Network Working Group
Internet-Draft
Intended status: Informational
Expires: September 16, 2019

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March 15, 2019

Virtualization YANG Servise Model (VYSM)
draft-shytyi-netmod-vysm-01.txt

Abstract

This document provides a specification of the Virtual Network Functions YANG Service Model (VYSM). The VNF YANG Service Model serves as a base framework for managing an universal Customer-Premises Equipment (uCPE) NFV subsystem from the Orchestrator.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

Network Function Virtualization is a technology that allows to virtualize the network services running on dedicaded hardware. This technology became a base for universal Customer-Premises Equipment(uCPE). This document defines the uCPE as harware with x86 capabilities (whitebox or greybox) that has a hypervisor. In other words, uCPE is a host that may run multiple Virtual Machines with guest OSs, where each Guest OS may represent a Physical Network Function. This document presents the VNF YANG Service Model (VYSM) to manage from an Orchestrator the Network Function Virtualization Infrastructure inside the uCPE.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

Link - is an entity that enables link layer communication of nodes.

Port - node connector to the link.

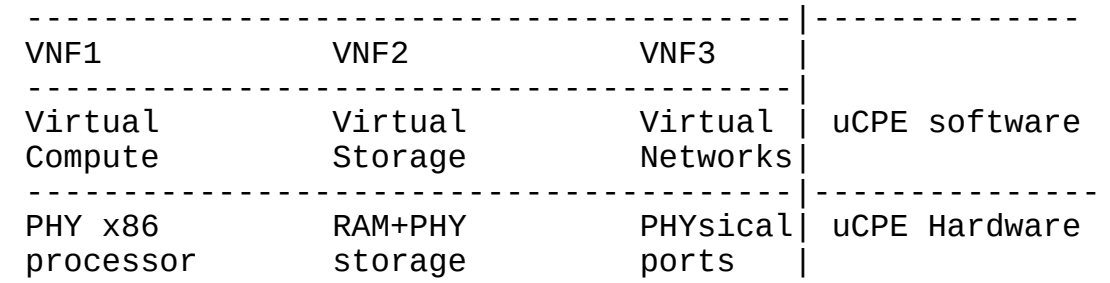
NE - Network Element.

NSYM - Network Service Yang Module.

VYSM - VNF YANG Service Model.

3. Universal CPE

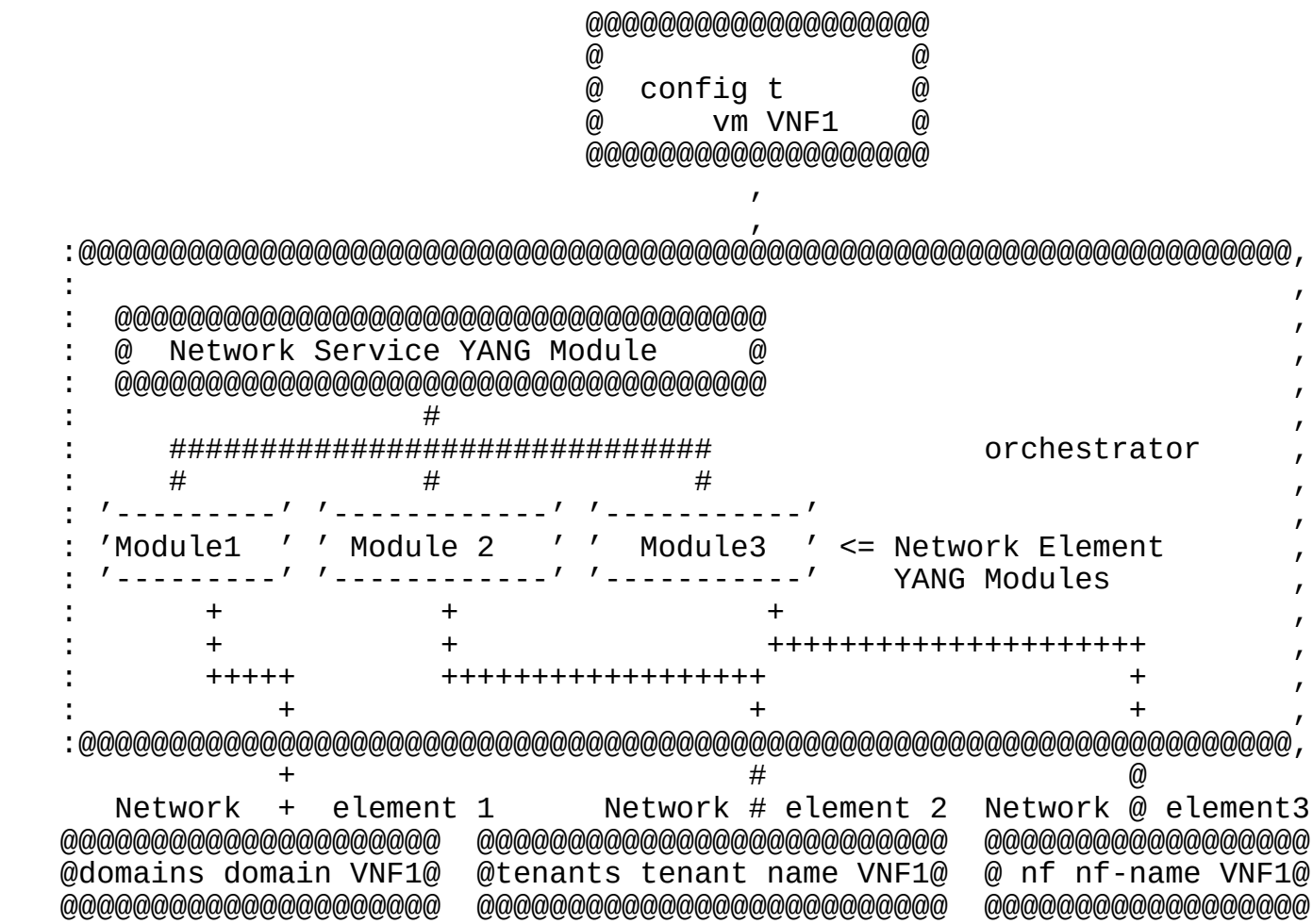
Firstly, this document defines the platform that is controlled with VYSM - universal CPE (uCPE). The uCPE as harware with x86 capabilities that is running Linux distibution with additinal virtualisation layer. Virtualization layer provides virtual compute, virtual storage and virtual network resources. Each VNF runnning in the uCPE requires the amount of virtual resources (for example: 4 vCPUs, 4GB RAM, 40GB storege, 4 vPorts). VNFs MAY be interconnected between each other and physical ports via Virtual Networks. The figure below presents the uCPE architecture.



4. Virtual Network Function YANG Service Model

Secondly, this document defines and classifies the VYSM as Network Service YANG Module(NSYM) layer component RFC 8199 [RFC8199]. Thus it inherits the characteristics of the NSYM Layer. VYSM is a modeled representation of the specific service requirements. It provides abstraction of services configuration and operations that MAY be implemented in Network Elemets(NEs). Thus VYSM does not describe all configuration to be performed on the devices, but provides the configuration that is required for the "Network Service to Network Element(s)" decomposition process RFC 8199 [RFC8199]. Example of the decomposition is presented in the figure below.

The Network Service YANG module exposes the configuration commands via the Southbound interfaces of the orchestrator. Therefore the set of the commands modeled in the VYSM can be inputed via Southbound interfaces(for example CLI). In the example the command "vm VNF1" is passed via Southbound interface to the orchestrator. It defines the virtual machine name. Further the same configuration MAY be transormed to the one or multiple Network Element payloads (for example xml for NETCONF) that carry an equivalent of commands such as "nf nf-name VNF1"



5. VNF YANG Service Model tree diagram overview

This section provides an overview of the VNF Service YANG Model (VSYM) that MAY be made with "pyang" utility. The figure below presents the tree diagram of VYSM.

```
            module: ietf-vysm
                +--rw virtualization* [name]
                   +--rw name          string
                   +--rw device*       string
                   +--rw links* [link]
                   |  +--rw link    string
                   +--rw interfaces* [interface]
                   |  +--rw interface    string
                   |  +--rw ports* [port]
                   |     +--rw port    string
                   |     +--rw link?   -> ../../../links/link
                   +--rw switches* [switch]
                   |  +--rw switch    string
                   |  +--rw ports* [port]
                   |     +--rw port    string
                   |     +--rw name?   string
                   |     +--rw link?   -> ../../../links/link
                   +--rw vms* [vm]
                      +--rw vm          string
                      +--rw ports* [port]
                      |  +--rw port    string
                      |  +--rw name?   string
                      |  +--rw link?   -> ../../../links/link
                      +--rw ram?        string
                      +--rw cpu?        string
                      +--rw storages* [id]
                         +--rw id          string
                         +--rw location?   string
```

6. Specification of the VNF YANG Service Model

This section presents the specification of the VYSM.

```
<CODE BEGINS> file "ietf-vysm@2018-07-01.yang"
module ietf-vysm {
  namespace "urn:ietf:params:xml:ns:yang:ietf-vysm";
  prefix ietf-vysm;
        organization
        "SFR/ALTICE";
        contact
                "Dmytro Shytyi
                EMail:ietf.dmytro@shytyi.net";
        description
                "This is a Network Function Virtualization (NFV) YANG
                service model.";
        revision 2018-07-01 {
```

```
                description
                "Initial revision.";
                reference
          "draft-shytyi-netmod-vysm-01";
          }

   list virtualization {
     key name;
     leaf name {
                type string;
                description "Name of the instance of the service";
     }

     // may replace this with other ways of refering to the devices.
     leaf-list device {
                type string;
                description "List of the devices in available in the
                orchestrator";
     }

   list links{
                key link;
                leaf link{
                        type string;
                description "Name of the virtual link from the pool
                of the links";
                }
           description "Pool of the virtual links that connect VMs and
           Interfaces";
          }
          list interfaces{
                key interface;
                leaf interface{
                        type string;
                         description "Name of physical interface";
                }
                list ports{
                        key port;
                        leaf port{
                                type string;
                        description "Name of the connector";
                        }
                        leaf link{
                                type leafref{
                                        path "../../../links/link";
                                }
                          description "Link that is connected to
                          the port via connector";
```

```
                        }
                        description "Set of the connectors the
                        physical interface has";
                }
                description "Set of physical interfaces";
        }
        list switches{
          key switch;
                leaf switch{
                        type string;
                        description "Name of the forwarding domain";
                }
                list ports{
                        key port;
                        leaf port{
                                type string;
                                description "Name of the connector";
                        }
                        leaf name{
                          type string;
                                description "Name of the subconnector";
                        }
                        leaf link{
                                type leafref{
                                        path "../../../links/link";
                                }
                        description "Link that is connected to the
                        switch via port";
                        }
                  description "Set of the connectors the
                  forwarding domain has";
                }
                description "Set of the forwarding domains";

        }

        list vms{
                key vm;
                leaf vm{
                        type string;
                description "Name of the Virtual Machine";
                }
                list ports{
                        key port;
                        leaf port{
                                type string;
                                description "Name of the connector";
                        }
```

```
                        leaf name{
                                type string;
                                description "Name of the subconnector";
                        }
                        leaf link{
                                type leafref{
                                        path "../../../links/link";
                                }
                                description "Link that connects the
                                VM with a switch or     Interface
                                via connector";
                        }
                  description "Set of Virtual Machine connectors";
                }

                leaf ram{
                        type string;
                        description "Amount of memory to allocate for
                        the Guest OS";
                }
                leaf cpu{
                        type string;
                        description "Amount of cpus to allocate for the
                        Guest OS";
                }
                list storages{
                        key id;
                        leaf id{
                                type string;
                                description "Name of the Storage";
                        }
                        leaf location{
                                type string;
                                description "External location where
                                the image is saved.";
                        }
                        description "Virtual storge of the image
                        for the Virtual Machine";
                }
                description "Set of the Virtual Machines configured
                on the universal Customer-Premises Equipment";
        }
        description "This is an RFS skeleton service";
   }
   }
}
<CODE ENDS>
```

7. Security Considerations

At this time, no security considerations are addressed by this memo.

8. IANA Considerations

No request to IANA at this time.

9. Acknowledgements

At this time, no acknowledgements are addressed by this memo.

10. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC8199] Bogdanovic, D., Claise, B., and C. Moberg, "YANG Module Classification", RFC 8199, DOI 10.17487/RFC8199, July 2017, <https://www.rfc-editor.org/info/rfc8199>.

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