Demonstration of Zero-touch Device and L3-VPN Service Management using the TeraFlow Cloud-native SDN Controller

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TeraFlow will create a novel cloud-native SDN controller for beyond 5G networks.

- Integrate with current NFV and MEC frameworks
- Flow aggregation
- Service management
- Network equipment integration
- ML-based security and forensic
- Multi-tenancy

http://www.teraflow-h2020.eu
H2020 TeraFlow project

• ETSI TeraFlowSDN OSG (TFS)
  • Creation of OpenSource Group to ensure sustainability of the TeraFlow SDN controller after the H2020 TeraFlow project ends.
  • Collecting support from different ETSI groups that can benefit from the project:
    • OSM, MEC, mWT, ENI, PDL, ZSM, SAI, NFV...
TeraFlow OS Architecture
Network Service

Virtual Infrastructure Manager

openstack

VNF 1

VDU 1 - mgmt VM

internal net

VDU 2 - data VM

mgmt net

data net

openstack

Virtual Infrastructure Manager

WAN Infrastructure Manager

NFV Orchestrator

IETF L2VPN WIM Connector

VNF 2

VDU 1 - mgmt VM

internal net

VDU 2 - data VM

TeraFlow

Virtual Infrastructure Manager
Create Multi-site NS

- **New LCM functionality:**
  - Check if multiple VIMs are involved in a NS.
  - Find WIM able to interconnect the VIMs.
    - If WIM specified, use specified one, do not infer a WIM.
  - Populate RO task with params inferred from WIM port mapping.

```bash
osm ns-create --ns-name ms-ns --nsd_name hackfest_multivdu-ns --vim_account openstack-72 --config '{
  vnf:[
    {member-vnf-index: "1", vim_account: openstack-72},
    {member-vnf-index: "2", vim_account: openstack-73}
  ],
  vld:[
    {name: mgmtnet, vim-network-name: {openstack-72: mgmt72, openstack-73: mgmt73}},
    {name: datanet, vim-network-name: {openstack-72: data72, openstack-73: data73}, wim_account: wim }
  ]}'
```
WIM Port Mapping

- datacenter_id: "openstack-72"
  device_id: "openflow:dpid-72"
  device_interface_id: "port-1"
  service_endpoint_id: "SEP1"
  service_mapping_info:
    site-id: "site-1"
    encapsulation:
      type: "dot1q"
      vlan: 400
    bearer:
      bearer-reference: "1a"

- datacenter_id: "openstack-73"
  device_id: "openflow:dpid-73"
  device_interface_id: "port-1"
  service_endpoint_id: "SEP2"
  service_mapping_info:
    site-id: "site-2"
    encapsulation:
      type: "dot1q"
      vlan: 500
    bearer:
      bearer-reference: "2b"
WIM Parameters

RO Tasks:
  // Tasks for openstack-72: images, flavors, DC networks, VDUs, ...
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  // Task for the WIM:
  {'action': 'CREATE', 'item': 'sdn_net', 'params': {
    'type': 'ELINE',
    'vlds': ['nsrs:<nsr_id>:vld.datanet'],
    'sdn-ports': [
      {'device_id': 'openstack-72', 'switch_id': 'openflow:dpid-72', 'switch_port': 'port-1',
       'service_endpoint_encapsulation_type': 'dot1q', 'service_endpoint_id': 'SEP1', 'vlan': 400},
      {'device_id': 'openstack-73', 'switch_id': 'openflow:dpid-73', 'switch_port': 'port-1',
       'service_endpoint_encapsulation_type': 'dot1q', 'service_endpoint_id': 'SEP2', 'vlan': 500}
    ]
  }}
IETF L2VPN Requests (I)

- Create Connectivity Service

  POST /restconf/data/ietf-l2vpn-svc:l2vpn-svc/vpn-services?
  {'ietf-l2vpn-svc:vpn-service': [{'
    'vpn-id': '<svc-id>', 'vpn-svc-type': 'vpws', 'svc-topo': 'any-to-any',
    'customer-name': 'osm'}]}

- Add Endpoint to Connectivity Service (site-1, similar for site-2)

  POST /restconf/data/ietf-l2vpn-svc:l2vpn-svc/sites/site=site-1/site-network-accesses/?
  {'ietf-l2vpn-svc:site-network-access': [{'
    'network-access-id': '<site-net-access-id>',
    'vpn-attachment': {'vpn-id': '<svc-id>', 'site-role': 'any-to-any-role'},
    'connection': {
      'encapsulation-type': 'dot1q-vlan-tagged',
      'tagged-interface': {'dot1q-vlan-tagged': {'cvlan-id': 400}},
      'bearer': {'bearer-reference': '1a'}}]}

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IETF L2VPN Requests (II)

• Get Connectivity Service Status

GET /restconf/data/ietf-l2vpn-svc:l2vpn-svc/vpn-services/vpn-service=<svc-id>/?

• Delete Connectivity Service

DELETE /restconf/data/ietf-l2vpn-svc:l2vpn-svc/vpn-services/vpn-service=<svc-id>/?
Workflow: VPN Service Creation
Bug reports and fixes

• [Bug 1886] [OSMClient] Command wim-show shows password in clear.
  • Approved and Merged

• [Bug 1899] [RO] WIM is not properly selected by RO due to multiple issues
  • Under review

• [Bug 1900] [LCM] WIM is not automatically selected and WIM parameters are not populated by the LCM component
  • Under review

• [Bug 1901] [IM-NBI] check_valid_wim_account fails due to wrong parameters and wrong WimAccountTopic password_to_encrypt
  • Under review

• [Bug 1902] [RO] Multiple typos/small issues prevent using IETF L2VPN WIM connector
  • Under review
Open Issues and Future Work

• Enable definition of service constraints for VLDs to feed WIMs:
  • Capacity, latency, jitter, etc.

• Implement other WIM connectors:
  • IETF L3-VPN
  • Transport API for Digital Signal Rate (DSR) connectivity services
Try it yourself: https://gitlab.com/teraflow-h2020/controller
TeraFlow OS videos: https://www.youtube.com/hashtag/teraflowos
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Thank you!

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