

# Network Services Interface

## Path finding Inclusions/Exclusions

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# Exclusions



- Allow uRA to specify network resources that should NOT be used in the reservation.
- Take error feedback from uPA and exclude any unavailable resources in next path finding iteration.
- For EVTS services this would typically be an STP, a list of STP, or a network.
- Could potentially include other exclusion items:
  - Attributes that may be associated with STP/SDP in the future (SRLG, Policy groups, etc).
  - Other reservations to exclude “associated resources”.

# Inclusions



- Guide pathfinders to use a specific set of resources in path computation.
  - Different from an ERO in that an ERO provides a specific path through the network, while Inclusions specifies the set of resources to be used in path finding (not all of the resources need be used).
  - Examples include a filtered list of STP (different from an ERO), networks, STP based on attributes, etc.

# Order of preference

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- If Inclusions is present it is used to build the initial routing graph, otherwise the complete set of resources are used.
- If Exclusions is present then the specified exclusions are pruned from the graph.
- Any ERO is applied during path finding using the resulting graph.

# What do we have to work with?



```
<xsd:complexType name="ReservationRequestCriteriaType">
  <xsd:sequence>
    <xsd:element name="schedule" type="tns:ScheduleType" minOccurs="0" />
    <xsd:element name="serviceType" type="xsd:string" minOccurs="0" />
    <xsd:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded" />
  </xsd:sequence>
  <xsd:attribute name="version" type="xsd:int" use="optional" />
  <xsd:anyAttribute namespace="##other" processContents="lax" />
</xsd:complexType>
```

```
<xsd:complexType name="P2PServiceBaseType">
  <xsd:sequence>
    <xsd:element name="capacity" type="xsd:long" />
    <xsd:element name="directionality" type="types:DirectionalityType" default="Bidirectional" />
    <xsd:element name="symmetricPath" type="xsd:boolean" minOccurs="0" />
    <xsd:element name="sourceSTP" type="types:StpIdType" />
    <xsd:element name="destSTP" type="types:StpIdType" />
    <xsd:element name="ero" type="types:StpListType" minOccurs="0" />
    <xsd:element name="parameter" type="types:TypeValueType" minOccurs="0" maxOccurs="unbounded" />
    <xsd:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded" />
  </xsd:sequence>
</xsd:complexType>
```

# Possible solutions

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- We could encode exclusion into the existing parameter's element
- Include an externally defined element using the “any” within the p2p element.
- Extend the existing schema with a new dedicated “optional” element if recompile will be permitted.

# Parameter Solution



```
<globalReservationId>urn:uuid:83fe4f36-5b38-41b6-bc46-a362a06a54ee</globalReservationId>
<description>My example reservation using NSI CS 2.1.</description>
<criteria version="1">
  <schedule>
    <startTime>2015-08-15T09:30:10Z</startTime>
    <endTime>2015-08-15T10:30:10Z</endTime>
  </schedule>
  <serviceType>http://services.ogf.org/nsi/2013/12/descriptions/EVTS.A-GOLE</serviceType>
  <p2p:p2ps>
    <capacity>10000</capacity>
    <directionality>Bidirectional</directionality>
    <symmetricPath>true</symmetricPath>
    <sourceSTP>urn:ogf:network:kddilabs.jp:2013:topology:bi-ps?vlan=1780-1782</sourceSTP>
    <destSTP>urn:ogf:network:uvalight.net:2013:topology:ps?vlan=1780-1782</destSTP>
    <parameter type="exclude">networkId=urn:ogf:network:es.net:2013:</parameter>
    <parameter type="exclude">stpId=urn:ogf:network:icair.org:2013:topology:jgn-x?vlan=1790</parameter>
  </p2p:p2ps>
</criteria>
```

Of course this could just be an stpld.

Resource type and value encoded in parameter value.

Use the existing p2p optional parameters to encode exclusions.



# ANY Solution



```
<globalReservationId>urn:uuid:83fe4f36-5b38-41b6-bc46-a362a06a54ee</globalReservationId>
<description>My example reservation using NSI CS 2.1.</description>
<criteria version="1">
  <schedule>
    <startTime>2015-08-15T09:30:10Z</startTime>
    <endTime>2015-08-15T10:30:10Z</endTime>
  </schedule>
  <serviceType>http://services.ogf.org/nsi/2013/12/descriptions/EVTS.A-G0LE</serviceType>
  <p2p:p2ps>
    <capacity>10000</capacity>
    <directionality>Bidirectional</directionality>
    <symmetricPath>true</symmetricPath>
    <sourceSTP>urn:ogf:network:kddilabs.jp:2013:topology:bi-ps?vlan=1780-1782</sourceSTP>
    <destSTP>urn:ogf:network:avalight.net:2013:topology:ps?vlan=1780-1782</destSTP>
    <ext:exclusions>
      <networkId>urn:ogf:network:es.net:2013:</networkId>
      <stp>urn:ogf:network:icair.org:2013:topology:jgn-x?vlan=1790</stp>
    </ext:exclusions>
  </p2p:p2ps>
</criteria>
```

OR

```
<ext:exclusions>
  <exclusion type="networkId">urn:ogf:network:es.net:2013:</exclusion>
  <exclusion type="stpId">urn:ogf:network:icair.org:2013:topology:jgn-x?vlan=1790</exclusion>
</ext:exclusions>
```

Use a dedicated type with defined elements supported for exclusion by p2p service.

Use a dedicated type with generic elements and string types/values for more flexibility.

# ANY Solution #2



```
<globalReservationId>urn:uuid:83fe4f36-5b38-41b6-bc46-a362a06a54ee</globalReservationId>
<description>My example reservation using NSI CS 2.1.</description>
<criteria version="1">
  <schedule>
    <startTime>2015-08-15T09:30:10Z</startTime>
    <endTime>2015-08-15T10:30:10Z</endTime>
  </schedule>
  <serviceType>http://services.ogf.org/nsi/2013/12/descriptions/EVTS.A-GOLE</serviceType>
  <p2p:p2ps>
    <capacity>10000</capacity>
    <directionality>Bidirectional</directionality>
    <symmetricPath>true</symmetricPath>
    <sourceSTP>urn:ogf:network:kddilabs.jp:2013:topology:bi-ps?vlan=1780-1782</sourceSTP>
    <destSTP>urn:ogf:network:uvalight.net:2013:topology:ps?vlan=1780-1782</destSTP>
    <ext:exclusions>
      <exclusion type="stpId">
        <value xsi:type="types:StpIdType">urn:ogf:network:es.net:2013:</value>
        <value xsi:type="types:StpIdType">urn:ogf:network:netherlight.net:2013:topology</value>
        <value xsi:type="types:StpIdType">urn:ogf:network:icair.org:2013:topology:jgn-x?vlan=1790</value>
      </exclusion>
      <exclusion type="srlg">
        <value xsi:type="xsd:int">1025</value>
        <value xsi:type="xsd:int">2750</value>
        <value xsi:type="xsd:int">6969</value>
      </exclusion>
    </ext:exclusions>
  </p2p:p2ps>
</criteria>
```

Use a dedicated element with string type and anyType values to maintain type safeness.

Multi-value flexibility.

# Questions

- Should we support range types for inclusions/exclusions?
  - Examples
    - Exclude links with SLGR=1000-1100
    - Include links with capacity  $\geq 10$  Gb/s
    - Exclude links with capacity  $< 10$  Gb/s
  - This will change the format of the inclusion/exclusion elements.
- Should we support explicitly support AND/OR constructs?

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