RSVP Extensions for Flexible Resource Sharing

draft-narayanan-tsvwg-rsvp-resource-sharing-01

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Agenda

- Recap of problem

- Recap of solution

- Changes from previous version

- Outstanding issues

Recap of problem

- Currently RSVP flows with different SESSION objects cannot share resources

- There are some use cases where this is important
  - Symmetric NAT
  - VoIP call sharing

- Proposed solution: separate resource sharing from SESSION object

Recap of solution

- Resource Sharing ID (RSID): New object carried with FILTER_SPEC in Resv message
  - Only supported for SE and WF styles
  - Can be carried in Path as an advisory from sender to receiver, or signaled out-of-band

- RSID propagated upstream as part of reservation

- Routers along the path will allocate shared resources to reservations carrying the same RSID on the same interface

Changes from previous version

- Further definition of RSID object format
  - Draft-00 left it up to implementations, possibly causing conflicts
  - Draft-01 defines disambiguating options

- Editorial changes

Format of RSID

- Disambiguated by sender IP address

Length (16 bits)	Class=RSID	C-Type=1
IPv4 address of allocating node (32 bits)		
Resource Sharing ID (variable length)		

Length (16 bits)	Class=RSID	C-Type=2
IPv6 address of allocating node (128 bits)		
Resource Sharing ID (variable length)		

Format of RSID

- Disambiguated by vendor ID
  - Independent of sender address, but vendor must guarantee RSID uniqueness
  - Uses IANA Private Enterprise Number (RFC2578), from `http://www.iana.org/assignments/enterprise-numbers`

Length (16 bits)	Class=RSID	C-Type=3
Vendor Private Enterprise Number (32 bits)		
Resource Sharing ID (variable length)		

Outstanding issues

- RFC4872/4873 define an existing mechanism to share resources between flows of different sessions
  - ASSOCIATION object of Resource-Sharing type carried in Path message can define a resource-sharing relationship between two LSPs

- Problem: ASSOCIATION is carried in Path message
  - Doesn't work for multicast
  - Not really suitable for RSVP QoS, where the Resv message should define resource management requests. Note that RSID can be carried in the Path, but it is advisory to the receiver. ASSOCIATION MUST be in the Path and is used as definitive.

- Problem: ASSOCIATION appears to only share resources between LSPs with the same endpoint addresses
  - RFC4872: "In the context of end-to-end LSP recovery, the association MUST only identify LSPs that support the same Tunnel ID as well as the same tunnel sender address and tunnel endpoint address"
  - RFC4873: "In this document, we define a new Association Type field value to support make-before-break; the formats and procedures defined in [RFC4872] are not otherwise modified."

Outstanding issues

- Problem: Association parameters are
    <Association Source Address> + <16-bit Association ID>
  - Suitable for LSPs which have the same Tunnel ID and endpoint addresses only
  - Restrictive for other applications (and in fact for general LSP resource sharing)
  - Association ID is bound to a sender, requiring state maintenance mechanisms for flows coming from different senders

- Need to determine whether to define a new mechanism for this or to somehow enhance ASSOCIATION object behavior
 - Suggestions welcome

Backup Slides

Motivation

- SESSION object has three unique functions
  - Functions as a unique key
  - Specifies destination L3+L4 address of data flow
  - Defines set of flows that may share resources

- RSVP reservations can only share resources if the flows go to the same destination

- This restriction causes problems with certain use cases of RSVP

Problem: VoIP features

- Sharing bandwidth between calls currently in call-waiting

- Shared calls between shared-line extensions at different locations

- Sharing not possible in RSVP for reservations going to different {L3,L4} destinations
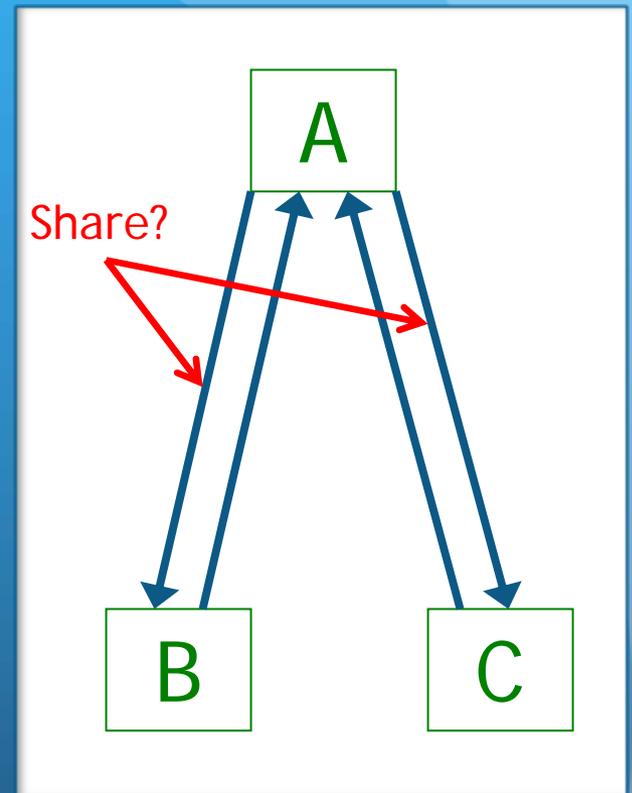
Problem: Symmetric NAT

- Unidirectional flows to the same destination, traversing symmetric NAT

- NAT issues different destination ports to the different senders

- Sharing not possible in RSVP for reservations going to different {L3,L4} destinations
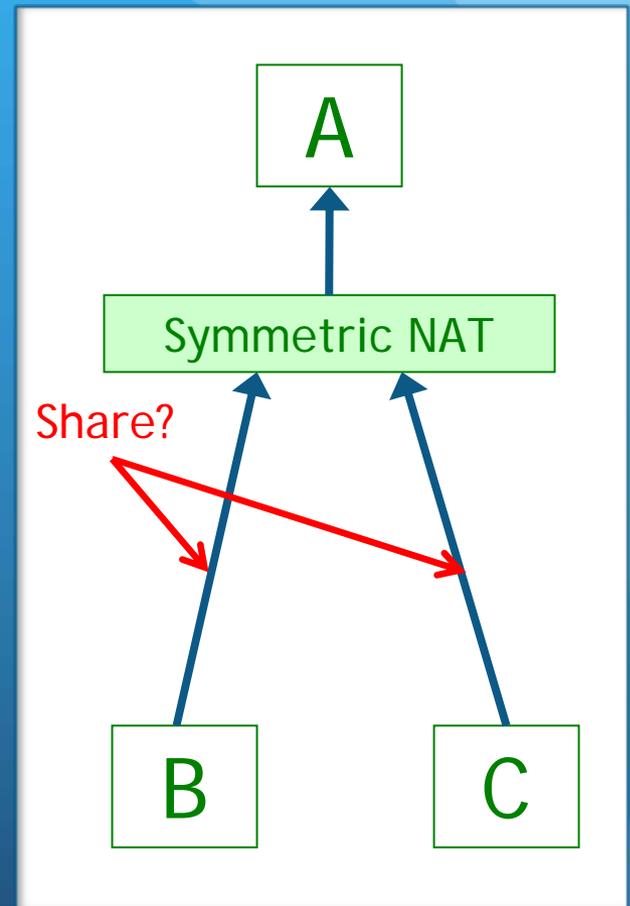
Solution space

- We need to separate the "reservation sharing" decision from the "session destination"

- Broadly, two options:
  1. Define new object describing reservation sharing, leave session destination in SESSION
  2. Define new object describing session destination, leave reservation sharing in SESSION

- Backward compatibility better with Option 1

Resource Sharing ID

- Resource Sharing ID (RSID): New object carried with FILTER_SPEC in Resv message
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- RSID propagated upstream as part of reservation

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RSVP Resv Message Format RBNF

```
<Resv Message> ::=        <Common Header> [ <INTEGRITY> ]
                          <SESSION> <RSVP_HOP> <TIME_VALUES>
                          [ <RESV_CONFIRM> ] [ <SCOPE> ]
                          [ <POLICY_DATA> ... ]
                          <STYLE> <flow descriptor list>

<flow descriptor list> ::= empty | <FF flow descriptor list>
                 | <SE flow descriptor> | <WF flow descriptor>

<FF flow descriptor list> ::= unchanged

<SE flow descriptor> ::= <FLOWSPEC> <SE filter spec list>

<SE filter spec list> ::= <SE filter spec> |
                          <SE filter spec list> <SE filter spec>

<SE filter spec> ::= <FILTER_SPEC> [ <RSID> ]

<WF flow descriptor> ::= <FLOWSPEC> [ <RSID> ]
```

RSVP Path Message Format RBNF

```
<Path Message> ::=          <Common Header> [ <INTEGRITY> ]
                            <SESSION> <RSVP_HOP> <TIME_VALUES>
                            [ <POLICY_DATA> ... ]
                            <sender descriptor>


<sender descriptor> ::=     <SENDER_TEMPLATE> <SENDER_TSPEC>
                            [ <ADSPEC> ] [ <RSID> ]
```
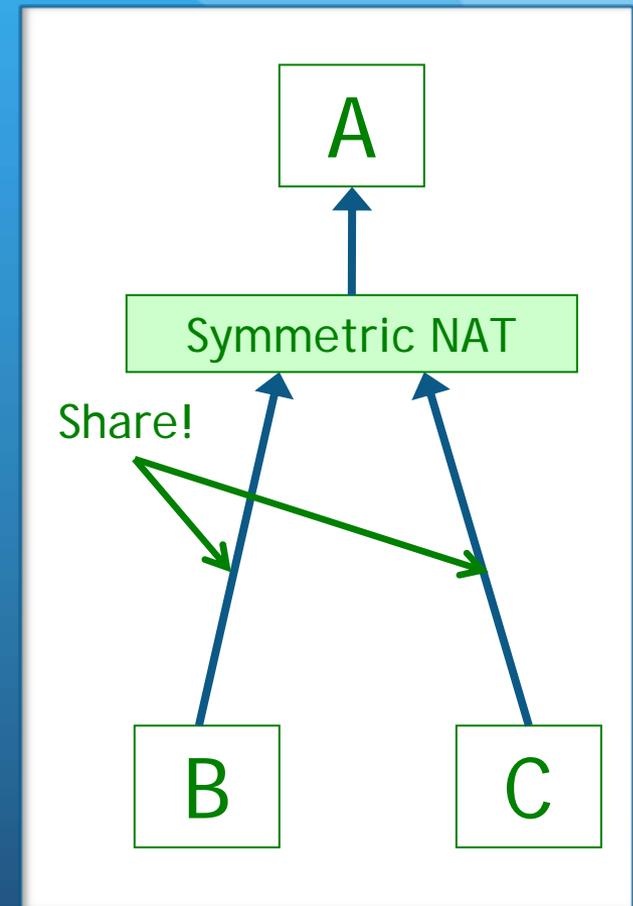
RSID with Symmetric NAT

- Unidirectional flows to the same destination, traversing symmetric NAT

- Two Resv messages from A (for B→A and C→A flows) carry same RSID
  - Either generated by signaling, or communicated in Path

- The B→A and C→A flow reservations can now share bandwidth on common links

RSID Mechanics

- Object format opaque to midpoints
  - Only support byte-wise comparison of RSIDs

- MUST be allocated to be unique within the solution space. Can be:
  - allocated as part of call signaling
  - composed out of sender IP + sender-allocated ID

- Reservations with same {SESSION,FILTER_SPEC} MUST carry the same RSID
  - If not, "Conflicting RSID" ResvError is generated

- For WF style, RSID causes reservations to different SESSION objects to share bandwidth
  - Resvs for same SESSION MUST have same RSID

More about RSID

- RSID only controls *which* reservations share resources, not *how* they are shared
  - Computation of shared envelope FLOWSPEC unchanged
  - Sharing mechanism (e.g. shared queue) unchanged

- RSID for resource theft?
  - Admission policy enforceable independent of RSID

- RSID for resource denial?
  - Killer-reservation problems from RFC2205 apply
  - Fortunately, K-R solutions apply too ☺