Instantiation of IETF Network Slices in service providers networks

draft-barguil-teas-network-slices-instantation-00

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Motivation

• The IETF has produced several YANG data models to support the Network Automation:
  • Service Models: Capture the customer requirements (i.e. LXSM, ...)
  • Network Models: Capture the Network requirements to deliver a service. (i.e. LXNM)
  • TE Models:
    • Service Mapping: Maps the TE data models and the service/network models.
  • ACLs and Routing Policies

• The IETF is working on a Network Slice Architecture:
  • [draft-ietf-teas-ietf-network-slice-definition-00] Definition of IETF Network Slices
  • [draft-nsdt-teas-ns-framework-05] Framework for IETF Network Slices

• Consistency is needed with other architectures and frameworks proposed for Network Automation and SDN:
  • [RFC 8969] A Framework for Automating Service and Network Management with YANG
  • [RFC 8453] Framework for Abstraction and Control of TE Networks (ACTN)

• Goal: How to instantiate IETF Network Slices considering the variety of potential SDN implementations?
IETF Network Slice: requirements and data models

[e.g. draft-contreras-teas-slice-nbi-03]

<table>
<thead>
<tr>
<th>Network Slice Requirements for 5G service</th>
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<tbody>
<tr>
<td>Availability</td>
</tr>
<tr>
<td>Deterministic communication</td>
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<tr>
<td>Downlink throughput per network slice</td>
</tr>
<tr>
<td>Energy efficiency</td>
</tr>
<tr>
<td>Group communication support</td>
</tr>
<tr>
<td>Isolation level</td>
</tr>
<tr>
<td>Maximum supported packet size</td>
</tr>
<tr>
<td>Mission critical support</td>
</tr>
<tr>
<td>Performance monitoring</td>
</tr>
<tr>
<td>Slice quality of service parameters</td>
</tr>
<tr>
<td>Support for non-IP traffic</td>
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<tr>
<td>Uplink throughput per network slice</td>
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<td>User data access (i.e., tunneling mechanisms)</td>
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</tbody>
</table>

The set of Yang models proposed today allow to request tunnels/paths with different resiliency requirements in terms of protection and restoration.

However, none of them include the possibility of requesting a specific availability (e.g. 99.9999%).

The LxVPN Models allow to specify the bandwidth at the interface level between the slice and the customer. In addition, the TE models allow to force a given bandwidth in the connection between Provider Edges.
Implementation options (1/3)

**Hierarchical Network Controller**

**Network Slice Controller**

- **Map**: The customer request received using the [draft-wd-teas-ietf-network-slice-nbi-yang-01](draft-wd-teas-ietf-network-slice-nbi-yang-01) must be processed by the NCS.

- **Realize**: Create necessary network requests. The slice realization can be translated into one or several LXNM Network requests, depending on the number of underlay controllers. Thus, the NCS must have a complete view of the network to map the orders and distribute them across domains. The realization should include the expansion/selection of **Forwarding Policies**, **Routing Policies**, **VPN policies**, and **Underlay transport preference**.

**Example**: instantiation of slice requests received by a hierarchical SDN controller incorporating NSC functionality and interacting with per-domain Network controllers below.
Implementation options (2/3)

- **Map**: Process the customer request. The customer request can be sent using the [draft-liu-teas-transport-network-slice-yang-01]. This draft allows the topology mapping of the Slice request.

- **Realize**: Create necessary network requests. The slice's realization can be translated into one or several LXNM Network requests, depending on the number of underlay controllers. Thus, the NCS must have a complete view of the network to map the orders and distribute them across domains. The realization should include the expansion/selection of Forwarding Policies, Routing Policies, VPN policies, and Underlay transport preference.

*Example*: instantiation of slice requests received by an independent NSC interacting with Network controllers below (case reflected in IETF definitions draft)
Implementation options (3/3)

Example: instantiation of a conventional service realized on top of an IETF Network Slice (being the NSC part of the Network Controller)

- **Map**: Process the customer request at NCS level.
- **Realize**: Instantiate the slices using devices datamodels.
Conclusions and next steps

• A wide variety of yang models currently progressing in IETF can be used by Network Controllers to instantiate IETF network slices.
  • Some of the IETF slice requirements can be satisfied by multiple means, as there are multiple choices available.
  • However, other requirements are still not covered by the existing models.

• A more detailed definition of those uncovered requirements is needed.

• Keep working on detailing the different implementation options

• Collect feedback / comments from the WG

• Prepare a new version for IETF#111