A Method for Service Orchestration in hSFC

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Hierarchical SFC is a network architecture for implementing SFC the chain with an ordered set of service functions which could be deployed in multiple geographically dispersed networks. How to forward traffic between networks in Hierarchical SFC is what the draft wants to present.

This document proposes a mapping-based forwarding method with coordinated orchestration by the translation of H-SFC and I-SFC to forward traffic between networks in Hierarchical SFC.

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1. Introduction

Hierarchical SFC is a network architecture for supporting service function chains across multiple geographically dispersed networks. Hierarchical SFC is described in detail in [I.D. dolson-sfc-hierarchical] and [I.D.ao-sfc-for-dc-interconnect], and is not repeated here.

In H-SFC, SFs in top-domain can be logical and composed of several more refined SFs in sub-domain. Therefore, it is necessary to check the availability of SFs especially those logical SFs in the procedure of orchestration.
This document proposes that adding an east-west interface for coordination among different control planes of separate SFC-enabled domains so to supporting hierarchical service orchestration.

1.1. Assumptions

The following assumptions are made:

- A Hierarchical SFC-enabled network has multiple level network domains. Each domain has their own control plane and data plane.

- Control planes of different domain can work coordinately, but they are independent or non-transparent to each other. For example, Top-domain network domain just uses logical SFs, but don’t care how to construct a corresponding SFC for these logical SFs in Lower-Level network domains.

1.2. Requirements Language

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 RFC 2119 [RFC2119].

2. Terminology

The reader should be familiar with the terms contained in [RFC7665], [I-D.ietf-sfc-control-plane], [I-D.dolson-sfc-hierarchical] and [I-D.ao-sfc-for-dc-interconnect].

H-SFC: The SFC in the Top-domain network domain.

I-SFC: The SFC in the Lower-Level network domain.

3. Hierarchical Service Orchestration

When receiving a service request, the control plane should decide a SFC for it, select appropriate SF instances and make a SFP for the SFC. Furthermore, a classification policy which binds the flow with the request to a given SFC should be told to classifiers so that the flow can pass through relevant SFs along the SFP.

But in hierarchical SFC, SFs might be logical which means it can be decomposed to several less abstract, more refined SFs. Besides, logical SFs always represent SFCs in SFC-enabled sub-domains. So, how to guarantee the availability of logical SFs and forward SFC traffic among multiple SFC-enabled domains is an important problem.
3.1. East-west interface

![Diagram of SFC Control Plane interfaces]

Figure 1: Interfaces of SFC Control Plane

[I-D.ietf-sfc-control-plane] presents a reference architecture of the SFC control plane, including 4 kinds of interfaces between the SFC control plane and various SFC data plane elements.

In hierarchical SFC that SFs are distributed over multiple SFC-enabled domains that the SFC needs to pass through, the control plane also should be hierarchical. As we know, each control plane is responsible for managing a single SFC-enabled domain. Then, each SFC control plane should gather and update information of local domain real-timely. Due to there is no formal control hierarchy scheme, this document attempts to propose a simple Hierarchical Control Plane Scheme for Hierarchical SFC architecture.

Figure 1 shows the interface reference points of the SFC control plane architecture. C1 is the interface between SFC Control Plane and SFC Classifier; C2 is the interface between SFC Control Plane and SFF; C3 is the interface between SFC Control Plane and SFC-aware SFs; C4 is the interface between SFC Control Plane and SFC Proxy; C5 this document proposes is the east-west interface between SFC Control Planes for supporting coordination among those control planes of separate domains.

3.1.1. C5: Interface between SFC Control Planes

As [I-D.ietf-sfc-hierarchical] said the IBN acts as a SFC-aware SF in the Top-Level domain and as a classifier in the Lower-Level domain.

At the Top-domain, the SFs that compose an SFC might be logical which means they are actually SFCs composed by more refined SFs in the Lower-Levels. To setup these logical SFs, it needs coordinated orchestration between the control planes of Top-domain and Lower-domains.
3.1.2. Interface between SFC Control Planes and IBN

Due to IBN behaves as an SF to Top-domain, it is controlled by interface C3 or C4. Besides, IBN acts as a classifier and a SFF of end-of-chains to Lower-Level domain, it exchanges information with control plane of Lower-Level domain through interface C1 and C2.

3.2. Hierarchical service orchestration

During the orchestration for logical SFs of service chains in the Top-domain, the control plane of the Top-domain should send an instruction to control plane of the corresponding Lower-domain. When the latter receives this instruction, it is likely that the Top-domain receives service requests from users. Then Lower-Level would construct or assign an I-SFC for this "service request", and make a classification rule for the classifier of the IBN.

4. Metadata Consideration

Because the IBN is regarded as a Service Function to the Top-domain domain, it should provide the ability to handle the metadata in the NSH header if necessary.

For example, it is common that checking the liveness of the service function of a service function path before the traffic selected by a Classifier traverse the network along a SFC which has been describe in [I-D.penno-sfc-trace-03]. Therefore, the IBN must be able to add its identifying information at the end of the existing NSH headers as a Service Function.

5. Security Considerations

TBD.

6. IANA Considerations

TBD.

7. References

7.1. Normative References

7.2. Informative References

[I-D.dolson-sfc-hierarchical]

[I-D.ao-sfc-for-dc-interconnect]

[I-D.ietf-sfc-dc-use-cases]

[I-D.ietf-sfc-control-plane]

[I-D.unify-sfc-control-plane-exp]

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