# Service Termination Points (STPs) in NSI

**Scope**

This document summarises the usage of STPs in NSI. Only the usage of STPs in the Connection Service is considered here, usage of STPs in the Topology Service and in the Monitoring Service is out of scope. The details of how STPs map to NML objects is described in the NSI Topology Service.

## Agreed decisions relating to STPs

**NSI framework**

* The following set of services are supported:
	+ Topology Service (TS)
	+ Connection Service (CS)
	+ Monitoring Service (MS)
	+ Discovery Service (DS)
* The TS, CS and MS each have their own state-machine/s each of which is associated with an NSA. This is shown diagrammatically here:

NSI Framework

Conn.

Service

Topology

Service

Discovery

Service

Monitoring

Service

NSA

NSA

NRM

TSDB

**Definitions, usage and description of STPs**

* The NSI Topology will be referenced in several places:
	+ STP concepts are to be introduced in the NSI Framework
	+ Use of STP for CS described are to be described in the CS protocol document
	+ The Topology Service will describe how STPs map to NML and will define how to exchange topology

This document considers only the usage of STPS in the Connection Service

**Networks**

* A Network is a group of STPs that belong to a common topology description.
* A 1:1 relation exists between an NSA instance and an associated Network.
* It is legitimate for a Network to advertise a set of STPs some of which come from underlying providers. Eg Nordunet advertises an STP as part of Nordunet network that has been originally defined as a SUnet STP and retains a SUnet in its URN.

**STPs**

* STPs (Service Termination Points) are identifiers and are globally unique and persistent
* The concepts around STPs and Networks remain as currently described in the NS Framework.
* STPs point to an NML port described using the NML port syntax
* STPs are used in Connection requests to identify the endpoints of a Connections, and optionally as intermediate points on the path of the Connection to be used as path finding constraints.

**SDPs**

* An SDP (Service Demarcation Point) is defined as a grouping of two peering STPs on the edge of different Networks.

**Connection Requests in NSI v1.1**

In v1.1 a connection request includes a <path> object:

StpListType

*stp* [0..\*]

ServiceTerminationPointType

*stpId* StpIdType

*stpSpecAttr* [0..1]

OrderedServiceTerminationPointType

*order* int

*stpId* StpIdType

PathType

*stpList* [0..1]

*directionality* DirectionalityType

*sourceSTP*

*destSTP*

TechnologySpecificAttributesType

*guaranteed* [0..1]

*preferred* [0..1]

Connections but be identified as being either bidirectional or unidirectional.

Where <stpList> is optional ordered list of type <STP>.

The NSI v1.1 syntax for an STPId is: urn:ogf:network:stp:<networkId>:<localId>

Issues with this approach:

1. Not compliant with Freek’s new GFD URN naming.
2. Handling of unidirectional STPs is clumsy for proposes of expansion to multipoint service requests.
3. The routing of a Connection could be ambiguous as end STPs do not have an inherent direction. (ingress/egress interpretation problem)
4. The Network associated with an STP has to be found by parsing the URN.
5. Where an STP is re-advertised by a federating NSA, a new STP has to be created with the NetworkId of the Federating Network. This could be overcome by assigning a separate <Network> object.
6. Vlans cannot be identified in an STP (requires redirection to NML port).

**Connection Requests in NSI v2.0**

In v2.0 a connection request includes a <path> object which is structured as follows:

StpType

ErolistType

*order* int

*stp* StpType

PathType

*eroList* [0..1] EroListType

*originSTP* StpType

*destSTP* StpType

PortGroupType

*portGroupId*

*sink*  PortGroupType [0..1]

*networkId*

*source* PortGroupType [0..1]

*label* labelType[0..1]

LabelType

*type* VLAN

*value* list/range of integers [1..4094]

**Paths**

* A path contains originSTP which is the STP of the beginning of the path
* A path contains destSTP which is the STP of the end of the path
* A path contains an eroList which is an ordered list of STPs which are to be used as routing constraints. These constraints must be used in the route of the path in the sequence provided in the ERO list. The path computation may return a path with additional STPs beyond those in the ERO list.

**STPs**

* An STP is constituted of networkId, source , sink
* A bidirectional STP includes a networkId and both a source and a sink.
* A unidirectional STP includes a networkId and either a source or a sink.

**Network**

* The networkId is a globally unique identifier that identifies the Network. Rather than forcing parsing of an STP to determine the Network, a separate Network object is defined to allow an intermediate NSA to forward the message to the target Network without needing to know about the STPs within that domain.
* The syntax of <network> is urn:ogf:network:<DNSname>:<date>:org, Where urn:ogf:network:<DNSname>:<date> conform to GFD.191:
	+ DNSname is registered domain name
	+ Date is year in case domain name is reused

**Source/Sink**

* Source and sink are identifiers for unidirectional components of the STP
* In the case of a candidate STP the <source>, <sink> parts are optional. (see below for discussion on candidate STPs)
* Source and sink are of type port

**PortGroup**

A portGroup contains portGroupId and a Label.

* PortGroupId is a unique identifier in the form of a URN in conformance with GFD.191.
* Label is a list/range of optional technology specific labels (eg vlans).
* PortGroupId syntax is: urn:ogf:network:<DNSname>:<date>:<opaque>, Where urn:ogf:network:<DNSname>:<date> conforms to GFD.191 and <opaque> is a string conforming to URN characters and must be unique to that Network.
* Label is a type-value pair describing an optional technology label which can have a list/range of integer values of 1 through 4094. In future other technology specific attributes may be added.
* Label type is VLAN == "http://schemas.ogf.org/nml/2013/10/ethernet/vlan"

**Candidate/Instance**

* Connection ***requests*** are made up of ‘candidate STPs’ where candidate STP support a list or range of labels (vlans). E.g 118-259 or 118, 342,4,259
* Candidate STP could also include only the <network> part of STP, i.e. the <source>,<sink> parts are optional.
* Connection ***confirmations*** will return an ‘STP instance’ i.e no label part.

## Appendix 1: Example STP usage

**Example v1.1 NSI Connection request**

 <path>

 <directionality>Bidirectional</directionality>

 <sourceSTP>

 <stpId>urn:ogf:network:stp:czechlight.ets:ps-80</stpId>

 </sourceSTP>

 <destSTP>

 <stpId>urn:ogf:network:stp:czechlight.ets:ams-80</stpId>

 </destSTP>

 </path>

**Example v2.0 NSI Connection request**

*<!-- Example v1.1 NSI Connection request -->*

 *<path>*

 *<directionality>Bidirectional</directionality>*

 *<sourceSTP>*

 *<stpId>urn:ogf:network:stp:czechlight.ets:ps-80</stpId>*

 *</sourceSTP>*

 *<destSTP>*

 *<stpId>urn:ogf:network:stp:czechlight.ets:ams-80</stpId>*

 *</destSTP>*

 *</path>*

*<!-- Examples v2.0 NSI Connection request -->*

*<!-- Example 1: bidirectional path, PortGroups (pick any one VLAN), no ERO -->*

 *<path>*

 *<!-- Two STP, each with a source and sink: a bidirectional path -->*

 *<originSTP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<source><PortGroup>urn:ogf:network:nordu.net:2012:nordunet-surfnet</PortGroup></source>*

 *<sink><PortGroup>urn:ogf:network:nordu.net:2012:surfnet-nordunet</PortGroup></sink>*

 *</originSTP>*

 *<destSTP>*

 *<Network>urn:ogf:network:sne.science.uva.nl:2012:lighthouse</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<source><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-egress</PortGroup></source>*

 *<sink><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-ingress</PortGroup></sink>*

 *</destSTP>*

 *</path>*

*<!-- Example 2: unidirectional path, PortGroups (pick any one VLAN), no ERO -->*

 *<nsi:path>*

 *<!-- Two STP, one with a source and one with a sink: a unidirectional path -->*

 *<nsi:STP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- No VLAN specified: pick any one VLAN within this Port Group. -->*

 *<source><PortGroup>urn:ogf:network:nordu.net:2012:nordunet-surfnet</PortGroup></source>*

 *</nsi:STP>*

 *<nsi:STP>*

 *<Network>urn:ogf:network:sne.science.uva.nl:2012:lighthouse</Network>*

 *<!-- No VLAN specified: pick any one VLAN within this Port Group. -->*

 *<sink><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-ingress</PortGroup></sink>*

 *</nsi:STP>*

 *</nsi:path>*

*<!-- Example 3: multipoint to multipoint path, PortGroups (pick any one VLAN), no ERO -->*

 *<nsi:path>*

 *<!-- Three STP, each with a source and a sink: Each source will send to all sinks at all other STPs.*

 *Thus a multipoint to multipoint path. -->*

 *<nsi:STP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<source><PortGroup>urn:ogf:network:nordu.net:2012:nordunet-surfnet</PortGroup></source>*

 *<sink><PortGroup>urn:ogf:network:nordu.net:2012:surfnet-nordunet</PortGroup></sink>*

 *</nsi:STP>*

 *<nsi:STP>*

 *<Network>urn:ogf:network:sne.science.uva.nl:2012:lighthouse</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<source><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-egress</PortGroup></source>*

 *<sink><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-ingress</PortGroup></sink>*

 *</nsi:STP>*

 *<nsi:STP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<source><PortGroup>urn:ogf:network:cesnet.cz:2012:jk23h4723hj:TX</PortGroup></source>*

 *<sink><PortGroup>urn:ogf:network:cesnet.cz:2012:jk23h4723hj:RX</PortGroup></sink>*

 *</nsi:STP>*

 *</nsi:path>*

*<!-- Example 4: point to multipoint path, PortGroups (pick any one VLAN), no ERO -->*

 *<nsi:path>*

 *<!-- Three STP, one source and two sinks: The source will send to the sinks at the other STPs.*

 *Thus a point to multipoint path. -->*

 *<nsi:STP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<source><PortGroup>urn:ogf:network:nordu.net:2012:nordunet-surfnet</PortGroup></source>*

 *</nsi:STP>*

 *<nsi:STP>*

 *<Network>urn:ogf:network:sne.science.uva.nl:2012:lighthouse</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<sink><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-ingress</PortGroup></sink>*

 *</nsi:STP>*

 *<nsi:STP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- No VLAN specified: pick any one VLAN within these Port Groups. -->*

 *<sink><PortGroup>urn:ogf:network:cesnet.cz:2012:jk23h4723hj:RX</PortGroup></sink>*

 *</nsi:STP>*

 *</nsi:path>*

*<!-- Example 5: bidirectional path, Ports (use this specific Port), no ERO -->*

 *<nsi:path>*

 *<!-- Two STP, each with a source and sink: a bidirectional path -->*

 *<nsi:STP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- URI of a specific Port listed. Use this Port, an no-one else. This port may not be VLAN-tagged. -->*

 *<source><PortGroup>urn:ogf:network:nordu.net:2012:CPH001:intf3-2-1:vlan56</PortGroup></source>*

 *<sink><PortGroup>urn:ogf:network:nordu.net:2012:CPH001:intf3-2-1:vlan56</PortGroup></sink>*

 *</nsi:STP>*

 *<nsi:STP>*

 *<Network>urn:ogf:network:sne.science.uva.nl:2012:lighthouse</Network>*

 *<!-- URI of a specific Port listed. Use this Port, an no-one else. This port may not be VLAN-tagged. -->*

 *<source><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:force10:ge4-1</PortGroup></source>*

 *<sink><PortGroup>urn:ogf:network:sne.science.uva.nl:2012:force10:ge4-1</PortGroup></sink>*

 *</nsi:STP>*

 *</nsi:path>*

*<!-- Example 6: bidirectional path, PortGroup with VLAN (use this VLAN within this Portgroup), no ERO -->*

 *<nsi:path>*

 *<!-- Two STP, each with a source and sink: a bidirectional path -->*

 *<nsi:STP>*

 *<Network>urn:ogf:network:cesnet.cz:2012:czechlight</Network>*

 *<!-- Pick any one VLAN from those listed with the Port Groups. -->*

 *<source>*

 *<PortGroup>urn:ogf:network:nordu.net:2012:nordunet-surfnet</PortGroup>*

 *<label>*

 *<labeltype> "http://schemas.ogf.org/nml/2013/10/ethernet/vlan" </labeltype>*

 *<value>1719-1834,2103-2106</value>*

 *</label>*

 *</source>*

 *<sink>*

 *<PortGroup>urn:ogf:network:nordu.net:2012:surfnet-nordunet</PortGroup>*

 *<label>*

 *<labeltype> "http://schemas.ogf.org/nml/2013/10/ethernet/vlan"</labeltype>*

 *<value>1719-1834,2103-2106</value>*

 *</label>*

 *</sink>*

 *</nsi:STP>*

 *<nsi:STP>*

 *<Network>urn:ogf:network:sne.science.uva.nl:2012:lighthouse</Network>*

 *<!-- Pick any one VLAN from those listed with the Port Groups. -->*

 *<source>*

 *<PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-egress</PortGroup>*

 *<label>*

 *<labeltype> "http://schemas.ogf.org/nml/2013/10/ethernet/vlan" </labeltype>*

 *<value>1719-1834,2103-2106</value>*

 *</label>*

 *</source>*

 *<sink>*

 *<PortGroup>urn:ogf:network:sne.science.uva.nl:2012:lighthouse-ingress</PortGroup>*

 *<label>*

 *<labeltype> "http://schemas.ogf.org/nml/2013/10/ethernet/vlan"</labeltype>*

 *<value>1719-1834,2103-2106</value>*

 *</label>*

 *</sink>*

 *</nsi:STP>*

 *</nsi:path>*

*<!-- Example 7: bidirectional path, PortGroups (pick any one VLAN), ERO -->*

 *<path>*

 *<!-- follows later -->*

 *</path>*