Packet Generation in Service Function Chains

Draft-penno-sfc-packet-03
IETF96 - Berlin

Reinaldo Penno (rpenno@cisco.com)
Carlos Pignataro (cpignata@cisco.com)
  Chui-Tin Yen (tin@cisco.com)
  Eric Wang (ejwang@cisco.com)
  Kent Leung (kleung@cisco.com)
David Dolson (ddolson@sandvine.com)
Review of Problem Statement

Service Functions generate packets in the reverse flow direction to the source of the current in-process packet/flow

- Firewall
- NAT
- Proxies, caches, accelerators
- Intrusion Prevention Systems
Changes since -02

- Added an optimized method of encoding reverse path information in 32 bits of metadata (vs. 48 bits)
- Identified 6 classes of metadata
Methods of Path Reversal

1. SF has reverse path config -- configure SFs with reverse SPI/SI per forward SPI/SI
2. SF requests SFF to reverse using OAM protocol; SFF has reverse path config -- configure SFF with a reverse SPI/SI per forward SPI/SI
3. Classifier encodes reversal information in metadata
4. Algorithmic -- assuming systematic assignment of pairs of SPI/SI by control plane
## Methods -- Scope of Impact

<table>
<thead>
<tr>
<th>Method</th>
<th>Requires symmetric path</th>
<th>Control Classifier (C1)</th>
<th>Control SFF (C2)</th>
<th>Control SF (C3)</th>
<th>Requires OAM protocol</th>
<th>Special SPI/SI selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SF has reverse path config</td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. SF requests SFF to reverse; SFF has reverse path config</td>
<td></td>
<td>YES</td>
<td></td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>3. Metadata encodes reversal</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>4a. Same path, disjoint index (algorithmic)</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>4b. Flip path ID (algorithmic)</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>
Document recommends Flip-Path-ID

- Solution contained to SF
- Assumes paths are assigned in pairs
- Requires symmetry in number of hops
  - Shows how “no-op” in SFF can create symmetry in some cases

“Same Path-ID with Disjoint Index Spaces” has similar properties and limitations

- Satisfying to use same SPI for both directions
- But more restrictions on SI selection
The No-Op Next-Hop in SFF

- The recommended approach does not work for asymmetric path layout
  - (The math assumes same number of SFs in each direction)
- Adding the no-op concept to the SFF simplifies things
- If the SFF finds “no-op” entry for a received SPI/SI, the SFF decrements the index and repeats the lookup.
## Classes of Metadata

<table>
<thead>
<tr>
<th>Type</th>
<th>Meaning</th>
<th>Example</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Path-invariant</td>
<td>Same for all packets of a path</td>
<td>VPN identifier</td>
<td>Configure SF with the value for each path</td>
</tr>
<tr>
<td>Path default</td>
<td>Can vary packet by packet but there is a default value that works</td>
<td>QoS treatment</td>
<td>Configure SF with the default value globally or per path</td>
</tr>
<tr>
<td>Bidir cloneable</td>
<td>Represents both directions of a transport flow</td>
<td>Subscriber identifier</td>
<td>May be copied from one packet to another for the same transport flow.</td>
</tr>
<tr>
<td>Unidir cloneable</td>
<td>Represents one direction of a transport flow.</td>
<td>Ingress identifier</td>
<td>May be copied from one packet to another for same direction of same transport flow.</td>
</tr>
<tr>
<td>Created by SF</td>
<td>The SF is responsible for adding it</td>
<td>DPI output</td>
<td>The SF needs no special instructions</td>
</tr>
<tr>
<td>Reclassified</td>
<td>The SF cannot know what value to use</td>
<td>Policing color</td>
<td>Injected packet must be sent for reclassification</td>
</tr>
</tbody>
</table>
Questions for Audience

● Are SF implementers facing path reversal problem?
  ○ Yes? Which type of SF?
  ○ No? Which type of SF?

● What solutions have you chosen? Anything not in this draft?
  ○ Solutions for SPI/SI reversal?
  ○ Solutions for metadata of injected packets?
Adoption?

● Authors believe document is ready for adoption.

● Addresses critical issues for service chaining.

● Would chairs issue an Adoption poll?