

# **OGF NSI: the Network as a Manageable Resource for Clouds and Grids**

Science Agency Uses of Clouds and Grids

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# Networks in Clouds & Grids

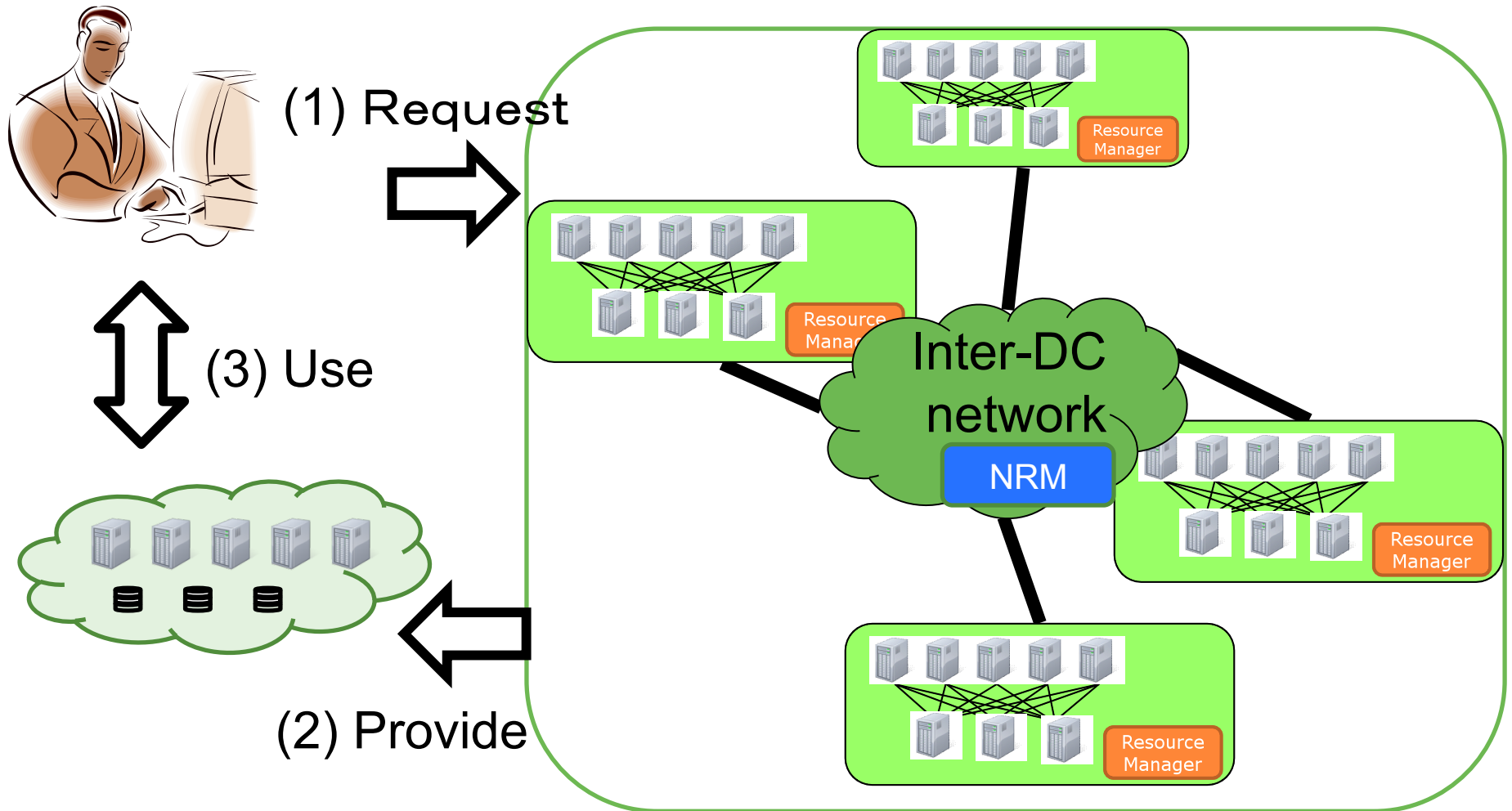
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- Networks are often been taken for granted by Clouds and Grids
- Networks performance sensitive to distance and congestion
- Longer distances may require using more than one provider

*Goals is to have networks as a manageable resource*

# Inter-DC connectivity challenge



# Managing complex networks in Clouds



## Requirements:

- A simple API to support connectivity management
- Network should be just another resource – easy integration with scheduling of computing resources
- Dynamic assignment of bandwidth, VLAN ids etc.
- Compatibility with monitoring systems for virtual infrastructures while keeping isolation
- Global reach: multi-provider enabled solution

# Dynamic circuits – service rollout

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- Research and education networks are rolling out dynamic service networks, but use a range of different technologies:
  - OSCARS (Esnet, Internet2, LHCnet, NORDUnet, several RONS)
  - AutoBAHN (GÉANT and several NRENs)
  - G-lambda (AIST, KDDI, NTT)
  - openDRAC (SURFnet)
- These systems are currently not interoperable

*Network services Interface (NSI) protocol will allow these systems to interoperate.*

# Network Service Interface

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- NSI is designed to allow Grid, Cloud and other applications to manage network connectivity.
- NSI also supports provider-to-provider circuit request
- NSI can also allow existing BoD systems to interoperate
- Oriented to creating and managing L1/L2 connection-oriented circuits: bandwidth guarantees.

# NSI is a framework

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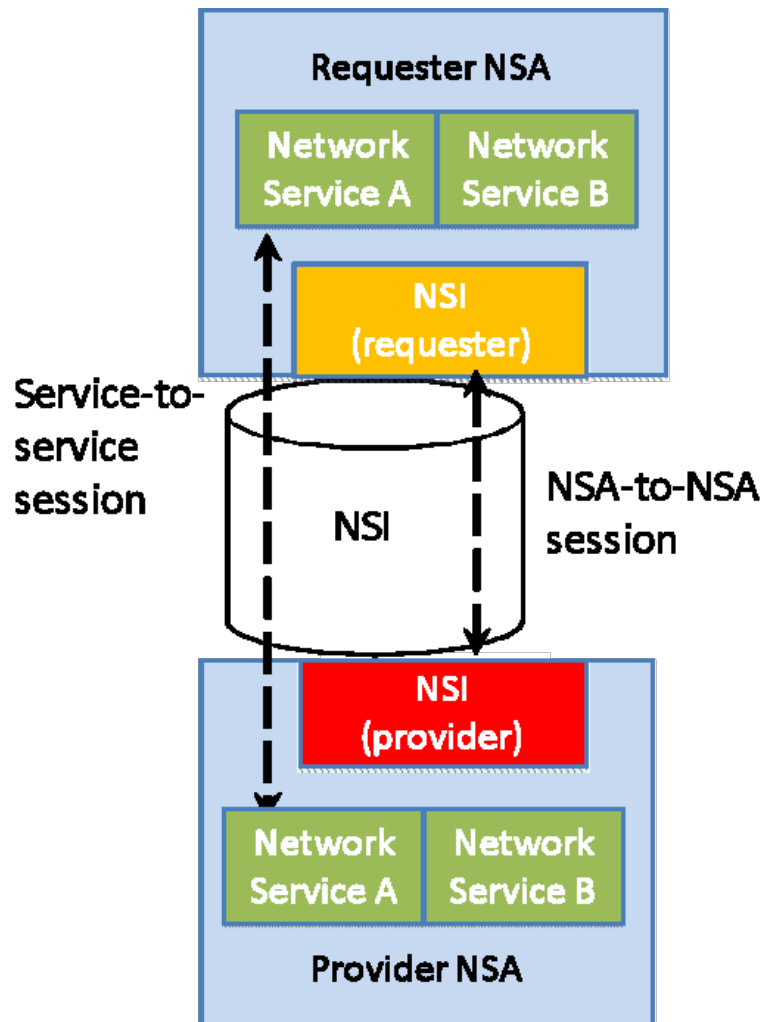


- NSI provides a framework for multiple services:
  - Connection service
  - Topology exchange service
  - Negotiating monitoring

- The NSI Framework is available here:

<http://forge.gridforum.org/sf/go/doc16014?nav=1>

# Network Service Framework (NSF)



- Platform for many services
- Services sessions established between service instances
- NSI Requester-Provider session established between NSAs

# Connections in NSI

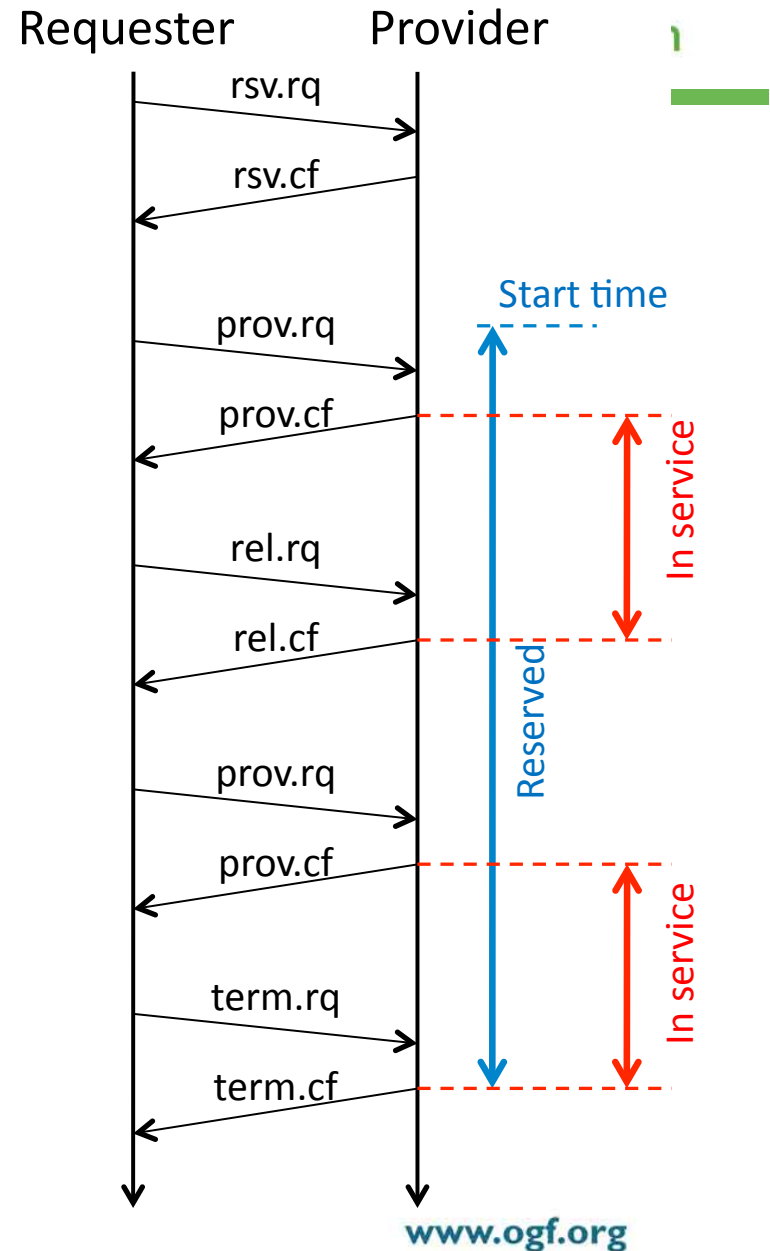
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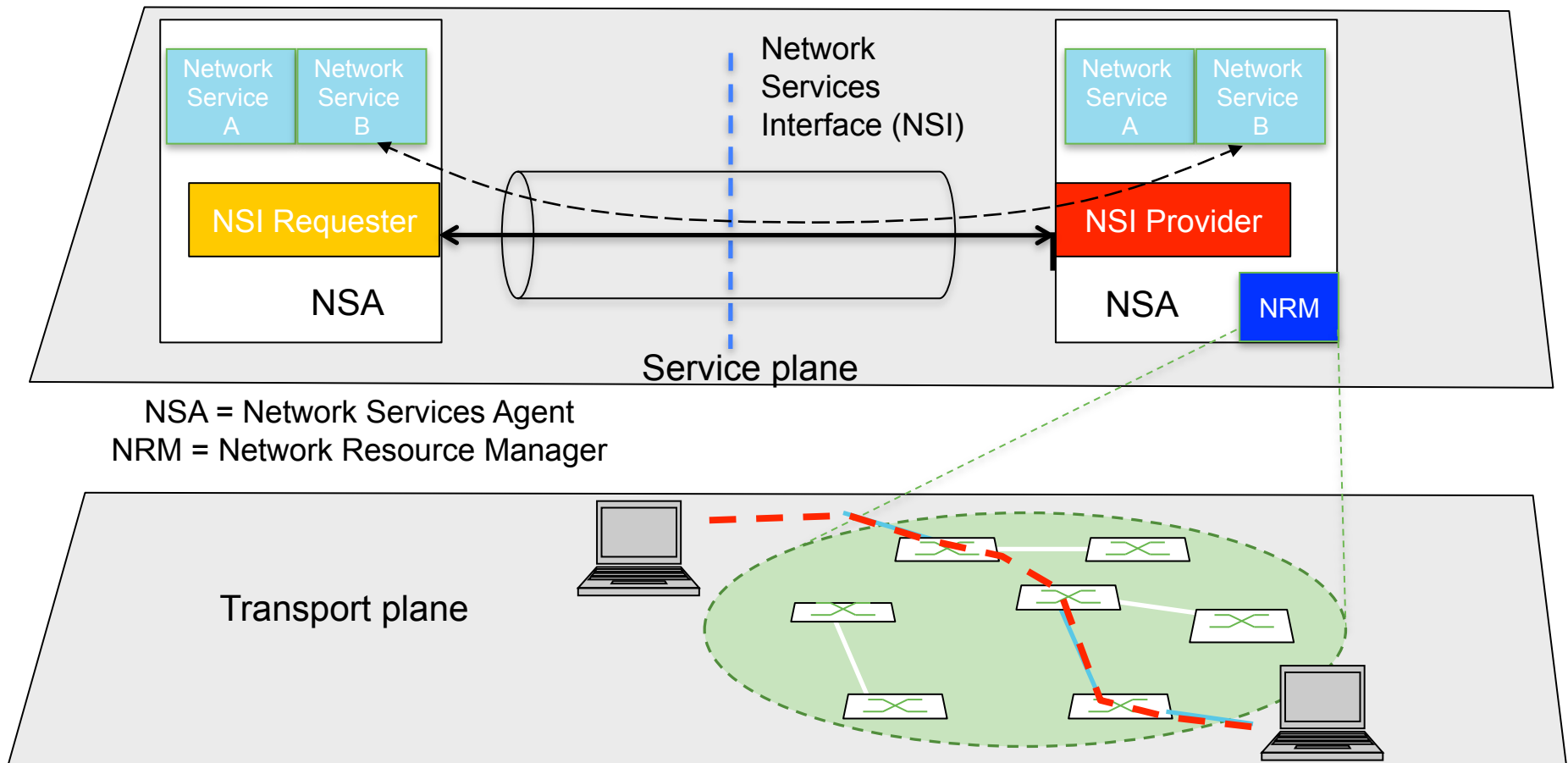
- Connections have:
  - Source and Destination (point to point)
  - Performance characteristics (capacity, framing, etc)
  - Authorization policy (defined by domain)
  - Book-ahead schedule (“now” for on demand)
- Two part connection establishment :
  - Reservation- includes PathFinding and Resource allocation
  - Provisioning- includes re-configuration of the network elements along a pre-computed path

# Connection lifecycle

- messages (primitives) manage connection lifecycle
  - Request a connection (creates a reservation)
  - Terminate the connection (removes the reservation)
  - Provision the connection (enable on transport plane)
  - Release the connection (releases connection)



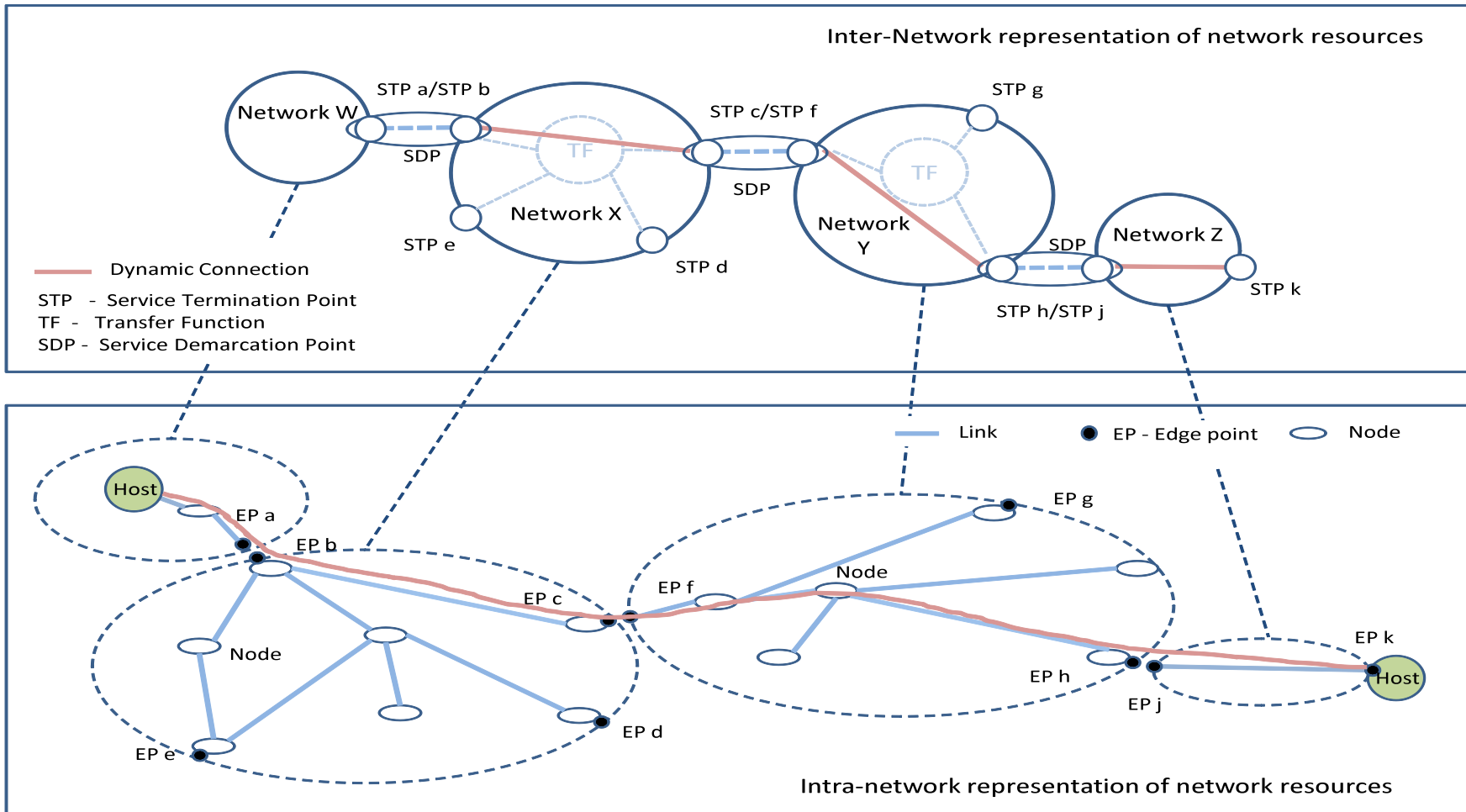
# Delivering Network Services



NSA = Network Services Agent  
NRM = Network Resource Manager

*NSI used to communication requests between Agents*  
*Provider Agent delivers circuit via Network Resource Manager*

# NSF: Network topology



*NSF describes method for aggregating topology into 'Networks'*

# NSI documents

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## GFD.173 Network Services Framework

- The NSF is a framework to support Network Services
- Supports many services – initial service is Connection Service
- Possible future services, e.g.: Network Topology Exchange Service
- Status – NSF v1.0 has been published

## GFD.XXX Connection Service Protocol

- Allows an application or network provider to request and automatically reserve and provision circuits from other network providers
- Designed to support circuits that transit multiple service providers
- Status – protocol freeze this week to support NSI plugfest Sept 2011

# NSI implementation timeline



- ION service (Esnet and Internet2), AutoBAHN (GÉANT), G-lambda (AIST, KDDI, NTT), openDRAC (SURFnet), openNSA (NORDUnet) are all developing NSI compliant interfaces.
- NSI plugfest will take place at GLIF meeting in Rio September this year
- Aiming to demonstrate first protocol implementations at SuperComputing in November 2011

# Summary



- Inter data center connectivity not trivial
- NSI is an open interface request connectivity
- R&E networks around world rolling out dynamic services
- Commitment by these providers to become NSI compliant

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