Statelet-Based Efficient and Seamless NFV State Transfer

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Network Function Virtualization (NVF) is a concept which allows users to operate network related services and precisely monitor the network traffic with Software Defined Network (SDN).Main approach is for consistent and improved NVF state transfers.Statelet (packets)are used to modulate the virtualized network functions.SLiM migration system (SLiM) is introduced for efficient state transfer/network management.

1 Introduction

NVF provides flexible and improved network architecture. Migration techniques provides properties like elasticity, flexibility for better state migration. VNF migration mechanism needs smooth transfer, so that customers does not receive any network service issues. While transferring these instances some issues come under the process like packet loss, bandwidth requirements, network traffic etc. To address these problems statelet approach (Compact representation of packets information) has introduced. SLiM system analyze this approach and implement statelet-based mechanism.

2 Approach: Statelet Interface

In previous approaches statelet interface methods were bigger and time consuming (memory difference, packet duplication, statelet installation) and can cause traffic. According to current statelet interface considered as variable-length byte vector. In this how NVF can use this statelet interface to avoid trafficking in network by using following methods :

Network address translation:

Track entries of packets, store those byte and packet counters which contains information which has to transferred.

Signature-based intrusion detection:

keeps the information related previous harmful content in packets, so future harmful attacks can be prevented.

Vpn concentrator:

keeps the track of number of packets

3 System Model

This part includes methods of slim migration system, as VNF migration architecture. Migration is performed from source to destination and has divided into two parts partial and complete VNF migration. Slim Controller starts the destination environment, source instance allows reliable transmission of snapshot and statelet. This statelet transmission goes until snapshot has fully received.Following methods are used.

1. **State Migration Procedure**

   Shows components in datapath state migration before and after redirect traffic do destInst.

2. **Mutual Exclusion**

   Mutual exclusion between datapath and synchronization of actions on state.

3. **Extending to Partial State Migration**

split and merge operations for seamless VNF state transfer.

4 Analysis

State migration is bandwidth limited to solve this problem and to analyze its other requirements "statelet factor" has included. Main focus is on migration complete time (successfully), bandwidth usage and statelet factor [] Statelet factor describes ratio of average statelet traffic volume caused by packets transfer and total packets itself. According to statelet factor size of the snapshot is selected and transferred (checks dataplane capacity)

5 Evaluation

Data plane development kit is utilized for dataplane interfaces to reduce stack overhead and to use its other features to manage interfaces. Implemented proof-of-concept on NFVI hypervisor. Hardware and Virtualization architecture has used for setup (shows bidirectional flow)

6 Results

For seamless transfer two main characteristics are observed packet loss and delay which can affect the migration. Compared to Duplication, SLiM reduces the traffic rate.

7 Conclusion

Concluded that SliM reduces packet loss and it is synchronized for two or more instances.

8 Future Work

Future plan is to extend SliM with partial state migration and for large scale operations. Show SliM with its feasibility in different types of ways (additional ways) ex. In order to decrease delay and jitter, migration time etc.

9 References

[1] Gember-Jacobson et al., "OpenNF: Enabling innovation in network function control", Proc. SIGCOMM, pp. 163-174, 2014.
[2] L. Nobach, I. Rimac, V. Hilt, D. Hausheer, "SliM: Enabling efficient seamless NFV state migration", Proc. ICNP, pp. 1-2, Nov. 2016.