

Data Model for Computing-Aware Traffic Steering (CATS)

draft-yl-cats-data-model-07

Huijuan Yao (China Mobile)

Changwang Lin (New H3C)

Zhenqiang Li (China Mobile)

Presenter : Quan Xiong (ZTE Corporation)

Luis M. Contreras (Telefonica)

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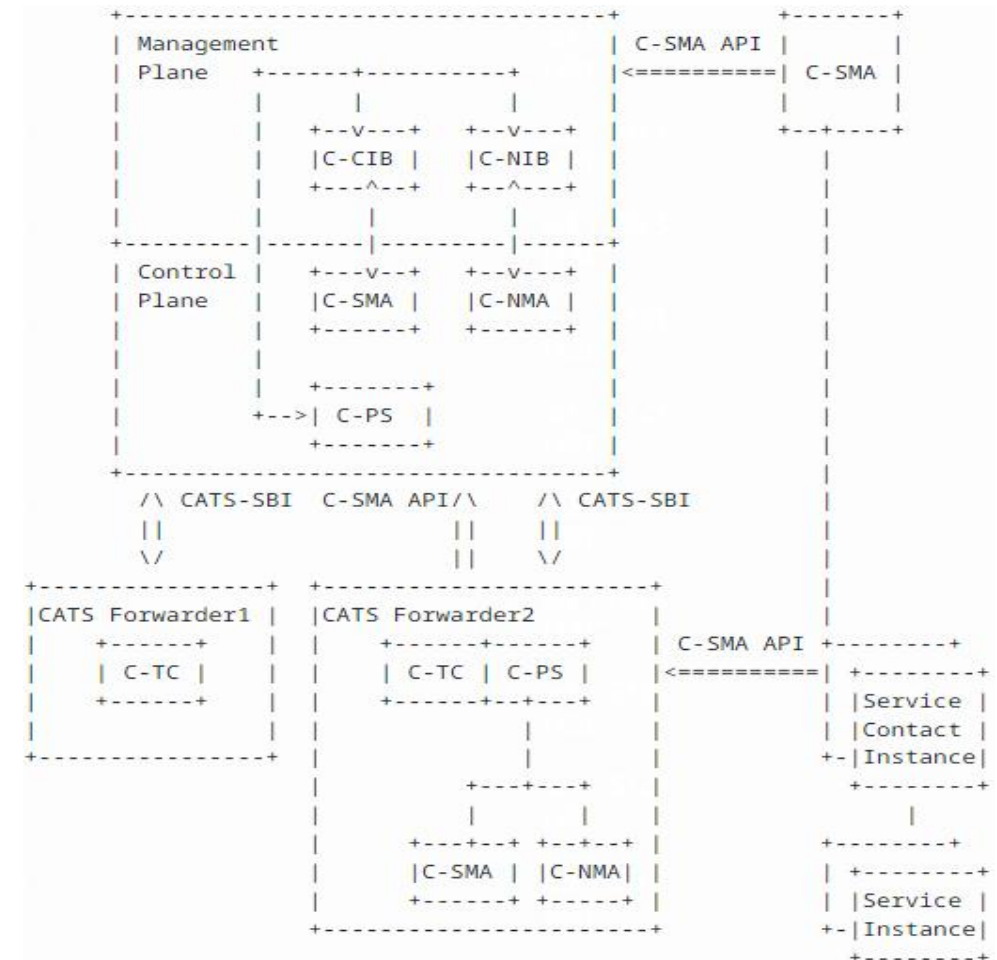
Why CATS need a data model?

- As per [I-D.ietf-cats-framework], the CATS management plane is responsible for monitoring, configuring, and maintaining CATS network devices. The CATS data is required to be maintained in the management plane and configured to the control plane, data plane and C-SMA.
- A YANG data model is required to structure, validate, and automate this data across CATS components.
- As described in [I-D.yxl-cats-protocols-applicability], the CATS data model requires the functionalities such as configuration management, traffic steering policy configuration, service metric management , and event reporting as following shown:
 - provide interfaces for the functionality of the C-PS component, which can be used for communication between the Control Plane and the C-SMA, as well as for the interface between the Control Plane and the CATS-Forwarder.
 - provide interfaces for the functionality of the C-TC component, which can be used for communication between the Control Plane and the CATS-Forwarder.
 - provide interfaces for the C-SMA component, which can be used for communication between the Control Plane and the CATS-Forwarder, as well as for transmitting service metric information from the C-SMA to the Control Plane. It is also used for distributing service metric information from the Control Plane to the CATS-Forwarder.
 - enable the CATS-Forwarder to report events to the Control Plane.

How the data model will be used?

- The data model can be used for CATS information maintaining and communication interfaces among the Management Plane, Control Plane, C-SMA, C-NMA and CATS Forwarders.

- **C-CIB:** CATS Computing Information Base, responsible for maintaining CATS network computing information, provides basic data for C-SMA.
- **C-NIB:** CATS Network Information Base, responsible for maintaining CATS network information, provides basic data for C-NMA.
- **CATS-SBI:** It could be used to report computing metric information from CATS Forwarders to the Control Plane, and also could be used to send path and service policy information or service information from the Control Plane to CATS Forwarders.
- **C-SMA API:** An extended interface between the Control Plane or Management Plane and the C-SMA or between CATS Forwarders and service instance, it is also used to report service metric information to the Control Plane or CATS Forwarders.



Updates from Last Version

- Presented at IETF#123/124/125 and comments at the meeting and on the mailing list are appreciated from :
 - Adrian Farrel, Peng Liu, Bin Zhang, Yimi Zhang, Yidan Zhu
- **Key Updates** from version -04 to -07
 1. Complete structural reorganization for clarity.
 2. YANG data model scope modification and refinement.
 3. Modify the YANG tree syntax to align with RFC 8340.
 4. Revise the YANG Module based on the data model modifications.
 5. Modify terminology and text descriptions.
 6. Supplement the Security Considerations section according to RFC9907.
 7. Supplement the IANA Considerations section.

Update: Data Model Modification and Refinement

- Changes the 'traffic-classifier' container as the 'traffic-classifier' list.
- In the 'traffic-classifier' list, 'protocol' type is changed from uint16 to uint8.
- Adds read-only statistical counters: 'matched-packets' and 'matched-bytes', indicating the statistics of traffic matching the specified service.

CATS Traffic-classifier Tree:

- Can be used for interfaces between the Control Plane and the CATS-Forwarder.
- Can be used to define the features of the service and to classify the traffic.

```

+--rw traffic-classifiers
|   +--rw traffic-classifier* [cs-id]
|       +--rw cs-id                cs-id
|       +--rw description?         string
|       +--rw server-port?         uint16
|       +--rw protocol?            uint8
|       +--ro matched-packets?     yang:zero-based-counter64
|       +--ro matched-bytes?       yang:zero-based-counter64

```

Update: Data Model Modification and Refinement

- In the 'metric' list, 'metric' leaf is renamed to 'metric-value'.
- Adds read-only statistical counters: 'forwarded-packets' and 'forwarded-bytes', indicating the statistics of traffic forwarded by the specified service metric entry..

CATS Service-metric Tree:

- Be used for interfaces between the Control Plane and the CATS Forwarder, as well as for transmitting service metrics information from the C-SMA to the Control Plane.
- Be used for forwarding service metric information from the Control Plane to the CATS Forwarder.
- Be used to control the delivery service metrics on the control plane, thereby generating the forwarding table on the forwarding plane in conjunction with network metrics.

```
+--rw service-metrics
|   +--rw service-metric* [cs-id csci-id source-type]
|       +--rw cs-id                cs-id
|       +--rw csci-id              csci-id
|       +--rw source-type          enumeration
|       +--rw priority?            uint8
|       +--rw affinity?            uint8
|       +--rw location?            inet:ip-address
|       +--rw metrics
|           +--rw metric* [metric-type]
|               +--rw metric-type    enumeration
|               +--rw metric-value?  uint32
+--ro forwarded-packets?            yang:zero-based-counter64
+--ro forwarded-bytes?              yang:zero-based-counter64
```

Update: Data Model Modification and Refinement

- In the 'notify' notification, 'entry-limit-reached' is renamed to 'metric-limit-reached'.

CATS Notify Tree:

- Be utilized for the CATS forwarder to report events to the Control Plane.

```
+---n notify
      +---ro metric-limit-reached?      boolean
      +---ro flow-limit-reached?        boolean
```

- ◆ When the number of CATS (metric or flow) table entries reaches the maximum.
- ◆ When the number of entries goes from maximum to not being maximum,
- ◆ A event notification will be sent indicating the change in the number of CATS table entries reaching the maximum.

Update: YANG Tree Syntax Modification

➤ **Modify the YANG tree syntax to align with Section 2.6 of RFC 8340 .**

```
module: ietf-cats
  augment /rt:routing:
    +--rw cats
      +--rw base
        | +--rw enable?          boolean
        | +--rw update-interval? uint32
        | +--rw metric-limits?   uint32
        | +--rw flow-limits?     uint32
        | +--rw flow-timeout?    uint32
        | +--rw service-policy* [cs-id]
        | | +--rw cs-id          cs-id
        | | +--rw policy-type?   enumeration
        +--rw traffic-classifiers
          | +--rw traffic-classifier* [cs-id]
          | | +--rw cs-id          cs-id
          | | +--rw description?   string
          | | +--rw server-port?   uint16
          | | +--rw protocol?      uint8
          | | +--ro matched-packets? yang:zero-based-counter64
          | | +--ro matched-bytes?  yang:zero-based-counter64
          ...
      ...
    ...
    +--rw service-metrics
      | +--rw service-metric* [cs-id csci-id source-type]
      | | +--rw cs-id          cs-id
      | | +--rw csci-id        csci-id
      | | +--rw source-type     enumeration
      | | +--rw priority?      uint8
      | | +--rw affinity?      uint8
      | | +--rw location?      inet:ip-address
      | | +--rw metrics
      | | | +--rw metric* [metric-type]
      | | | | +--rw metric-type enumeration
      | | | | +--rw metric-value? uint32
      | | +--ro forwarded-packets? yang:zero-based-counter64
      | | +--ro forwarded-bytes?   yang:zero-based-counter64
      +--n notify
        | +--ro metric-limit-reached? boolean
        | +--ro flow-limit-reached?   boolean
```

Next Steps

- **Comments on the mailing list have been resolved and further feedback are appreciated.**
- **Request the CATS WG to adopt this draft.**

Thanks!