RSVP Refresh Overhead Reduction - rfc 2961 Support

Amrit Hanspal, PM – MPLS & QoS
ITD Product Management
• RSVP Basics
• Issues with Signaling Overhead
• Refresh Reduction
  What is Refresh Reduction?
  RSVP Header/Objects – A Recap...
  Message IDs Formats
  Reliable Messages
  Summary Refresh Messages
  Bundle Refresh Messages
• Summary
RSVP Architecture

Control Plane

Host

Data Plane

Router

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RESV and PATH Messages

- Path messages
  - Server generates PATH message toward requested receiver. PATH messages are forwarded to each hop.

- Reservation request messages
  - Receiver generates RESV message which inversely traverses the path.
ERROR Messages

• Path Error messages result from path messages and travel toward senders

Path Error messages

Reservation request error messages

• Admission failure
• Bandwidth unavailable
• Service not supported
• Bad flow specification
• Ambiguous path
Confirmation Messages

- Reservation request acknowledgment messages

Reservation Req ACK

- These messages travel towards the receiver.
Teardown Messages

Two Types

- Path teardown messages
- Reservation request teardown messages

Path teardown messages

Reservation request teardown messages

Both types travel from the point of initiation
Issues with RSVP Refresh signaling

- RSVP is a “soft state” protocol; i.e., it maintains state in each router or host
- State needs to be periodically refreshed – thus Refresh Messages are required
- Refresh Messages are used for:
  - State Synchronization between RSVP neighbors
  - Recover from Lost RSVP Messages
- Operational problems with Refresh Signaling
  - *Scaling* – Number of RSVP sessions $\propto$ Overhead refresh traffic $\propto$ Resource Requirements (processing/memory)
  - *Reliability and Latency* – Based on Refresh Period:
    - Greater Refresh Period $\Rightarrow$ Longer time to synchronize state
    - Lower Refresh Period $\Rightarrow$ Greater refresh signaling volume
What is Refresh Reduction?

Refresh Reduction Extensions are defined in IETF RFC - rfc2961.

The following have been implemented as part of Reliability Enhancements for RSVP in Cisco IOS:

• Add a “refresh-reduction-capable-bit” in RSVP message headers - indicates whether node is Refresh Reduction capable.

• Support for Message IDs - RSVP session “identifiers”

• Reliable Messages - Using Message IDs with explicit Acknowledgements and rapid retransmission

• Summary Refresh Messages - Uses Message IDs to refresh state rather than using PATH/ RESV refresh messages.

• Bundle Refresh Messages - Ability to “Receive Only” is being implemented.
RSVP Headers/Objects – A recap

Common Header Format

Object Format

32 bit word length
Message_ID Object Formats

<table>
<thead>
<tr>
<th>Flags</th>
<th>Epoch</th>
<th>Message Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flags = 0x01 \(\Rightarrow\) ACK Desired which is used for Reliable Messages - Used Only with Message_ID

Randomly chosen number - Value should NOT change unless node is restarted

**Message_ID**
Class Number = 23
Class Type = 1

**Message_ID_ACK**
Class Number = 24
Class Type = 1

**Message_ID_NACK**
Class Number = 24
Class Type = 2
Reliable Messages

\[ R_{rt} = \text{Retransmit Time}; \quad R_{aht} = \text{Acknowledgement Hold Time}; \]

\[ R_{m} = \text{Successive Refresh Messages Missed} \]

- **Origin Node**
- **Destination Node**

- **Message_ID with ACK**
- **Successful Response**
- If Successful Response is received - STOP, else proceed down
- **Retransmit Message_ID with Ack**
- Continue Retransmission till \( R_{m} \) Refresh Messages are missed. Increase \( R_{m} \) by factor of 2 for next retransmission
- **Retransmit Message_ID with Ack**
- **Begin Teardown after \( R_{m} \) Refresh Messages are lost**

- **Time**

- \( 0 \) secs.

- **Raht**

- **Rrt**

- \( n \times R_{rt} \) where \( n < R_{m} \)
Summary of IOS Commands for Reliable Messages

- **ip rsvp signalling refresh reduction**
  
  *Enables Refresh Reduction on interface*

- **ip rsvp signalling refresh reduction reliable ack-hold-time**
  
  *Time to wait for Acknowledgement – should be less than retransmit time*

- **ip rsvp signalling refresh reduction reliable ack-max-size**
  
  *Controls size of Ack messages – lower size means fewer acks per message, higher size means more acks per message*

- **ip rsvp signalling refresh reduction reliable retransmit-time**
  
  *Specifies Retransmit Time for messages*

- **ip rsvp signalling refresh missed**
  
  *Specifies number of successive Refresh messages are missed before RSVP initiates teardown of session*
Summary Refresh Message Format

Summary Refresh Messages:

- Contains Message IDs of RSVP sessions that need to be refreshed
- Length of Summary Refresh message is configurable. Smaller size will increase SRefresh volume – however larger size may result in inefficient filling of SRefresh message
- If a Refresh failure occurs – a Message_ID_NACK is returned to sender
IOS Command for Summary Refresh

ip rsvp signalling refresh reduction

Enables Summary Refresh messages to be exchanged between RSVP neighbors – Summary is switched on by default with this command.

ip rsvp signalling refresh reduction summary

Enables Summary Refresh messages to be exchanged between RSVP neighbors – Explicitly switches on Summary, used especially after the below command.

no ip rsvp signalling refresh reduction summary

Disables Summary Refresh messages to be exchanged between RSVP neighbors.
**Bundle Messages**

<table>
<thead>
<tr>
<th>Version</th>
<th>Flags</th>
<th>Message Type</th>
<th>RSVP Checksum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Send TTL</th>
<th>(Reserved)</th>
<th>RSVP Length</th>
</tr>
</thead>
</table>

**Second Sub Message**

**First Sub Message**

**Bundle Messages ⇒**

Message Type = 12

"Bundling" of Messages

Cisco supports “receive only” of Bundle Messages. Bundle messages is NOT recommended for achieving true Refresh Reduction.
Availability

• Rfc2961 – Refresh Overhead Reduction will be available in 5\textsuperscript{th} release of 12.2T and 12.0(24)S