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SERIES Q: SWITCHING AND SIGNALLING, AND
ASSOCIATED MEASUREMENTS AND TESTS

Signalling requirements and protocols for the NGN –
Service and session control protocols

Signalling requirements for telemetry of virtual broadband network services

Recommendation ITU-T Q.3406

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Recommendation ITU-T Q.3406

Signalling requirements for telemetry of virtual broadband network services

Summary

Recommendation ITU-T Q.3406 specifies the signalling requirements for telemetry of virtual broadband network services, by architecturally adding the dedicated functional component and the corresponding interfaces in the network functions virtualization (NFV) framework.

History

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Recommendation ITU-T Q.3406

Signalling requirements for telemetry of virtual broadband network services

1 Scope

The scope of this Recommendation consists of:

- Overview for telemetry of virtual broadband network services;
- Interface Ti.x reference model;
- Signalling procedures for interfaces Ti.x;
- Signalling requirements for interfaces Ti.x.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.3321] Recommendation ITU-T Y.3321 (2015), *Requirements and capability framework for NICE implementation making use of software-defined networking technologies*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 service function chain [b-ITU-T Y-Sup.41]: A chain that defines an ordered set of abstract service functions and ordering constraints that must be applied to packets and/or frames and/or flows selected as a result of classification and/or policy.

3.1.2 virtualized network function [ITU-T Y.3321]: A network function whose functional software is decoupled from hardware and runs on virtual machine(s).

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 telemetry server: The centralized server which is responsible for controlling the telemetry services.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ISDOEV	Integrated Service and Device OAM Evaluation Value
OIAF	OAM Information Acquisition Function
OISF	OAM Information Sending Function
SFC	Service Function Chain

SFF	Service Function Forwarder
VNF	Virtualized Network Function

5 Convention

The keywords "**is required to**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

In the body of this document and its appendixes, the words shall, shall not, should, and may sometimes appear, in which case they are to be interpreted, respectively, as is required to, is prohibited from, is recommended, and can optionally. The appearance of such phrases or keywords in an appendix or in material explicitly marked as informative are to be interpreted as having no normative intent.

{A}: indicates that the parameter A is mandatory;

*: indicates that the parameter may be multiple items.

6 Overview

For virtual broadband network services, there are several requirements where an open application model (OAM) in the virtualized environment cannot be met by traditional OAM tools.

1) High data-collection frequency

The conventional OAM technologies such as SNMP, cannot meet the real-time data collection requirement, especially for the virtual resource, due to its low-frequency pull-based mechanism. The telemetry with a push-based mechanism can satisfy the requirement.

2) Real-time probe deployment

The probe's updating and deploying pace should be in resonance with the pace of virtual service resource change. The conventional OAM technologies which are developed off-line by a specific vendor and installed/uninstalled manually take too much time to catch up with the pace of a virtual resource change. By contrast, the telemetry with an open and programmable interface can deploy and activate the probes without the vendors' limitations.

3) Model-based integration

Many applications need to collect data from multiple sources (e.g., from distributed nodes or from different network layers). Too many models and formats of data bring difficulties to consolidate the data from multiple sources. Therefore, it is necessary to define the uniformed data model to integrate all the data from different sources. The traditional OAM technologies have a proprietary data model for limited objects and cannot meet this requirement. The telemetry having the standard model of data can satisfy this requirement.

To conclude, telemetry technologies are playing a very important role in managing virtual broadband network services and are usually implemented in the NFV framework. Therefore, it is needed to specify the NFV based telemetry architecture and the signalling requirements for virtual broadband network services.

7 The interface Ti.x reference model

The interface Ti.x reference model for the telemetry of virtual broadband network services is shown below.

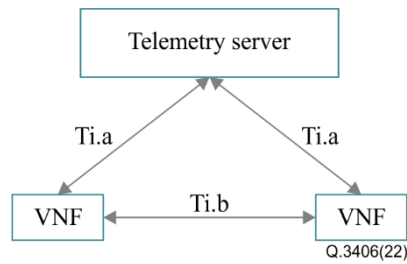


Figure 7-1 – The interface Ti.x reference model for the telemetry of virtual broadband network services

The telemetry server is responsible for data collection and storage.

The telemetry server collects data through an open and programmable interface Ti.a with push-mode.

1) Interface Ti.a

Interface Ti.a is between the telemetry server and the virtualized network function (VNF). It collects OAM data from the VNFs.

2) Interface Ti.b

Interface Ti.b is between different VNFs. It transfers data packets that carry the OAM request information and collected OAM information between VNFs.

The VNFs could reside in the same protocol domain or different domains. Usually, the inter-domain communication occurs in the service function chaining service, since there are a large number of legacy network functions in the network which cannot support the SFC protocol. Correspondingly, the messages exchanged through Ti.b are different based on the locations of the VNF pairs.

- (A) If the VNFs pair is located in the same domain, the interface Ti.b permits the information exchange between different VNFs.
- (B) If the VNFs pair are located in different domains, there must be a network proxy located between the two VNFs (see Figure 7-2).

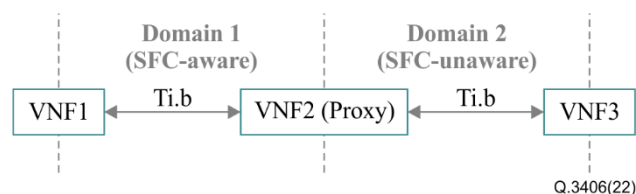


Figure 7-2 – The reference model for Ti.b in the inter-domain scenario

For the interface Ti.b between VNF1 and VNF2 (Proxy) in domain 1, the messages exchanged through it are always encapsulated in dedicated packet headers used in domain 1 (e.g., NSH of SFC).

For the interface Ti.b located in domain 2 between VNF2 (Proxy) and VNF3, the messages exchanged through it are always encapsulated in dedicated packets headers used in domain 2 (e.g., IP network).

From the interface Ti.b's perspective, the header selection for message encapsulation and the related operations are triggered by the signalling initiator within the pair. For example, for the interface Ti.b in domain 1, the header selection and related operation are decided by VNF1 which is the SFC service initiator within the VNF1-VNF2 pair. Equivalently, for the interface Ti.b in domain 2, the header selection and the related operations are decided by proxy which is the IP service initiator within the VNF2-VNF3 pair.

8 Signalling procedures for Ti.x

8.1 Signalling procedure for Ti.a

Figure 8-1 describes the general signalling procedure between the VNF and the telemetry server. The information exchange is based on a push-mode that the VNF actively pushes the OAM information of itself to the telemetry server. When the telemetry server receives the VNF OAM information, it sends an acknowledgement information back to the VNF. Then the VNF checks if the information which the telemetry server received is correct.

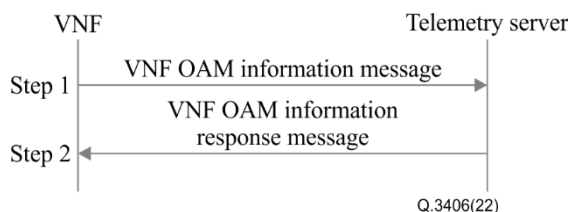


Figure 8-1 – The general telemetry signalling procedure through interface Ti.a

Step 1: The VNF sends a VNF OAM information message to the telemetry server.

Step 2: The telemetry server responds to the VNF to acknowledge that the information is received.

One kind of VNF, the service function chain, is not a dedicated VNF but an ordered set of VNFs. (e.g., CGN, firewall, DPI, etc.). In this situation, the "hybrid way" which is depicted in Figure I.1 is used for pushing SFC's OAM information to the telemetry server.

NOTE – Other than the hybrid way, there are also "centralized way" and "distributed way" to push the OAM information to the telemetry server. Appendix I analyses the advantages and disadvantages of these three ways.

8.2 Signalling procedure for Ti.b in an intra-domain telemetry

To fulfil the telemetry, the signalling procedure of the interface Ti.b between VNF1 and VNF2 is depicted in Figure 8-2. In SFC aware domain, the VNF1 is a service function, the VNF2 could be a service function or an SFC proxy within the SFC aware domain.

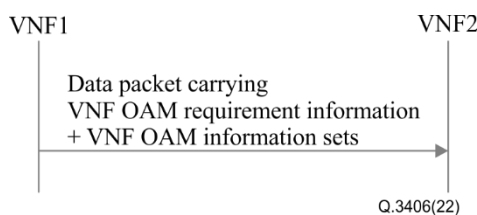


Figure 8-2 – The general telemetry signalling procedure through Ti.b in an SFC aware domain

Figure 8-3 describes the signalling procedure of intra-domain telemetry for an SFC service, which is one of the most complicated service scenarios. The signalling procedures of intra-domain telemetry for other network services are similar or simpler than the SFC scenario and consequently not described in this Recommendation.