



# JRA3 - Bandwidth on Demand

Internet2-CANARIE-GEANT2 meeting

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GRNET



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# Goals of JRA3

- Streamline the inter-domain setup of ‘lightpaths’
  - shorten the provisioning time
  - reduce the amount of human intervention
- Take into account heterogeneity from the beginning
- Specify and document the manual procedures
- Automate the process step-by-step focus on inter-domain coordination process
- Providing “advanced users” access to the BoD service hooks already being requested by some (e.g. GRID users)



# Service Definition

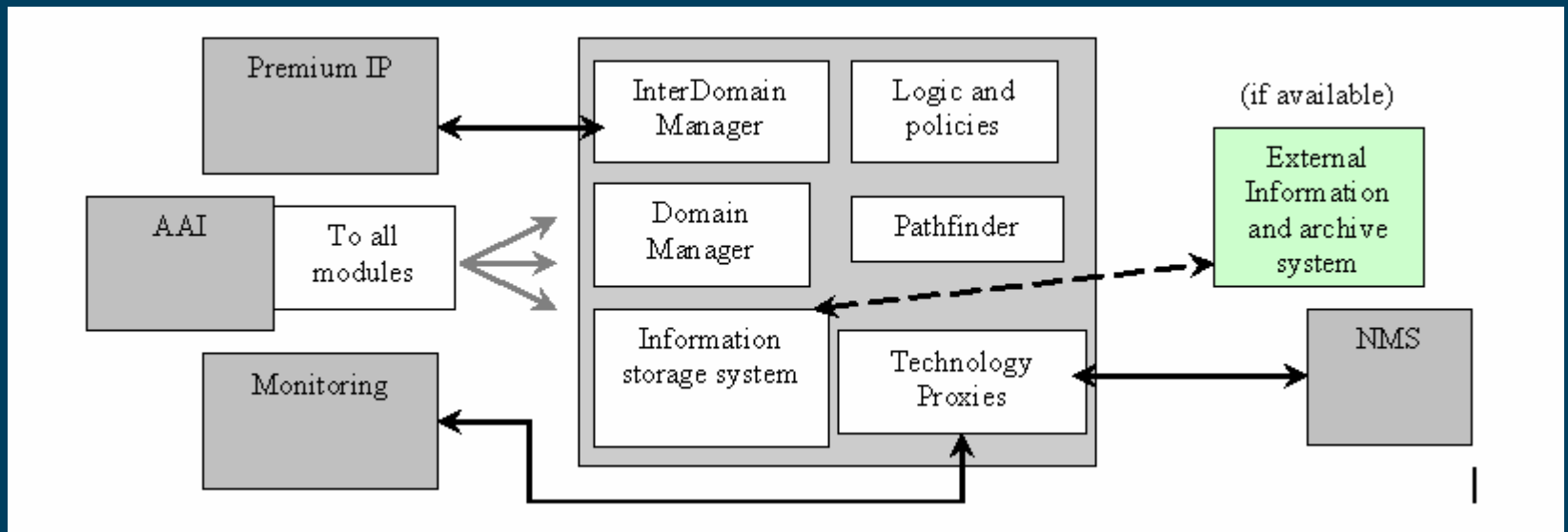
- Point-to-point, connection oriented service
- Non-contended capacity
- Layer 1, 2
  - focus on provisioning of a deterministic non-contended bandwidth pipe between two 1 Gigabit Ethernet access ports over multiple domains that employ different technologies
- Multi-domain and multi-technology
  - e.g. SDH with GFP, EoMPLS, native Ethernet
- Automated provisioning
- Advance reservation (scheduled)



# Framework specification

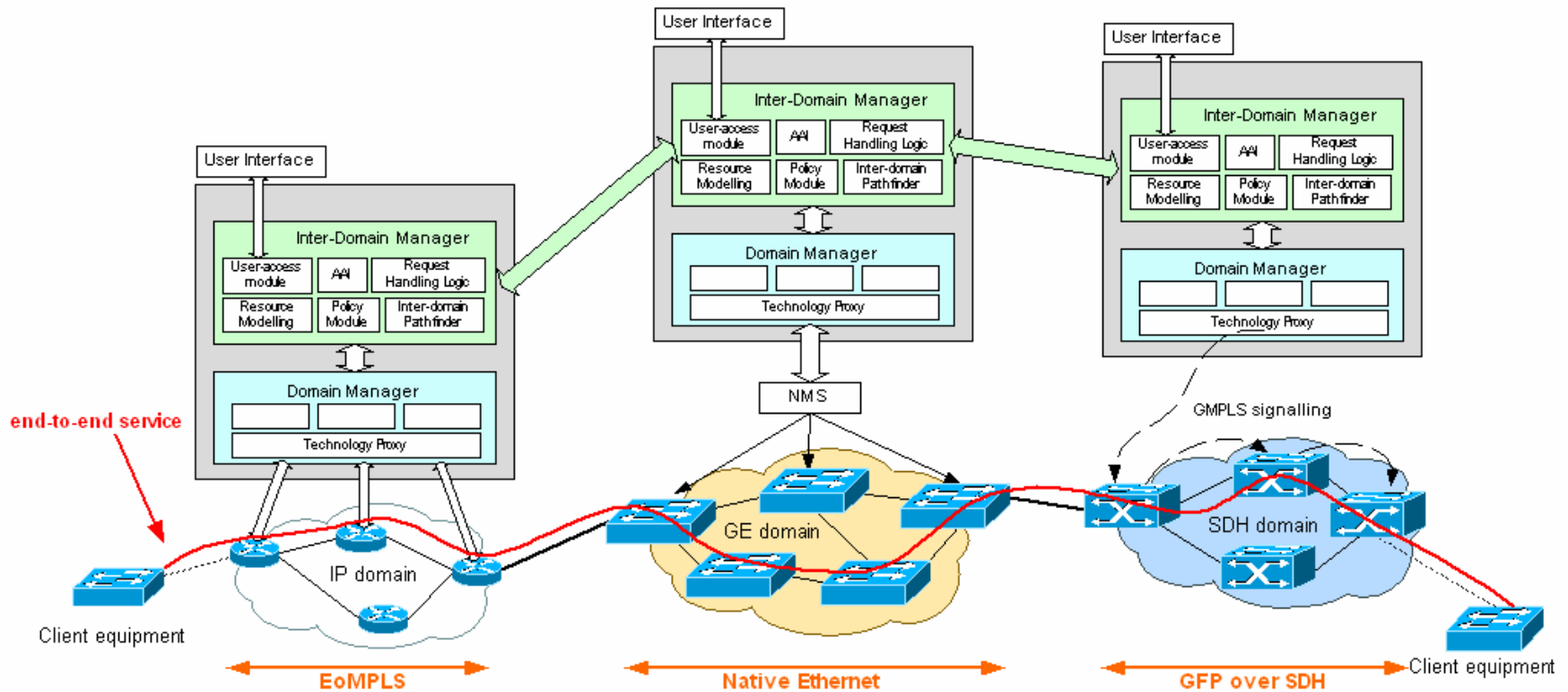
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- DJ3.3.1: 'GEANT2 Initial Bandwidth on Demand Framework and Architecture'



# Multi-domain provisioning

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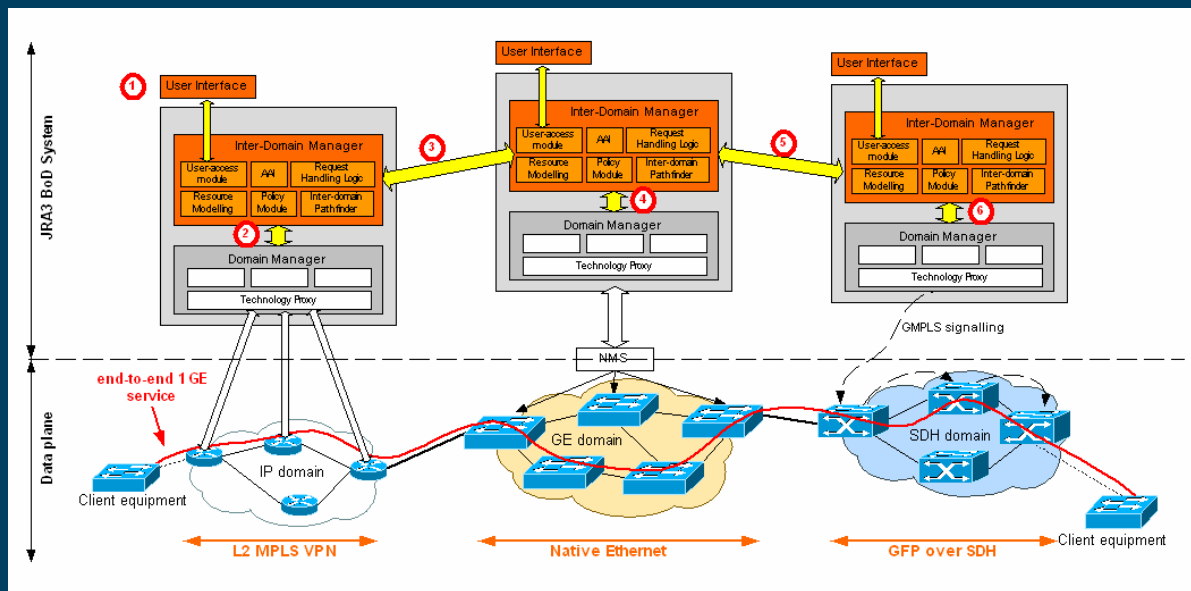
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# Service characteristics

- Inter-domain: the end user points may be located in different domains
- Capacity: The minimum amount of capacity that can be requested will depend on local domain policies and restrictions imposed by the technology used (e.g. SDH granularity)
- Point to point: the BoD service provides Point-to-Point services. Point-to-Multipoint may be realized as a set of point-to-point services
- Bi-directional: the service is a bi-directional service
- Symmetric capacity
- Symmetric paths
- Advance reservations
- Protection

# Inter Domain Manager

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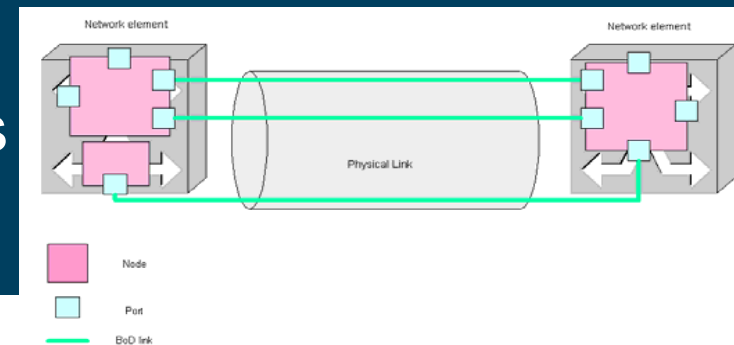
- A set of automated procedures for the required non-technology specific inter-domain negotiations in order to establish an end-to-end non-contended 1 GE bandwidth pipe
- Path-finding process
  - Signaling and routing information
  - Looking at existing implementations (OSPF-TE extensions)
    - DRAGON (<http://cni.gmu.edu/dragon/software.htm>)
    - EuroNGI-Quagga Routing Suite (<http://www.quagga.net/>)



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# Inter Domain Manager

- Reservation process
  - Ensure adequate e2e capacity
  - Ensure technical feasibility (e.g. a common VLAN id along the e2e path)
  - Capacity reservation scheduling
  - Path resilience-restoration
- AAI module that will interoperate with the eduGAIN architecture (federated AAI produced from JRA5 of GN2 project)
- Abstract representation of resources
- Addressing





# Intra-domain provisioning

- Manual intra-domain configurations and provisioning processes for the establishment of the intra-domain segments of the end-to-end path
- Intra-domain provisioning design to accommodate
  - Domains that have a G.ASON/GMPLS CP “out of the box” e.g. Generic MPLS Routing Engine (distributed control plane in their Alcatel 1678 MCC OXC)
  - Domains operated via NMS
  - Domains that may decide to adopt proprietary Bandwidth Brokers
- Intra-domain modules, implemented in later phases, will comprise the so-called BoD service Domain Manager (DM)

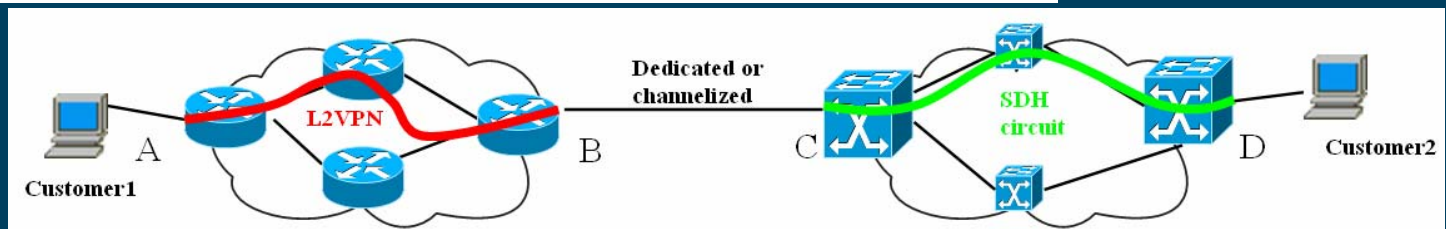
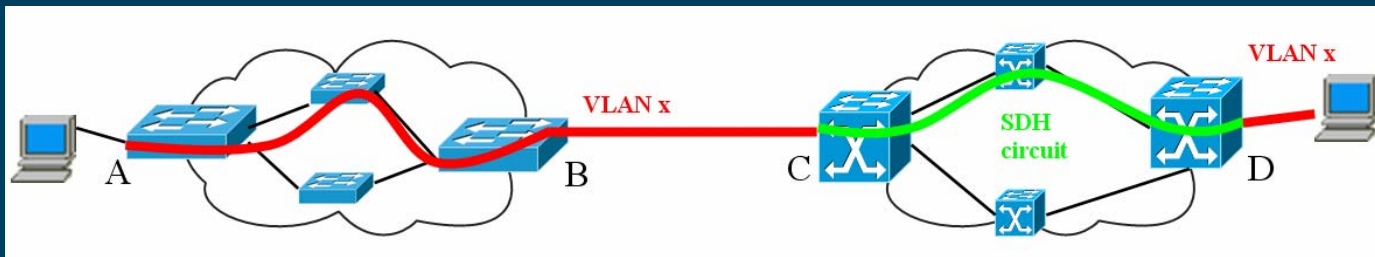


# Integration of technologies

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- Evaluating the implementation implications and testing a number of scenarios

	SDH/SONET	Layer 2 MPLS VPN	DiffServ	Ethernet
Ethernet	X	X	X	X
DiffServ	X	X	X	
Layer 2 MPLS VPN	X	X		
SDH/SONET	X			





# Monitoring

- Inter-domain monitoring system must
  - Troubleshoot in case of failure
  - Provide concatenated monitoring data of the quality of the end-to-end service
- Working together with relevant GN2 project activities (JRA1 and JRA4)
  - JRA3 will provide technology-specific monitoring data at L1-2 as well as topology data
  - JRA1 will provide monitoring data management and visualization
- Activities:
  - Design and prototype implementation of the database schema and interface for retrieving and storing monitoring data from the Alcatel NMS (GEANT2 core)
  - Specification and design of the database schema and application for retrieving and storing monitoring data in EoMPLS and native Ethernet topologies
  - Integration of the monitoring data extraction and storage components with the JRA3 Network Topology Database
- Minimum requirements for monitoring
  - Initially focus on “availability”  $\Leftarrow$  up/down info, unavailable-seconds
  - Also: offered capacity, “errors”  $\Leftarrow$  BER, error counter, errored-seconds



# Common Service Definition

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- Version 0.6 March 6, 2005 (Jerry Sobieski & Tom Lehman)
- Common Service Definition (CSD) should try to distinguish between 'services' and 'technologies' used to implement them, so that an Ethernet LAN service can also be provided using L2 MPLS VPNs.
- Wrt service verification parameters, the GN2 BoD activity is moving to the direction of defining a specific set of parameters/metrics/service characteristics for each different layer (i.e. layer 1, layer 2 and layer 3) and associating each service definition with the parameters for the corresponding layer (e.g. basic Ethernet service as defined in the CSD document uses the Layer 2 verification parameters)
- GN2 BoD is also interested in metrics/monitoring/troubleshooting of segments of the end-to-end path, apart from the service quality perceived end-to-end. How to include this in a Common Service Definition (CSD) is an open issue
- Additional attributes for the CSD from the GN2 BoD point of view include:
  - Whether the service defined entails buffering or not
  - Whether the service defined at layer 2 entails frame reordering or not
  - Whether a service implemented using Ethernet technology provides VLAN/PDU transparency or not
  - The explicit path used for the service provisioning
  - Resilience-specific attributes
  - Whether the service client ports will go down when the service 'breaks' in between them
- The idea of defining a hierarchically structured set of services (i.e. 'Basic Ethernet service' at the top and specializations like 'Ethernet VLAN service', 'Ethernet LAN service' as subcategories that inherit and extend the parent service definition) is fully supported by GN2 BoD