

Network Description Language

Semantics for Hybrid Networks

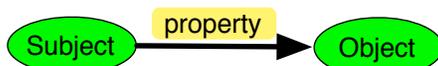
Jeroen van der Ham, Paola Grosso, Ronald van der Pol, Andree Toonk, Freek Dijkstra, Cees de Laat

What is NDL?

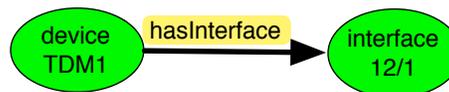
The Network Description Language (NDL) is a language that can be used to describe hybrid networks, so that different administrative domains can share and correlate topology information.

NDL Basics

NDL is based on Resource Description Framework (RDF), a semantic web technique developed by the W3C. RDF describes relations using triplets:



The subject has a property with a value. For example, TDM1 has an interface 12/1.



The most powerful feature of NDL is its ability to effectively create a distributed network topology database.

Correlations between domains are built by referencing from one repository to another, much like a URL can point to another web page.

Recent Developments

The current version of NDL can describe the physical topology of a network. We are extending NDL with features to include higher level knowledge, like device capabilities.

This work will be based upon existing standards like ITU-T Recommendation G.805 and GMPLS routing protocols.

Demonstrator in Dutch Booth

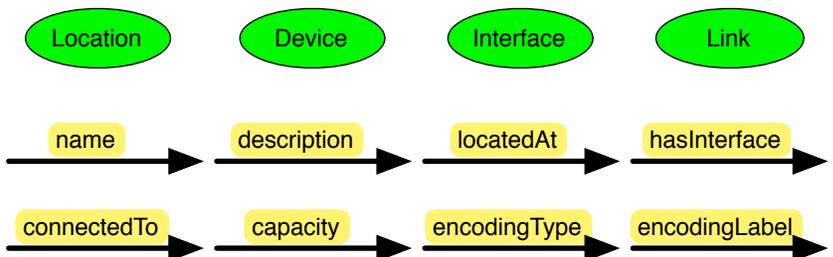
In co-operation with the GLIF exchange points there is now a fully distributed description of the GLIF network. Visualisations of this network can be seen at various sites on the show floor.

In the Dutch Booth (1805) we show a demonstration of the capabilities of the NDL described network with path-computation and visualisation.

Hybrid Networks

Several research networks around the world are implementing hybrid networks. These networks provide end-users with traditional routed IP services, but also lightpaths. To automate lightpath provisioning, broker systems must have topology information, both intra and inter-domain. This requires that the information is described in a computer-readable format.

NDL schema - Classes and properties defined in the NDL schema



Usage of NDL

- **Network advertisement.** NDL helps the end-user to express a lightpath reservation request, and helps the service provider to validate the feasibility of such a request.
- **Visualization.** Because the topology information can be correlated across domains, NDL allows for automatic generation of network maps that can be shared among providers.
- **Lightpath reservation planning.** A resource broker can use the information to handle a reservation request.

SARA currently uses NDL in SURFnet6 and NetherLight for both generating topology pictures and lightpath planning.

Code example - Excerpt from a description of NetherLight

```
<ndl:Device rdf:about="#tdm1.amsterdam1.netherlight.net">
  <ndl:name>tdm1.amsterdam1.netherlight.net</ndl:name>
  <ndl:locatedAt rdf:resource="#amsterdam1.netherlight.net"/>
  <ndl:hasInterface rdf:resource="#tdm1.amsterdam1.netherlight.net:12/1"/>
  <ndl:hasInterface rdf:resource="#tdm1.amsterdam1.netherlight.net:6/1"/>
</ndl:Device>
<ndl:Interface rdf:about="#tdm1.amsterdam1.netherlight.net:12/1">
  <ndl:name>12/1</ndl:name>
  <ndl:connectedTo rdf:resource="#tdm3.amsterdam1.netherlight.net:501/2"/>
  <ndl:capacity rdf:datatype="xsd:float">1.244E+9</ndl:capacity>
</ndl:Interface>
```

Network map - Partial map of Netherlight

