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YANG Data Model for Virtual Network Interfaces Management
draft-zhang-vni-yang-model-01

Abstract

This document defines a YANG data model for the management of VNIs (Virtual Network Interfaces), including vNIC and CNI, depending on the different ways of virtualization. It exposes the real-time VNI resources to network controller and service orchestrator in order to supervise the cloud resource states for dynamic adjustment of service function placement and load-balancing of service instances to ensure the SLO (Service Level Objective).

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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This Internet-Draft will expire on 8 January 2026.

Table of Contents

1. Introduction

Telecom operators rely on edge cloud infrastructure to deliver services to end users for low-latency. However, edge cloud resources are relatively limited. It is necessary to monitor resource consumption in real time to optimize service deployment and load balancing strategies. While telecom operators have control over both cloud and network domains, there are still gaps in achieving effective cloud-network coordination.

This document defines a YANG data model for the management of VNIs (Virtual Network Interfaces), including vNIC and CNI, depending on the different ways of virtualization. It exposes the real-time VNI resources to network controller and service orchestrator in order to supervise the cloud resource states for dynamic adjustment of service function placement and load-balancing of service instances to ensure the SLO (Service Level Objective).

The YANG modules in this document conform to the Network Management Datastore Architecture (NMDA) [RFC8342].

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14] [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

The terminology for describing YANG data models is found in [RFC7950].

The following conventions are used in this document.

* VNI: Virtual Network Interfaces, including vNIC and CNI.

* vNIC: virtual Network Interface Card, based on VM (Virtual Machine).

* CNI: Container Network Interface, based on container, like Kubernetes.

1.2. Tree Diagrams

Tree diagrams used in this document follow the notation defined in [RFC8340].

2. Design of the Data Model

This data model intends to expose the information of VNIs to the network controller and service orchestrator for a better coordination between cloud and network systems. Specifically, it collects the type of virtualization, the latency, bandwidth, utilization, priority, and packet loss rate of VNI of virtualized nodes in clouds. Generally, there are two mainstream approaches to virtualization in cloud environments, which are VM based on Openstacks and container based on Kubernetes.

Based on the information of VNIs, the operators can not only optimize the service deployment and load-balancing strategies in edge clouds, but also dynamically adjust the route and flow between DCs and end users in order to ensure the SLO.

3. YANG Tree of VNI Management YANG Data Model

This document defines the YANG module "ietf-vni-mng", which has the following structure:

```
module: ietf-vni-mng
  +--rw dc
     +--rw dc-id?   string
     +--rw nodes
        +--rw node* [node-id]
           +--rw node-id                  string
           +--rw node-type?               enumeration
           +--rw allocatable-bandwidth?   uint64
           +--rw allocated-bandwidth?     uint64
           +--rw bandwidth-usage?         uint64
           +--rw priority?                uint8
           +--rw latency?                 uint64
           +--rw packet-loss-rate?        uint64
           +--rw ingress-bytes?           uint64
           +--rw egress-bytes?            uint64
           +--rw policy* [policy-id]
              +--rw policy-id     string
              +--rw service-id?   string
```

4. VNI Management YANG Module

This section presents the VNI Management YANG module defined in this document.

```
<CODE BEGINS> file "ietf-vni-mng@2025-07-07.yang"
module ietf-vni-mng {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-vni-mng";
  prefix vni-mng;

  organization
    "XXX";
  contact
    "WG Web: <http://tools.ietf.org/wg/neotec/>
     WG List: <mailto: neotec@ietf.org>

     Author:  Fan Zhang
              <zhangf52@chinatelecom.cn>
     Author:  Yongqing Zhu
              <zhuyq8@chinatelecom.cn>";
  description
    "This document defines a YANG data model for the management
     of VNIs (Virtual Network Interfaces), including vNIC and CNI,
     depending on the different ways of virtualization. It exposes
     the real-time VNI resources to network controller and service
     orchestrator in order to supervise the cloud resource states
     for dynamic adjustment of service function placement and
     load-balancing of service instances to ensure the
```

```
        SLO (Service Level Objective).

        The model is based on YANG 1.1 as defined in RFC 7950 and
        conforms to Network Management Datastore Architecture (NMDA)
        as defined in RFC 8342.

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        authors of the code.  All rights reserved.

        Redistribution and use in source and binary forms, with or
        without modification, is permitted pursuant to, and subject
        to the license terms contained in, the Simplified BSD License
        set forth in Section 4.c of the IETF Trust's Legal Provisions
        Relating to IETF Documents
        (http://trustee.ietf.org/license-info).

        This version of this YANG module is part of RFC XXXX; see the
        RFC itself for full legal notices.";

    revision 2025-07-07 {
      description
        "Init revision";
      reference
        "YANG Data Model for Virtual Network Interfaces Management";
    }

    /* Data nodes */

    container dc {
      description
        "Datacenter";
      leaf dc-id {
        type string;
        description
          "Identifier for the datacenter";
      }
      container nodes {
        description
          "Virtualized nodes (VMs or containers)";
        list node {
          key "node-id";
          description
            "List of virtualized nodes.";
          leaf node-id {
            type string;
            description
              "Identifier for the virtualized node.";
          }
```

```
            leaf node-type {
              type enumeration {
                enum vm {
                  description
                    "Indicates that the node is a Virtual
                     Machine (VM) instance.";
                }
                enum container {
                  description
                    "Indicates that the node is a Container instance.";
                }
              }
              description
                "Specifies the type of the node.";
            }
            leaf allocatable-bandwidth {
              type uint64;
              units "bps";
              description
                "The maximum allocatable bandwidth for the
                 node's virtualized interface.";
            }
            leaf allocated-bandwidth {
              type uint64;
              units "bps";
              description
                "The allocated bandwidth for the node's
                 virtualized interface.";
            }
            leaf bandwidth-usage {
              type uint64;
              units "bps";
              description
                "The current bandwidth usage on the node's
                 virtualized interface.";
            }
            leaf priority {
              type uint8;
              description
                "Priority level of the node or its traffic,
                 with lower values indicating higher priority.";
            }
            leaf latency {
              type uint64;
              units "ms";
              description
                "Average one-way latency experienced by the
                 node.";
```

```
          }
          leaf packet-loss-rate {
            type uint64;
            units "%";
            description
              "The average packet loss rate observed on the
               node's virtualized interface.";
          }
          leaf ingress-bytes {
            type uint64;
            units "bytes";
            description
              "Total number of bytes received by the node.";
          }
          leaf egress-bytes {
            type uint64;
            units "bytes";
            description
              "Total number of bytes transmitted from the
               node.";
          }
          list policy {
            key "policy-id";
            description
              "The service deployed on the node and its
               related policy.";
            leaf policy-id {
              type string;
              description
                "Identifier for the policy of the service
                 deployed on the node.";
            }
            leaf service-id {
              type string;
              description
                "Identifier for the service deployed on the
                 node.";
            }
          }
        }
      }
    }
  }
  <CODE ENDS>
```

5. IANA Considerations

This document registers a URI in the IETF XML registry [RFC3688]. Following the format in [RFC3688], the following registration is requested to be made:

URI: urn:ietf:params:xml:ns:yang:ietf-vni-mng
Registrant Contact: The XXX WG of the IETF.
XML: N/A, the requested URI is an XML namespace.

This document registers a YANG module in the YANG Module Names registry [RFC6020].

Name: ietf-vni-mng
Namespace: urn:ietf:params:xml:ns:yang:ietf-vni-mng
Prefix: vni-mng
Reference: RFC XXXX

6. Security Considerations

TBD.

7. Acknowledgments

The authors wish to thank xxx for their helpful comments.

8. References

8.1. Normative References

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[RFC8342] Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "Network Management Datastore Architecture (NMDA)", RFC 8342, DOI 10.17487/RFC8342, March 2018, <https://www.rfc-editor.org/info/rfc8342>.

8.2. Informative References

[RFC8340] Bjorklund, M. and L. Berger, Ed., "YANG Tree Diagrams", BCP 215, RFC 8340, DOI 10.17487/RFC8340, March 2018, <https://www.rfc-editor.org/info/rfc8340>.

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