New CS services:

* **√** Multipoint services: Switching service (Miyamoto), VLAN multipoint
* **√** Multipoint connections – bi-directional connections built from unidirectional connections
* **√** High availability services: What are real requirements? Multiple disjoint paths, Protected Connections
* **√** Service groupings, eg disjoint path grouping
* **√** New query messages for resource availability

New NML/NSI Topology features:

* **√** Capacity needs to be added to NSI topology v1.0
* **√** Technology specific extensions to NML topology for example:
* Ethernet eg 802.1q capabilities
* VLAN swapping capabilities
* Layer adaptation – carrier Ethernet
* **√** Transfer functions description – eg blocking nature of non-colourless WSS
* **√** Shared risks and geo-location information
* **√** Enhanced STP reference syntax – theoretically possible in v2.0, wildcard extension needed?
* **√** Topology distribution

Non-Network type service

* **√** Support for non-network resources, eg compute.

NSI architecture and pathfinding

* Federation –
* Cyclic use of NSA. NSI v2.0 can form loops in requests
* Reactive behaviour
* Smart Aggregator
* Advanced pathfinding constraints
* Policy specification and enforcement

NSI applications and integration with other standards:

* **√** NSI as multi-domain SDN
* **√** Integration with standards such as openStack

Message transport layer:

* **√** REST based NSI
* Formal definition of MTL and interface between MTL and NSA
* Session mode

Monitoring:

* Do we need a monitoring service?
* What level of performance verification is needed?

Security

* Topology verification and authenticity
* Security profile

Discovery protocol – what is in scope?

Miyamoto-san presents switching service

* E-LAN service.. transparent service based on VPLS technology
* New end-point called switching point. Switching point contains one or more virtual STPs
* Switching service can be broadcast or multicast behaviour depending on the way it is connected.
* Switching service is a grouping of STPs that is an overlay on top of the pt2pt transfer function

New service definition to describe multipoint networks.

Action: Miyamoto-san will prepare a service definition for NSI v2.0 and an associated OGF informational document explaining how to implement and use this service.

Inder: is it possible to add new end-points to an existing service? Miyamoto-san: yes this is done using modify. Should include use-case of how to do it with specific service type. Inder: how would Multi-domain switching service be supported? – Miyamoto-san, this is done using a smart aggregator.

Action for Miyamoto-san: prepare a service definition for the switching service and write an informational OGF document describing the implementation and usage of this SD.

Proposed change: The current documentation for NSI CS v2.0 allows modify only for Capacity and start/end time. Proposal is for the SD to define which parameters can be modified. Since the NSI v2.0 protocol already supports this functionality this requires only a documentation update. **This proposal has been accepted by the NSI working group.**

Otsuki-san:

Multi-point interoperability open questions:

* Service announcement, how is this done?
* Hierarchical tree calculation
* Identify if a domain supports this – mixing SD types, how to do this?
* Definition of bandwidth guarantee – difficult to do this.
* Error

Kudoh-san:

* Explained how SDs are sub-parts of Connection Service
* Question about topology – one topology per service or one per provider?
* Does NSI have a mechanism to associate an SD with a topology?
* John: we have an open action to associate a topology and even a individual STP with a SD.

Protection services:

* Inder there is a need to add protection path to an existing unprotected path.

Jeroen vd Ham

* NML standard has been published
* NSI extensions is in draft state
  + Class that defines NSI objects
  + NSA: Admin contact, base service, id, hasService
  + Attribute: describedBy, link…
* Jeroen ran through example jgn-x
* PeersWith: Peering relationship with NSAs exist in topology but are not used currently. Needed if there is no full mesh of NSA reachability.
* Jerry: concern that there will be a full routing mechanism needed to find NSA reachability.
* Jerry: concerned that this adds a lot of complexity.
* PortGroups and labelGroups
* PortGroup- group of one or more ports
* LabelGroup – group of one or more labels.
* Jeroen – VLAN is normally described as a port with VLAN as a label.
* Should use portGroup in preference to port for flexibility
* Jeroen showed an example of how a switching service could be defined in the topology. Includes a switching service item which has an Id and a grouping of ports.
* Currently there is no bandwith/capacity parameter in NML this needs to be added.
* Action point: Jeroen to propose a technology specific extension to NSI topology to describe the capacity. This will be included in the NSI protocol v1.0
* Henrik: some inconsistency between NML and NSI schema and topology schema in the way that ports are described. These two approaches are not necessarily consistent once we get to more complex technology specific models.
* John: Multiple topologies per NSA.
* Jeroen: current GitHub topology distribution mechanism is good start for demos, but is not a long-term solution
* Security with GitHub topo. dist. is has security problems – certificate based or filters does not not work properly.
* Action: Underspecified LocaIds.. needs review for v3.0
* Action: NML group to define technology specific extensions to NML… starting with Ethernet.
* Action: Jeroen to update NSI topology document to clarify open points.
* Current status of NSI topology distribution:
  + Jeroen has prepared a draft informational document on topology distribution (has been submitted). Includes three options.
  + Demo implementation by ESnet (Ahmed).
  + Next steps: topology service to be agreed and documented.
* Action: Progression of topology distribution is needed, NSI-WG to review the proposal by Jeroen and the results of the demo implementation by Ahmed.
* NML and NSI need to discuss what the NSI network ‘transfer function’ (TF) is and how to describe this in the topology. Much of these TF capabilities will be technology specific.
* In addition to the technology is there a technology independent transfer function behaviour that needs to be defined?
* John: NSI needs TF to provide information about the connectability of two STPs in a Network.
* Action: Progression of TF needed. Working team should be assembled from NML and NSI to come up with a proposal.
* Action: NML working group to consider shared risks and geo-location information. How can two paths be assured to be physically diverse. Can geo-location information be represented in NML?
* Action: Jerry to prepare enhanced reference syntax proposal for STPs.
* Bidirectional Connections
  + John: Bi-direction STPs are nominated and the ‘bidirectional’ attribute must be selected to create a bidirectional Connection.
  + Jerry: how do we manage the return paths? Both forward and return paths are subject to the ero.
  + If the symmetric parameter is set this means that the Connection will use the same routing in both directions and will have the same capacity in both directions.
* Availability Query
  + A use case for the availability query is needed.
  + Action: Jerry to prepare a couple of slides describing the LHC use case for availability and how an availability query could help them. Deadline March OGF meeting.
  + Action: Kudoh-san to prepare a proposal for how an availability query could work.
* Support for non-network resources
  + NSI could be used as an advance reservation method for compute resources.
  + Service decoupling makes this relatively simple – just need to:
    - Rename the connection service to ‘reservation service’.
    - Rename parameters that refer to ‘data plane’ in the NSI CS.
  + Define an advance reservation of service orchestration in an NFV (network function virtualization) context.
  + Action: Radek and Kudoh-san to prepare a Service Definition for requesting compute resources.
* Simplification of NSI
  + Create an easy to understand explanation of NSI CS to help user take-up.
  + Add REST as an MTL (in addition to SOAP)
  + Develop reference implementation of light-weight client Requester Agent.
  + Reference implementation – wizard based easy install
  + Publish standard library for Java (or other language?) for rapid implementation
  + Remove modify??
  + Simplify the firewall traversal method.
    - Currently NSI CS has querySync which can be used for polling the status of a Connection. Using this querySync NSI can operate behind a firewall. This is not very elegant, but will work.
    - Alternative solution is to create a session that is kept alive during the reservation lifecycle. Note: http may not be suitable for this purpose, but could use SSH.
  + Dynamic topology discovery and validation… to make implementation faster and more reliable.
* Initiate a query to any point in the service tree (Requested by Jerry)
  + Would require messages to be sent both up and down the tree
  + Flooding operation
  + Use case: this would allow any NSA in the tree to know the full end-to-end information.
* Inder: NSI and SDN and OpenFlow
  + Action: Inder (with help from others) to prepare white paper on NSI for ONF by October 16th ?
  + Action: NSI working group should agree on model/framework for SDN/NSI interop
  + The NSI working group needs to identify where there are gaps in NSI in supporting OF/SDN
  + Who will work on this? NSI working group of ISOD group?
  + Action: to investigate models for SDN and OF extensions to NSI (for example FELIX, MOTE)
  + Inder: a mailing group for NSI/OF discussions is needed?
  + Action: Inder to investigate NSI/OF mailing list
* Local End System discovery
  + Kudoh-san: link between last STP and end system is normally not NSI controlled
  + Discovery implementation part missing from NSI. This is needed to support end equipment.
  + John: it may be possible to use the existing NSI Discovery Service to implement Local End System discovery protocol.
  + Action: NSI-WG needs to identify the use-cases and document.
* Inder: REST interface
  + John: REST interface is needed as it is fashionable at the moment.
  + John: A full RESTful model is a different paradigm which is resource based rather than message based as is currently the case in Web Services.
  + Inder: REST based interface for light weight client only
  + Guy: Light weight client will help adoption
  + Kudoh-san: The 1phase/2phase question is independent of the question of use of REST.
  + Question: two types of REST, pure REST and pseudo REST. Which to use?
    - Pseudo REST simply encapsulates existing messages in a REST wrapper.
    - Pure REST applies REST methodology including modifying the NSI CS protocol to make it conform to a resource based methodology.
  + Action: all NSI implementers/users to consider which of these approaches would be most suitable for NSI
* Monitoring:
  + Inder: Performance verification and monitoring are different
  + Inder: we need to scope out the potential service
  + Jerry: can we leverage work done in PerfSonar?
  + Coverage analysis: how much information do we get from current exceptions/error messages and where are there gaps in the current messages?
  + Jerry: do we need an advance warning/notification of data plane errors for reserved but not provisioned services.

Web page:

* Action: Guy to speak to DANTE PR team and web developers
* Action: Radek to prepare materials
* Action: Inder to investigate domain name – OGF subdomain?