provides status information to the service consumers
 - Network Operator Confidentiality problems are raised
- If the Network resources are too abstracted → automation issues
 - Planning of the Network resources become complex
 - Scheduling of network services becomes un-implementable
- Specification of the Network Service component is required
 - To schedule the network services delivery
 - To schedule locally the network resource usages (network domain)
 - To enable (re) configuring the network services
 - To define the right level of virtualization for network service exposures

GNI architecture and functionalities depend on a number of requirements that are especially important in a large-scale, distributed Grid network environment

- *Interoperability*: GNI must be able to provide a generic interface between grid and network service boundaries
- *Extensibility*: GNI architecture needs to scale to potentially support any possible Grid/network service provisioning system

GNI Characteristics II



- *Performance and agility:* GNI should dynamically adjust the service provisioning level (e.g. Bandwidth provisioning) and accept different signal types and levels of granularity.
- *QoS assurance:*
 - Service Level Agreement
 - Reliability
- *Security and Policy:* GNI should provide means to check and forward service credentials for using grid and network resources and accounting for the real resource usage.
 - Authentication and authorization
- *Failure notification:* Escalation of information

GNI Informational Draft in OGF (GHPN-RG)

<https://forge.gridforum.org/sf/go/doc15126?nav=1>

GNI Informational Draft formation



- Introduction
 - Draft objectives
- Current standardisation related to GNI
- GNI Role in Grid Networking environment
 - GNI definition
 - GNI roles and activities
- Requirements
 - From Grid Applications and Network operators
- Architecture and Functionalities
 - Services offered by GNI
- Abstract messages and procedures
- Use cases

<https://forge.gridforum.org/sf/go/doc15126?nav=1>

Grid Network Interface (GNI) participants



- **Europe**
 - IST-Phosphorus
 - UEssex (G. Zervas, E. Escalona, R. Nejabati, D. Simeonidou)
 - NXW (N. Ciulli, G. Carrozzo)
 - PSNC (A. Binczewski, D. Parniewicz, B. Belter)
 - FHG (O. Waeldrich, W. Ziegler)
 - I2cat (Sergi Figuerola)
 - CARRIOCAS
 - Alcatel-Lucent Bell Labs (Dominique Verchere)
- **USA**
 - MCNC, Research & Development Institute (Gigi Karmous-Edwards)
 - NORTEL (Inder Monga)
- **Japan**
 - AIST (Tomohiro Kudoh)
 - KDDI R&D Labs (Takahiro Miyamoto)
- **China**
 - 3TNET (SJTU- Wei Guo)
- **GLIF**
 - GNI group

GNI Network Services



- Connection creation
- Connection deletion
- Connection status enquiry
- Network Topology Enquiry and Restoration
- Network Resource Capability
- Network Resource Availability
- Network Advance Reservation
- Monitoring
- ...

GNI BoF in OGF23



- GNI BoF organized in OGF 23 in Barcelona
(Wednesday 4th of June between 3:45 pm - 5:15 pm.)

- Agenda:

Welcome – Agenda Basin

Presentation on target, scope and aim of GNI-WG

Presentation from current participants on this activity

(GHPN, GLIF, Phosphorus, G-Lambda, KDDI, NORTEL, Alcatel-Lucent, i2cat)

Further participants:

(Internet2 DCN, GEANT AutoBan)

Discussion:

Charter review

Activity in DMNR BOF

Election of Chairs

Action Points

http://www.ogf.org/gf/event_schedule/index.php?id=1279

Any Questions?

gzerva@essex.ac.uk

You are all welcome to participate in
GNI BoF at OGF23 in Barcelona
(4th June)

http://www.ogf.org/gf/event_schedule/index.php?id=1279