Analysis of Source Address Validation
Data Plane Performance
— An Implementation of Independent SAV Table

draft-li-savnet-dataplane-performance-00

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Background

• For any SAV mechanism, source address checking actions are added to the data plane, which affects the forwarding performance of network devices.

• The accuracy of the new SAV mechanisms is expected to improve upon the current ones. The data plane implementation of new SAV mechanisms may be different.

• There are concerns about the data plane performance of SAV mechanisms, whether the existing mechanisms or new ones.
SAV Table

• The key idea of SAV is to check whether a source prefix arrives from a valid interface.

• A SAV Table is the data structure that stores SAV rules on the data plane.

• Strict uRPF uses FIB as its SAV table. If the packet is received on the interface which would be used to forward the traffic to the source, it passes the check.
Independent SAV Table Mechanism

- New SAVNET mechanisms are expected to generate SAV rules based on the real data plane forwarding path. So, unlike Strict-uRPF reusing FIB, independent SAV table may be required.
- An early prototype of independent SAV Table mechanism is implemented.

![Diagram showing Local Table and Global Table]

Local Table (Each line card stores part of SAV rules which are related with its own interfaces)

+----------------+----------------+
| Key-1:         | Key-2:         |
| Source Prefix  | Valid Incoming Interface |
+----------------+----------------+
| p1             | if1             |
+----------------+----------------+
| p3             | if1             |
+----------------+----------------+

Global Table

+----------------+----------------+
| Key:           | Source Prefix  |
+----------------+----------------+
| p1             | p2             |
| p3             | p4             |
+----------------+----------------+

Source IP, Interface → Local Table
Source IP → Global Table

- Valid
- Invalid
- Unknown

Example: p1 arrives at if1
Example: p2 arrives at if1
Example: p4 arrives at if1

* The described mechanism is a possible option for realizing independent SAV table. Vendors may choose different solutions based on their existing implementations.
### Performance Testing

- A test for the data plane performance of SAV is carried out on the H3C CR Device.

<table>
<thead>
<tr>
<th>Index</th>
<th>SAV Mechanism</th>
<th>pps of Export Flows</th>
<th>(Ratio to Non-SAV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Non-SAV</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ACL</td>
<td>96.6%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Strict uRPF</td>
<td>94.4%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Loose uRPF</td>
<td>94.4%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Independent SAV Table</td>
<td>94.5%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Independent SAV Table</td>
<td>94.5%</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Independent SAV Table</td>
<td>94.5%</td>
<td></td>
</tr>
</tbody>
</table>

**Test Traffic:** IPv6 packets, 78 Byte, line rate

```
A +--------+ C
| -------+ DUT |
| ------+ Flow-Out--|
| ----Flow-In-->| D | Flow-Out--|
|       | B +-------+ |
|       | TC        |
|       +-------+ 100Gbps Ethernet
```

- A +--------+ C
- 1,000 source prefixes
- 10,000 source prefixes
- 100,000 source prefixes
Next Steps

• Revise the draft according to feedbacks.
  – The main purpose of this draft is to address the concerns about the data plane performance of SAV mechanisms.
  – Rename and modify the text to conform with the SAVNET charter.

• Any questions or comments are Welcomed.
Thanks