rtgwg
Internet-Draft
Intended status: Informational
Expires: September 22, 2016

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March 21, 2016

Overlay OAM Requirements
draft-ooamdt-rtgwg-ooam-requirement-00

Abstract

This document describes a list of functional requirements for Operations Administration and Maintenance (OAM) in various Overlay and Service networks like Service Function Chaining (SFC), Bit Index Explicit Replication (BIER), Network Virtualization over Layer 3 (NVO3).

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on September 22, 2016.

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1. Introduction

We have witnessed and participated in design of new paradigms in the networking that are aimed to address network virtualization, service function chaining, and multicast services. New paradigms require new architectural concepts, principles and components. [RFC7365] defines a framework for Data Center Network Virtualization over Layer 3 (NVO3). [RFC7665] describes the architecture for creating and maintaining Service Function Chains (SFCs) in a network. [I-D.ietf-bier-architecture] defines a stateless multicast architecture for optimal multicast packet forwarding using "Bit Index Explicit Replication" (BIER). These frameworks are defined in a

flexible manner that they are transport agnostic and may be deployed on various underlay networks such as IPv4, IPv6 and MPLS.

The above mentioned new architectural concepts and principles have been combined into new network layers with distinct encapsulation headers. For example, [I-D.ietf-sfc-nsh] defines an encapsulation header as Network Service Header (NSH) to realize Service Function Path. While [RFC7348] (VxLAN) and [RFC7637] (NVGRE) are different encapsulation header proposed for NVO3, [I-D.ietf-nvo3-vxlan-gpe] extends VxLAN further to be used for Service Function Chain (SFC). Similarly, [I-D.ietf-bier-mpls-encapsulation] defines the BIER encapsulation header over MPLS network and [I-D.xu-bier-encapsulation] describes the BIER encapsulation header over IP network.

Introduction of the new Overlay networks, sets forth new Operations, Administration and Maintenance (OAM) requirements that can be addressed by enhancing the existing toolset or developing new protocols. For example, [I-D.ietf-sfc-oam-framework] defines the framework for SFC OAM, [I-D.nordmark-nvo3-transcending-traceroute] proposes a way to perform traceroute in NVO3 networks and [I-D.kumarzheng-bier-ping] proposes on-demand connectivity verification and fault isolation procedure (Ping and Trace) on BIER network.

The goal of this document is to identify and list the OAM requirements commonly applicable to new Overlay networks which can further be used to analyze the existing OAM tools. The identified gaps can be addressed, either through enhancing existing OAM tools and if necessary, constructing new OAM tools, that can be used as a common unified OAM toolset to support and perform various OAM functions including proactive and on-demand path monitoring and service validation on the new Overlay network.

2. Requirements notation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

3. Terminology

ECMP: Equal Cost Multipath

UCMP: Unequal Cost Multipath

SFC: Service Function Chaining

BIER: Bit Index Explicit Replication

NVO3: Network Virtualization over L3

OAM: Operations, Administration and Maintenance

MPLS: Multiprotocol Label Switching

VxLAN: Virtual Extensible Local Area Network

NVGRE: Network Virtualization Using Generic Routing Encapsulation

4. Detailed Requirement List

This section list the OAM requirement for different Overlay networks. The below listed requirement MUST be supported with any underlay transport network:

REQ#1: The listed requirements MUST be supported with any type of transport layer over which the overlay network can be realized

REQ#2: It MUST be possible to initialize Overlay OAM session from any node in the overlay network.

REQ#3: It SHOULD be possible to initialize an Overlay OAM session from a centralized controller.

REQ#4: Overlay OAM MUST support proactive and on-demand OAM monitoring and measurement methods.

REQ#5: Overlay OAM MUST support unidirectional OAM methods, both continuity check and performance measurement.

REQ#6: Overlay OAM packets SHOULD be fate sharing with data traffic, i.e. in-band with the monitored traffic, i.e. follow exactly the same path as data plane traffic, in forward direction, i.e. from ingress toward egress end point(s) of the OAM test session.

REQ#7: Overlay OAM MUST support bi-directional OAM methods. Such OAM methods MAY combine in-band monitoring or measurement in forward direction and out-of-band notification in the reverse direction, i.e. from egress to ingress end point of the OAM test session.

4.1. Fault Management

4.1.1. Pro-active Fault Management

Availability, not as performance metric, is understood as ability to reach the node, i.e. the fact that path between ingress and egress does exist. Such OAM mechanism also referred as Continuity Check.

REQ#8: Overlay OAM MUST support pro-active monitoring of any virtual node availability in the given overlay network.

REQ#9: Overlay OAM MUST support Reverse Defect Indication (RDI) notification by egress to the ingress, i.e. source of continuity checking.

REQ#10: Overlay OAM MUST support connectivity verification. Definition of mis-connectivity defect entry and exit criteria are outside the scope of this document.

4.1.2. On-demand Fault Management

REQ#11: Overlay OAM MUST support fault localization of Loss of Continuity check.

REQ#12: Overlay OAM MUST support tracing path in overlay network through the virtual nodes.

REQ#13: Overlay OAM MAY support verification of the mapping between its data plane state and client layer services.

REQ#14: Overlay OAM MUST have the ability to discover and exercise equal cost multipath (ECMP) paths in its transport network.

REQ#15: Overlay OAM MUST be able to trigger on-demand FM with responses being directed towards initiator of such proxy request.

4.2. Performance Management

REQ#16: Overlay OAM MUST support active one-way packet delay measurement.

REQ#17: Overlay OAM MUST support passive one-way packet delay measurement.

REQ#18: Overlay OAM MUST support active two-way packet delay measurement.

REQ#19: Overlay OAM MUST support packet delay variation measurement.

REQ#20: Overlay OAM MUST support active end to end packet loss measurement.

REQ#21: Overlay OAM MUST support passive end to end packet loss measurement.

REQ#22: Overlay OAM SHOULD support active per-segment packet delay measurement.

REQ#23: Overlay OAM SHOULD support passive per-segment packet delay measurement.

REQ#24: Overlay OAM SHOULD support active per-segment packet loss measurement.

REQ#25: Overlay OAM SHOULD support passive per-segment packet loss measurement.

REQ#26: Overlay OAM MUST support delivered packet throughput measurement.

4.3. Alarm Indication Suppression

REQ#27: Overlay OAM MUST support defect notification mechanism, like Alarm Indication Signal.

REQ#28: Any virtual node in the given overlay network MAY originate a defect notification addressed to any node in that network.

4.4. Overlay Network Resiliency

REQ#29: Overlay OAM MUST support methods to enable survivability of an overlay network. These recovery methods MAY use protection switching and restoration.

5. IANA Considerations

This document does not propose any IANA consideration.

6. Security Considerations

This document list the OAM requirement for various Overlay network and does not raise any security considerations.

7. Acknowledgement

TBD

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