

# Service Decoupling

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## Introduction

In NSI CS version 2.0 focused was placed on a number of improvements, including two-phase reserve/modify, better support for service activation, more complete state machine definition, and clearing up ambiguities around STP definition. All these improvements were an important step along the path to deploying production services, however, little focus was actually placed on the definition of the service itself. This proposal discusses the current service offering supported by NSI CS version 2.0, and a simple modification to allow for more flexibility in the protocol, allowing for multiple new services to be offered without the need to update the existing base NSI CS protocol.

## Current Offering

In NSI CS version 1.x and 2.0 only unidirectional and bidirectional point-to-point services are offered as part of the protocol. In fact, the NSI working group violated most common protocol design principles by hard coding the service offering directly into the core protocol specification, when in fact, the NSI CS protocol was meant to support many service types. We will now discuss where we have made these easy to correct mistakes.

The base NSI CS *reserve* operation, as shown in Figure 1 below, is extremely generic from a service point of view, containing only base identification and descriptive information. The specifics of the service reservation request are held within the criteria element.<sup>1</sup>

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<sup>1</sup> It could be argued (and I do here) that the ***connectionId*** should really be named ***localReservationId*** as this is really what is being modeled. The term “connection identifier” implies the existence of a single connection, when in fact; we are dealing with a multitude of connections within the network for this single reservation.

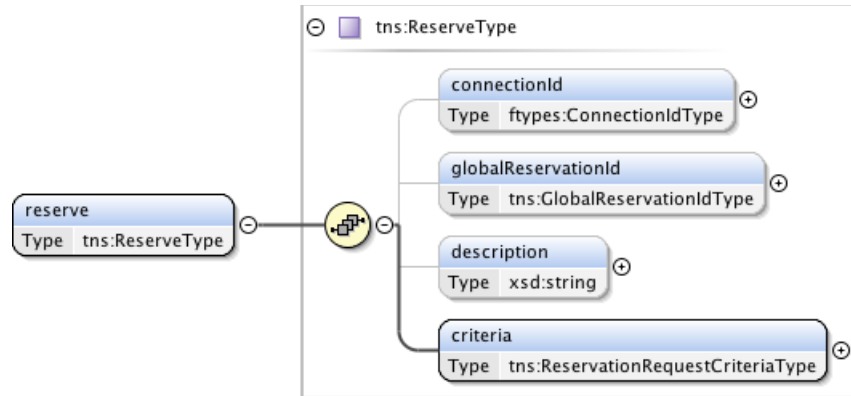


Figure 1 – Reserve request operation.

Exploding the criteria element in Figure 2 we can see the details of the service request. The **version** attribute represents the version of the reservation and is not related to the type of service being requested. The **schedule** element contains the reservation start and end time criteria, providing a generic scheduling capability independent of the service type being offered. The **serviceAttributes** element is also a generic structure allowing for the specification of parameters applying to the service reservation. At the moment, the **serviceAttributes** allows for generic type/value strings, or inclusion of elements from external namespaces. Where we run into a problem is with the **bandwidth** and **path** criteria elements.

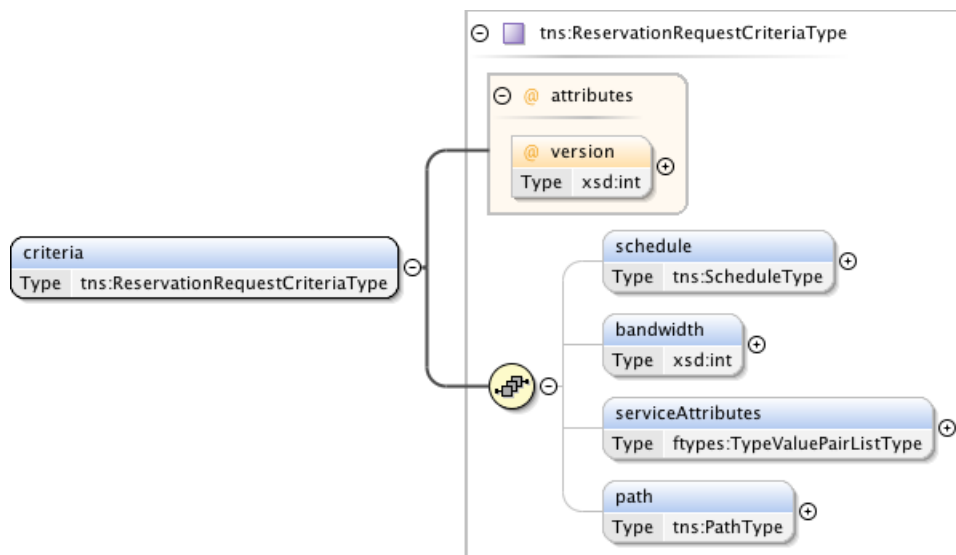


Figure 2 – Service criteria element.

As currently defined, **bandwidth** and **path** restrict a reservation request to either a unidirectional or symmetric bidirectional point-to-point service. Figure 3 shows details of the reservation **path** object.

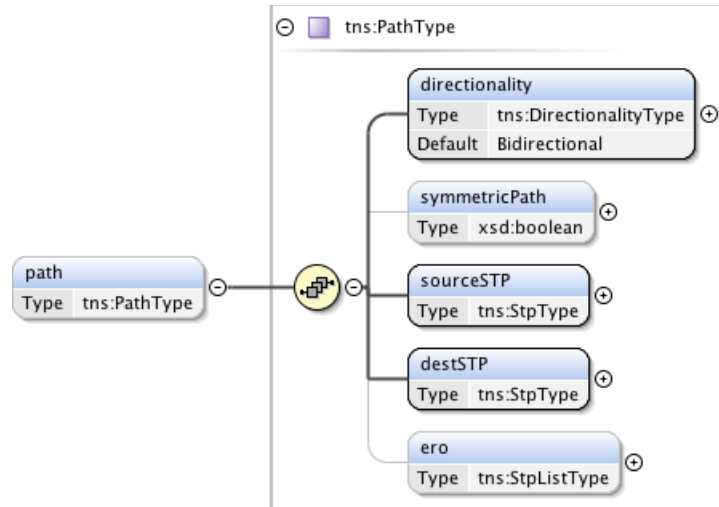


Figure 3 – Service path element.

It should be noted that the *symmetricPath* element applies to only the bidirectional service specification, and indicates whether unidirectional components of the bidirectional service must follow the same path (true) or are free to take diverse paths (false).<sup>2</sup>

As we can see from the current definition, any time we would like to add new services, or extend/correct an issue in an existing service, we need to modify the core NSI CS protocol definition. This is an extremely expensive proposition for NSI as a standard body, as well as NSA implementations for the churn in the core protocol. Unfortunately, we have built what could be termed a brittle protocol with respect to offered services.

## Proposed Changes

Our primary goal should be to remove the dependencies of service specification from the core NSI CS protocol. This will allow the existing NSI CS protocol to remain stable while permitting changes to the services offered by NSA within the network. Fortunately, with XML and a small change to the structure of our existing NSI CS protocol we can achieve this exact behavior.

The key to this change is the use of the existing *serviceAttributes* element within the reservation criteria. This element has already been used by some NSA implementations to specify additional service parameters within their client requests. For example, SURFnet uses these parameters to allow customers to

<sup>2</sup> Do not confuse this attribute with bandwidth symmetry as only symmetric bidirectional services are supported.

request Layer 1 sub network protection for their NSI services. The following XML snippet would appear in the *criteria* element of an NSI CS v2.0 reservation request:<sup>3</sup>

```
<serviceAttributes>
  <surf:sNCP xmlns:surf="http://schemas.surfnet.nl/nsi/2013/04/services">Protected</surf:sNCP>
</serviceAttributes>
```

In this case, we are taking advantage of the flexible ANY element feature within XML that permits inclusion of elements from external namespaces, or in this specific case, we are seeing an element called “sNCP” from the SURFnet schema namespace. The SURFnet NSA knows how to interpret elements from their services namespace, and therefore, can provide additional capabilities outside the core NSI CS protocol. No extensions to the core NSI protocol were required.

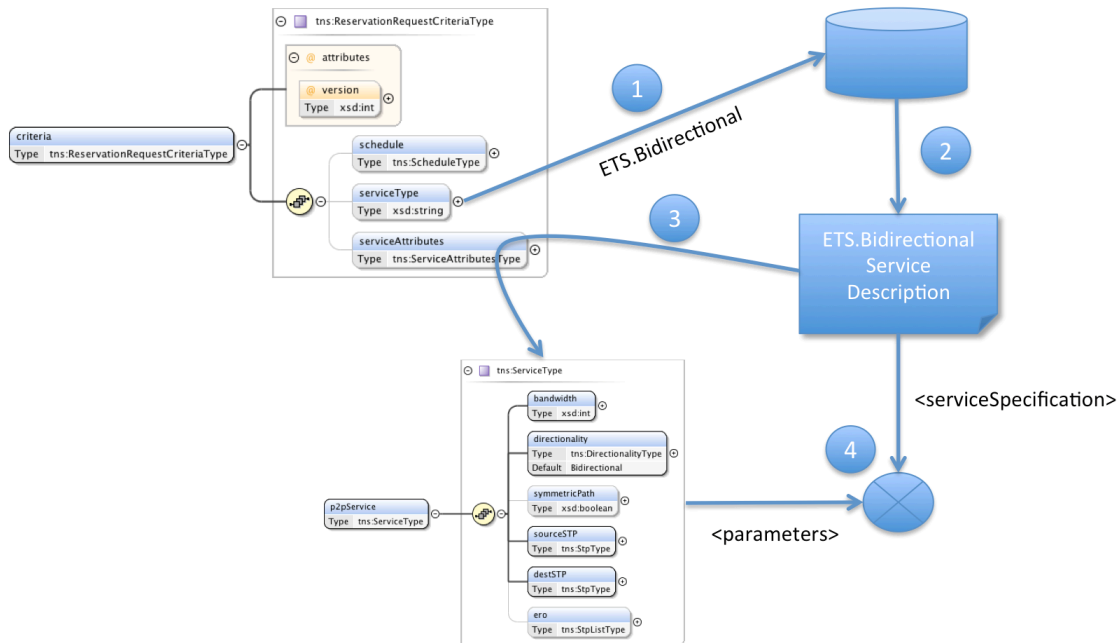
The proposal is to remove the point-to-point specific *bandwidth* and *path* elements from the *criteria* element and place them into the *serviceAttributes* element. With this change we will also define a simple point-to-point service schema with its own namespace definition.

In addition to the service specification decoupling, we introduce a new string element called *serviceType*. The *serviceType* element will relay the specific service type being requested in the reservation. This service type string maps to a specific Service Description template defined by the network providers describing the type of service offered, parameters supported in a reservation request (mandatory and optional), defaults for parameters if not specified (as well as maximums and minimums), and other attributes relating to the service offering. The NSA in turn uses this information to determine the specific service parameters carried in the *serviceAttributes* element required to specify the requested service.

The Service Description template is an important component in the solution, linking the opaque information carried in the NSI CS protocol to the concrete parameters needed to satisfy a specific service request. Figure 4 is a pictorial view of how the *serviceType* maps through the Service Description template, identifying the mandatory and optional *serviceAttributes* needed to satisfy the request.

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<sup>3</sup> This assumes the discussed simplification of the *ServiceAttributesType*.



1. Extract **serviceType** value from incoming reservation request and lookup Service Description corresponding to **serviceType**.
2. Use Service Description to determine **serviceAttributes** needed for the specific service requested and any other service related parameters.
3. Extract specific services elements from **serviceAttributes** as described in Service Description.
4. Process service request using supplied service parameters and service template information.

Figure 4 – Using serviceType to determine required and optional serviceAttributes.

Incorporating these described changes, the new **criteria** element would be simplified to what is now shown below in Figure 5.

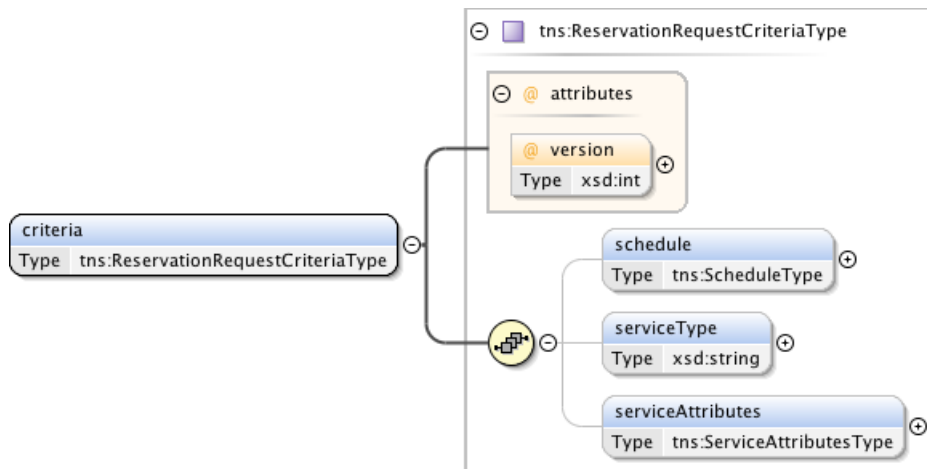


Figure 5 – New reservation criteria element.

The *serviceAttributes* element, as shown in Figure 6, is also cleaned up to remove the additional type/value pair support. It now focuses exclusively on support for inclusion of external namespace elements from our service definitions.

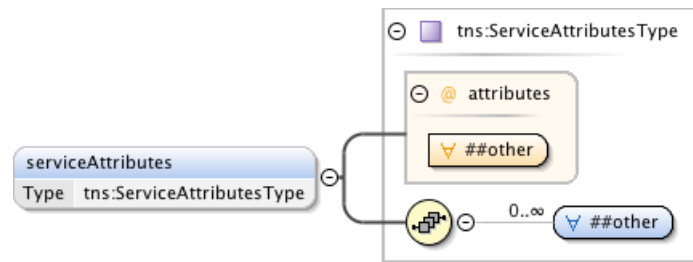


Figure 6 – New serviceAttributes element.

An interesting side effect of this service decoupling is the core NSI CS protocol specification is simplified with the remove of the service specific types that get moved to the new service schema. Figure 7 shows a repackaged *p2pService* element that will be included in the *serviceAttributes* when a point-to-point service is requested.

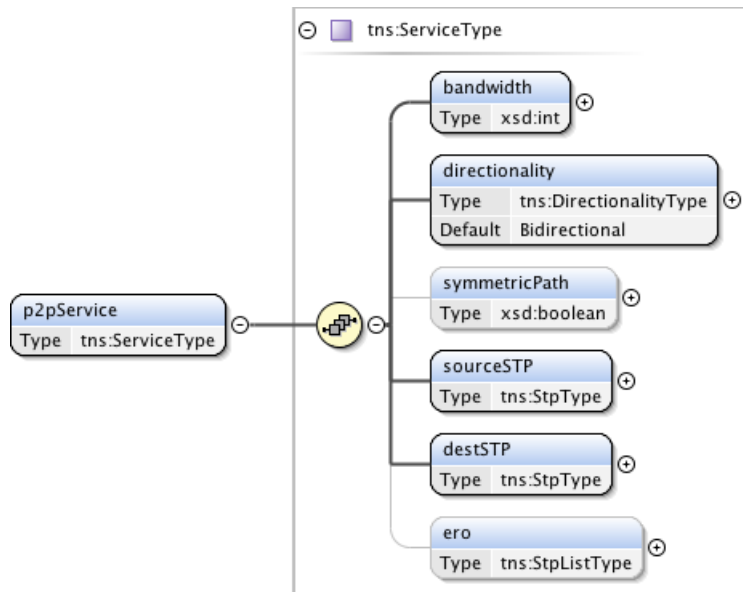


Figure 7 – A point-to-point service definition.

Below we see an example *reserve* request XML message for a bidirectional service as currently defined in NSI CS version 2.0. Notice the *bandwidth* and *path* elements are members of the *criteria* element. Also notice that *serviceAttributes* contains the SURFnet specific *SNCP* element as an example of including from an external namespace.

```
<nsi:reserve
  xmlns:nsi="http://schemas.ogf.org/nsi/2013/04/connection/types"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```

xmlns:surf="http://schemas.surfnet.nl/nsi/2013/04/services">

<connectionId>urn:uuid:4b4a71d0-3c71-47cf-a646-beacb14a4c72</connectionId>
<globalReservationId>urn:uuid:83fe4f36-5b38-41b6-bc46-a362a06a54ee</globalReservationId>
<description> My example reservation with existing NSI CS 2.0 schema</description>
<criteria version="1">
  <schedule>
    <startTime>2013-09-30T09:30:10Z</startTime>
    <endTime>2013-09-30T10:30:10Z</endTime>
  </schedule>
  <bandwidth>1000</bandwidth>
  <serviceAttributes>
    <attribute>
      <surf:sNCP>Protected</surf:sNCP>
    </attribute>
  </serviceAttributes>
  <path>
    <directionality>Bidirectional</directionality>
    <symmetricPath>true</symmetricPath>
    <sourceSTP>
      <networkId>urn:ogf:network:netherlight.net:2012</networkId>
      <localId>uvalight-netherlight</localId>
      <labels>
        <attribute type="vlan">
          <value>1901</value>
        </attribute>
      </labels>
    </sourceSTP>
    <destSTP>
      <networkId>urn:ogf:network:netherlight.net:2012</networkId>
      <localId>netherlight-czechlight</localId>
      <labels>
        <attribute type="vlan">
          <value>1901</value>
        </attribute>
      </labels>
    </destSTP>
  </path>
</criteria>
</nsi:reserve>

```

Below we have the proposed restructured *reserve* request XML message.

```

<nsi:reserve xmlns:nsi="http://schemas.ogf.org/nsi/2013/04/connection/types"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:p2p="http://schemas.ogf.org/nsi/2013/04/services/point2point"
  xmlns:surf="http://schemas.surfnet.nl/nsi/2013/04/services">

  <connectionId>urn:uuid:4b4a71d0-3c71-47cf-a646-beacb14a4c72</connectionId>
  <globalReservationId>urn:uuid:83fe4f36-5b38-41b6-bc46-a362a06a54ee</globalReservationId>
  <description> My example reservation with proposed NSI CS 2.0 schema </description>
  <criteria version="1">
    <schedule>
      <startTime>2013-09-30T09:30:10Z</startTime>
      <endTime>2013-09-30T10:30:10Z</endTime>
    </schedule>
    <serviceType>ETS.Bidirectional</serviceType>
    <serviceAttributes>

```

```

<p2p:p2pService>
  <bandwidth>1000</bandwidth>
  <directionality>Bidirectional</directionality>
  <symmetricPath>true</symmetricPath>
  <sourceSTP>
    <networkId>urn:ogf:network:netherlight.net:2012</networkId>
    <localId>uvalight-netherlight</localId>
    <labels>
      <attribute type="vlan">
        <value>1901</value>
      </attribute>
    </labels>
  </sourceSTP>
  <destSTP>
    <networkId>urn:ogf:network:netherlight.net:2012</networkId>
    <localId>netherlight-czechlight</localId>
    <labels>
      <attribute type="vlan">
        <value>1901</value>
      </attribute>
    </labels>
  </destSTP>
</p2p:p2pService>
<surf:sNCP>Protected</surf:sNCP>
</serviceAttributes>
</criteria>
</nsi:reserve>

```

These messages look quite similar, but there are some key differences:

- The **p2p** namespace is defined in the **reserve** element using a unique URL defining the service XSD document. We have encapsulated all types needed for this service in that XSD document.

```
xmlns:p2p="http://schemas.ogf.org/nsi/2013/04/services/point2point"
```

- The **bandwidth** and **path** elements members are now part of the **p2pService** element held within the **serviceAttributes** element. These attributes are part of the service specification, and therefore, separate from the core reservation criteria. We have effectively decoupled the attributes of a service from the core NSI protocol.
- The **serviceType** element is added to identify the desired service requested and will identify the specific service elements carried in the **serviceAttributes**.
- The **serviceAttributes** element was flattened to simplify specification of these external namespace elements.
- Multiple service attributes can be specified as show by inclusion of both the **p2pService** and SURFnet specific **sNCP** elements.



In addition to the changes in the *reserve* request message, the restructuring of the ***criteria*** element would be done in the *reserveConfirmed* and *query* messages.

## Summary

The proposed decoupling changes are an improvement over the current tight coupling of the point-to-point service definition within the NSI CS version 2.0 protocol specification. Refactoring the service elements into the ***serviceAttributes*** element does not change the behavioral aspects of the protocol, nor the information carried in the messages, as this is just a syntactic change to where the data is carried. There will be minimal impact current NSA implementation of NSI CS version 2.0.