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                              RSVP Proxy

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Abstract

   RSVP has been extended in several directions [POLICY], [RSVP-APPID],
   [DCLASS], [AGGRRSVP], [RSVPDIFF]. These extensions have broadened the
   applicability of RSVP characterizing it as a signaling protocol
   usable both inside and outside the Integrated Services [INTSERV]
   model.

   With the addition of the "Null Service Type" [NULLSERV], RSVP is
   also being adopted by mission critical applications that require some
   form of prioritized service, but cannot quantify their resource
   requirements. In cases where RSVP cannot travel end-to-end, these
   applications may still benefit from reservations that are not truly
   end-to-end, but that are 'proxied' by a network node on the data path
   between the sender and the receiver(s).

   RSVP Receiver Proxy is an extension to the RSVP message processing
   (not to the protocol itself) in which an intermediate network node
   originates the Resv message on behalf of the receiver(s) identified
   by the Path message.

   RSVP Sender Proxy involves generating a Path message based on some
   match criteria at a router. For example, a packet filter can be
   installed at a router and the action associated with a match in the
   filter could be to generate a Path message.

1. **Introduction**

   Network administrators and application developers would sometimes
   like to provide QoS to a flow based on information such as:

   o the type of application to which the flow belongs
   o a specific transaction within an application to which the flow
     belongs
   o the user running the application to which the flow belongs

   Typically, such flows belong to applications that cannot quantify
   their traffic characteristics.

   Since the data packets themselves do not usually carry information
   such as application or user id, an alternative approach is to signal
   this information separately.

   RSVP [RFC2205] is a well established, standard IETF protocol that is
   used by applications to signal their QoS requirements to the network
   and obtain feedback about the network's ability to provide the
   requested QoS. An existing RFC [RSVP-APPID] defines the objects that
   can be used to carry the application id/sub-id and user-id in an RSVP
   message. Also, ISSLL has defined a new service type called Null
   Service Type [NULLSERV] for use within the IntServ framework. This

service is intended for applications whose QoS requirements are
better left to the discretion of the network administrators.

However, RSVP as currently defined travels end-to-end i.e. from the sender to the receiver and back. For the applications discussed above, this end-to-end nature of RSVP is not always applicable. For example, it might be that the application has been modified only on the sender side to support RSVP; there is no use in forwarding this message to the receiver since it does not support RSVP. Another example is where RSVP is used only within an administrative domain and a provisioned core is used outside of this domain. In such situations, RSVP is beneficial only within the administrative domain it has been enabled in. An example of this situation is QoS in PacketCable[DQOS], where resource reservations are used only within the access portion of the network and the core of the network is provisioned.

RSVP Receiver Proxy is proposed to address such situations.

2. RSVP Receiver Proxy

RSVP Receiver Proxy is a functionality provided by a network device, such as a switch or a router, in which the network device originates the Resv message in response to an incoming Path message, on behalf of the receiver(s) identified by the Path message.

The generation of the Resv message is done under policy control. Policy control can be performed using policy that has either been locally specified or specified by a policy server via a protocol such as COPS for RSVP [COPS-RSVP].

The proxy functionality does not imply merely generating a single Resv message. Proxying the Resv involves installing state in the node doing the proxy i.e. the proxying node should act as if it had received a Resv from the true endpoint. This involves reserving resources (if required), sending periodic refreshes of the Resv message and tearing down the reservation if the Path is torn down.

Optionally, the network device can also be configured to classify the packets and mark them with an appropriate DSCP. The codepoint used to mark these packets can also be communicated to the sender of the Path message via the DCLASS[DCLASS] object carried in the proxy Resv message.

RSVP Receiver Proxy does not change the "on-the-wire" RSVP protocol. It entails only a modification in the processing of the RSVP messages.

RSVP Receiver Proxy can be used with all the service types - Controlled Load [CLSVC], Guaranteed Service[GUSVC] and Null Service - defined by Integrated Services.

2.1 Processing of other RSVP messages

Apart from proxying the Resv message, the proxying node must also be

   modified to handle differently the following RSVP messages:

   o PathTear message is honored and its forwarding behavior is similar
     to a Path message. However, in addition to tearing down the Path
     state, the node must also send a ResvTear and tear down the
     reservation state.

   o PathErr messages are treated as in normal RSVP. Just as in the case
     of PathTear, if a Resv is being proxied, the PathErr should also
     result in the tear down of the reservation state.

   Processing of other RSVP messages is similar to existing behavior as
   defined in [RFC2205].

2.2 RSVP Receiver Proxy: An Example

   This section illustrates the RSVP Receiver Proxy functionality
   provided by a network device. The description is focussed mainly on
   the two fundamental messages in RSVP, i.e. the Path Message and the
   Resv message.

   Figure 1 depicts a simple network topology consisting of two hosts H1
   and H2 and four intermediate routers, R1-R4.

```
                       Path Message ----->
                       <----- Resv Message

   +----+    +----+    +----+    +----+    +----+    +----+
  | H1 |---| R1 |---| R2 |---| R3 |---| R4 |---| H2 |
   +----+    +----+    +----+    +----+    +----+    +----+

    H1 ----> R1 ----> R2 ----> R3 ----> R4 ----> H2   Case A: Normal
                                                  |    RSVP Processing
                                                  v
    H1 <---- R1 <---- R2 <---- R3 <---- R4 ----> H2


    H1 ----> R1
            |                               Case B: RSVP Receiver Proxy
            v
    H1 <---- R1


    Hx: Host x
    Ry: Router y
```
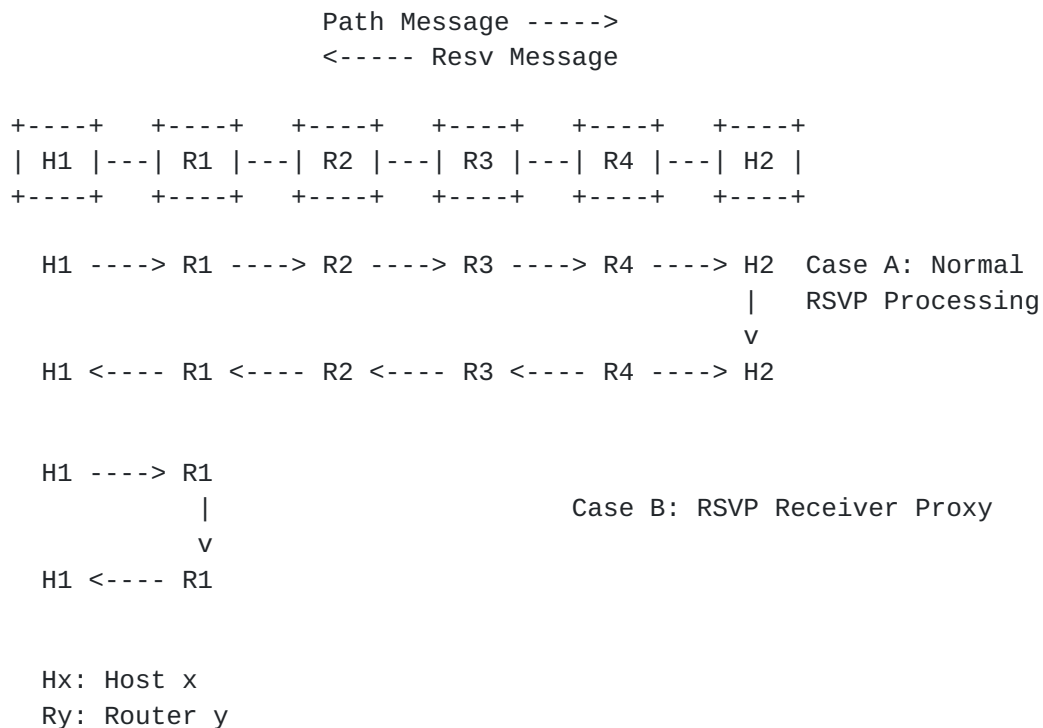
   Figure 1: Possible Message Forwarding Behaviors in RSVP

   In Figure 1, case A illustrates the normal RSVP message processing.
   The Path message is generated by H1, is destined to H2, and it gets

to H2 from H1 via R1, R2, R3 and R4. The Resv message uses the

      reverse of the path setup by the Path message and goes hop-by-hop
      from H2 to H1.

      With RSVP Receiver Proxy (case B) the RSVP Path message is terminated
      by the router R1 acting as a proxy for H2.

      A possible sequence of steps is:

      o An application on H1 indicates to the RSVP subsystem that it is a
        sender wishing to use RSVP. It might specify additional parameters
        such as traffic characteristics and application specific
        information.

      o This causes the RSVP subsystem on H1 to start transmitting RSVP
        Path messages in accordance with normal RSVP/SBM rules.

      o The first hop network device (R1) receives this message and applies
        policy control to decide how to process this message.

      o The policy specifies a decision to not forward the Path message,
        but instead to proxy a Resv on behalf of H2. Additionally, the
        policy could specify the list of objects that need to be sent in
        the Resv message. One such additional object is the DCLASS
        object. Further, the policy could specify a DSCP that the
        network device (R1) must mark the flow identified by the Path
        message.

      o On receiving the Resv message, if the DCLASS object is specified
        the message, H1 can mark the packets of the traffic flow signaled,
        according to the DSCP specified in the DCLASS object.

[3]. RSVP Sender Proxy

      Just as a network device can proxy a Resv message on behalf of a
      receiver, it can also be made to proxy a Path message on behalf of a
      sender. However the trigger that determines when a network device
      must generate a proxy Path message is potentially outside the RSVP
      subsystem. One mechanism for example, would be to install filter
      entries in the network device such that if an incoming flow matched
      one of the filters, the device would start generating a proxy Path
      message. At this point, it could potentially contact a policy server
      or use local policy in determining the behavior and contents of the
      proxy Path message.

      The device generating the Path message must correctly terminate the
      Resv, ResvTear and PathErr messages.

[4]. Where To Proxy

      In the example described in [section 3], the Receiver Proxy

functionality was placed in the network device that was the first hop

   from the sender of the Path message. This is one possibility, not
   a requirement. While designing a network, the following trade-offs
   should be considered:

   o In case of Receiver Proxy, proxying farther from the sender of the
     Path message enables additional downstream network elements to
     benefit from the information carried in the signaling messages, and
     to participate in the response. For example, if some receivers are
     located off low-bandwidth links and other receivers off
     high-bandwidth links, the QoS to be applied could be different for
     the different receivers.

   o The proxying might be done at the boundary of an access network and
     a core network as in the case of PacketCable.

   o In case of Receiver Proxy, proxying closer to the sender results in
     a lower the latency experienced by the sender between the
     generation of the Path message and the receipt of the Resv
     message. This lower latency might be desirable to some
     applications.

   The network administrator must take into account such factors in
   deciding where to place the proxy.

5. Security Considerations

   The security considerations related to proxying are similar to those
   raised with respect to RSVP (section 2.8 in [RFC2205]). Specifically,
   the main concern in using a proxy is to ensure that unauthorized
   nodes do not mount a denial of service attack or cause theft of
   service by generating proxy RSVP messages on behalf of either a
   receiver or a sender. The problem is addressed via router to router
   authentication and using the INTEGRITY object [RFC 2747] in RSVP
   messages. Security policy enforcement can further prevent such attacks.

6. Intellectual Property Considerations

   The IETF is being notified of intellectual property rights claimed in
   regard to some or all of the specification contained in this document.
   For more information consult the online list of claimed rights.

7. References

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