Recent Progress of SAV Open Playground

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Review of the SAV Open Playground

- SAV Open Playground (SAVOP) tries to build a virtualized network platform to enable easy implementation of SAV mechanisms
- SAVOP is open-source: [https://github.com/SAV-Open-Playground/savop](https://github.com/SAV-Open-Playground/savop)
SAVOP’s Contributions to SAVNET WG

**SAVOP helps the completion of WG Charter items.**

**SAVOP**

- Implement and emulate the uRPF-based SAV mechanisms in different network scenarios, and analyze the emulation results.
- Implement and emulate a new SAV mechanism called RPDP, which is implemented by extending BGP, and demonstrate its accuracy improvement upon existing mechanisms.
- Plan to implement new mechanisms for generating SAV rules by extending BGP and emulate them in various network scenarios.

**Charter of SAVNET WG**

- Existing SAV mechanisms like uRPF-related technologies may improperly permit spoofed traffic or block legitimate traffic...
- Should include an analysis of the current solutions and their limitations...
- The accuracy of the new SAV mechanisms is expected to improve upon the current ones...
- The SAVNET WG will coordinate and collaborate with other WGs as needed.

Specific interactions may include (but are not limited to): idr for BGP extensions...
From March 2023 until now, we had committed **15K LoCs** to the Github repositories.

- **SAVOP**
  - [https://github.com/SAV-Open-Playground](https://github.com/SAV-Open-Playground)
- **SAV Reference Router**
- **SAV Agent**
  - [https://github.com/SAV-Open-Playground/sav-agent](https://github.com/SAV-Open-Playground/sav-agent)
- **SAVOP Ops Tools**
  - [https://github.com/SAV-Open-Playground/sav-ops](https://github.com/SAV-Open-Playground/sav-ops)
Communication Methods between SAV Agents
SAV Mechanisms Implemented by SAV Agent

3. NLnetLabs: https://github.com/NLnetLabs
Flexible Deployment of SAV Rules

Control Plane

- EFP-uRPF
- Strict uRPF
- RPDP

SAV Information Base (SIB)

- EFP-uRPF SAV Rules
- Strict uRPF SAV Rules
- RPDP SAV Rules

How can we deploy the SAV rules with IP tables flexibly?

- A module for using CLI configurations to deploy SAV rules at run time
- A web interface for specifying the deployed SAV rules dynamically

The SAV rules from various mechanisms are ready
The SAVOP Traffic Generator

- A UDP-based traffic generator has been implemented and has the following features to support the emulations of various SAV scenarios:

<table>
<thead>
<tr>
<th>Features</th>
<th>Functions</th>
</tr>
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<tbody>
<tr>
<td>Configuring source and destination addresses flexibly</td>
<td>Generating the traffic with the legitimate source addresses</td>
</tr>
<tr>
<td></td>
<td>Generating the traffic with the spoofing source addresses</td>
</tr>
<tr>
<td>Configuring the volume of generated traffic dynamically</td>
<td>Testing whether network configurations for routing work correctly</td>
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<tr>
<td></td>
<td>Testing whether the SAV table in the data plane work correctly</td>
</tr>
<tr>
<td>Reporting the traffic statistics in a real-time manner</td>
<td>Obtaining the functioning results for the legitimate traffic in real time</td>
</tr>
<tr>
<td></td>
<td>Obtaining the functioning results for the spoofing traffic in real time</td>
</tr>
<tr>
<td>Supporting flexible deployment of the generator</td>
<td>Making the traffic sender connect to any containerized routers easily</td>
</tr>
<tr>
<td></td>
<td>Making the traffic receiver connect to any containerized routers easily</td>
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</tbody>
</table>
The Future Development Plan of SAVOP

- We have aligned the SAVNET BGP extensions with vendors
  - New BGP SAFI: 251
  - Using BGP UPDATE message to propagate SPA
    - MP_REACH_NLRI for updating prefixes
    - MP_UNREACH_NLRI for withdrawing prefixes
  - Using BGP REFRESH message to propagate SPD

- We plan to implement the mechanisms of SPA and SPD based on the BGP extensions aligned with vendors and present the outcomes at the IETF 118 meeting

![SPA (Source Prefix Advertising) TLV Format](image1)

![SPD (Source Path Discovery) TLV format](image2)
Thank you 😊
Backup
SAVOP Architecture Overview

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SAVOP Architecture

Web App visualizes the workings of SAV mechanisms in a scenario

Users → Web App

Sim. Topology

Configs

Backend

Config DB

Virtual Network Manager setup container network for SAV scenarios

Emulated SAV Scenario

Router → SAV Agent → Router

SAV Agent

A reference SAV agent for BIRD router, which can implement all SAV mechanisms

Config DB stores the SAV scenarios for replaying on the web app