Benchmarking Methodology for Source Address Validation

draft-chen-bmwg-savnet-sav-benchmarking-02

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Background

- This document defines the methodologies for benchmarking the performance of source address validation (SAV) mechanisms
  - Taking the approach of considering a SAV device to be a black box and defining the methodology in a manner that is agnostic to the mechanisms.
  - Providing a method for measuring the performance of existing and new SAV implementations.
- Historical versions
  - **draft-chen-bmwg-savnet-sav-benchmarking-00, IETF 120 SAVNET WG and BMWG**
  - draft-chen-bmwg-savnet-sav-benchmarking-01, August 7, 2024
  - **draft-chen-bmwg-savnet-sav-benchmarking-02, IETF 121 SAVNET WG and BMWG**

Motivation

- Proposing standard benchmarking methodology is important for evaluating the performance of intra-domain and inter-domain SAV mechanisms fairly
  - For network operators, the benchmarking methodology can help them get a more accurate idea about the performance of the SAV devices in their deployed network environments, in order to utilize the appropriate SAV mechanism.
  - For device vendors, the benchmarking methodology can help vendors test the performance of the SAV implementation supported by their devices.
  - The benchmarking methodology can guide how to evaluate whether the new intra-domain SAV mechanisms can satisfy the design requirements defined in [draft-ietf-savnet-intra-domain-problem-statement] and the new inter-domain SAV mechanisms can satisfy the design requirements defined in [draft-ietf-savnet-inter-domain-problem-statement].

Summary of Comments on Versions 00 and 01

1. Comments on the definition of SAV performance indicator

   ◆ In Section 4, the "Protocol-speaking Agent Processing Throughput" can be simplified as "Protocol Message Processing Throughput". (Aijun)

2. Comments on the test cases for intra-domain SAV

   ◆ In Section 5.1.1.2.1/5.1.1.2.2, within the "Test Case 1/Test Case 2", the direction of "outbound/inbound “ should be swapped. The description should be based on the DUT's view. (Aijun)

3. Comments on the protocol convergence performance measurement

   ◆ In Section 5.1.2.1.2, for "Test Scenarios" of protocol convergence performance measurement (Figure 8), how are the prefixes withdraw within the IGP proactively? And how does the DUT record the beginning and completion of protocol convergence? I think you should check them with the vendors. (Aijun)

Summary of Comments on Versions 00 and 01

4. Comments on the test cases of DSR scenarios for inter-domain SAV

   ◆ In Figure 11, for the DSR scenario, why does not the return traffic take the path AS 1-AS 2 directly and bypass DUT? How do you deal with such situation? (Aijun)

5. Comments on the locations of DUT for inter-domain SAV

   ◆ Should the problem described in Figure 11/12 be solved by the AS 2 only will be more efficient? Or else, if AS 2 doesn't support SAVNET, and AS 2 also advertises the P1 out to DUT (P4), how can DUT block the attacker's traffic correctly? (Aijun)

6. Other suggestions

   ◆ Can we shorten the number depth of each sub section? (Aijun)

   ◆ Protocol convergence time performance in benchmarking WG for either BGP or IGP has a long history about how you measure when protocol convergence starts. You will see that in that WG. (Susan Hares)

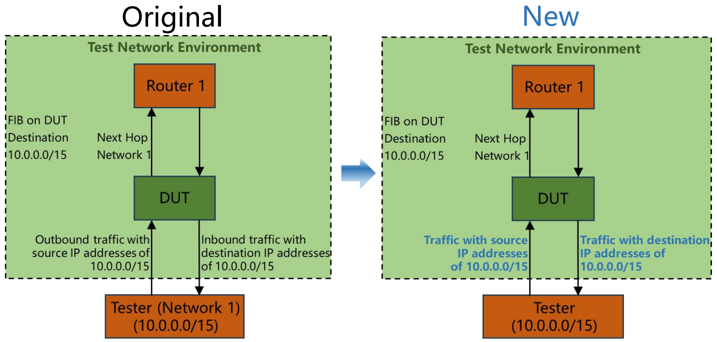
Responses and Revision Summary

1. In Section 4, we have revised "protocol-speaking agent processing throughput" to "protocol message processing throughput", as well as its descriptions.
2. In Section 5.1, we have revised all related figures and descriptions to clarify the direction of the traffic for describing symmetric and asymmetric routing scenarios for intra-domain SAV.
3. In Section 5.1.2, we have discussed the operation recommendations for withdrawing prefixes proportionally and measuring protocol convergence time.

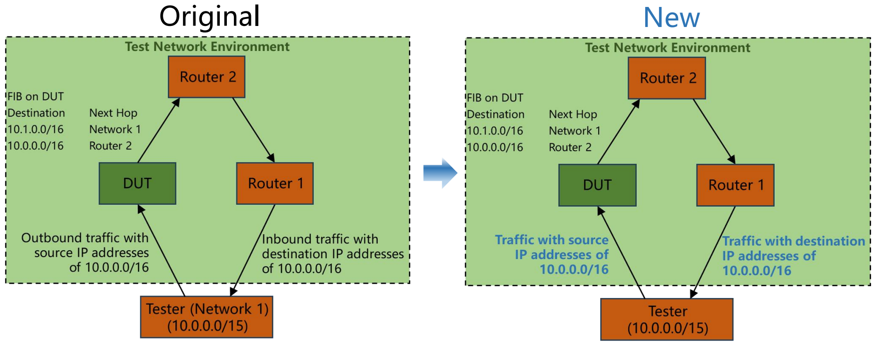
Responses and Revision Summary

4. In Section 5.2, we have revised the descriptions of Figure 11 and added the requirements about controlling the return traffic from tester to the user along the path including DUT.
5. In Section 5.2.1, we have discussed more test cases to test SAV accuracy of DUT by modifying the locations of DUT in the topology.
6. We have optimized the structure of Section 5.
7. We have updated the descriptions for protocol convergence performance measurement by referring to the benchmarking methods of IGPs.

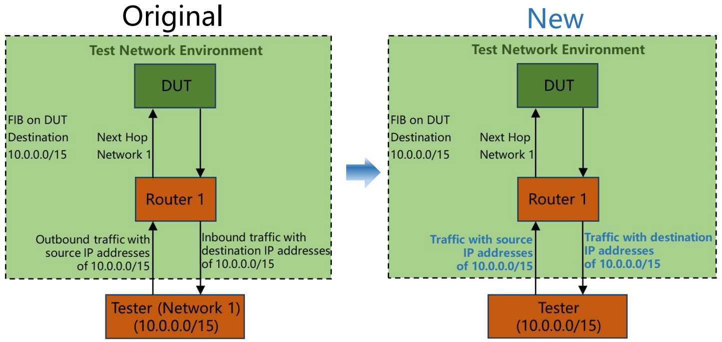
Updates of Test Cases for Clarifying the Traffic Direction in Intra-domain SAV



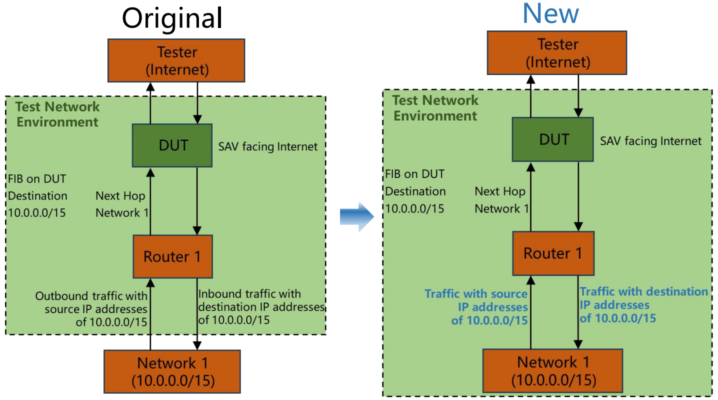
(a) Test Case: SAV for customer or host network in intra-domain symmetric routing scenario.



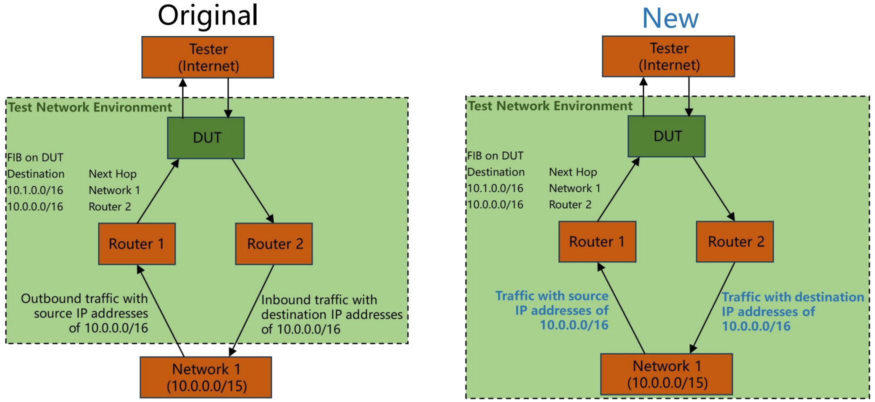
(b) Test Case: SAV for customer or host network in intra-domain asymmetric routing scenario.



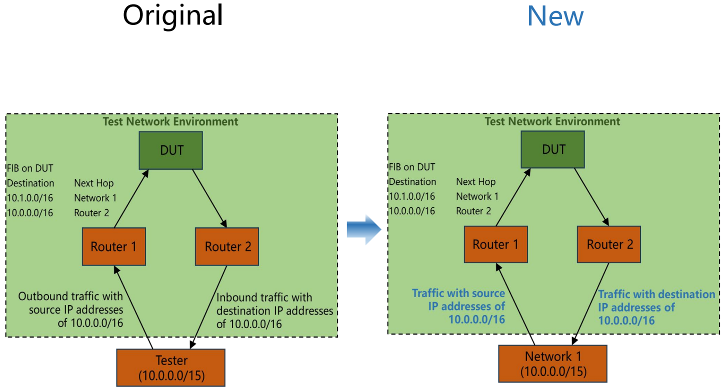
(c) Test Case: SAV for aggregation-router-facing network in intra-domain symmetric routing scenario.



(d) Test Case: SAV for Internet-facing network in intra-domain symmetric routing scenario.



(e) Test Case: SAV for Internet-facing network in intra-domain asymmetric routing scenario.



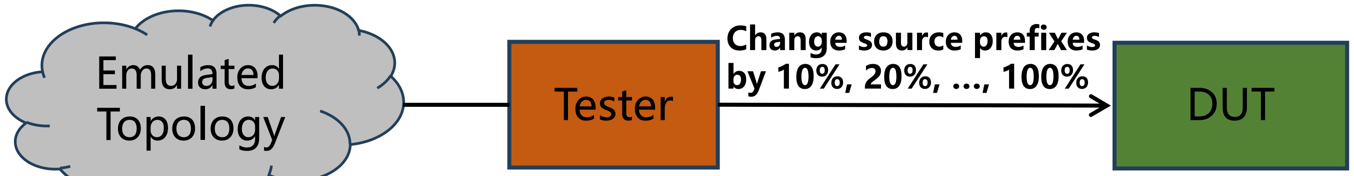
(f) Test Case: SAV for aggregation-router-facing network in intra-domain asymmetric routing scenario.

- We have revised all the six figures and descriptions of the traffic for constructing the symmetric and asymmetric routing scenarios in intra-domain SAV.
- In the figures, the traffic directions are described by the arrows in the figures from the view of the test network environments.

Updates of Protocol Convergence Performance Measurement

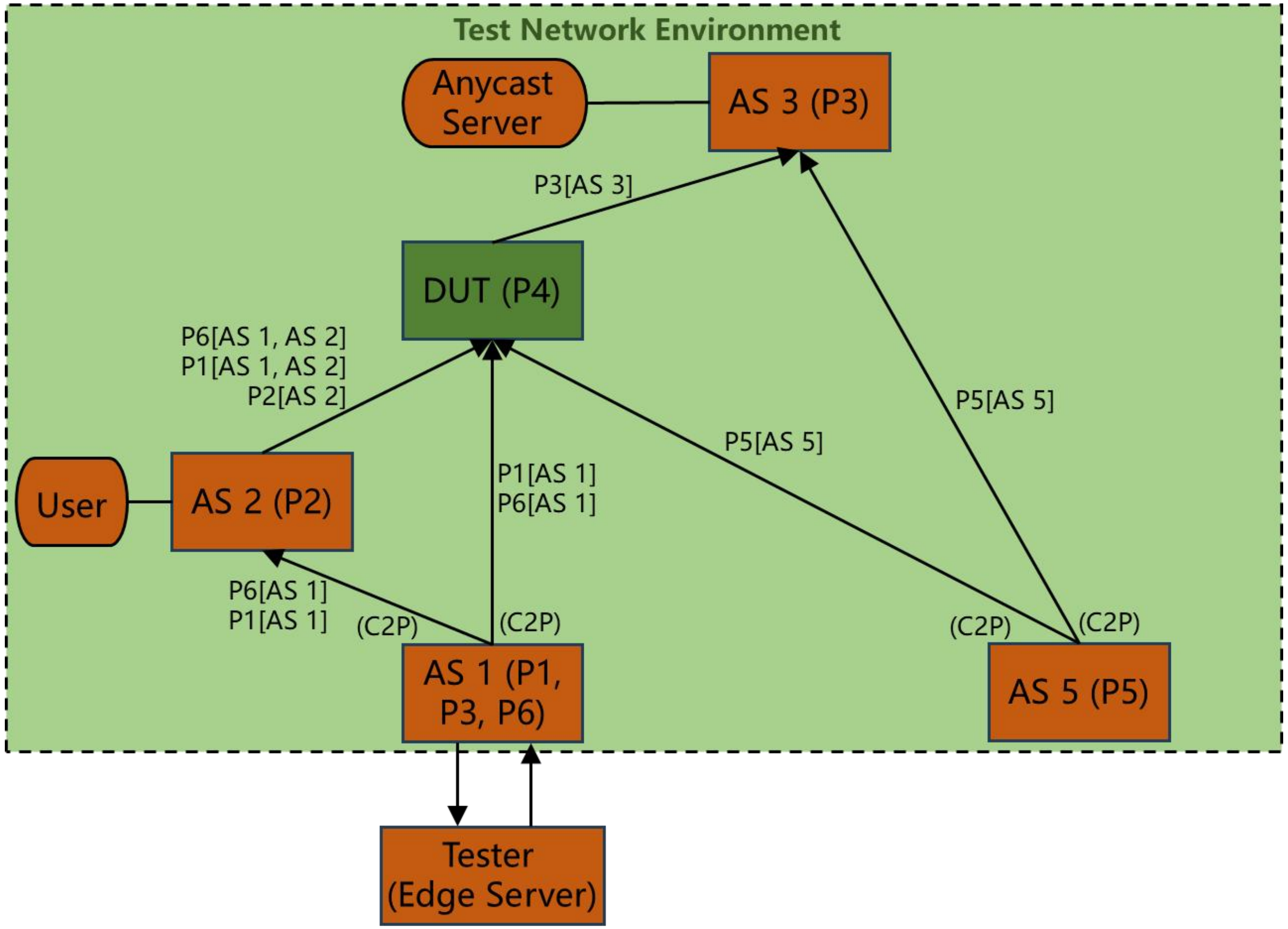
Protocol convergence performance

- Protocol convergence time is calculated by subtracting the beginning time from the completion time of the protocol convergence process.
- Withdrawing prefixes proportionally for IGP can be achieved by shutting down interfaces proportionally. For example, the Tester connects to an emulated network topology with each interface connecting to an emulated device. The Tester can connect to ten emulated devices via ten interfaces.
- The ten emulated devices can advertise their prefixes to the DUT. To withdraw 10% prefixes, the Tester can shut down one interface to the emulated device randomly.



Protocol convergence performance test

Updates of Test Cases for DSR Scenarios in Inter-domain SAV



SAV for customer-facing ASes in the scenario of direct server return (DSR).

- AS 1, AS 2, AS 3, the DUT, and AS 5 constructs the test network environment of DSR scenarios, and the DUT performs SAV as an AS.
- The user accesses the anycast destination along the path AS 2->DUT->AS 3.
- The tester (edge server) sends the content to the user with source addresses in prefix P3. The reverse forwarding path is AS 1->DUT->AS 2.
- To direct the return traffic from the edge server to the user along the path AS 1->DUT->AS 2, it is recommended to config static route to direct the traffic with source addresses in P3 and destination addresses in P2 to the DUT.
- The locations of DUT can be changed to AS 1 and AS 2 to evaluate SAV accuracy, which applies to other scenarios as well.

Next Step

- We seek feedback and comments.
- We are going to implement a benchmarking tool based on SAVOP (https://github.com/SAV-Open-Playground) for testing SAV mechanisms.
- Collaborations are welcome.

Thanks! ☺