Network Services Interface

Path finding Inclusions/Exclusions

John MacAuley, ESnet

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Exclusions

- Allow uRA to specify network resources that should <u>NOT</u> 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".

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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.

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Order of preference

- 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.

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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

- 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.

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Parameter Solution

```xml
<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 stpId.

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-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>
            <networkId>urn:ogf:network:es.net:2013:</networkId>
            <stp>urn:ogf:network:icair.org:2013:topology:jgn-x?vlan=1790</stp>
        </ext:exclusions>
        <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>
    </p2p:p2ps>
</criteria>
```

OR

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

```xml
<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.

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Questions

- Should we support range types for inclusions/ exclusions?

    - Examples

        - Exclude links with SLGR=1000-1100

        - Include links with capacity >= 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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