Protocol Assisted Protocol (PAP)

draft-li-rtgwg-protocol-assisted-protocol-01
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Motivation

• Protocol troubleshooting methods
  • Centralized data collection + SDN server analysis: SNMP, Netconf, BMP
    • Advantage:
      • Network-wide data view
      • facilitating automatic troubleshooting
    • Disadvantage:
      • Relying on the existence of a centralized SDN server
      • gh network resource consumption: bandwidth + CPU cost
      • Lack cross-domain information (out of management domain)
  • Distributed troubleshooting: Manual per-device login + CLI checking statistics/logs/alarms
    • Advantage:
      • Low network resource consumption
    • Disadvantage:
      • Lack network-wide view
      • Low efficiency for locating the issue
      • Requiring high NOC experience
  • Semi-centralized semi-distributive approach: convey diagnosing data using existing routing protocols
    • Advantage
      • Not relying on the existence of a centralized SDN server
    • Disadvantage
      • Requires persistent augmentation work to all routing protocols
      • Possible interop issues with legacy devices, affecting existing routing system
PAP (Protocol assisted Protocol)

• A new semi-distributive semi-centralized approach
  • A generic “tunnel” for exchanging troubleshooting data of various protocols
• PAP (Protocol assisted Protocol)
  • designed for devices to exchange protocol related information between each other
  • Separates routing and non-routing data
• Merits
  • Adds more network-wide data for individual device
  • Not relying on a centralized server
  • No data collection boundary in cross-domain environment
  • Relieves bandwidth/CPU pressure of centralized data collection/analysis
  • Facilitates automatic troubleshooting
  • No impact on existing routing system
Troubleshooting Use Cases

• BGP route oscillation
  • A PAP Request Message sent: “Are you the oscillation source?”
  • A PAP Reply Message sent: “I’m the oscillation source!”
  • or A PAP Reply Message sent: “I’m not the oscillation source!”; with a further PAP Request Message sent: “Are you the oscillation source?”
  • …
  • Until someone replies with “I’m the oscillation source!”

• RSVP-TE set up failure
  • A PAP Notification Message “A link failure happens here!” sent from the failure device to the Ingress device.
PAP Messages

• PAP uses UDP as its transport protocol
  • UDP vs TCP: PAP designed for on-demand communications
  • Requires the assignment of a User Port registry for the UDP Destination Port

• PAP Message format
  • PAP common Header
  • Negotiation Message
  • Request Message
  • Reply Message
  • Notification Message
  • ACK Message

[Diagrams of PAP message formats and encapsulation in UDP]

<table>
<thead>
<tr>
<th>ETH. Header</th>
<th>IP Header</th>
<th>UDP Header</th>
<th>PAP Header</th>
<th>PAP Payload</th>
</tr>
</thead>
</table>

Figure 1. Encapsulation in UDP

```
<table>
<thead>
<tr>
<th>0 15 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence Number</td>
</tr>
<tr>
<td>Msg. Type</td>
</tr>
</tbody>
</table>
```

Figure 2. PAP Common Header

```
<table>
<thead>
<tr>
<th>0 15 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
</tr>
</tbody>
</table>
```

Figure 3. PAP Negotiation Message

```
<table>
<thead>
<tr>
<th>0 15 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]C</td>
</tr>
</tbody>
</table>
```

Figure 4. PAP Request Message

```
<table>
<thead>
<tr>
<th>0 15 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]C</td>
</tr>
</tbody>
</table>
```

Figure 5. PAP Request Message

```
<table>
<thead>
<tr>
<th>0 15 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]C</td>
</tr>
</tbody>
</table>
```

Figure 6. PAP Notification Message

```
<table>
<thead>
<tr>
<th>0 15 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]C</td>
</tr>
</tbody>
</table>
```

Figure 7. PAP ACK Message
PAP Operations

• Capability Negotiation Process
  • Exchange protocol capabilities between PAP speakers
  • Inform the remote PAP speakers of enabling/disabling local protocol capabilities

• Data Request and Reply Process
  • Request specific data from remote PAP speakers
  • Reply with requested data to requested PAP speakers

• Data Notification Process
  • Actively send notification information to remote PAP speakers
Questions and Comments?