High Availability mechanism for Service Function Chains
draft-xuan-sfc-chain-high-availability-00

Status of this Memo

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Abstract

   This document describes mechanisms to achieve the high
   availability of the service function chains. This document
   considers the high availability in the perspective of entire chain.
   This means the SFC control plane needs to take into account some
   metrics related service chain in addition to individual service
   functions. This document covers both stateless and stateful service
   functions as well.

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1. Introduction

Service function chaining currently is redesigned with the support
of the software-defined network (SDN) and network function
virtualization (NFV) which provide more flexible and dynamical
end-to-end services.

In order to ensure the high availability of service function
chains, some traditional mechanisms for individual service function
are reused (e.g. Active/Standby or Active/Active). These mechanisms
are based on the deployment of the backup or redundant service
functions. The recovery of whole service chain relies on the
recovery of individual service function.

This document describe a mechanism which ensure the high
availability of service chain based on some metrics of whole chain.
The mechanism also considers both stateless and stateful service
functions in the chain.

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].

   The terms about SFC are defined in [RFC7498] and
   [I-D.ietf-sfc-architecture]

3. **High availability architecture of SFC**

Figure 1. shows the architecture for achieving the high
availability of the SFC. We make assumptions that each service
function has several instances which are connected to different
service function forwarders (SFF). Each service function path (SFP)
is created by the combination of different service instances of
different service functions. We propose a new entity called SFC
HA manager which is responsible for monitoring metrics which belong
not only to the individual service functions, such as fail-over,
load condition, but also the whole service chain, such as, latency,
total load, and traffic engineering. The SFC HA Manager takes
responsibilities of making the backup SFPs. SFC HA manager should
be located in the control plane part [I-D.ietf-sfc-control-plane]
of SFC architecture

```
                                             [SFC HA Manager]


           +*****************+********+***>> back-up SFP
     +|.......+........|........|.........+.....>> current SFP
     ||       |        |        |         |
         SFI1     SFI2     SFI2     SFI3     SFI3
     |       |        |        |         |
     +---+----+        +----+---+         |
        |                  |              |
      SFFI1                               SFFI2        SFFI3
```
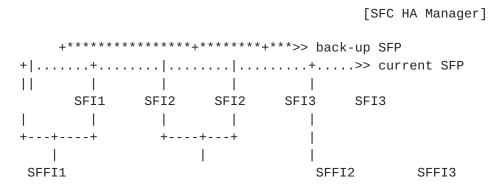
Figure 1. High availability architecture of SFC

3.1. Metrics for back-up SFPs

Some metrics for whole service function chain are listed below:

Fail-over: a back-up SFP with the replacement of failed service functions

Total latency: a back-up SFP with better latency

Total bandwidth: a back-up SFP with highest bandwidth

Total path: a back-up SFP with shortest path

Total load: a back-up SFP with the lowest load

Traffic engineering: a back-up SFP with the pre-defined traffic engineering goals

3.2 SFP with all stateless service functions

Procedures for making a back-up service function path

+ Gather and monitor the states of current service function paths
+ Evaluate the current SFPs based on collected data and above
  metrics
+ HA manager makes back-up SFPs for current SFP
+ When a critical event occurs, the back-up SFP can be invoked and
  replace the current SFP.
+ The information about new SFP (back-up) is updated to all
  corresponding SFFs.

3.3 SFP with stateful service funtions

Procedures for making a back-up service function path

+ Gather and monitor the states of current service function paths
+ Evaluate the current SFPs based on collected data and above metrics
+ HA manager makes back-up SFPs for current SFP
    - For stateful service functions in the SFP, internal state management for each service function is required and synchronized with the same kind of service function when creating a back-up SFP
    - State synchronization can be handled by the direct communication between two same kind service functions

+ When a critical event occurs, the back-up SFP can be invoked and replace the current SFP.
+ The information about new SFP (back-up) is updated to all corresponding SFFs.

4. Security Considerations

TBD.

5. IANA Considerations

TBD.

6. References

6.1. Normative References

   [RFC7498]
            Quinn, P. and T. Nadeau, "Problem Statement for Service
                 Function Chaining", RFC 7498, April 2015.

6.2. Informative References

      [I-D.ietf-sfc-architecture]

            Halpern, J. and C. Pignataro, "Service Function Chaining
            (SFC) Architecture", draft-ietf-sfc-architecture-11 (work
            in progress), July 2015.

      [I-D.ietf-sfc-control-plane]
                     H. Li, Q. Wu, O. Huang, etc. al., "Service Function
                     Chaining (SFC) Control Plane Components &
Requirements",
                     draft-ietf-sfc-control-plane-00, Aug 2015

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