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Test Report of Service Function Chain with NSH in Cloud Datacenter
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Abstract

Service function chaining is provided in cloud datacenters with some encapsulation technology adopted in classifing and forwarding traffic flows of service function chaining. This draft introduces the test of service function chain with the encapsulation technology NSH in Cloud Datacenter, which shows significance to the pratical deployment of carrier grade services of NFV datacenter.

Status of This Memo

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

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1. Introduction

Service function chaining is provided in cloud datacenters which means that several service functions are at service in a required order. In providing the service function chaining, Network Service Header (NSH) encapsulation is used by inserting the NSH onto the encapsulated packets or frames to realize function paths.

This draft describes the test on service function chaining (SFC) solution with NSH for NFV architectures. In the test, a single point of SFC controller is used in controlling the NFV networks. This solution is targeted at carrier grade services using SFC solution integrated into a top of rack (TOR) switch. Performance, scalability, and impact on customization are evaluated.

2. Terminology

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].

In this document, these words will appear with that interpretation only when in ALL CAPS. Lower case uses of these words are not to be interpreted as carrying RFC-2119 significance.

3. Definition of terms

DPI Deep Packet Inspection

FW Firewall

LB Load Balance

NAT Network Address Translation

NSH Network Service Header

OAM Operation and Management

SF Service Function

SFC Service Function Chaining

SFC CLA Service Function Chaining Classification

SFF Service Function Forwarding

VNF Virtual Network Function

4. Test setup

The evaluation test aims at testing the complete SFC solution which is integral to build a carrier class NFV datacenter.

The solution shown as follows includes:

SFC controller and Management

The SFC controller is used to translate the service function chains to forwarding paths and propagate the path information to participating nodes in order to realize the service function

chain.The SFC mangement is charge for managing the service function chains and service functions. [draft-ietf-sfc-control-plane]

SFC Classification (SFC CLA)

Locally instantiated matching of traffic flows against policy for subsequent application of the required set of network service functions, which is defined in [draft-ietf-sfc-architecture]. The policy may be customer/network/service specific.

SF Forwarding (SFF)

SFF is responsible for forwarding traffic to one or more connected service functions according to information carried in the SFC encapsulation and handling traffic coming back from the SF.

Service function features

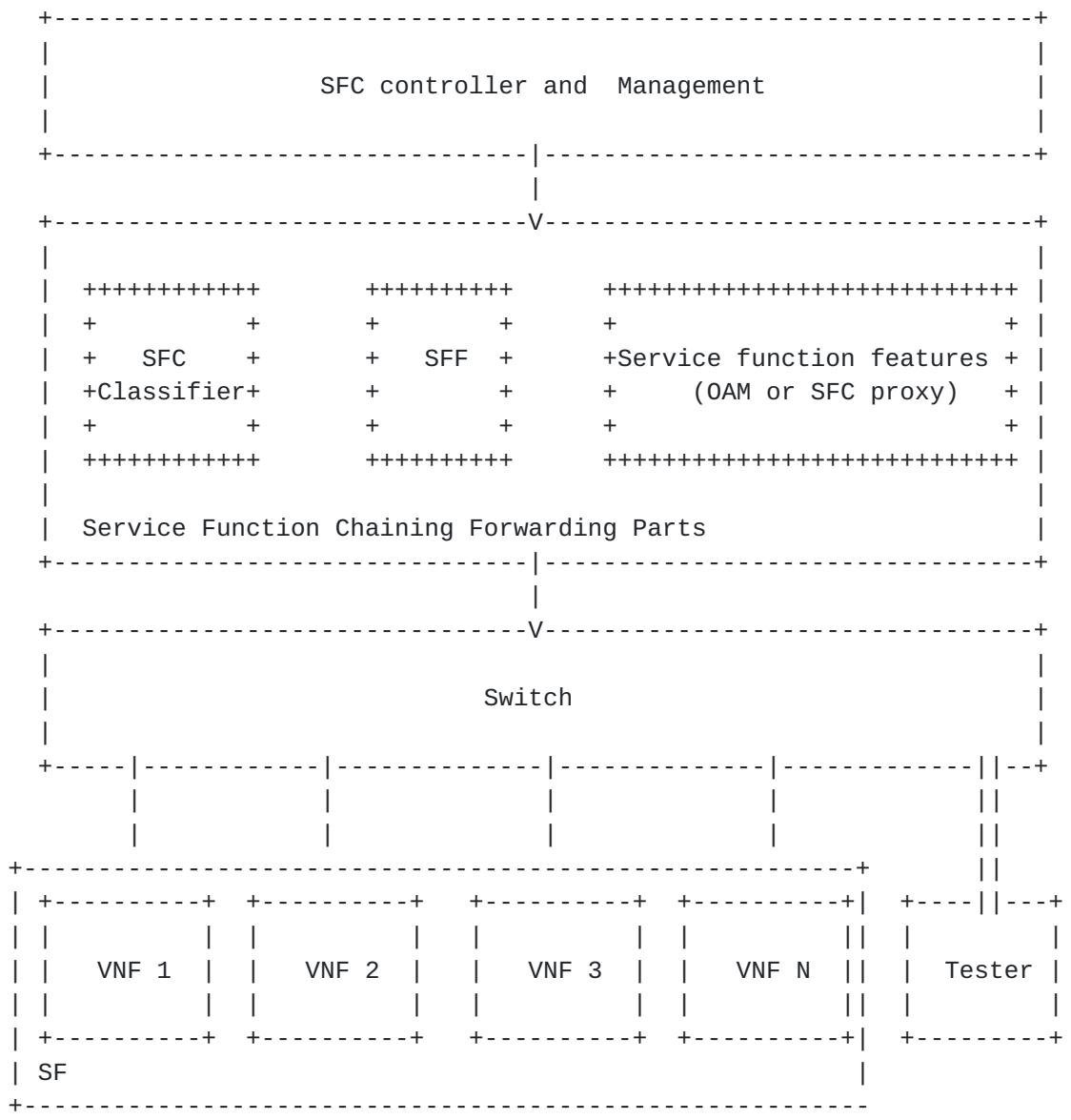
Service function features provide some additional service function features such as OAM and SFC proxy.

Switch

The switch provides the data center underlay switching and provides the high speed connectivity required in data centers.

Virtual Network Functions

Virtual network function acts on the specific treatment of received packets, which belong to various layers of a protocol stack. The service functions include: firewalls, load balancer, WAN, DPI, NAT and so on.



Test Topology

In the test, the tester responsible for the traffic source and the monitors sends out the traffic with all of the required test patterns and receives the traffic coming back after handling from the VNFs. When the SFC controller tells the information of the service function chain to the service function forwarding parts, the CL SLA and SFF perform the operations. In indicating the service chain path, NSH are supported by the service function chaining forwarding devices and the vNFs.

5. Test cases and results

5.1. Functionality

Content:

The VNF is updated with the encapsulation technology. In this test, GRE tunnel and NSH is used during the service function chaining. So the VNF is developed by decoding GRE header and NSH header, doing the security check of the IP packet and modify the GRE and NSH headers.

The test aims at the service function forwarding parts can work with the updated VNFs.

Significance:

The significance of the test is to demonstrate the service function chain does work with NSH.

Process:

The traffic sent out from the tester to the Service Function Chaining Forwarding Parts where the service function classification chooses the flow path and the service function forwarding does the forwarding actions. The traffic is forwarded into the VNFs by the service function forwarding. The traffic can pass through a single VNF or multiple VNFs due to the path planned, and returns back to the tester after handling by VNFs and termination by the Service Function Forwarding Parts.

Result:

Incoming and outcoming traffic are checked in the switch with no packet loss monitored in the tester.

5.2. Performance

5.2.1. High bandwidth test

Content:

The high bandwidth of source traffic with smaller packet sizes processed by the service function chaining forwarding devices is tested.

Significance:

The significance of this test is to demonstrate that the service function chaining forwarding devices can support high bandwidth classification at line rate, which is important in the NFV datacenter.

Process:

The tester sends out the traffic with small packet size (e.g. 288Byte in the test) at the full bandwidth (e.g.40Gbps one hop in the test). Several VNFs with several separate service function chains are constructed (e.g. six hops with total bandwidth of 240Gbps).

Result:

Incoming and outcoming traffic are checked in the switch with no packet loss monitored in the tester.

5.2.2. Large scale SFC flow test

Content:

The large scale SFC flow test includes the large scale flow classification testing and the large scale SFC flow with SFF testing in order to test the classification and forwarding tables.

Significance:

The significance of large scale flow classification test is to demonstrate that the service function chaining forwarding devices can support large scale flow tables and perform all the necessary classification and lookup at full bandwidth. Both high scale flow and SFF lookups are demonstrated in the large scale SFC flow with SFF testing.

Process:

In the first step, traffic is sent out by the tester with a large number (e.g. 9million) of flows mapped to few service function paths (e.g. 3 service function paths).

In the second step, traffic is sent out by the tester with a large number (e.g. 4million) of flows mapping to many service function paths (TBD).

Result:

Incoming and outcoming traffic are checked in the switch with no packet loss monitored in the tester.

5.2.3. Flow update rate test

Content:

In this test, the update rate of adding new entries to the classification flow tables will be tested.

Significance:

It is important that a device doing flow classification can do add/delete/modify operations at a high enough rate to support the data center requirements as new flows (subscribers, application) are added or existing ones removed.

Process:

The tester sends out the traffic by the planned service function chain. And at one moment, another traffic sends out by the tester as well aiming at adding new entries to the classification flow tables.

Result:

It shows out that greater than 40K flow updates per second are added successfully.

5.2.4. Forwarding latency

Content:

Forwarding latency of the service chain classification and forwarding and the VNFs is tested.

Significance:

Latency is of concern in some particular services provided such as video service in cloud datacenters.

Process:

The tester sends out the traffic by the planned service function chain with time at every hop recorded.

Result:

The latency we tested was 200usec total over with 23 hops, 5 emulated vNFs not only the VNFs themselves.

6. Security Considerations

TBD.

7. IANA Considerations

TBD.

8. Conclusion

Due to the test of functionality and performance, NSH encapsulation technology shows its pratical value in the service function chaining in NFV datacenters.However, some more key points need to be further studied in order to large scale deployment, such as introducing the SFC parts into the existed SDN architecture, and the relationship between the SDN controller and the SFC controller and so on.

9. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", March 1997.

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