TEAS Working Group
Internet Draft
Intended Status: Standard Track
Expires: July 9, 2019

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January 9, 2019

YANG models for ACTN TE Performance Monitoring Telemetry and Network Autonomics

draft-lee-teas-actn-pm-telemetry-autonomics-09

Status of this Memo

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Abstract

Abstraction and Control of TE Networks (ACTN) refers to the set of virtual network operations needed to operate, control and manage large-scale multi-domain, multi-layer and multi-vendor TE networks, so as to facilitate network programmability, automation, efficient resource sharing.

This document provides YANG data models that describe Key Performance Indicator (KPI) telemetry and network autonomics for TE-tunnels and ACTN VNs.

Table of Contents

1. Introduction

Abstraction and Control of TE Networks (ACTN) describes a method for operating a Traffic Engineered (TE) network (such as an MPLS-TE network or a layer 1/0 transport network) to provide connectivity and virtual network services for customers of the TE network [RFC8453]. The services provided can be optimized to meet the requirements (such as traffic patterns, quality, and reliability) of the applications hosted by the customers. Data models are a representation of objects that can be configured or monitored within a system. Within the IETF, YANG [RFC6020] is the language of choice for documenting data models, and YANG models have been produced to allow configuration or modeling of a variety of network devices, protocol instances, and network services. YANG data models have been classified in [RFC8199] and [RFC8309].

[ACTN-VN] describes how customers or end to end orchestrators can request and/or instantiate a generic virtual network service. [ACTN-Applicability] describes a connection between IETF YANG model classifications to ACTN interfaces. In particular, it describes the customer service model can be mapped into the CMI (CNC-MDSC Interface) of the ACTN architecture.

The YANG model on the ACTN CMI is known as customer service model in [RFC8309]. [PCEP-Service-Aware] describes key network performance data to be considered for end-to-end path computation in TE networks. Key performance indicator is a term that describes critical performance data that may affect VN/TE service.

This document provides TE KPI Telemetry Model which provides the TE-Tunnel level of performance monitoring model and the scaling mechanisms. It also provides ACTN VN TE KPI Telemetry Model which provides the VN level of the aggregated performance monitoring model and the scaling mechanisms.

1.1. Terminology

Refer to [RFC8453], [RFC7926], and [RFC8309] for the key terms used in this document.

1.2. Tree diagram

A simplified graphical representation of the data model is used in Section 5 of this this document. The meaning of the symbols in these diagrams is defined in [RFC8340].

1.3. Prefixes in Data Node Names

In this document, names of data nodes and other data model objects are prefixed using the standard prefix associated with the corresponding YANG imported modules, as shown in Table 1.

Prefix	YANG module	Reference
rt	ietf-routing-types	[RFC8294]
te	ietf-te	[TE-tunnel]
te-types	ietf-te-types	[TE-Types]
te-kpi	ietf-te-kpi-telemetry	[This I-D]
vn	ietf-vn	[ACTN-VN]
actn-tel	ietf-actn-te-kpi-telemetry	{This I-D]

Table 1: Prefixes and corresponding YANG modules

2. Use-Cases

[ACTN-PERF] describes use-cases relevant to this draft. It introduces the dynamic creation, modification and optimization of services based on the performance monitoring in the Abstraction and Control of Transport Networks (ACTN) architecture. Figure 1 shows a high-level workflows for dynamic service control based on traffic monitoring.

Some of the key points from [ACTN-PERF] are as follows:

. Network traffic monitoring is important to facilitate automatic discovery of the imbalance of network traffic, and initiate the network optimization, thus helping the network operator or the virtual network service provider to use the network more efficiently and save CAPEX/OPEX.
. Customer services have various SLA requirements, such as service availability, latency, latency jitter, packet loss rate, BER, etc. The transport network can satisfy service availability and BER requirements by providing different

protection and restoration mechanisms. However, for other performance parameters, there are no such mechanisms. In order to provide high quality services according to customer SLA, one possible solution is to measure the service SLA related performance parameters, and dynamically provision and optimize services based on the performance monitoring results.

. Performance monitoring in a large scale network could generate a huge amount of performance information. Therefore, the appropriate way to deliver the information in CMI and MPI interfaces should be carefully considered.

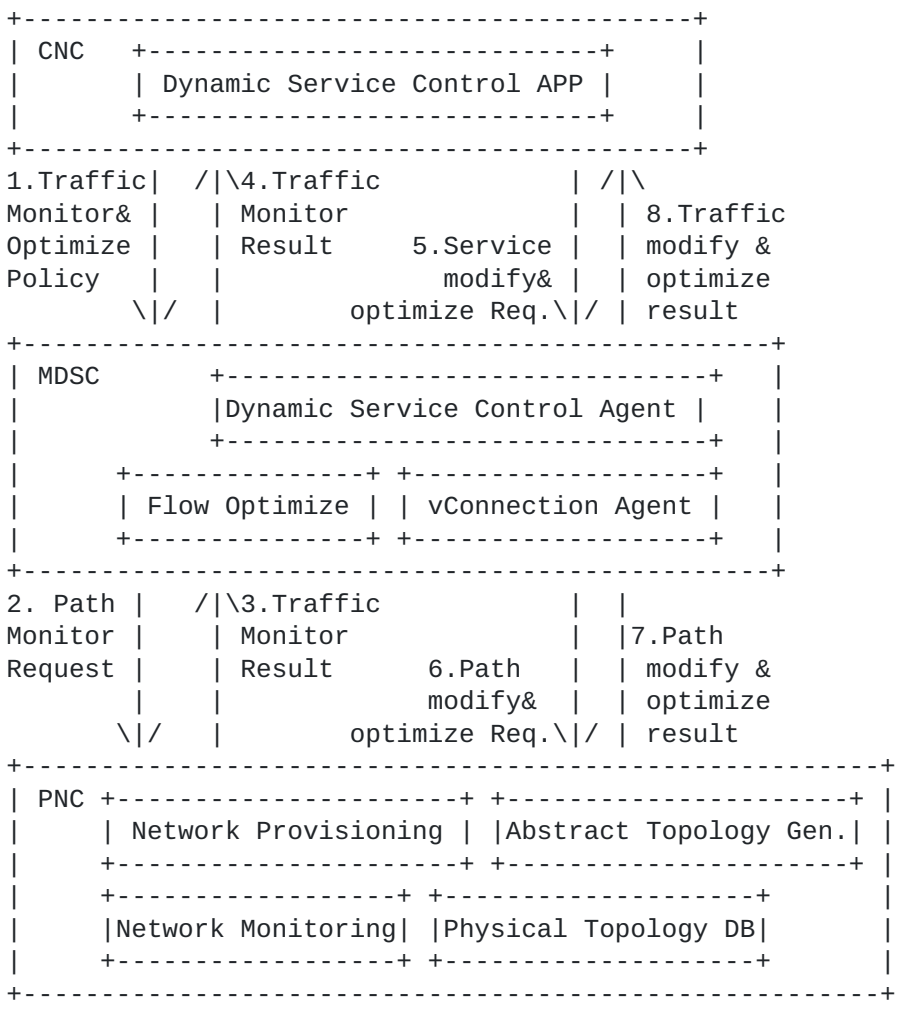


Figure 1 Workflows for dynamic service control based on traffic monitoring

3. Design of the Data Models

The YANG models developed in this document describe two models:

(i) TE KPI Telemetry Model which provides the TE-Tunnel level of performance monitoring mechanism (See Section 3.1 & 7.1 for details).

(ii) ACTN TE KPI Telemetry Model which provides the VN level of the aggregated performance monitoring mechanism (See Section 3.2 & 7.2 for details).

The models include -

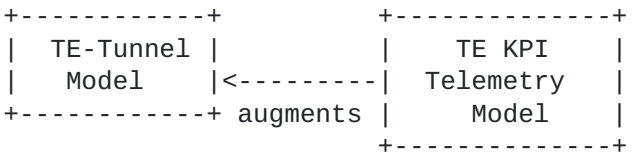
(i) Performance Telemetry details as measured during the last interval, e.g., delay.

(ii) Scaling Intent based on with TE/VN could be scaled in/out (See Section 4 for an illustration).

3.1. TE KPI Telemetry Model

This module describes performance telemetry for TE-tunnel model. The telemetry data is augmented to tunnel state. This module also allows autonomic traffic engineering scaling intent configuration mechanism on the TE-tunnel level. Various conditions can be set for auto-scaling based on the telemetry data (See Section 5 for details)

The TE KPI Telemetry Model augments the TE-Tunnel Model to enhance TE performance monitoring capability. This monitoring capability will facilitate proactive re-optimization and reconfiguration of TEs based on the performance monitoring data collected via the TE KPI Telemetry YANG model.

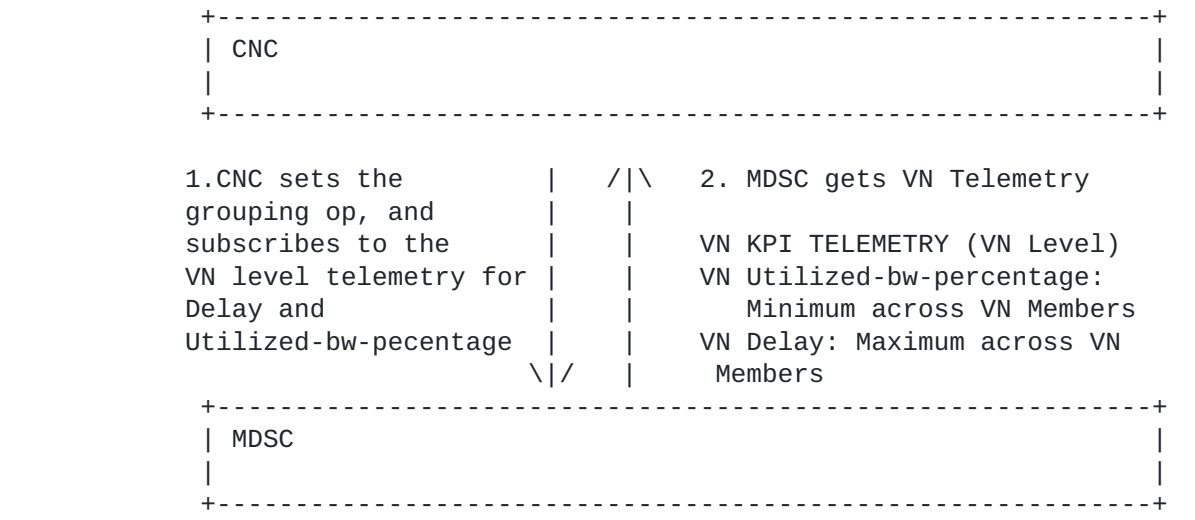


3.2. ACTN TE KPI Telemetry Model

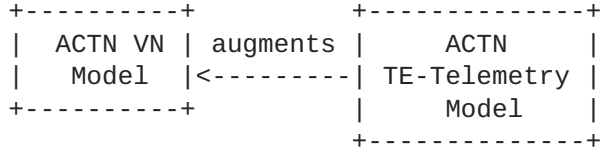
This module describes performance telemetry for ACTN VN model. The telemetry data is augmented both at the VN Level as well as individual VN member level. This module also allows autonomic traffic engineering scaling intent configuration mechanism on the VN level. Scale in/out criteria might be used for network autonomics in

order the controller to react to a certain set of variations in monitored parameters (See Section 4 for illustrations).

Moreover, this module also provides mechanism to define aggregated telemetry parameters as a grouping of underlying VN level telemetry parameters. Grouping operation (such as maximum, mean) could be set at the time of configuration. For example, if maximum grouping operation is used for delay at the VN level, the VN telemetry data is reported as the maximum {delay_vn_member_1, delay_vn_member_2,.. delay_vn_member_N}. Thus, this telemetry abstraction mechanism allows the grouping of a certain common set of telemetry values under a grouping operation. This can be done at the VN-member level to suggest how the E2E telemetry be inferred from the per domain tunnel created and monitored by PNCs. One proposed example is the following:



The ACTN VN TE-Telemetry Model augments the basic ACTN VN model to enhance VN monitoring capability. This monitoring capability will facilitate proactive re-optimization and reconfiguration of VNs based on the performance monitoring data collected via the ACTN VN Telemetry YANG model.



4. Scaling Intent Illustration

The following tree is a part of ietf-te-kpi-telemetry tree whose model is presented in full detail in Sections 6 & 7.

```
module: ietf-te-kpi-telemetry
  augment /te:te/te:tunnels/te:tunnel:
    +-rw te-scaling-intent
    |  +-rw scale-in-intent
    |  |  +-rw threshold-time?            uint32
    |  |  +-rw cooldown-time?             uint32
    |  |  +-rw scale-in-operation-type?   scaling-criteria-operation
    |  |  +-rw scaling-condition* [performance-type]
    |  |     +-rw performance-type           identityref
    |  |     +-rw threshold-value?           string
    |  |     +-rw te-telemetry-tunnel-ref?   -> /te:te/tunnels/tunnel/name
    |  +-rw scale-out-intent
    |     +-rw threshold-time?            uint32
    |     +-rw cooldown-time?             uint32
    |     +-rw scale-out-operation-type?   scaling-criteria-operation
    |     +-rw scaling-condition* [performance-type]
    |        +-rw performance-type           identityref
    |        +-rw threshold-value?           string
    |        +-rw te-telemetry-tunnel-ref?   -> /te:te/tunnels/tunnel/name
```

Scaling intent configuration mechanism allows the client to configure automatic scale-in and scale-out mechanisms on both the TE-tunnel and the VN level. Various conditions can be set for auto-scaling based on the PM telemetry data.

For example, if the client were to set scale-out-intent (as the above tree), it can specify the threshold-time and cooldown-time to which the scaling intent would apply. Threshold time refers to the duration for which the criteria must hold true. Cooldown time refers to the duration after a scaling action has been triggered, for which there will be no further operation.

Performance type can be any type as defined in performance-type (e.g., one-way-delay, one-way-delay-min, one-way-delay-max, two-way-delay, two-way-delay-min, two-way-delay-max, utilized bandwidth, etc.). Scaling condition can be set with one or more performance types. When multiple performance types are set, then scaling-operation-type (AND or OR) is applied to these selected performance types and its threshold values.

Let say the client wants to set the scaling out operation based on two performance-types (e.g., two-way-delay and utilized-bandwidth for a te-tunnel), it can be done as follows:

- Two-way-delay threshold: 300 mileseconds
- Utilized bandwidth: 300 megabytes

By setting AND for the scale-out-operation-type, the two criteria have to meet at the same time to trigger scale-out operation.

5. Notification

This model does not define specific notifications. To enable notifications, the mechanism defined in [I-D.ietf-netconf-yang-push] and [I-D.ietf-netconf-rfc5277bis] can be used. This mechanism currently allows the user to:

- Subscribe notifications on a per client basis.
- Specify subtree filters or xpath filters so that only interested contents will be sent.
- Specify either periodic or on-demand notifications.

5.1. YANG Push Subscription Examples

Below example shows the way for a client to subscribe for the telemetry information for a particular tunnel (Tunnel1). The telemetry parameter that the client is interested in is one-way-delay.

```
<netconf:rpc netconf:message-id="101"
    xmlns:netconf="urn:ietf:params:xml:ns:netconf:base:1.0">
    <establish-subscription
       xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-push:1.0">
       <filter netconf:type="subtree">
          <te xmlns="urn:ietf:params:xml:ns:yang:ietf-te">
             <tunnels>
                <tunnel>
                  <name>Tunnel1</name>
                  <identifier/>
                  <state>
                    <te-telemetry xmlns="urn:ietf:params:xml:ns:yang:ietf-
te-kpi-
   telemetry">
                         <one-way-delay/>
```

```
                        </te-telemetry>
                      </state>
                     </tunnel>
                  </tunnels>
               </te>
            </filter>
            <period>500</period>
            <encoding>encode-xml</encoding>
         </establish-subscription>
    </netconf:rpc>
```

This example shows the way for a client to subscribe for the telemetry information for all VNs. The telemetry parameter that the client is interested in is one-way-delay and one-way-utilized-bandwidth.

```
   <netconf:rpc netconf:message-id="101"
       xmlns:netconf="urn:ietf:params:xml:ns:netconf:base:1.0">
       <establish-subscription
          xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-push:1.0">
          <filter netconf:type="subtree">
             <actn-state xmlns="urn:ietf:params:xml:ns:yang:ietf-vn">
                <vn>
                   <vn-list>
                     <vn-id/>
                     <vn-name/>
                     <vn-telemetry  xmlns="urn:ietf:params:xml:ns:yang:ietf-
actn-te-kpi-
   telemetry">
                         <one-way-delay/>
                         <one-way-utilized-bandwidth/>
                     </vn-telemetry >
                   </vn-list>
                 </vn>
             </actn-state>
          </filter>
          <period>500</period>
       </establish-subscription>
    </netconf:rpc>
```

6. YANG Data Tree

```
module: ietf-te-kpi-telemetry
  augment /te:te/te:tunnels/te:tunnel:
    +-rw te-scaling-intent
    |  +-rw scale-in-intent
    |  |  +-rw threshold-time?           uint32
    |  |  +-rw cooldown-time?            uint32
    |  |  +-rw scale-in-operation-type?   scaling-criteria-operation
    |  |  +-rw scaling-condition* [performance-type]
    |  |     +-rw performance-type          identityref
    |  |     +-rw threshold-value?          string
```

```
    |  |     +-rw te-telemetry-tunnel-ref?   -> /te:te/tunnels/tunnel/name
```

```
    |  +-rw scale-out-intent
    |     +-rw threshold-time?             uint32
    |     +-rw cooldown-time?              uint32
    |     +-rw scale-out-operation-type?   scaling-criteria-operation
    |     +-rw scaling-condition* [performance-type]
    |        +-rw performance-type           identityref
    |        +-rw threshold-value?           string
    |        +-rw te-telemetry-tunnel-ref?   -> /te:te/tunnels/tunnel/name
    +-ro te-telemetry
       +-ro id?                            string
       +-ro performance-metric-one-way
       |  +-ro one-way-delay?                uint32
       |  +-ro one-way-min-delay?            uint32
       |  +-ro one-way-max-delay?            uint32
       |  +-ro one-way-delay-variation?      uint32
       |  +-ro one-way-residual-bandwidth?   rt-types:bandwidth-ieee-float32
       |  +-ro one-way-available-bandwidth?  rt-types:bandwidth-ieee-float32
       |  +-ro one-way-utilized-bandwidth?   rt-types:bandwidth-ieee-float32
       +-ro performance-metric-two-way
       |  +-ro two-way-delay?             uint32
       |  +-ro two-way-min-delay?         uint32
       |  +-ro two-way-max-delay?         uint32
       |  +-ro two-way-delay-variation?   uint32
       +-ro te-ref?                       -> /te:te/tunnels/tunnel/name



module: ietf-actn-te-kpi-telemetry
  augment /vn:actn/vn:vn/vn:vn-list:
    +-rw vn-scaling-intent
    |  +-rw scale-in-intent
    |  |  +-rw threshold-time?            uint32
    |  |  +-rw cooldown-time?             uint32
    |  |  +-rw scale-in-operation-type?   scaling-criteria-operation
    |  |  +-rw scaling-condition* [performance-type]
    |  |     +-rw performance-type           identityref
    |  |     +-rw threshold-value?           string
    |  |     +-rw te-telemetry-tunnel-ref?   -> /te:te/tunnels/tunnel/name
    |  +-rw scale-out-intent
    |     +-rw threshold-time?             uint32
    |     +-rw cooldown-time?              uint32
    |     +-rw scale-out-operation-type?   scaling-criteria-operation
    |     +-rw scaling-condition* [performance-type]
    |        +-rw performance-type           identityref
    |        +-rw threshold-value?           string
    |        +-rw te-telemetry-tunnel-ref?   -> /te:te/tunnels/tunnel/name
    +-ro vn-telemetry
       +-ro performance-metric-one-way
       |  +-ro one-way-delay?                uint32
       |  +-ro one-way-min-delay?            uint32
       |  +-ro one-way-max-delay?            uint32
       |  +-ro one-way-delay-variation?      uint32
```

```
       |  +-ro one-way-residual-bandwidth?    rt-types:bandwidth-ieee-float32
       |  +-ro one-way-available-bandwidth?   rt-types:bandwidth-ieee-float32
```

```
       |  +-ro one-way-utilized-bandwidth?    rt-types:bandwidth-ieee-float32
       +-ro performance-metric-two-way
       |  +-ro two-way-delay?             uint32
       |  +-ro two-way-min-delay?         uint32
       |  +-ro two-way-max-delay?         uint32
       |  +-ro two-way-delay-variation?   uint32
       +-ro grouping-operation?           grouping-operation
  augment /vn:actn/vn:vn/vn:vn-list/vn:vn-member-list:
    +-ro vn-member-telemetry
       +-ro performance-metric-one-way
       |  +-ro one-way-delay?                uint32
       |  +-ro one-way-min-delay?            uint32
       |  +-ro one-way-max-delay?            uint32
       |  +-ro one-way-delay-variation?      uint32
       |  +-ro one-way-residual-bandwidth?   rt-types:bandwidth-ieee-float32
       |  +-ro one-way-available-bandwidth?  rt-types:bandwidth-ieee-float32
       |  +-ro one-way-utilized-bandwidth?   rt-types:bandwidth-ieee-float32
       +-ro performance-metric-two-way
       |  +-ro two-way-delay?             uint32
       |  +-ro two-way-min-delay?         uint32
       |  +-ro two-way-max-delay?         uint32
       |  +-ro two-way-delay-variation?   uint32
       +-ro te-grouped-params*            -> /te:te/tunnels/tunnel/te-kpi:te-
telemetry/id
       +-ro grouping-operation?           grouping-operation
```

7. Yang Data Model

7.1. ietf-te-kpi-telemetry model

The YANG code is as follows:

<CODE BEGINS> file "ietf-te-kpi-telemetry@2019-01-09.yang"

```
module ietf-te-kpi-telemetry {
  namespace "urn:ietf:params:xml:ns:yang:ietf-te-kpi-telemetry";
  prefix te-tel;

  import ietf-te {
    prefix te;
  }
  import ietf-te-types {
    prefix te-types;
  }
  import ietf-routing-types {
    prefix rt-types;
  }
```

```
  organization
    "IETF Traffic Engineering Architecture and Signaling (TEAS)
     Working Group";
  contact
    "Editor: Young Lee <leeyoung@huawei.com>
     Editor: Dhruv Dhody <dhruv.ietf@gmail.com>
     Editor: Ricard Vilalta <ricard.vilalta@cttc.es>
     Editor: Satish Karunanithi <satish.karunanithi@gmail.com>";
  description
    "This module describes telemetry for teas tunnel model";

  revision 2019-01-09 {
    description
      "Initial revision. This YANG file defines
       the reusable base types for TE telemetry.";
    reference "Derived from earlier versions of base YANG files";
  }

  identity telemetry-param-type {
    description
      "Base identity for telemetry param types";
  }

  identity one-way-delay {
    base telemetry-param-type;
    description
      "To specify average Delay in one (forward)
       direction";
  }

  identity two-way-delay {
    base telemetry-param-type;
    description
      "To specify average Delay in both (forward and reverse)
       directions";
  }

  identity one-way-delay-variation {
    base telemetry-param-type;
    description
      "To specify average Delay Variation in one (forward) direction";
  }

  identity two-way-delay-variation {
    base telemetry-param-type;
    description
      "To specify average Delay Variation in both (forward and reverse)
```

```
       directions";
  }

  identity utilized-bandwidth {
    base telemetry-param-type;
    description
      "To specify utilized bandwidth over the specified source
       and destination.";
  }

  identity utilized-percentage {
    base telemetry-param-type;
    description
      "To specify utilization percentage of the entity
       (e.g., tunnel, link, etc.)";
  }

  typedef scaling-criteria-operation {
    type enumeration {
      enum AND {
        description
          "AND operation";
      }
      enum OR {
        description
          "OR operation";
      }
    }
    description
      "Operations to analize list of scaling criterias";
  }

  grouping scaling-duration {
    description
      "Base scaling criteria durations";
    leaf threshold-time {
      type uint32;
      units "seconds";
      description
        "The duration for which the criteria must hold true";
    }
    leaf cooldown-time {
      type uint32;
      units "seconds";
      description
        "The duration after a scaling-in/scaling-out action has been
         triggered, for which there will be no further operation";
```

```
    }
  }

  grouping scaling-criteria {
    description
      "Grouping for scaling criteria";
    leaf performance-type {
      type identityref {
        base telemetry-param-type;
      }
      description
        "Reference to the tunnel level telemetry type";
    }
    leaf threshold-value {
      type string;
      description
        "Scaling threshold for the telemetry parameter type";
    }
    leaf te-telemetry-tunnel-ref {
      type leafref {
        path "/te:te/te:tunnels/te:tunnel/te:name";
      }
      description
        "Reference to tunnel";
    }
  }

  grouping scaling-in-intent {
    description
      "Basic scaling in intent";
    uses scaling-duration;
    leaf scale-in-operation-type {
      type scaling-criteria-operation;
      default "AND";
      description
        "Operation to be applied to check between
         scaling criterias to check if the scale in
         threshold condition has been met.
         Defaults to AND";
    }
    list scaling-condition {
      key "performance-type";
      description
        "Scaling conditions";
      uses scaling-criteria;
    }
  }
```

```
  grouping scaling-out-intent {
    description
      "Basic scaling out intent";
    uses scaling-duration;
    leaf scale-out-operation-type {
      type scaling-criteria-operation;
      default "OR";
      description
        "Operation to be applied to check between
         scaling criterias to check if the scale out
         threshold condition has been met.
         Defauls to OR";
    }
    list scaling-condition {
      key "performance-type";
      description
        "Scaling conditions";
      uses scaling-criteria;
    }
  }

  augment "/te:te/te:tunnels/te:tunnel" {
    description
      "Augmentation parameters for config scaling-criteria
       TE tunnel topologies. Scale in/out criteria might be used
       for network autonomics in order the controller
       to react to a certain set of monitored params.";
    container te-scaling-intent {
      description
        "scaling intent";
      container scale-in-intent {
        description
          "scale-in";
        uses scaling-in-intent;
      }
      container scale-out-intent {
        description
          "scale-out";
        uses scaling-out-intent;
      }
    }
    container te-telemetry {
      config false;
      description
        "telemetry params";
      leaf id {
```

```
        type string;
        description
          "Id of telemetry param";
      }
      uses te-types:performance-metric-container;
      leaf te-ref {
        type leafref {
          path "/te:te/te:tunnels/te:tunnel/te:name";
        }
        description
          "Reference to measured te tunnel";
      }
    }
  }
}

<CODE ENDS>
```

7.2. ietf-actn-te-kpi-telemetry model

The YANG code is as follows:

```
<CODE BEGINS> file "ietf-actn-te-kpi-telemetry@2019-01-09.yang"

module ietf-actn-te-kpi-telemetry {
  namespace "urn:ietf:params:xml:ns:yang:ietf-actn-te-kpi-telemetry";
  prefix actn-tel;

  import ietf-vn {
    prefix vn;
  }
  import ietf-te {
    prefix te;
  }
  import ietf-te-types {
    prefix te-types;
  }
  import ietf-te-kpi-telemetry {
    prefix te-kpi;
  }

  organization
    "IETF Traffic Engineering Architecture and Signaling (TEAS)
     Working Group";
```

```
  contact
    "Editor: Young Lee <leeyoung@huawei.com>
     Editor: Dhruv Dhody <dhruv.ietf@gmail.com>
     Editor: Ricard Vilalta <ricard.vilalta@cttc.es>
     Editor: Satish Karunanithi <satish.karunanithi@gmail.com>";
  description
    "This module describes telemetry for actn vn model";

  revision 2019-01-09 {
    description
      "Initial revision. This YANG file defines
       the ACTN VN telemetry.";
    reference "Derived from earlier versions of base YANG files";
  }

  typedef grouping-operation {
    type enumeration {
      enum MINIMUM {
        description
          "Select the minimum param";
      }
      enum MAXIMUM {
        description
          "Select the maximum param";
      }
      enum MEAN {
        description
          "Select the MEAN of the params";
      }
      enum STD_DEV {
        description
          "Select the standard deviation of the
           monitored params";
      }
      enum AND {
        description
          "Select the AND of the params";
      }
      enum OR {
        description
          "Select the OR of the params";
      }
    }
    description
      "Operations to analize list of monitored params";
  }
```

```
  grouping vn-telemetry-param {
    description
      "augment of te-kpi:telemetry-param for VN specific params";
    leaf-list te-grouped-params {
      type leafref {
        path "/te:te/te:tunnels/te:tunnel/te-kpi:te-telemetry/te-kpi:id";
      }
      description
        "Allows the definition of a vn-telemetry param
         as a grouping of underlying TE params";
    }
    leaf grouping-operation {
      type grouping-operation;
      description
        "describes the operation to apply to
         te-grouped-params";
    }
  }

  augment "/vn:actn/vn:vn/vn:vn-list" {
    description
      "Augmentation parameters for state TE VN topologies.";
    container vn-scaling-intent {
      description
        "scaling intent";
      container scale-in-intent {
        description
          "VN scale-in";
        uses te-kpi:scaling-in-intent;
      }
      container scale-out-intent {
        description
          "VN scale-out";
        uses te-kpi:scaling-out-intent;
      }
    }
    container vn-telemetry {
      config false;
      description
        "VN telemetry params";
      uses te-types:performance-metric-container;
      leaf grouping-operation {
        type grouping-operation;
        description
          "describes the operation to apply to the VN-members";
      }
    }
```

```
  }
  augment "/vn:actn/vn:vn/vn:vn-list/vn:vn-member-list" {
    description
      "Augmentation parameters for state TE vn member topologies.";
    container vn-member-telemetry {
      config false;
      description
        "VN member telemetry params";
      uses te-types:performance-metric-container;
      uses vn-telemetry-param;
    }
  }
}

<CODE ENDS>
```

8. Security Considerations

The configuration, state, and action data defined in this document are designed to be accessed via a management protocol with a secure transport layer, such as NETCONF [RFC6241]. The NETCONF access control model [RFC6536] provides the means to restrict access for particular NETCONF users to a preconfigured subset of all available NETCONF protocol operations and content.

A number of configuration data nodes defined in this document are writable/deletable (i.e., "config true") These data nodes may be considered sensitive or vulnerable in some network environments.

9. IANA Considerations

This document registers the following namespace URIs in the IETF XML registry [RFC3688]:

```
---------------------------------------------------------------------
URI: urn:ietf:params:xml:ns:yang:ietf-te-kpi-telemetry
Registrant Contact: The IESG.
XML: N/A, the requested URI is an XML namespace.
---------------------------------------------------------------------

---------------------------------------------------------------------
URI: urn:ietf:params:xml:ns:yang:ietf-actn-te-kpi-telemetry
Registrant Contact: The IESG.
```

XML: N/A, the requested URI is an XML namespace.

This document registers the following YANG modules in the YANG Module.

Names registry [RFC7950]:

---
name: ietf-te-kpi-telemetry
namespace: urn:ietf:params:xml:ns:yang:ietf-te-kpi-telemetry
reference: RFC XXXX (TDB)

---
name: ietf-actn-te-kpi-telemetry
namespace: urn:ietf:params:xml:ns:yang:ietf-actn-te-kpi-telemetry
reference: RFC XXXX (TDB)
---

10. Acknowledgements

We thank Rakesh Gandhi, Tarek Saad and Igor Bryskin for useful discussions and their suggestions for this work.

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