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CHAU
PARK
JUNG
Soongsil University
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Dynamic Forwarding by Constraint Options in SFC
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Abstract

This draft describes a Constraint-based Dynamic Control (CDC) inserted into SFC architecture to support dynamic assignment of Service Function (SF) with the use of filters functions. SFC Operators only need to provide general conditions for a chaining with CDC.

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[1. Introduction](#)

This draft describes a Constraint-based Dynamic Control (CDC) that inserted into SFC architecture to support dynamic assignment of Service Function (SF) with the use of filters functions.

Flow distribution, which is illustrated through Service Function Chain (SFC) and Service Function Path (SFP), is a crucial point to bring stability and improve performance to the SFC domain. Although SFC and SFP are specified in most of the cases, there are some cases where they can be decided through constraint options. Without specific information, SFC Control Plane or SFF can decide dynamically which SFC and SFP option is suitable for an incoming flow using constraint options.

Some but not all use cases for the constraint options are:

- o The SFP "must travel/must not travel" through one or more "type of SF"
- o The SFP "must travel/must not travel" through one or more "organization"
- o The SFP "may travel" through "type of service functions". The "may" constraint means that this is an optional constraint.
- o The SFP "must travel" through "type of service" "AND/OR" "another type of service"

2. Conventions used in this document

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](#)].

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. Terminology

This draft uses the following terminologies defined by SFC-arch.

- o SF: Service Function [[SFC-arch](#)]
- o SFC: Service Function Chain [[SFC-arch](#)]
- o SFF: Service Function Forwarder [[SFC-arch](#)]
- o SFP: Service Function Path [[SFC-arch](#)]
- o NSH: Network Service Header [[SFC-nsh](#)]

Here are the terminologies specific for this draft:

- o CDC: Constraint-based Dynamic Control
- o CNH: Constraint Header
- o OrgID: Organization ID
- o RCF: Related Constraint Field

4. Operational Procedures

4.1. Static Mode of Service Forwarding

When a Service Classification Function intends to put SFP and SFC into Static Mode, it SHOULD NOT append CNH into target packet or MUST append the CNH with the F bit set as 0.

On receipt of the packet, the SFF MUST treats packets without CNH as normal SFC packet. The same process is applied with the following cases:

- o Packets that have CNH with F bit set as 0
- o Packets that have CNH with F bit set as 1 and CLength bits set as 0.

4.2. Dynamic Mode of Service Forwarding

When a Service Classification Function intends to put SFP and SFC into Dynamic Mode, it SHOULD NOT append CNH into target packet or MUST append the CNH with the F bit set as 1 and CLength bit MUST be more than 0.

On receipt of the packet, the SFF MUST treats packets as dynamic SFC packet and processes based on information set on the base header and constraint headers.

4.3. Logical conjunction in Dynamic SFC

When a Service Classification Function intends to make a conjunction between constraint headers (for example: between constraint headers A and B), it MUST appends the constraint header ID of B to the RCF of constraint header A.

On receipt of the packet, the SFF MUST treats two constraint headers same as A "AND" B.

4.4. Logical disjunction in Dynamic SFC

When a Service Classification Function intends to make a disjunction between constraint headers, it MUST NOT append the constraint header ID of any constraint header to the RCF of other constraint headers.

On receipt of the packet, the SFF MUST treats constraint headers with zero value in RCF as "OR" logical.

5. Constraint-based Headers

A Constraint Header (CNH) contains single constraint information and its related metadata. A Service Classification Function, which is used to handle SFC policy and encapsulation, is also responsible for adding CNHs to a packet and set the service forwarding mode to dynamic when the packet reaches the boundary of SFC-enabled domain.

5.1. Constraint Header Format

A CNH consists of a 4-byte base header and constraint headers, as shown in Figure 1 below.

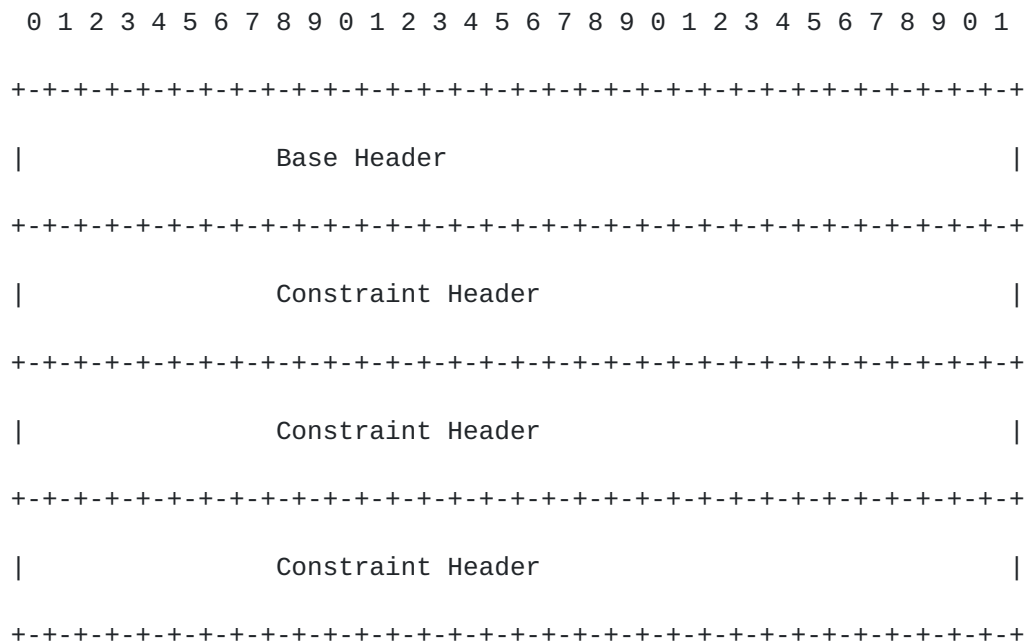


Figure 1: Constraint Header

Base header: provides basic information about the forwarding header.

Constraint header: provides information about constraint ID, organization ID, service type, constraint option, related constraint ID.

5.2. Base Header Format

Base header is an extension of NSH base format. One of the reservation bit is used as Service Forwarding Mode information.

```

 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|Ver|O|C|F|CLength|R|  Length  |  MD Type  | Next Protocol |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+

```

Base Header Fields Descriptions

Except for the left-to-right count 4 to 8 bit, all field descriptions are the same as described in [[SFC-nsh](#)]

F bit: Indicates that this packet is treated as dynamic/constraint or static/normal mode. 0 bit indicates normal mode and 1 bit indicates the dynamic mode.

CLength: The total Constraint header length.

5.3. Constraint Header Format

```

 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|  ID  |      OrgID      | Type | C |R|R|  RC  |  Reserved  |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+

```

ID: The first 4 bits indicate the constraint ID (maximum is 16 of constraints)

OrgID: The next 1-byte length which indicates the organization ID of SFs. 0 value means any organization is possible.

Type: 4 bits that indicate the service type. For example: Web filter, Mail filter, DLP?0 value means any type of service is possible.

C bits: Constraint bit which indicates the constraint that is given to this header. An example can be must travel, must not travel, may travel?The next two R bits are reserved for the development of constraint condition.

Related Constraint ID (RC): Some constraints are related with other constraints (like AND condition). This field indicates the relation of this header to another header.

Other bits are reserved.

6. Security Considerations

(TBD)

7. IANA Considerations

(TBD)

8. References

8.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

8.2. Informative References

[SFC-arch] Quinn, P., Ed. and J. Halpern, Ed., "Service Function Chaining (SFC) Architecture", 2014,
<<http://datatracker.ietf.org/doc/draft-quinn-sfc-arch>>.

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9. Acknowledgement

(TBD)

Authors' Addresses

Ngoc-Tu Chau
Soongsil University
369, Sangdo-ro, Dongjak-gu,
Seoul 156-743, Korea

Email: chaungoctu@ssu.ac.kr

Jungsoo Park
Soongsil University
369, Sangdo-ro, Dongjak-gu,
Seoul 156-743, Korea

Email: ddukki86@ssu.ac.kr

Souhwan Jung
Soongsil University
369, Sangdo-ro, Dongjak-gu,
Seoul 156-743, Korea

Email: souhwanj@ssu.ac.kr

