SFCMon: An Efficient and Scalable Monitoring System for Network Flows in SFC-enabled Domains

COINRG - IETF Meeting 106, Singapore
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Service Function Chaining

- SFC is a key enabler for NFV [Bhamare et al., 2016].
- The SFC standardization is addressed by IETF at the SFC working group (WG)
  - RFC 7665 [Halpern and Pignataro, 2015].
  - RFC 8300 [Quinn et al., 2018].
Problem

- Ideally, for SFC purposes, a monitoring task should take into account all transmitted packets at the same time that keeps memory and processing at acceptable levels.

- We propose SFCMon, an efficient and scalable monitoring solution to keep track network flows in SFC-enabled domains;

- It implements a pipeline of probabilistic data structures to keep track large flows directly inside the network switches, thus reducing both overall latency and signaling overhead.
SFCMon as an SFC Component

SFC-enabled Domain

SFC1: (SF1, SF2)
SFC2: (SF2)
**SFCMon Processing Pipeline**

1. **Update/Estimate SFCMonCMS**
   - If `flow_count > threshold`
   - `flow_id = extract(packet)`

2. **Membership Query SFCMonBF**
   - If `flow_id exists`

3. **Update SFCMonIBLT**
   - Insertion SFCMonBF SFCMonCMS

4. **Membership Query SFCMonBF**
   - If `flow_id not exists`
SFCMon’s Prototype Overview

```
table sfc_classifier {
  key = {
    hdr.ipv4.srcAddr: lpm;
  }
  actions = {
    sfc_encapsulate;
    drop;
    NoAction;
  }
  size = 1024;
  default_action = NoAction();
}
```

```
table sfc_Sf_forwarder {
  key = {
    hdr.nsh_sp.spi: exact;
    hdr.nsh_sp.si: exact;
  }
  actions = {
    sfc_forward;
    sfc_desencapsulate;
    drop;
    NoAction;
  }
  size = 1024;
  default_action = drop();
}
```
Conclusion

- The SFCMon as new SFC component.
- The Proof-of-Concept (PoC) framework, which provides a reference P4-based SFC switch and a Python-based SFC controller.
- Initial experiments demonstrate that SFCMon introduces a negligible performance penalty while providing significant scalability gains.
- **Source Code:** https://github.com/michelsb/SFCMon
References I

A survey on service function chaining.

Service Function Chaining (SFC) Architecture.
RFC 7665.

Network Service Header (NSH).
RFC 8300.
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