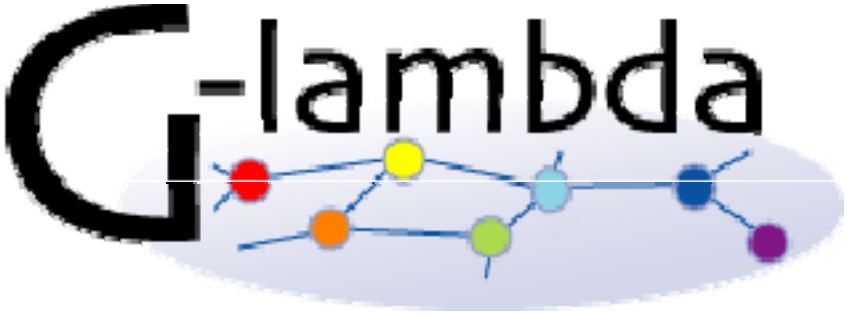
GNS-WSI3
Grid Network Service -
Web Services Interface, version 3

G-lambda project

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

National Institute of Advanced Industrial Science and Technology (AIST)
KDDI R&D Laboratories,
NTT Network Innovation Laboratories,
National Institute of Information and Communications Technology (NICT)



G- lambda project overview

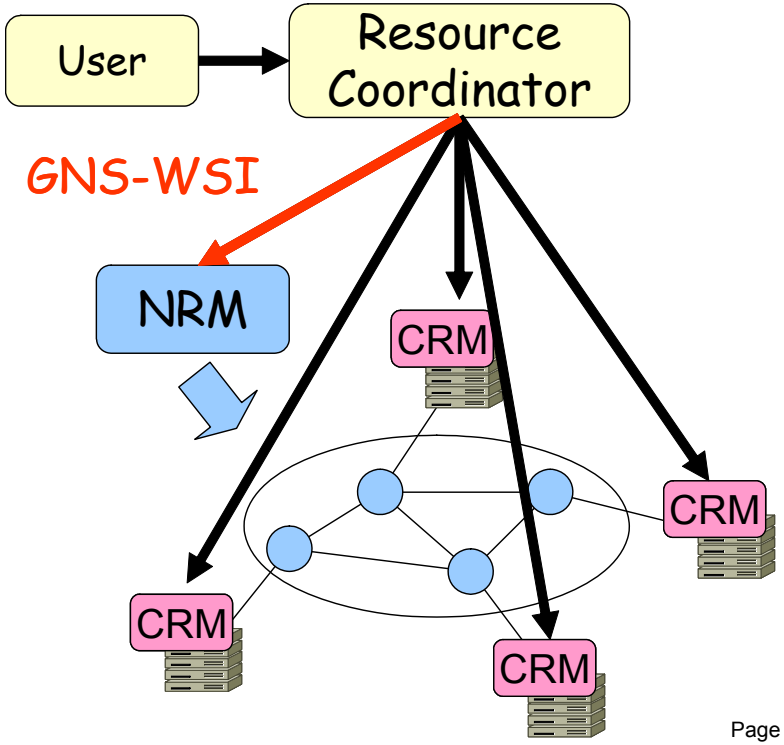
- Joint project of KDDI R&D labs., NTT, NICT and AIST.
- G-lambda project has been started in December 2004.
- The goal of this project is to establish a standard web services interface (GNS-WSI) between Grid resource manager and network resource manager provided by network operators.

- Draft specification of GNS-WSI3 is available at:

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

GNS-WSI

- Grid Network Service - Web Services Interface
- Interface to enable advance reservation of bandwidth from Grid applications and middleware
- Based on the Web Services interface technology
- Polling-based non-blocking operations
  - Advance reservation of a path between end points
  - Modification of reservation (i.e. reservation time or duration)
  - Query of reservation status
  - Cancellation of reservation
- Will support notification



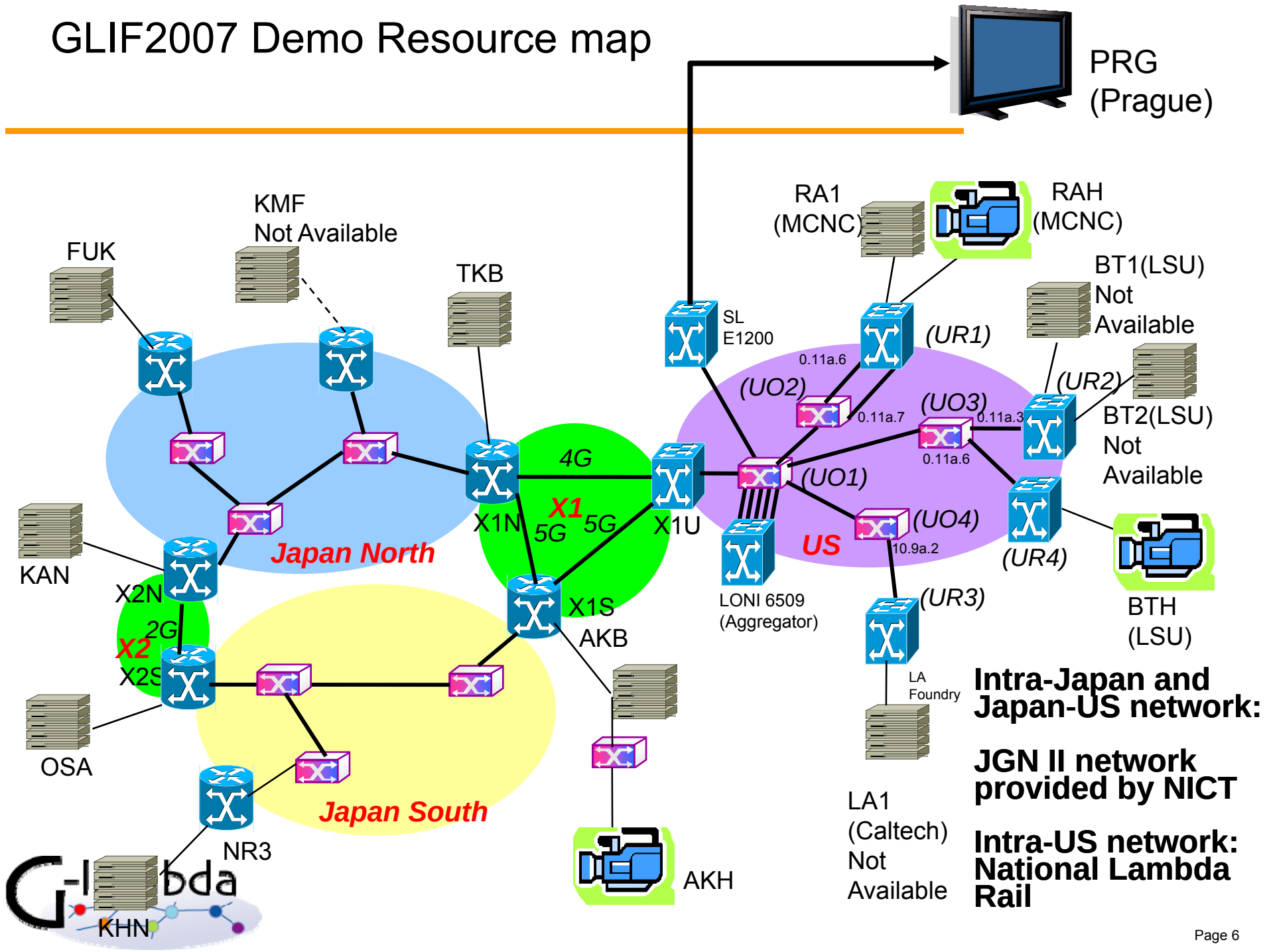
GNS-WSI

- GNS-WSI ver. 1 (released in 2005)
  - Provides simple Web services based interface
  - 1-phase commit
  - Used for the intra-domain demo at iPOP2005
- GNS-WSI2 (GNS-WSI ver. 2) (released in 2006)
  - Based on **WSRF** (Web Services Resource Framework)
  - Support **2-phase commit** protocol (useful in modify operations)
  - Used for the inter-domain demo at GLIF2006, SC2006, GLIF2007
- GNS-WSI3 (draft spec. released in Sep.2008)
  - Co-allocation function of multiple resources including compute resources
  - Specification of network parameters including SLA parameters
  - Will support both WSRF-based and non-WSRF-based impl.
  - Current specification based on WSRF

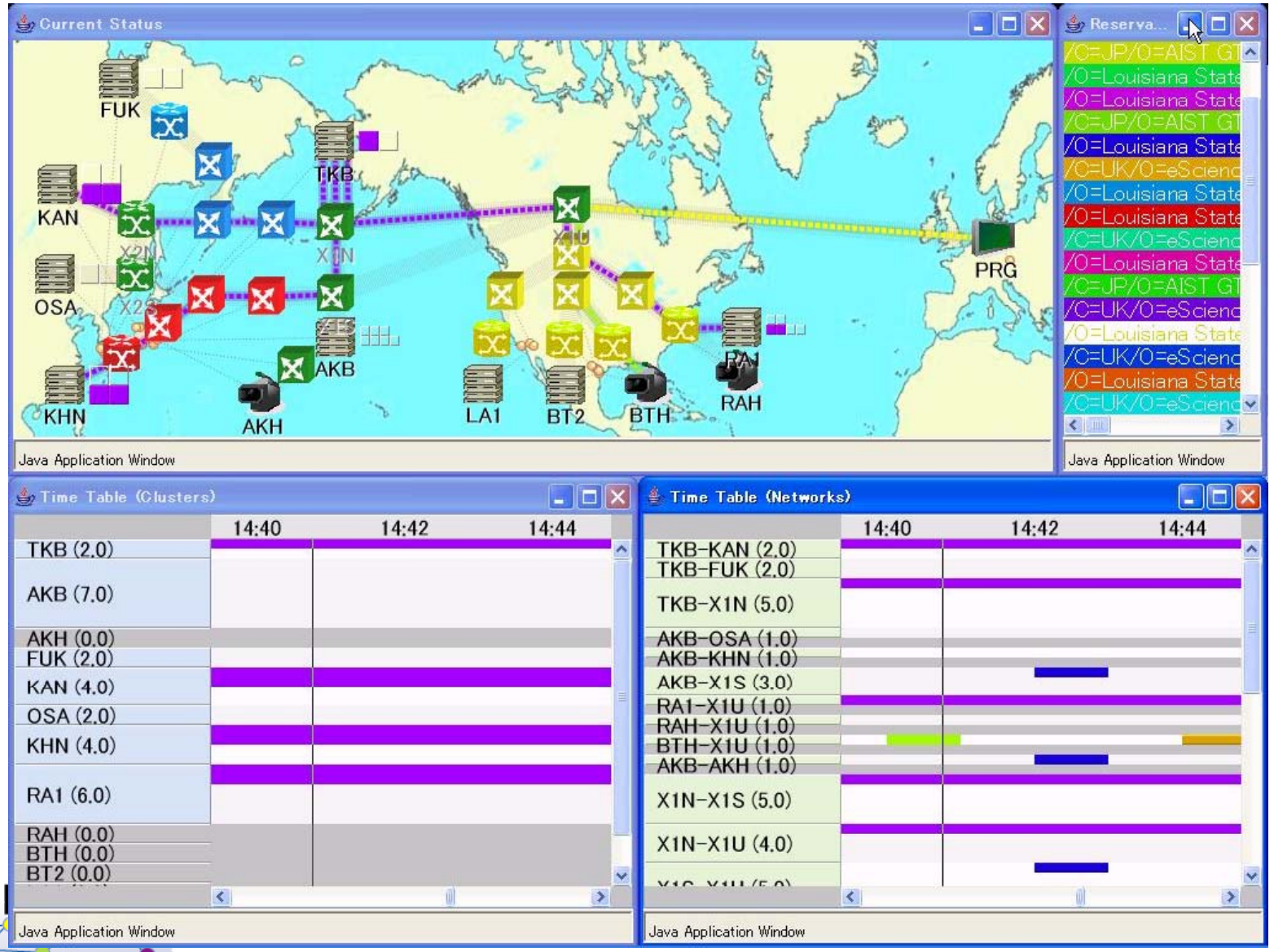
Demonstration at GLIF 2007

- G-lambda and EnLIGHTened collaboration
- MPI application and HD video streaming were executed using reserved bandwidth and resources
- 3 Continents (C3C): interconnectivity of the testbeds of the Enlightened Computing (USA), Phosphorus (Europe) and G-lambda (Japan) teams.
- Integrated computing and communication technology
  - Automated simultaneous in-advance reservation of network bandwidth between the US and Japan, and computing resources in the US and Japan
  - Inter-domain coordination of resource mangers for in-advance reservation
    - Resource managers have different I/F and are independently developed

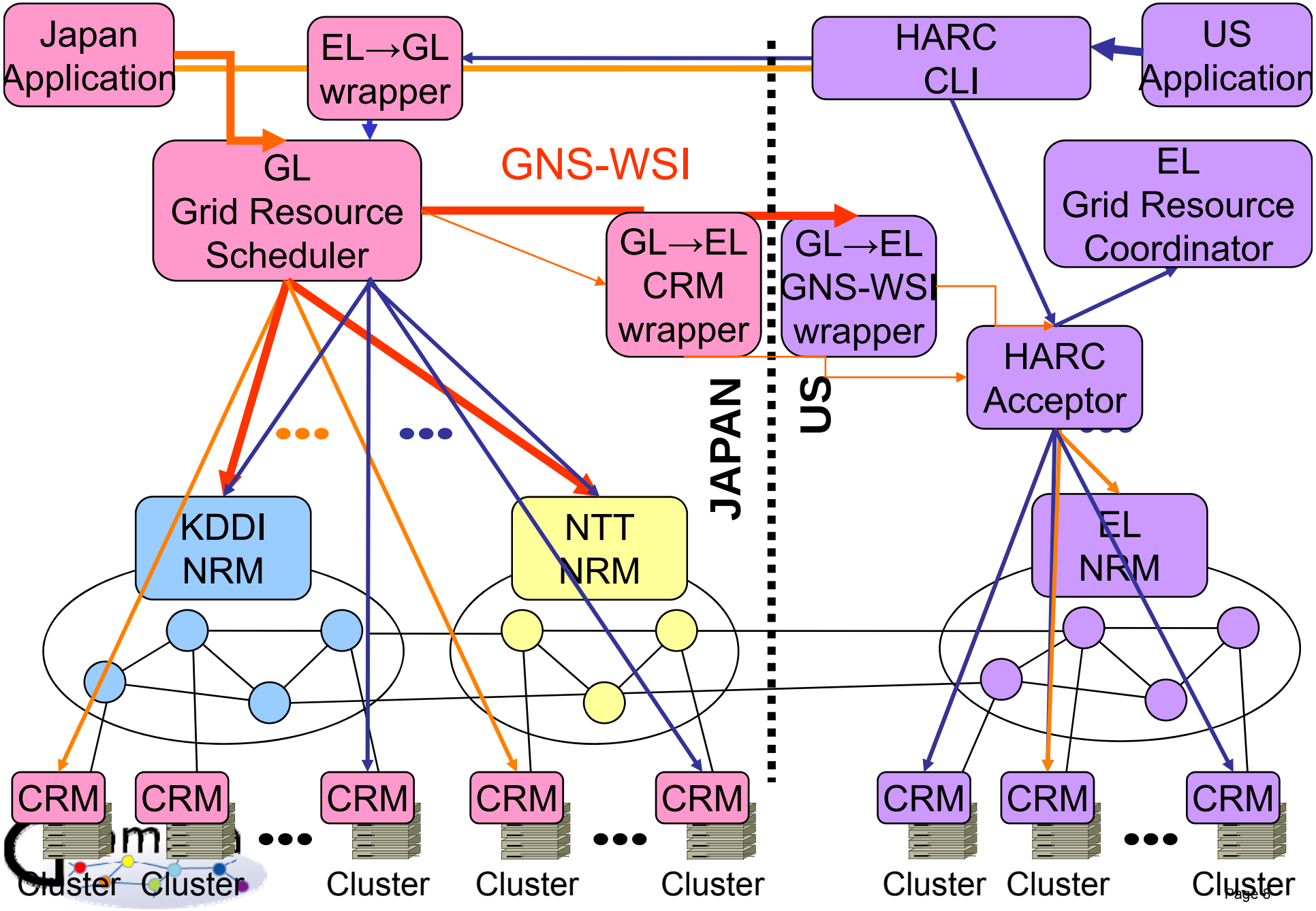
GLIF2007 Demo Resource map



Reservation Resource Monitor (RRM) snapshot



G-lambda/Enlightened middleware coordination diagram

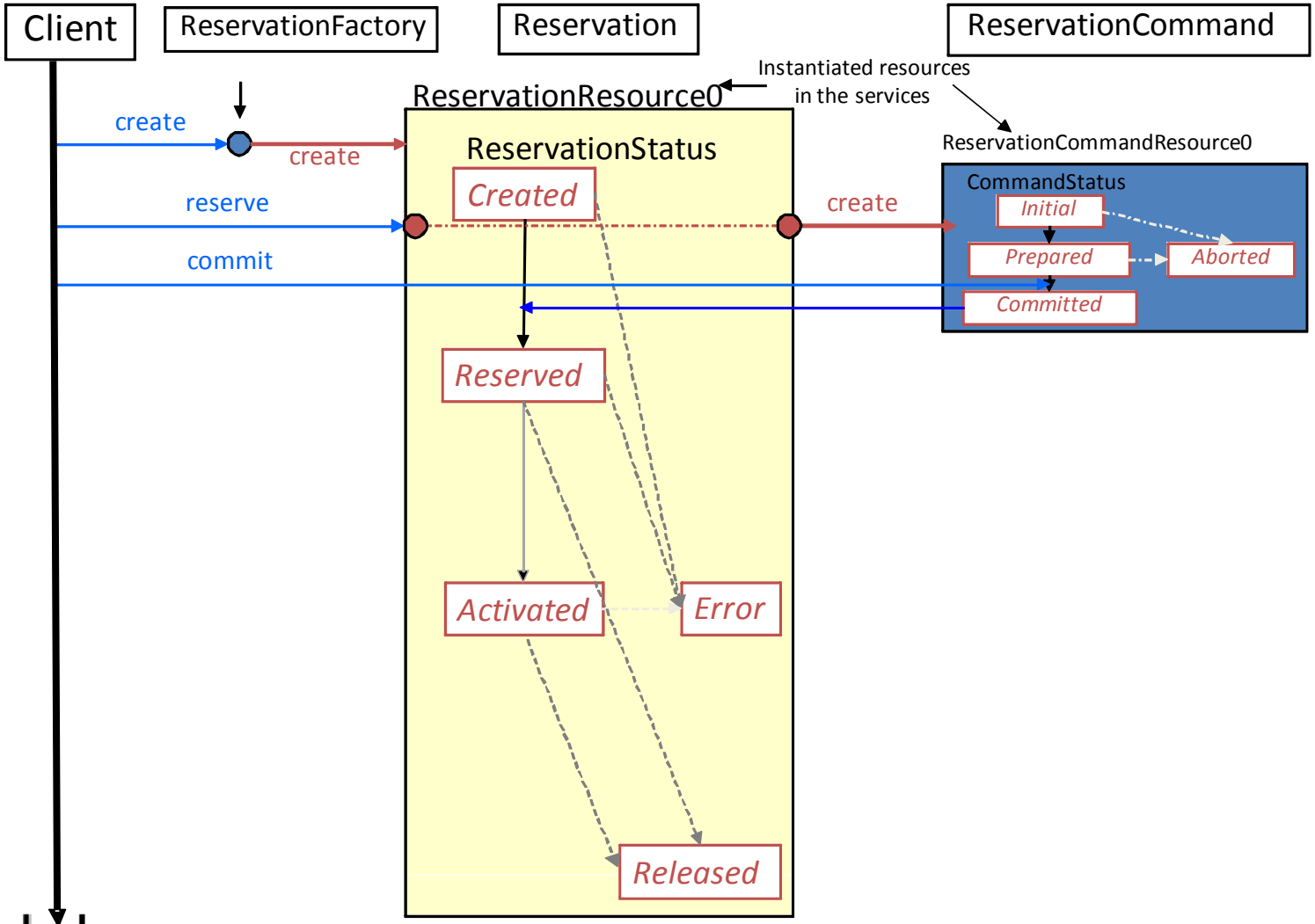


GNS-WSI3 Services (same as GNS-WSI2)

- ReservationFactoryService
  - Creates ReservationResource instance in ReservationService
  - Provides network resource information
- ReservationService
  - Provides general reservation operations
    - reservation, modification, release
  - Creates ReservationCommandResource instance in ReservationCommandService
- ReservationCommandService
  - Enables 2 phase commit and non-blocking operation

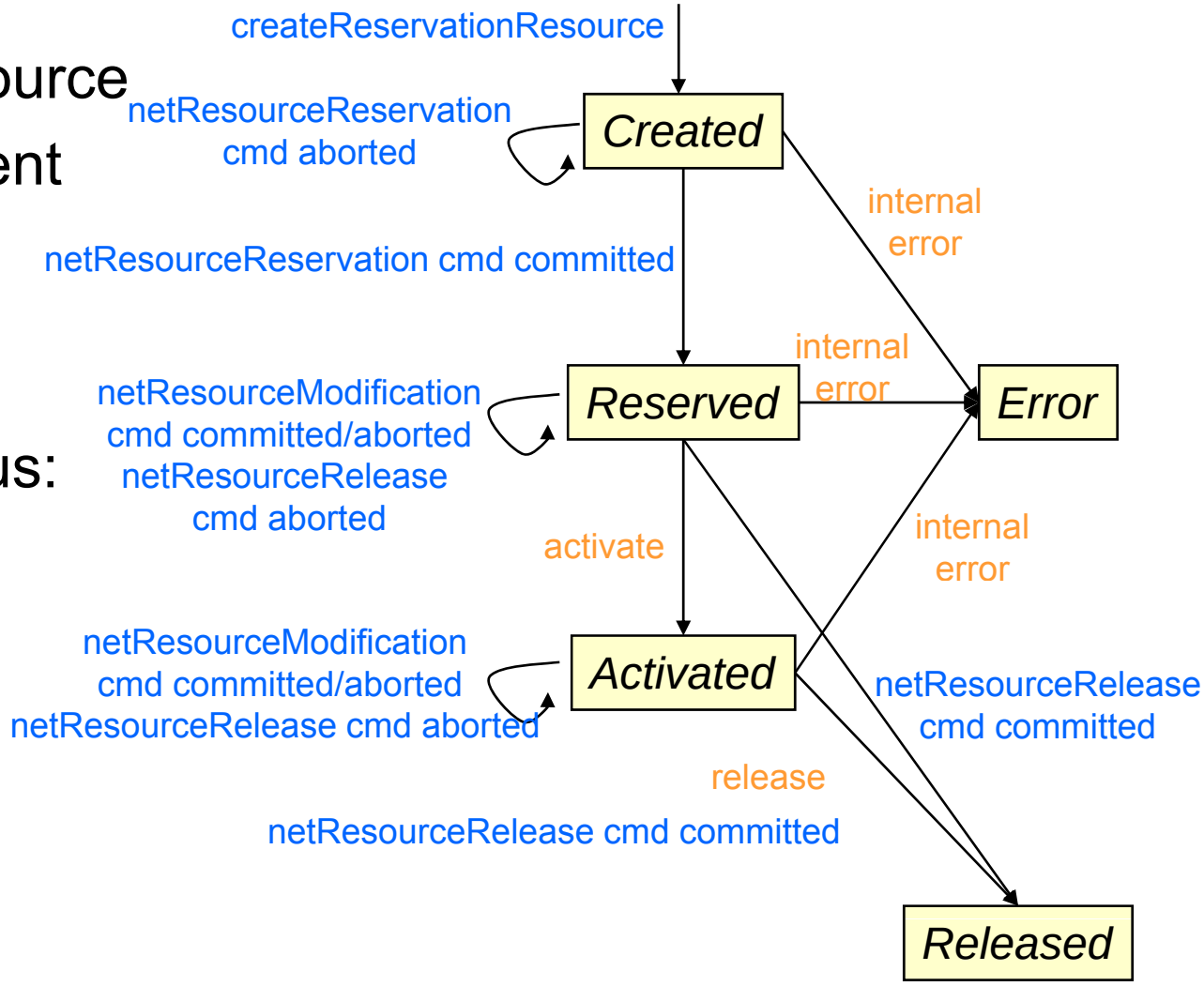
(xxxResource is a service instance for each user request)

Services in a reserve operation



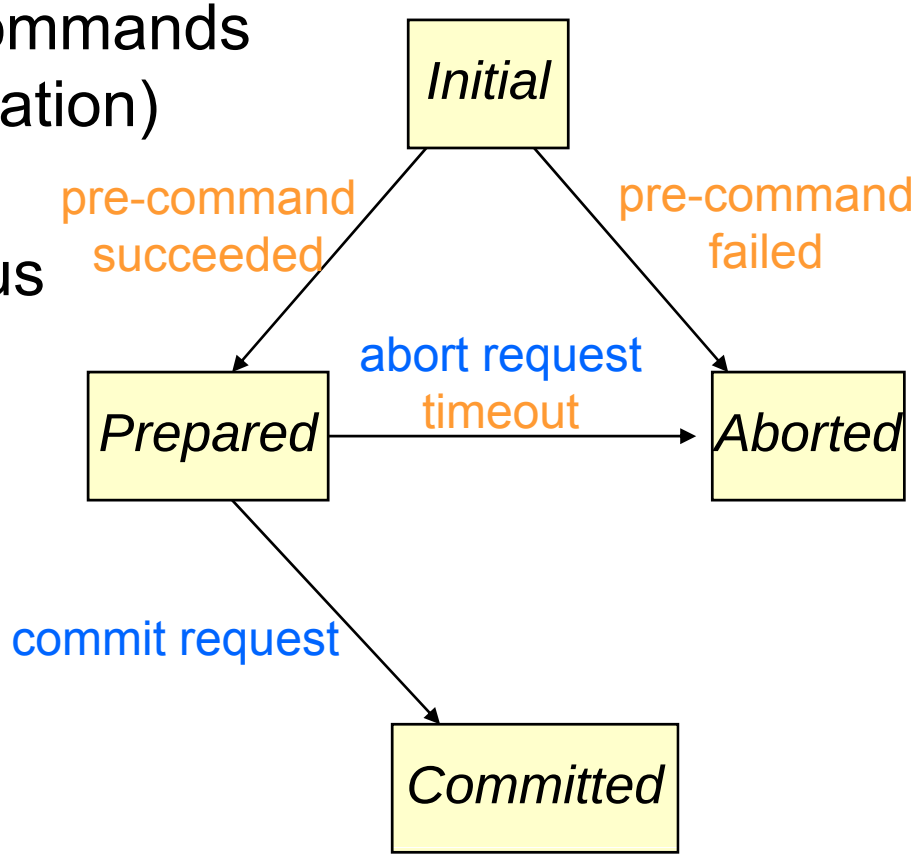
ReservationStatus Transition Process (Reservation)

- A property of ReservationResource
- Represents current "Reservation" status for each requested path
- ReservationStatus:
  - ***Created***
  - ***Reserved***
  - ***Activated***
  - ***Released***
  - ***Error***



CommandStatus Transition Process (ReservationCommand)

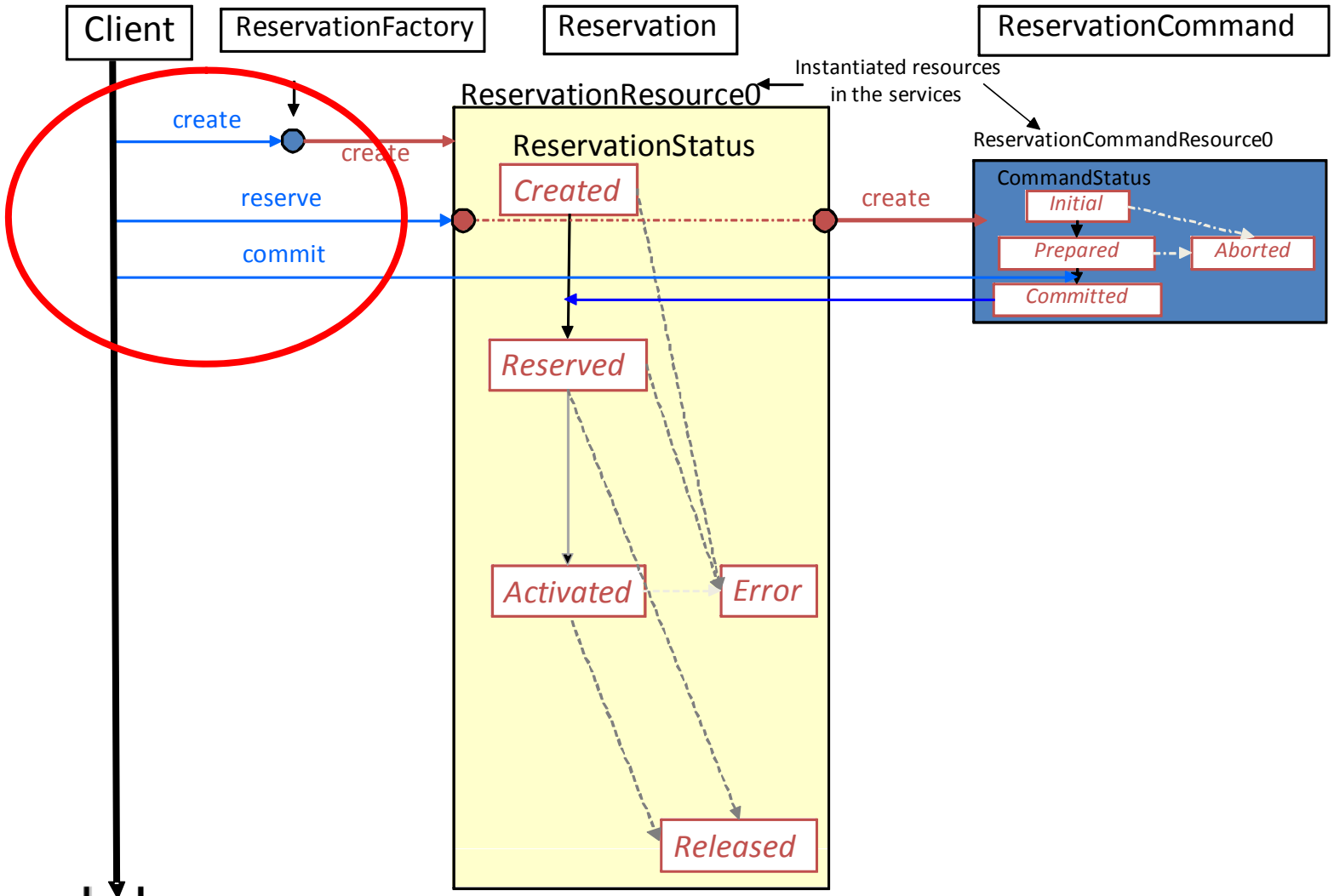
- A property of ReservationCommandResource created by reservation commands (e.g. netResourceReservation)
- Represents current requested operation status
- CommandStatus:
  - ***Initial***
  - ***Prepared***
  - ***Committed***
  - ***Aborted***



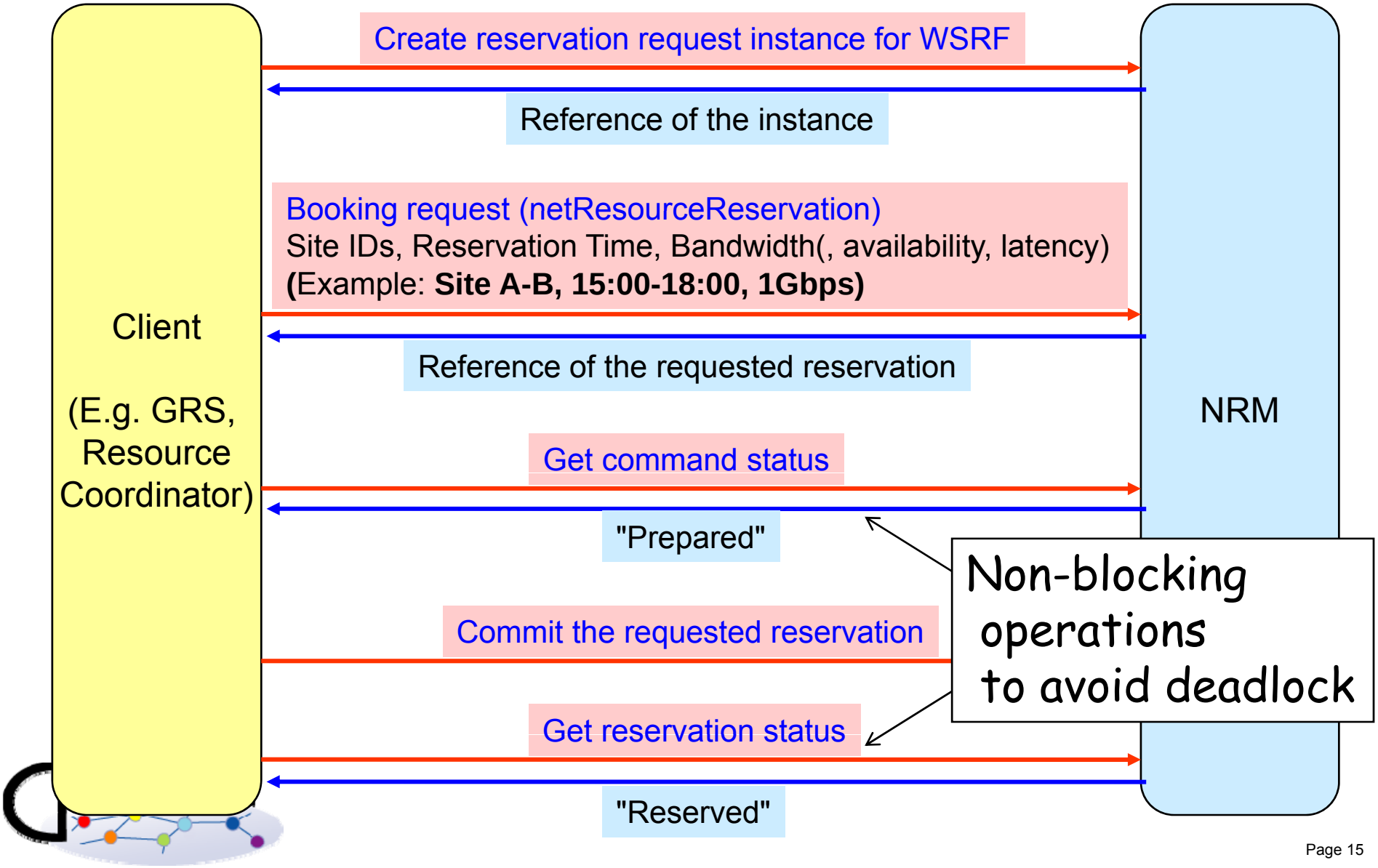
Summary of port-types and operations

ReservationFactory Port-Type	
create	Creates reservation resource
getAvailableResources	Discovery of available resources
checkResourceAvailability	Checks availability of specified resources
Reservation Port-Type	
reserve	Makes advance reservation
modify	Modifies specified reservation resources
modifyAll	Modifies reservation time of all the reserved resources
release	Releases specified reservation resources
releaseAll	Releases all the reserved resources
getReservationStatus	Returns the reservation status
getResourceProperty	Returns specified ReservationResource property
ReservationCommand Port-Type	
commit	Commits the request
abort	Aborts the request
getCommandStatus	Returns the command status
getResourceProperty	Returns specified ReservationResource property

Reserve


Client
ReservationFactory
Reservation
ReservationCommand
Instantiated resources
in the services
ReservationResource0
ReservationStatus
ReservationCommandResource0
CommandStatus
create
create
reserve
commit
create
Created
Initial
Prepared
Aborted
Committed
Reserved
Activated
Error
Released

Reserve (cont.)



Reserve (cont.)

9.1.1. Input(s)

Entity	Inherits from	Description
reserveRequest		Request for reserving a resource

Property	Type	Multi.	Unit	Description
ResourceRequirements	ResourceRequirements_Type	1		Information including resource requirements, time resources, and DistinguishedName

9.1.2. Output(s)

Entity	Inherits from	Description
reserveResponse		Response against a reserveRequest

Property	Type	Multi.	Unit	Description
ReservationCommandEPR	EndpointReferenceType	1		An end point reference for the ReservationCommandResource

Reserve (cont.)

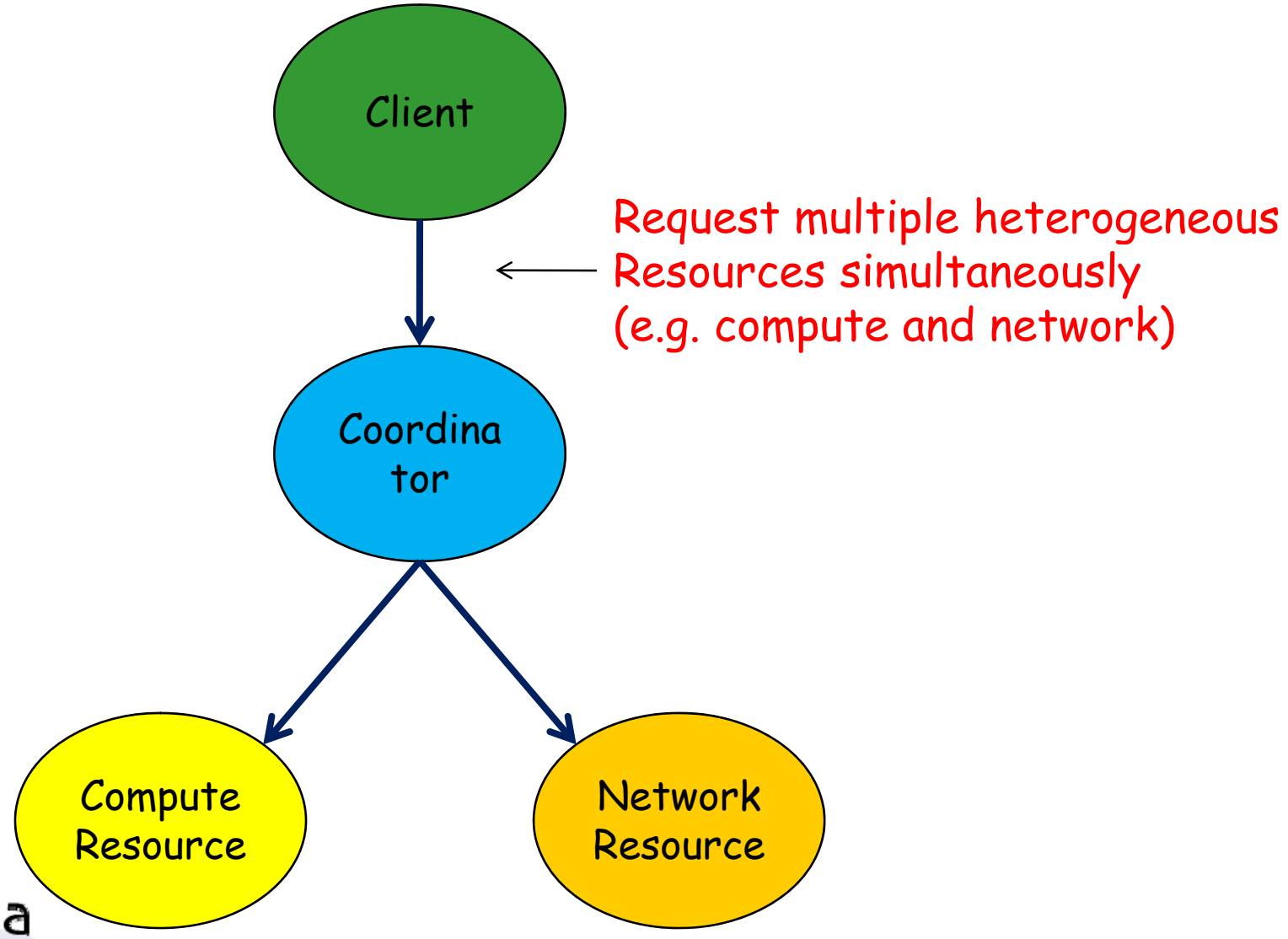
11.1.10. ResourceRequirements_Type

Entity	Inherits from	Description
ResourceRequirements_Type		Information including resource requirements, time resources, and DistinguishedName

Property	Type	Multi.	Unit	Description
CoallocationTimeframe	CoallocationTimeframe_Type	0..*		Coallocation time frame
ReservationResources	ReservationResources_Type	1..*		Reservation resources, each of which includes the reservation ID and the time specification

Supports request of multiple resources

Reservation of multiple hetero. resources

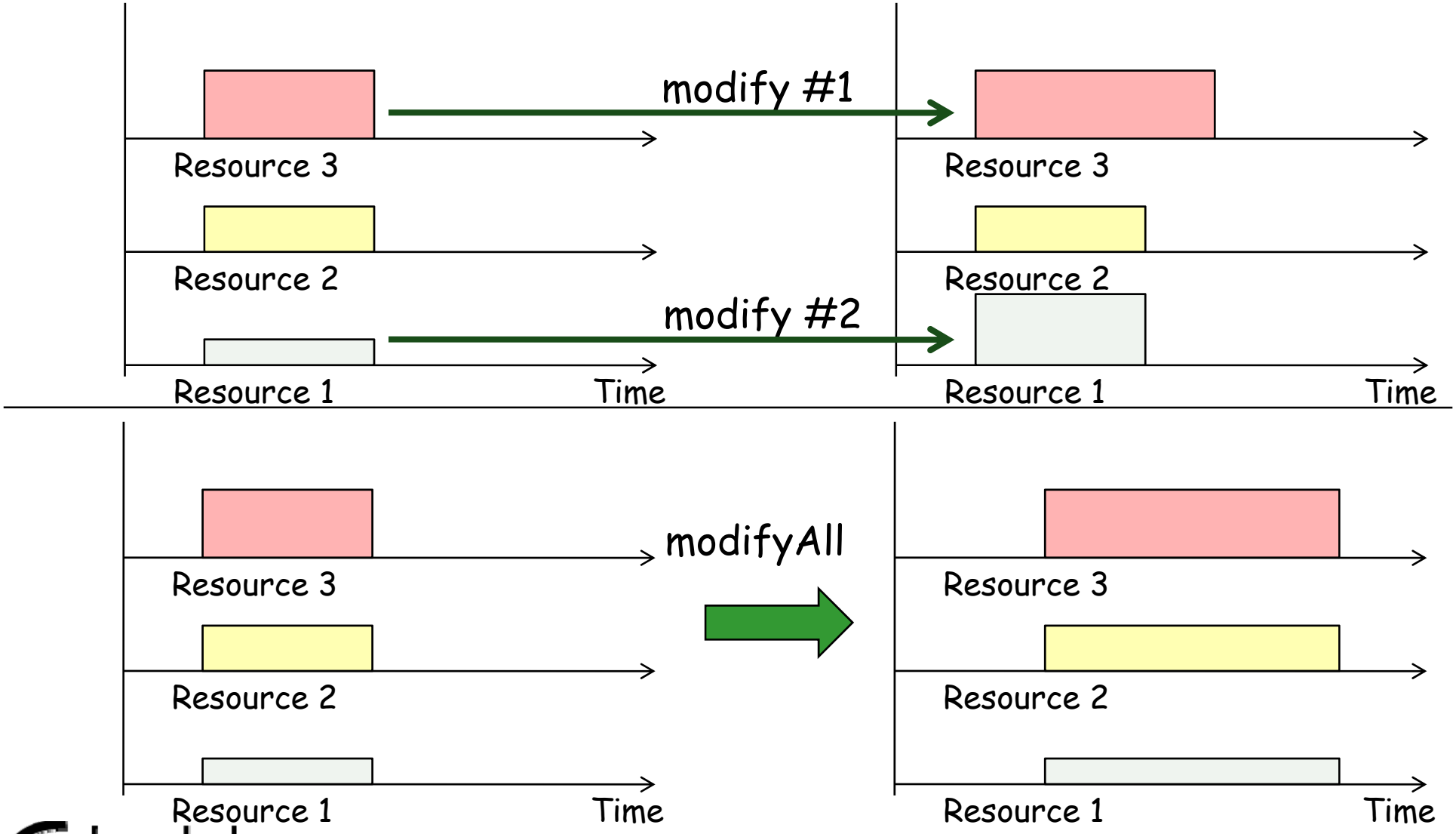


Support of compute resource (11.3.1)

11.3.1. ComputeResources_Type

Entity	Inherits from	Description		
ComputeResources_Type	ReservationResources_Type	Compute resources		
Property	**Type**	**Multi.**	**Unit**	**Description**
Site	string	0..1		A site name
Resources	Resources_Type	0..1		Resources defined in JSDL v 1.0
ResourceAttribute	ResourceAttribute_Type	0..*		The compute resources is related to zero or more attributes

modify and modifyAll operations



Reservation timeframe parameters (11.1.14-16)

11.1.14. Timeframe_Type

Entity	Inherits from	Description		
Timeframe_Type		Time frame of a reservation		
Property	**Type**	**Multi.**	**Unit**	**Description**
Exact	Exact_Type	0..1		Exact time frame type
Range	Range_Type	0..1		Ranged time frame type

11.1.15. Exact_Type

Entity	Inherits from	Description		
Exact_Type		Exact time frame type		
Property	**Type**	**Multi.**	**Unit**	**Description**
StartTime	dateTime	1		Start time of a reservation
EndTime	dateTime	1		End time of a reservation

11.1.16. Range_Type

Entity	Inherits from	Description		
Range_Type		Ranged time frame type		
Property	**Type**	**Multi.**	**Unit**	**Description**
Duration	Duration_Type	1		Duration
EarliestStartTime	dateTime	0..1		Earliest start time of a reservation
LatestStartTime	dateTime	0..1		Latest start time of a reservation

Path specifiction (11.2.5)

11.2.5. Path_Type

Entity	Inherits from	Description
Path_Type		A pair of logical network endpoints. When a path allocates over different domains, a path may contain sub-paths.

Property	Type	Multi.	Unit	Description
APoint	Endpoint_Type	1		An endpoint in a path. An APoint must be paired with a ZPoint.
ZPoint	Endpoint_Type	1		An endpoint in a path. A ZPoint must be paired with an APoint.
Route	Route_Type	0..1		A list of subsets of the path.
Bandwidth	Bandwidth_Type	1		An abstracted element of a requesting and assigned bandwidth.
PathProperties	PathProperties_Type	0..1		A set of a path information.

Endpoint and terminationpoint (11.2.6-7)

11.2.6. Endpoint_Type

Entity	Inherits from	Description
Endpoint_Type		A termination site of a path or sub-path. An endpoint may contain termination points of connections.

Property	Type	Multi.	Unit	Description
DomainName	string	0..1		A name of a domain, which is a network administrated by a telecommunication carrier, internet service provider, organization, group, or some other type of authority.
TerminationPoint	TerminationPoint_Type	0..*		A physical or logical termination point of a connection.

11.2.7. Termination_Point_Type

Entity	Inherits from	Description
TerminationPoint_Type		A physical or logical termination point of a connection.

Property	Type	Multi.	Unit	Description
TerminationPointName	string	0..1		A name of a termination point.
MediaType	MediaType_Type	0..1		A media type of a termination point.

Bandwidth (11.2.11)

11.2.11. Bandwidth_Type

Entity	Inherits from	Description
Bandwidth_Type		An abstracted element of a requesting and assigned bandwidth.

Property	Type	Multi.	Unit	Description
RequestedBW		0..1		
ReservedBW	ReservedBW_Type	0..1		An assigned bandwidth by the NRM.

Minimum, Maximum, Peak

Guaranteed, Peak

PathProperties (11.2.15)

11.2.15. PathProperties_Type

Entity	Inherits from	Description		
PathProperties_Type		A set of a path information.		
Property	**Type**	**Multi.**	**Unit**	**Description**
Availability	float	0..1	%	The ratio of the total time that a path is capable of being used in a year.
TransmissionDelay	int	0..1	msec	The acceptable one-way time to transfer between an APoint and a ZPoint. This parameter doesn't include a forwarding delay in switches or routers.
SwitchingScheme	SwitchingScheme_Type	0..1		A switching/routing scheme in a path.
EthernetParameters	EthernetParameters_Type	0..1		A set of Ethernet related information.
MPLSParameters	MPLSParameters_Type	0..1		A set of MPLS related information.
IPParameters	IPParameters_Type	0..1		A set of IP related information.

Other network related parameters

- MediaTypeName (11.2.2)
  - IANA-MAU-MIB: b10GbaseER, b1000BaseLX10 etc.
- SwitchingScheme (11.2.3)
  - LAMBDA, ETHERNET, ATM, MPLS, IP
- EthernetParameters (11.2.17)
  - MTU, VLANTagID, CoS
- MPLSParameters (11.2.18)
  - LSPID, Exp
- IPParameters (11.2.19)
  - Loss, Error, Jitter, Latency….
- NetworkResourceSLADocument (11.2.20)