

Draft on Grid Optical User Network Interface (G.OUNI)

**George Zervas, gzerva@essex.ac.uk
University of Essex**

Talk Overview

- Need for the Grid Optical User Network Interface (G.OUNI) Draft
 - Evolution and emergence of new applications and services
 - Broad range of Grid and Network Service Provisioning systems
 - Evolution of network infrastructure and technologies to support Grids
- Draft main areas
 - Current status and overview of all sections
- Drafts' Future Plan

New Solutions, Architectures, Technologies and Services are Emerging



- Evolving Grid Network Architectures:
 - Need interface that can provide interoperable procedures between a wide range of service provisioning systems .
 - Support of a number of distinct layer architectural models across geographical organizational boundaries, heterogeneous environments with different
 - Grid service provisioning systems (co-allocation services, Brokers, etc.),
 - Network Resource Provisioning Systems
 - Control plane (e.g. GMPLS, Grid-aware GMPLS)
 - Transport planes (e.g. Ethernet, SDH, OTN, OBS)
 - Policies standards,
 - security standards.

Talk Overview

- Need for the Grid Optical User Network Interface (GOUNI) Draft
 - Evolution and emergence of new applications and services
 - Broad range of Grid and Network Service Provisioning systems
 - Evolution of network infrastructure and technologies to support Grids
- Draft main areas
 - Current status and overview of all sections
- Draft Future Plan

Draft current formation

- Introduction
 - Draft objectives
 - Current standardization of UNI and position of G.OUNI
- G.OUNI Role in Grid Networking environment
 - Grid Network architecture Use Cases with respect to G.OUNI
 - Driven by different projects and architectural challenges
 - G.OUNI General Requirements driven by Use Cases
 - G.OUNI Capabilities
- G.OUNI Definition, Architecture and Functionalities

Grid Optical User Network Interface (GOUNI) Draft: Current Situation



- Contribution from organisations so far
 - **Contributors from European countries (UK, Italy, Spain)**
 - IST-Phosphorus
 - e-photon/One+
 - University of Essex (G.Zervas, R.Nejabati, D.Simeonidou)
 - Nextworks s.r.l (Nicola Ciulli, Gino Carrozzo)
 - UPC-I2CAT (Eduard Escalona)
 - **USA**
 - EnLIGHTened
 - MCNC, Research & Development Institute (Gigi Karmous-Edwards)
 - **Japan**
 - G-Lambda

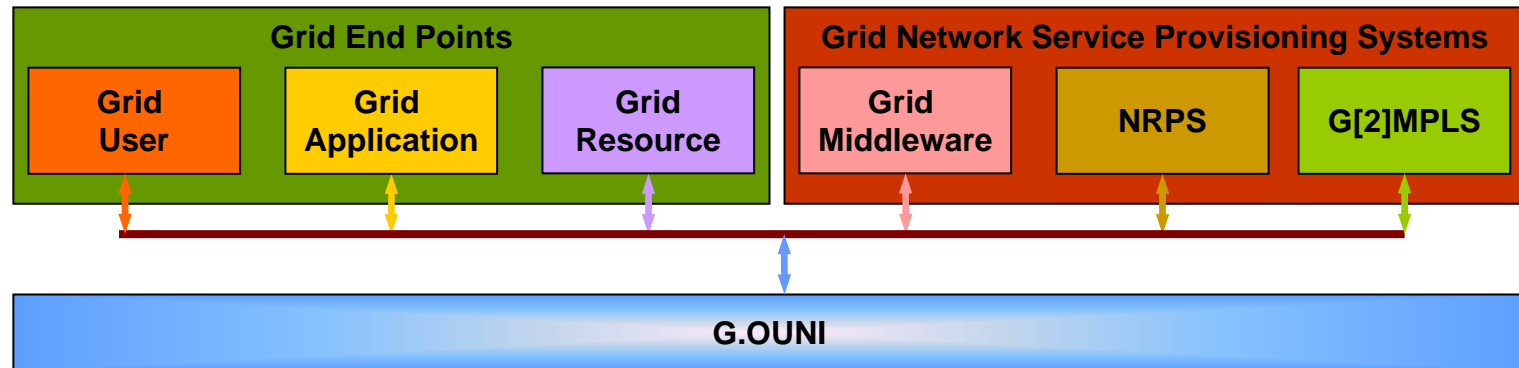
**Call for participation from other research people and major projects
as well as industrial groups**

Grid Optical User Network Interface Draft Objectives



- Define, describe and provide extensions to existing UNI standardization documents (OIF, IETF) required to support
 - Support/Propagate Grid service requirements/functionalities over GMPLS
 - Support Broader range of transport networks
 - Optical Transport Network
 - Sub-wavelength switching (e.g. OBS, OPS)
 - Interoperate with Network Resource Provisioning Systems
 - Interface with Grid Users/Applications/Resources via Web Services and take into consideration a number of OGF standardised languages of describing jobs and resources.
- Extensions should represent functionalities and requirements driven by
 - OGF
 - OASIS

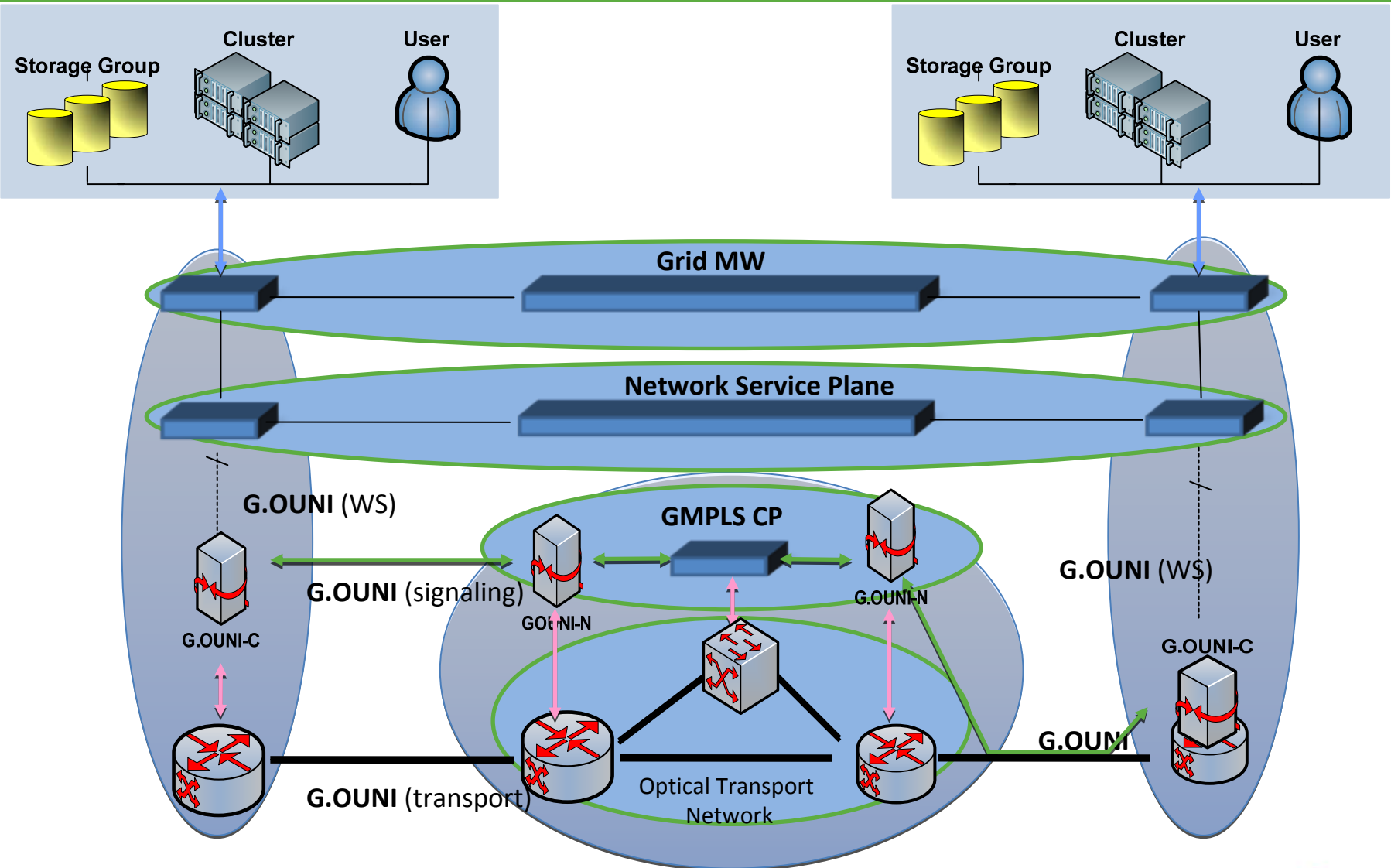
Grid Optical User Network Interface



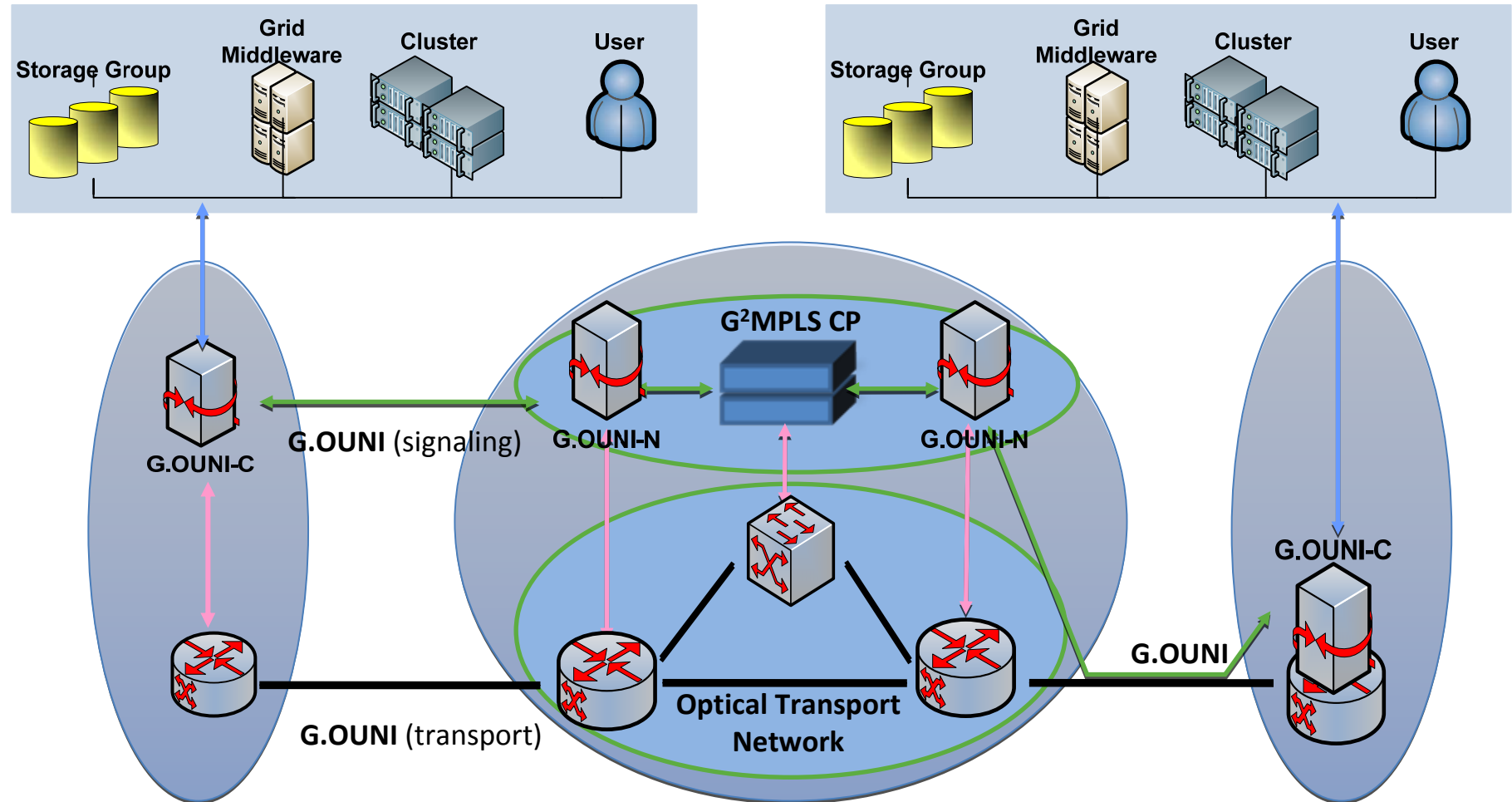
- *Extend the idea of UNI that is a service interface between a standard user and network for connection establishment and think more of a => **Grid service interface that's link any type of Grid End Point with a broadened Grid Network Service Provisioning System.***
- Support
 - Support Grid Middleware service requirements through
 - Web Services
 - Grid Users/Applications/Resources
 - JSDL
 - WSRF
 - Interoperate with Network Resource Provisioning Systems
 - Extensions to RSVP-TE signalling, ...
 - Broad range of transport networks

Grid Network Use Cases (so far) with respect to G.OUNI

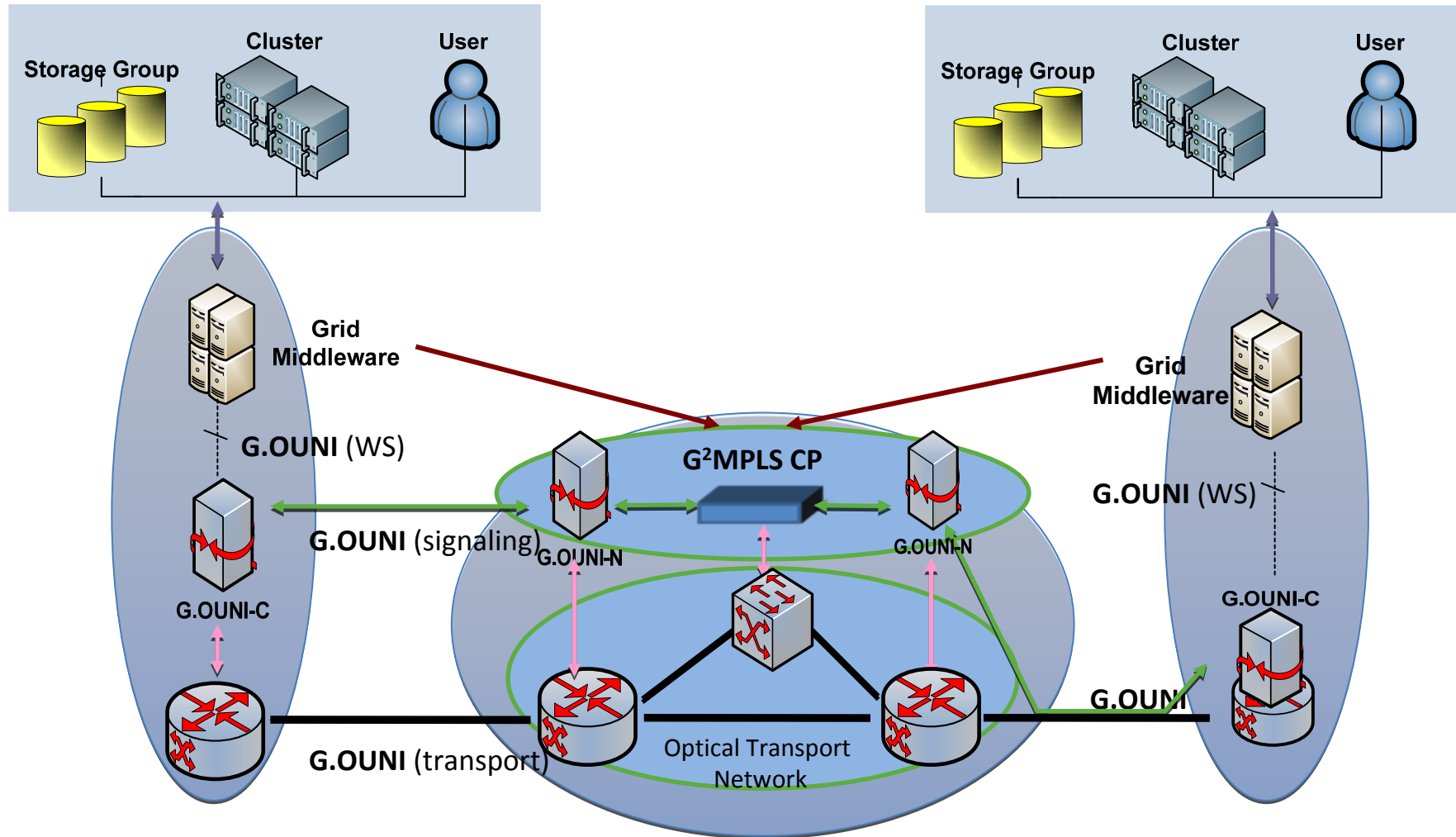
Grid Network Overlay Architecture I



Grid Network Integrated Architecture II



Grid Network Overlay Architecture III



Initial Requirements and Capabilities

G.OUNI Requirements

- Extensibility
- Interoperability
 - NRPS
 - Grid Middleware
 - Grid-aware GMPLS (Of course with standard GMPLS)
 - Grid Users/Resources
- Performance and Agility
- QoS assurance
- Service level Agreement
 - Migration
- Security and Policy: Support Grid AAA standards
- Flexibility:
 - Disaster
- Compliance: Architectural and system design based on OGF, OIF, IETF, ITU-T standards

G.OUNI Capabilities

- Exchange/Transaction of service and agreement related events/messages over heterogeneous Grid-aware GMPLS transport layer such as:
 - Job management
 - job request, job submission, Job monitoring , Job control
 - Resource management
 - Reservation, Brokering, Scheduling, Aggregation, Allocation of remote Grid resources.
 - Provide Grid Security Services
 - State Representation and Manipulation
 - Ability to access, manage the state
 - Notification
 - Dynamic Grid Network environment have components that can request and receive support status change notification (look at WS-Notification and WS-Eventing)
- Flexible bandwidth allocation
 - Allocation of bandwidth with different grades of granularity.
- Automatic and timely light-path setup
- Traffic classification, grooming, shaping and transmission entity construction
- Support for claiming existing agreements
- Fault detection, protection and restoration
- Security

Proposed Functionalities up to now

Functionalities I

- **Grid Service Invocation :**
 - Grid Middleware attached to GOUNI-C
 - Grid User attached to G.OUNI-C
 - Grid Resource attached to G.OUNI-C
 - GMPLS attached to G.OUNI-N
 - Grid-aware GMPLS attached to G.OUNI-N
- **Control plane/Layering architecture:** The G.OUNI must provide a general and open definition in order to support different architectural models. However, the information exchanged northbound and southbound is architecture dependant.
 - **Overlay model:**
 - In this model the Grid user sees the optical network topology as a black box and Grid user protocols are separated from network protocols. Under this model, the optical network provides a set of well-defined services to clients.
 - **Peer model:**
 - network acts like a single collection of devices including user and single protocol runs by both user and optical nodes for the optical path placement and setup. (e.g. Unified Control Plane layer integrating Middleware and GMPLS)

Functionalities II

- **Optical transport** : It determines how to send signaling and control messages as well as data from user/client to the optical network.
 - SONET/SDH
 - Ethernet (1GE, 10GE, e.g. OIF UNI v.2.0)
 - Optical Transport Network
 - Switching transport format
 - OBS
 - OPS
 - Multicast
- **Grid Network Service Provisioning**
 - **On-demand**: Capability to provision Grid resources (network + grid) just in time having into account actual available resources.
 - **In-advance**: Capability to provision Grid network resources by reserving them in future time slots.

Functionalities III

- **User required features**

- Job request
- Job submission as Described by JSDL
- Job manipulation
- Job scheduling: transparent and efficient access to remote and geographically distributed resources.
 - User requested job priority
 - Application classification
 - Allocation of resources based on percentages
 - User specifiable resource requirements
 - Concurrency limit on the numbers of jobs a user is allowed to run
- User report (*management reporting*) should be available for a variety of time frames and should contain the following information:
 - Number of request submitted, succeeded, failed, canceled
 - Total CPU time used
 - Total wall clock time used
 - Total bytes transferred

Functionalities IV

- **Resource required features**
 - Resource capabilities: applications need to explicitly specify their resources
 - Resource availability
 - Resource monitoring
 - Resource reporting (*management reporting*)
 - Usage reports to understand which users and/or organizations are using a particular resource or group of resources
 - Utilization reports that show the degree to which a resource or group of resources are approaching their capacity and should contain the following for each grid resource, sorted by resource ID
- Checkpointing and Job Migration
 - **Grid Force Deletion**
- **Security**
 - Authentication, Confidentiality, Data integrity

Call for participation

- G.OUNI initiative is driven It is currently driven from Phosphorus project
- Contribution on views and technical ideas from other research people and major projects (e.g. Enlightened, G-Lambda) as well as industrial groups are more than welcome.
- The structure of the document is open for discussion
- The level of technicality and approach regarding previous standardization reports (e.g. OIF UNI, IETF UNI)
 - First step
 - General description of G.OUNI architecture, functionalities, requirements
 - Possible Follow-up
 - More detailed description on objects, messages
- It is open for new ideas that can be integrated with existing ones or stand alone on separate chapters/paragraphs.

Any Questions?

gzerva@essex.ac.uk