YANG models for ACTN TE
Performance Monitoring Telemetry
and Network Autonomics

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Overview

• YANG data models that support
  • Performance Monitoring (PN) Telemetry for Tunnel and VN level
  • Network autonomies for Scaling Intent (for TE-tunnels and ACTN VNs.)
  • ACTN CMI Model – Customer-Driven Model

• [ACTN-Requirements] provides the operator’s requirements for VNS Performance Monitoring (Req. #7):

  *The customer MUST be able to define performance monitoring parameters and its associated policy such as frequency of report, abstraction/aggregation level of performance data (e.g., VN level, tunnel level, etc.) with dynamic feedback loop from the network.*

• Use-case: [I-D.xu-actn-perf-dynamic-service-control-03]
  • Performance Monitoring
  • Dynamic control in ACTN – creation, modification, optimization etc.
  • Monitor Network Traffic, Detects traffic imbalance, Initiate optimization!
  • Measure customer SLA, take dynamic action to make sure you meet them at all times
  • Scalability of Performance data
Updates for this version (03)

• A new PM data added
  • Utilized Percentage to indicate Tunnel/VN level bandwidth-utilization-percentage.

• NMDA Compliancy Status
  • ietf-te-kpi-telemetry
  • ietf-actn-te-kpi-telemetry
Interactions

1. CNC configures the grouping-operation
2. CNC subscribes to the VN or Tunnel (VN member level) telemetry for delay and bandwidth utilization Percentage streaming data
3. MDSC interacts with PNCs to configure the grouping-operation for delay and bandwidth utilization
4. MDSC collects from PNCs domain-level telemetry for delay and bandwidth utilization streaming data and creates Tunnel and VN level telemetry
5. MDSC is updated with telemetry data and the scaling data on VN or VN member (Tunnel) level data.
Yang Model Relationships

- TE KPI Telemetry model provides the TE tunnel level performance monitoring.
- Augment the TE tunnel State with performance attributes
  - Use the notification subscription (YANG PUSH)
- Scaling Intent configurations for auto scaling in/out based on the performance monitored attributes

Enable auto-scaling by configuring the condition when to scale out or in automatically!

- ACTN TE KPI Telemetry model provides the VN level aggregated performance monitoring.
- Augment the VN state as well as individual VN-member state with performance attributes.
  - Use notification subscription (YANG PUSH)
- Scaling Intent configurations at the VN level to reach to the monitored performance KPI
- Allow configuration of aggregation mechanism from the lower level telemetry details (max, mean etc.)
  - From VN-Member to VN
  - From per-domain tunnel to E2E VN-Member
VN Telemetry Params Grouping

• Problem:
  • How to group telemetry params for VNs?
    • E.g., How to define VN latency, bandwidth,...?

• Proposed solution:
  • Augment vn-list with telemetry-grouping-op:
    • Provide a grouping-operation for each telemetry-param-type
    • Examples:
      • utilized-bandwidth-op = MAXIMUM (default)
      • delay-op = MAXIMUM (default)
Scaling Intent Example

• It allows for grouping operation of various PM data and (re-)act accordingly

• Scale in/down of TE and VN

• Includes:
  • A list of params to monitor (scaling-criteria)
  • Logical operation to be applied to the monitored params
  • Hysteresis timers (threshold-time and cooldown-time)

• Example:
  • (VN two-way-delay > 50ms) AND (VN two-way-packet-loss > 1%) ➔ Triggers VN Scale In
YANG model: ietf-te-kpi-telemetry

module: ietf-te-kpi-telemetry
augment /te:te:tunnels/te:tunnel/
  +--ro te-telemetry
      +--ro id? string
      +--ro one-way-delay? uint32
      +--ro two-way-delay? uint32
      +--ro one-way-delay-min? uint32
      +--ro one-way-delay-max? uint32
      +--ro two-way-delay-min? uint32
      +--ro two-way-delay-max? uint32
      +--ro one-way-delay-variation? uint32
      +--ro two-way-delay-variation? uint32
      +--ro one-way-packet-loss? decimal164
      +--ro two-way-packet-loss? decimal164
      +--ro utilized-bandwidth? rt:bandwidth-ieee-
      +--ro utilized-percentage? decimal164
      +--ro te-ref? ->
/augment /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 scale-out-operation-type? scaling-criteria-
        | operation
        | +--rw scaling-condition* [performance-type]
        |     +--rw performance-type identityref
        |     | +--rw te-telemetry-tunnel-ref? ->
/augment /te:te:tunnels/te:tunnel:
  +--rw scale-out-intent
     +--rw scale-out-operation-type? scaling-criteria-
     | operation
     | +--rw scaling-condition* [performance-type]
     |     +--rw performance-type identityref
     |     | +--rw te-telemetry-tunnel-ref? ->
/augment /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 scale-out-operation-type? scaling-criteria-
        | operation
        | +--rw scaling-condition* [performance-type]
        |     +--rw performance-type identityref
        |     | +--rw te-telemetry-tunnel-ref? ->
module: ietf-actn-te-kpi-telemetry

augment /actn-vn:actn-state/actn-vn:vn/actn-vn:vn-list:
++ro vn-telemetry
  +++ro id?                string
  +++ro one-way-delay?     uint32
  +++ro two-way-delay?     uint32
  +++ro one-way-delay-min? uint32
  +++ro one-way-delay-max? uint32
  +++ro two-way-delay-min? uint32
  +++ro two-way-delay-max? uint32
  +++ro one-way-delay-variation? uint32
  +++ro two-way-delay-variation? uint32
  +++ro one-way-packet-loss? decimal16
  +++ro two-way-packet-loss? decimal16
  +++ro utilized-bandwidth? rt:bandwidth-ieee-float32
  +++ro te-ref?
    ->
  /te:te/tunnels/tunnel/name
  +++ro vn-ref?
    -> /actn-vn:actn/vn/actn-vn:vn-list/actn-vn:vn-member-list
    +++ro vn-member-ref?
      -> /actn-vn:actn/vn/actn-vn:vn-list/actn-vn:vn-member-list
  /list/vn-id
  +++ro vn-member-ref?
    -> /actn-vn:actn/vn/actn-vn:vn-list/actn-vn:vn-member-list
    +++ro vn-member-list
      +++ro vn-member-id
        -> /actn-vn:actn/vn/actn-vn:vn-list/actn-vn:vn-member-list
        +++ro te-grouped-params*
          -> /te:te/tunnels/tunnel/state/te-kpi:te-telemetry/id
        +++ro vn-grouped-params*
          -> /actn-vn:actn-vn-list/actn-vn:vn-member-list/actn-vn:vn-telemetry/id
  /list/vn-id
    +++ro vn-member-list
      +++ro vn-member-id
        -> /actn-vn:actn/vn/actn-vn:vn-list/actn-vn:vn-member-list
        +++ro grouping-operation
          grouping-operation

++rw vn-scaling-intent
  /te:te/tunnels/tunnel/state/te-kpi:te-telemetry/id
  +++ro vn-grouped-params*
    -> /actn-vn:actn-vn-list/actn-vn:vn-member-list/actn-vn:vn-telemetry/id
  /list/vn-id
    +++ro vn-member-list
      +++ro vn-member-id
        -> /actn-vn:actn/vn/actn-vn:vn-list/actn-vn:vn-member-list
        +++ro te-grouped-params*
          -> /te:te/tunnels/tunnel/state/te-kpi:te-telemetry/id
        +++ro vn-grouped-params*
          -> /actn-vn:actn-vn-list/actn-vn:vn-member-list/actn-vn:vn-telemetry/id
  /list/vn-id
    +++ro vn-member-list
      +++ro vn-member-id
        -> /actn-vn:actn/vn/actn-vn:vn-list/actn-vn:vn-member-list
        +++ro grouping-operation
          grouping-operation

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Next Steps

• This draft provides Customer-initiated PM telemetry and Network Automatics on the CMI of ACTN architecture.

• The authors believe this draft has a good base for WG adoption 😊
THANK YOU!