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CONTRIBUTION

Source: China Telecom， Ministry of Industry and Information Technology (MIIT) China

Title: Proposal to start a new work item - ITU-T Q.SRv6_im "Requirements and Reference Model for Integrated Monitoring of SRv6 Network"

Purpose: Proposal

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Keywords: SRv6;active method;passive method;integrated monitoring

Abstract: This contribution proposes to launch a new work item for Requirements and Reference Model for Integrated Monitoring of SRv6 Network. The motivation, scope, relationship with other related projects, and the proposed skeleton of Q.SRv6_im has been introduced in this contribution.

1. Standardization motivation

1.1 What is SRv6

Segment Routing(SR), as defined in RFC8402, is one of the technologies based on source routing paradigm. The nodes steer packets through an ordered list of instructions is called "segments". A segment can represent any instruction, topological or service based. Segment routing provides a

mechanism that allows a flow to be restricted to a specific topological path, while maintaining per-flow state only at the ingress node(s) to the SR domain.”

SRv6 refers to Segment Routing instantiated on the IPv6 dataplane [RFC8754],with a new type of routing header.In SRv6,a segment is encoded as an IPv6 address. An ordered list of segments is encoded as an ordered list of IPv6 addresses in the routing header. The active segment is indicated by the Destination Address (DA) of the packet. The next active segment is indicated by a pointer in the new routing header.”

SRv6 replaces conventional network protocols, such as MPLS LDP, RSVP-TE, and GRE, to reduce network protocol types and O&M complexity.It performs automatic traffic optimization to balance network loads and to help build a non-blocking network. Because SRv6 is based on native IPv6, it has inherent advantages in cross-domain interworking,large-scale networking, service cloudification, and cloud network synergy.

1.2 Existed monitoring methods of SRv6

Monitoring Type	Monitoring sub-Type	Tools	Methods	
FM(Fault Management)	CC(Continuity Check)	SRv6 SID ping	Active	Bi-direction: Request-path: SRv6 segment path Echo-path: IP path calculated by default routing protocols
	(CV)Connectivity Verification	SRv6 SID Traceroute		
Performance Management	Delay Measurement Loss Measurement Throughput	TWAMP,Color-based(IPFPM)	Passive	Uni-direction: SRv6 segment path

Table SRv6 monitoring types and related methods

The SRv6 monitoring can be divided into two major types based on functions.One is Fault Management (see table-1), another is Performance Measurement (see table-2).

(1) FM(Fault Management) includes two sub-types:

a. CC(Continuity Check) is used to check the destination address or SID could be arrived or not. The tools includes SRv6 SID ping.

b. CV(Connectivity Verification) is used for path verification and fault allocation.The tools includes SRv6 SID Traceroute.

(2) PM(Performance Measurement) includes three sub-types:

a. DM(Delay Measurement) is used for delay and jitter testing.

b. LM(Loss Measurement) is used for loss rate testing.

c. Throughput is used for test the bandwidth of network interfaces and links.

The tools for PM includes TWAMP and IPFPM.

The SRv6 monitoring methods are classified into two types:

(1) Active Measurement.

It has send and response two phases, and both those two phases are using dedicated OAM packets to collect the path and node information.This type of methods usually used in FM measurements, for example SRv6 SID ping.

(2) Passive Measurement.

The system use data packets in real traffic to carry the path and node information. No extra dedicated OAM packets are needed to measure the path. Because it use packet in data plane,it only has one direction to complete the measurements when data packets arrives at their destinations.

This method is usually used for PM,for example TWAMP and IPFPM.

1.3 The Drawbacks of existed monitoring methods

(1) Active Method

The drawbacks of the active Methods is using dedicated OAM packets.

Firstly,the time to use OAM packets to test the path situation often after the traffic jam has already happened. So, OAM packets have no chance to experience the real traffic congestion and the information it collected apparently cannot reflect the real situation.

Secondly,large quantities of the test packets even worse the traffic.The routers need to deal with extra OAM packets from two directions and consequently reduce the queuing and switching resource for data packets in the CPU.So,it will also cause inaccurate information collected from nodes and paths.

(2)Passive Method

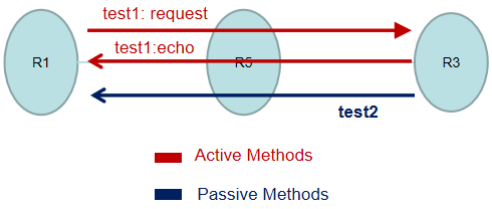
Passive monitoring methods use data packets to collect and carry OAM information of the nodes and path. It not only eliminates the extra dedicated test packets from the root, but can also catch the accurate information of the network in real time. However,this methods often cause too much status information.Especially when there is no congestion in the network, duplicated information will waste the link resources.

(3) Both Methods

Both of these two methods can only test one single path between two SIDs(source and destination). Even the automatic tools are used to make large amount of testing simultaneously, it cannot change its nature of point-to-point. So,to obtain all the nodes and paths information to gain a overall network status, large quantities of tests should be happened.

1.4 Integrated monitoring method is required

Active method and Passive method both have their disadvantages.However,if they could be used integratedly, they can limit the impact on real traffic ,reduce resource waste and more effective.



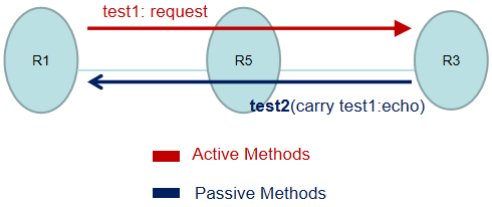
Pic-1 Existed monitoring methods

As shown in Pic-1, color red stands for active monitoring methods and color blue stands for passive methods.

Test1 uses active methods and has two types of packets “request” and “echo”. The direction of test1 is R1-R5-R3, the direction of “echo” is R3-R5-R1.

Test2 uses passive method.The direction of test2 is R3-R5-R1.

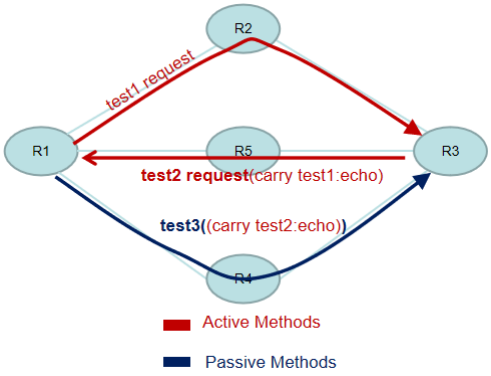
The segment path of “test1:echo” is overlapped with “test2”.



Pic-2 Integrated monitoring method

The integrated monitoring methods uses “test2” packet to carry “test1:echo” packet. Through this way, not only test FM(fault management) and PM(performance management) simultaneously, but also greatly save the CPU and switch resource in large-scale network by omitting “test1:echo” packets.

This method combines the active method and passive method and accordingly called “integrate method”.



Pic-3 Variant Integrated monitoring method

The “test1:echo” message is carried in “test2:request” message, and “test2:echo” message is carried in test3 message. This solution is also an integrated monitoring method and has the effects of save resources.

Consequently, the integrated monitoring method eliminates the drawbacks when they are used separately and it is required for large-scale network fault management and performance measurements.

2. Related works in ITU-T and other SDO

2.1 Related ITU-T works

ITU-T Y.1711 “Operation & Maintenance mechanism for MPLS networks”

ITU-T G.8113.2 “Operations, administration and Maintenance mechanisms for MPLS-TP networks using the tools defined for MPLS”

ITU-T Y.1731 “OAM Functions and Mechanisms for Ethernet-based Networks”

These recommendations are MPLS and EtherNet related.

2.2 Other SDO works

(1) “draft-ietf-6man-spring-srv6-oam-08”

The name of the IETF Working Group draft is “Operations, Administration, and Maintenance (OAM) in Segment Routing Networks with IPv6 Data plane (SRv6)”. This project focus on SRv6 ping and traceroute and totally use active method.

(2)IP ping/traceroute related RFCs

RFC792,RFC1208,RFC1122,RFC 4443,RFC 1470,RFC 2151,RFC 4884,RFC 5837 are IP ping, IP traceroute and ICMP related.They are not focus on SRv6 and all use active method.

(3) BFD related RFCs

RFC 5880~RFC5885 focus on Bidirectional Forwarding Detection. It use active methods and only focus on IP and MPLS.

(4) TWAMP related RFCs

RFC 2330,RFC 4656,RFC 5357,RFC 2678,RFC 2679,RFC 2680,RFC 2681,RFC 4737,RFC 5560 are focus on TWAMP and IPPM. They only use passive way to monitor the paths and nodes.

In conclusion, integrated monitoring method is necessary,but currently there are no related studies in ITU-T and other SDO. So it is essential to study the signaling requirements and methods of integrated monitoring method for SRv6.

3 Proposal

It is proposed to consider the initiation of a new work item, whose tentative title is “Requirements and Reference Model for Integrated Monitoring of SRv6 Network”.

If agreement is reached to launch this new work item, it is proposed that Q13/11 leads its development.

The following text is proposed as the baseline text for this new draft.

ITU-T Recommendations

Requirements and Reference Model for Integrated Monitoring of SRv6 Network

1 Scope

The scope of this Recommendation consists of:

(1) Requirements of monitoring SRv6 network;

(2) Method of Integrated Monitoring of SRv6 Network;

(3) Reference Model for Integrated Monitoring of SRv6 Network;

2 References

3 Definitions

3.1 Terms defined elsewhere

3.2 Terms defined in this Recommendation

4 Abbreviations and acronyms

5 Conventions

6 Introduction of SRv6

Segment Routing(SR), as defined in RFC8402, is one of the technologies based on source routing paradigm. The nodes steer packets through an ordered list of instructions is called "segments". A segment can represent any instruction, topological or service based. Segment routing provides a mechanism that allows a flow to be restricted to a specific topological path, while maintaining per-flow state only at the ingress node(s) to the SR domain.”

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7 Requirements of monitoring SRv6 network

TBD

8 Method of monitoring SRv6 network

8.1 Active method

It has send and response two phases, and both those two phases are using dedicated OAM packets to collect the path and node information.This type of methods usually used in FM measurements, for example SRv6 SID ping.

(1) FM(Fault Management) includes two sub-types:

c. CC(Continuity Check) is used to check the destination address or SID could be arrived or not. The tools includes SRv6 SID ping.

d. CV(Connectivity Verification) is used for path verification and fault allocation.The tools includes SRv6 SID Traceroute.

The drawbacks of the active Methods is using dedicated OAM packets.

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8.2 Passive method

The system use data packets in real traffic to carry the path and node information. No extra dedicated OAM packets are needed to measure the path. Because it use packet in data plane,it only has one direction to complete the measurements when data packets arrives at their destinations.

This method is usually used for PM,for example TWAMP and IPFPM.

(2) PM(Performance Measurement) includes three sub-types:

d. DM(Delay Measurement) is used for delay and jitter testing.

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Performance	Delay Measurement	TWAMP,Color-	Passive	Uni-direction: SRv6

Management	Loss Measurement Throughput	based(IPFPM)		segment path

Table SRv6 monitoring types and related methods

Both of active and passive methods can only test one single path between two SIDs(source and destination). Even the automatic tools are used to make large amount of testing simultaneously, it cannot change its nature of point-to-point. So,to obtain all the nodes and paths information to gain a overall network status, large quantities of tests should be happened.

8.3 Integrated method

TBD

9 Reference Model of Integrated monitoring SRv6 network

TBD

10 Attachment

The following A.1 table is the justification for the new draft.

A.1 justification for proposed draft new Recommendation

Question:	13 /11	**Proposed new ITU-T Recommendation**	March 2021	
Reference and title:	Q.SRv6_im, Requirements and Reference Model for Integrated Monitoring of SRv6 Network			
Base text:			**Timing:**	Q1-2023
Editor(s):	Cancan Huang, China Telecom, huangcanc@chiantelem.cn Minrui Shi,China Telecom shimr@chinatelecom.cn Xu Lu luxu@caict.ac.cn		**Approval process:**	AAP
Scope (defines the intent or object of the Recommendation and the aspects covered, thereby indicating the limits of its applicability): The scope of this Recommendation consists of: (1) Requirements of monitoring SRv6 network; (2) Method of Integrated Monitoring of SRv6 Network;				

(3) Reference Model for Integrated Monitoring of SRv6 Network;

Summary (provides a brief overview of the purpose and contents of the Recommendation, thus permitting readers to judge its usefulness for their work):

This Recommendation describes the requirements and reference model for integrated monitoring of SRv6 network . This Recommendation focuses on the requirements and reference model for integrated monitoring of SRv6 network.

Relations to ITU-T Recommendations or to other standards (approved or under development):

ITU-T Y.1711/ITU-T G.8113.2/ITU-T Y.1732

IETF on-going work item “draft-ietf-6man-spring-srv6-oam-08”

RFC792,RFC1208,RFC1122,RFC 4443,RFC 1470,RFC 2151,RFC 4884,RFC 5837

RFC 5880~RFC5885

RFC 2330,RFC 4656,RFC 5357,RFC 2678,RFC 2679,RFC 2680,RFC 2681,RFC 4737,RFC 5560

Liaisons with other study groups or with other standards bodies:

IETF

Supporting members that are committing to contributing actively to the work item:

China Telecom,MIIT China,China Unicom

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