

Network Services Interface

Use of NML SwitchingService

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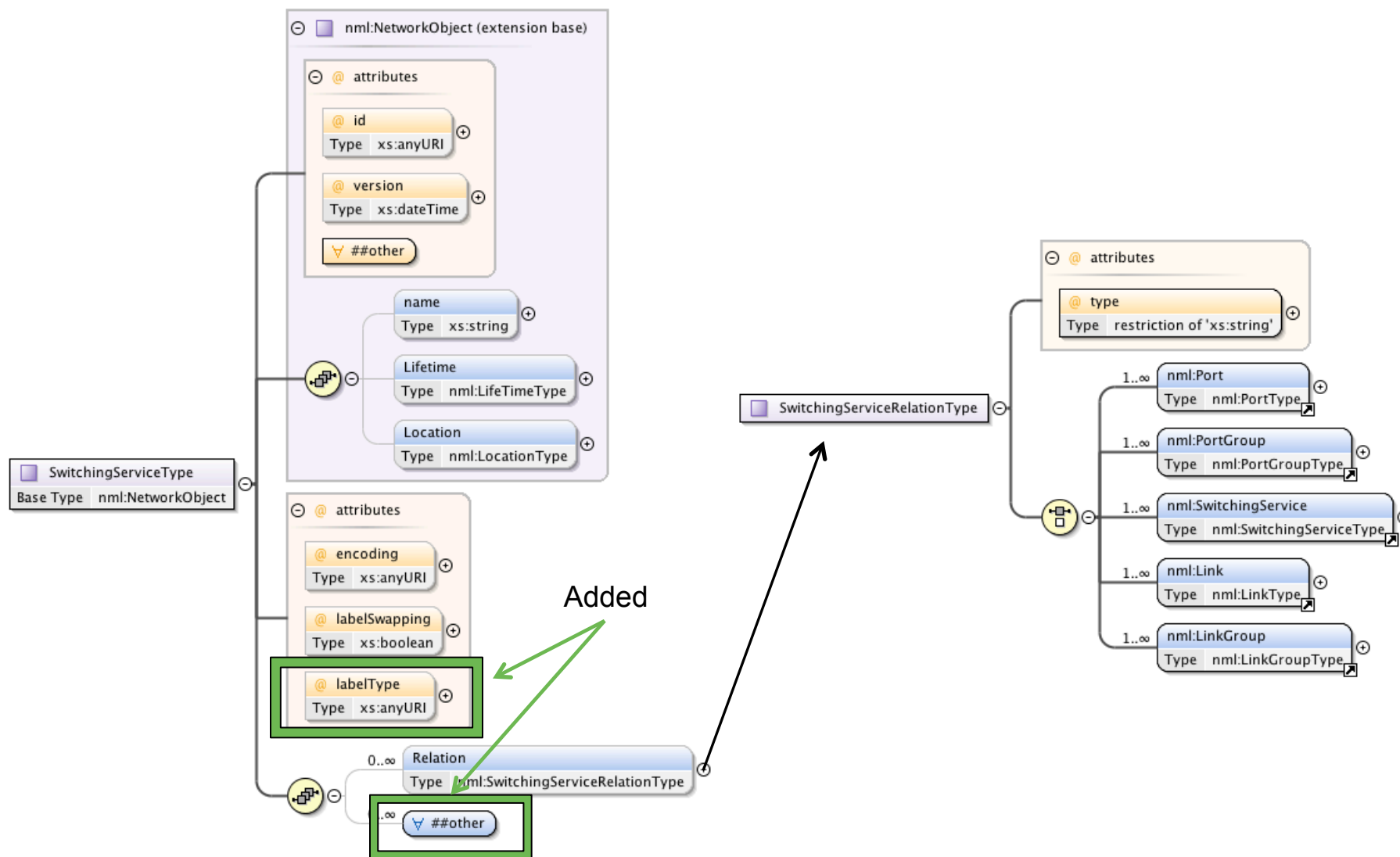
Agenda

- Discuss the NML SwitchingService and changes made to the published NML schema.
- Label Swapping and how it is modeled.
- Associating ServiceDefinitions with a SwitchingService.
- Mapping to the NSI ServiceDomain.
- Next steps.

Switching Service

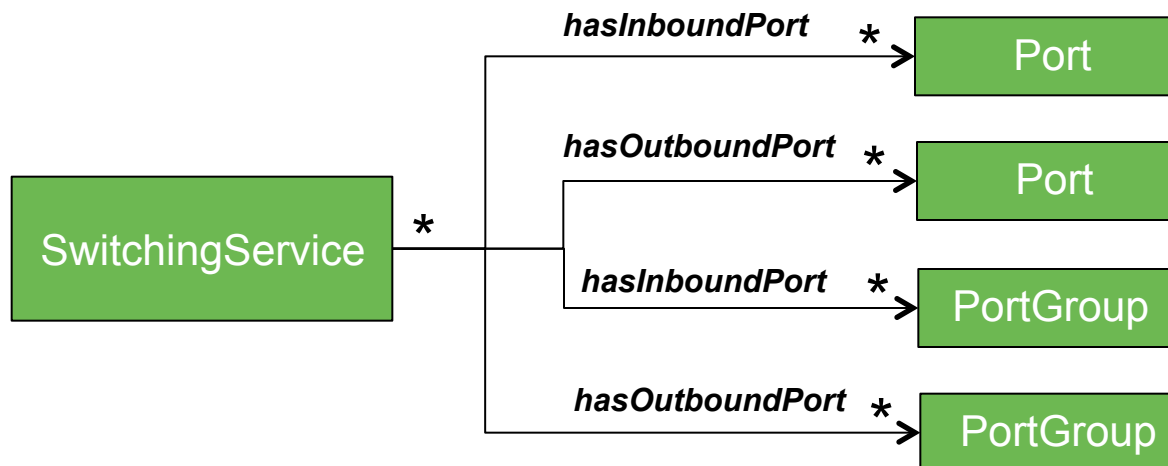
- A *SwitchingService* describes the ability to create new Links from any of its inbound Ports to any of its outbound Ports.
- A *SwitchingService* may have the following attributes:
 - **id** is assign a persistent globally unique URI.
 - **encoding** is assign a data encoding identifier associated with the *SwitchingService*.
 - **labelSwapping**. A value of **false** adds a restriction to the *SwitchingService*: it is only able to create cross connects from an inbound *Port* to an outbound *Port* if the *Label* of the connected *Ports* has the same value. The default value is **false**.
 - **labelType** is assign the label type identifier associated with a *Port* that is switched by the *SwitchingService*.
 - **other** and *anyAttributes* allowing for the inclusion of attributes from other namespaces.
- A *SwitchingService* may have the following element members:
 - **name** to assign a human readable string.
 - **Relation** describe how the *SwitchingService* relates to other defined NML objects.
 - **other** an *ANY* definition allowing for the inclusion of element from other namespaces.
- Other attributes and elements inherited from *NetworkObject* and *Service* are available for use.

SwitchingService Definitions



Relations

- A *SwitchingService* may have the following relations:
 - ***existsDuring*** to one or more *Lifetimes*
 - ***hasInboundPort*** to one or more *Ports* or *PortGroups*
 - ***hasOutboundPort*** to one or more *Ports* or *PortGroups*
 - ***isAlias*** to one or more *Switching Services*
 - ***providesLink*** to one or more *Links* or *LinkGroups*. The *providesLink* relation points to *Links* which describe the currently configured cross connects in a *SwitchingService*.



Label Swapping

- The *SwitchingService* supports the concept of label swapping.
- If the ***labelSwapping*** attribute is set to true then any port within the *SwitchingService* can be connected to any other port independent of label value.
- If set to false, then only ports with equivalent labels can be interconnected.
- The ***labelType*** attribute identifies the type of label the *SwitchingService* will switch.
- A *Port* or *PortGroup* may have at most one ***labelType***.

Example

The SwitchingService supports the concept of label swapping. If the labelSwapping attribute is set to true then any port within the SwitchingService can be connected to any other port independent of label. If set to false, then only ports with equivalent labels can be interconnected.

```
<SwitchingService id="urn:ogf:network:netherlight.net:2013:ServiceDomain:A-GOLE-EVTS"
  encoding="http://schemas.ogf.org/nml/2012/10/ethernet"
  labelSwapping = "true"
  labelType="http://schemas.ogf.org/nml/2012/10/ethernet#vlan">

  <!-- Port relations have to be specified separately from PortGroups as defined
    in the NML schema. -->
  <Relation type="http://schemas.ogf.org/nml/2013/05/base#hasInboundPort">
    <Port id="urn:ogf:network:netherlight.net:2013:port:a-gole:testbed:232:in"/>
  </Relation>

  <nml:Relation type="http://schemas.ogf.org/nml/2013/05/base#hasOutboundPort">
    <Port id="urn:ogf:network:netherlight.net:2013:port:a-gole:testbed:232:out"/>
  </nml:Relation>

  <Relation type="http://schemas.ogf.org/nml/2013/05/base#hasInboundPort">
    <PortGroup id="urn:ogf:network:netherlight.net:2013:port:a-gole:testbed:241:in"/>
    <PortGroup id="urn:ogf:network:netherlight.net:2013:port:a-gole:testbed:manlan:1:in"/>
  </Relation>

  <nml:Relation type="http://schemas.ogf.org/nml/2013/05/base#hasOutboundPort">
    <PortGroup id="urn:ogf:network:netherlight.net:2013:port:a-gole:testbed:241:out"/>
    <PortGroup id="urn:ogf:network:netherlight.net:2013:port:a-gole:testbed:manlan:1:out"/>
  </nml:Relation>

  <!-- Services supported by this SwitchingService (NSI Service Domain). -->
  <sd:ServiceDefinition id="urn:ogf:network:netherlight.net:2013:ServiceDefinition:EVTS.A-GOLE"/>
</SwitchingService>
```

labelSwapping set to "true" indicates that ports can be connected with different label values.

labelType indicates the label that could be switched.

Port elements can be members of SwitchingService.

PortGroup elements can also be members of SwitchingService.

ServiceDefinition associated with this SwitchingService.

Ethernet



- We are using the following Ethernet namespace for our NML documents:
<http://schemas.ogf.org/nml/2012/10/ethernet>
- The **encoding** attribute on both the *SwitchingService* and *Port/PortGroup* elements will use the following URL if they support Ethernet:
<http://schemas.ogf.org/nml/2012/10/ethernet>
- The **labeltype** attribute in the *SwitchingService* and *Label/LabelGroup* elements will use the following URL if they support IEEE 802.1Q Ethernet:
<http://schemas.ogf.org/nml/2012/10/ethernet#vlan>

Ethernet (continued)

- A Label element associated with an Ethernet port will contain a single VLAN value and have the “*labeltype*” set to <http://schemas.ogf.org/nml/2012/10/ethernet>.
- A LabelGroup element associated with an Ethernet port will contain one or more VLAN values and have the “*labeltype*” set to <http://schemas.ogf.org/nml/2012/10/ethernet>.
- A LabelGroup supports comma and hyphen separated ranges such as “1-1770,1780-2000,2002,2006”.

Default behavior no SwitchingService



- If no *SwitchingService* is specified within the NML *Topology* element then this implies a single *SwitchingService* for each supported ***labelType/encoding*** pair, containing all unidirectional ports of that ***labelType*** and ***encoding*** specified using the "has*Port" relations, all defined *ServiceDefinitions* supporting the ***encoding***, and the ***labelSwapping*** attribute set to false.
- Ports defined with no labels are matched on ***encoding*** type only and placed in a *SwitchingService* defined with no ***labelType*** or ***labelSwapping*** attributes.
- Ports defined with no ***encoding*** are matched on ***labelType*** only (if available) and placed in a *SwitchingService* defined with no ***encoding*** attribute, however, ***labelType*** and ***labelSwapping*** attributes can be present if used as a matching criteria.

Specifying a wildcard SwitchingService



- When a specific default behavior is required, a *SwitchingService* can be specified in the NML *Topology* element with wildcard behaviors.
- All ports matching the wildcard specification of the defined *SwitchingService* are included in that *SwitchingService*.
- When a wildcard *SwitchingService* is defined the default *SwitchingService* behavior is no longer used.
- A wildcard *SwitchingService* is specified within the NML *Topology* element similar to a normal *SwitchingService* specification except no *Relation* elements are included.
- The lack of *Relation* elements implies the *SwitchingService* includes any *Port/PortGroups* that match the specified ***labelType*** and ***encoding*** of that *SwitchingService*.

Continued...

- For example, the following wildcard *SwitchingService* is defined that includes all ports using a "vlan" **lableType** and an "ethernet" **encoding**. This *SwitchingService* is defined with **labelSwapping** set to "true" and with the "EVTS.A-GOLE" *ServiceDefinition*:

```
<SwitchingService id="urn:ogf:network:netherlight.net:2013:ServiceDomain:a-gole:testbed:A-GOLE-EVTS"
  encoding="http://schemas.ogf.org/nml/2012/10/ethernet"
  labelSwapping = "true"
  labelType="http://schemas.ogf.org/nml/2012/10/ethernet#vlan">
  <sd:serviceDefinition id="urn:ogf:network:netherlight.net:2013:ServiceDefinition:EVTS.A-GOLE" />
</SwitchingService>
```

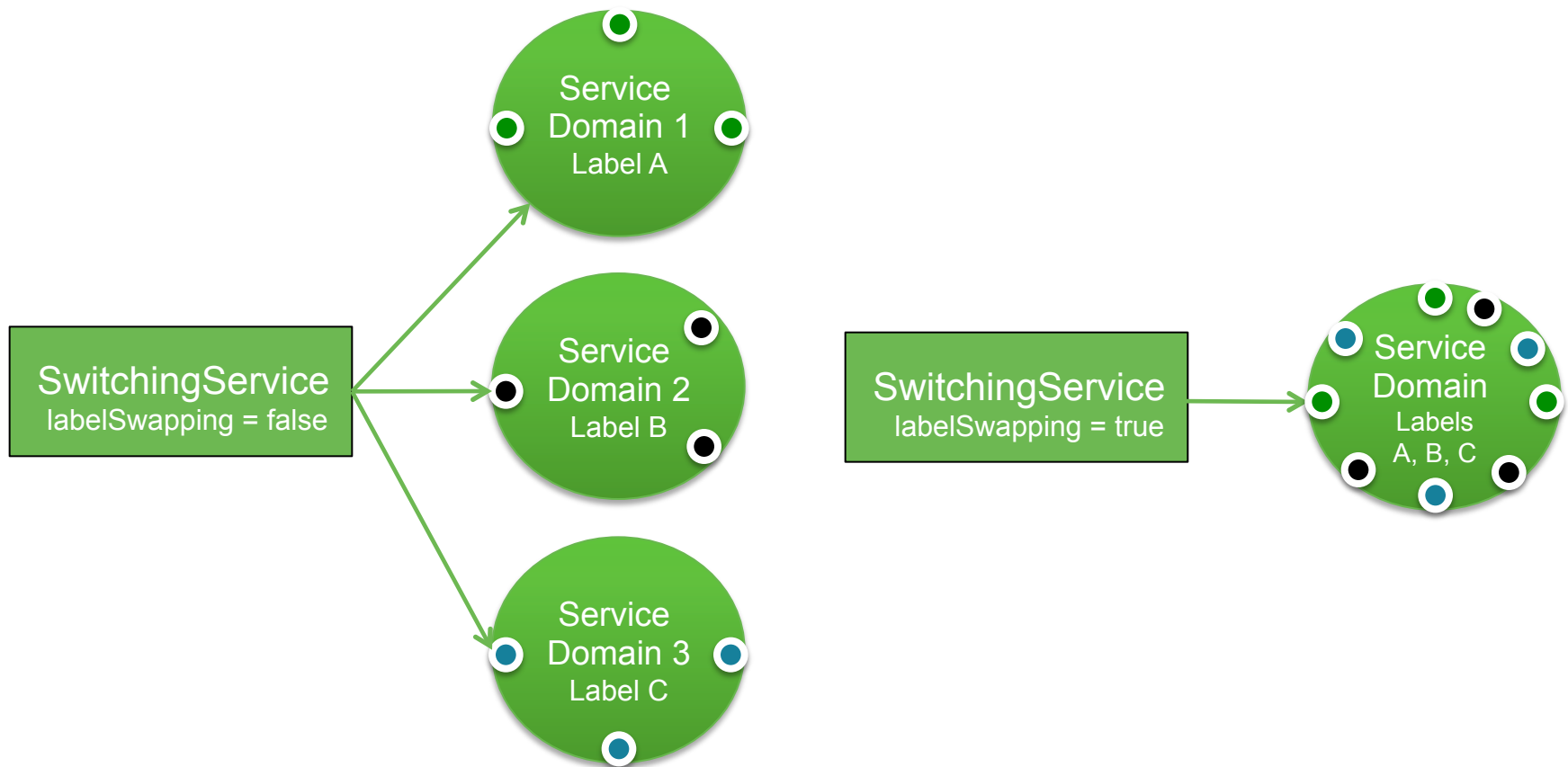
- If there are ports defined within the NML *Topology* element that do not match a defined *SwitchingService* then these ports are not connectable.

NSI Service Domain



- In a Service Domain any STP can be connected to any other STP with the following constraints:
 - Unidirectional inbound STP can only be connected to unidirectional outbound STP.
 - Bidirectional ports can only be interconnected to other bidirectional ports.
- A Service Domain has an associated Service Definition (SD) describing the service being offered.
- Service Domains are grouped into Network topologies that can be advertised by at most one NSA.
- An NSA can advertise multiple Network topologies.
- The SwitchingService element is used to model NSI Service Domains.
- A single SwitchingService declaration can expand into many NSI Service Domains depending if label swapping is supported or not (a domain per label value).

Service Domain Mappings



Next Steps

- Need to get an official designation for modified NML (errata, new version, etc.)
- NSA implementations need to incorporate new NML schema (in current form it is backwards compatible).
- Network deployments need to advertise their *SwitchingService* elements in NML topology documents.
- Path finders start utilizing the information to better model *ServiceDomains* within a network.