                Extending the Session Initiation Protocol (SIP)
                      Reason Header for Preemption Events

Status of This Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

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Abstract

   This document proposes an IANA Registration extension to the Session
   Initiation Protocol (SIP) Reason Header to be included in a BYE
   Method Request as a result of a session preemption event, either at a
   user agent (UA), or somewhere in the network involving a
   reservation-based protocol such as the Resource ReSerVation Protocol
   (RSVP) or Next Steps in Signaling (NSIS). This document does not
   attempt to address routers failing in the packet path; instead, it
   addresses a deliberate tear down of a flow between UAs, and informs
   the terminated UA(s) with an indication of what occurred.

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1. Introduction

   With the introduction of the SIP Resource-Priority (R-P) header [4],
   there became the possibility of sessions being torn down for (scarce)
   resource reasons, meaning there weren't enough resources for a
   particular session to continue. Certain domains will implement this
   mechanism where resources may become constrained either at the user
   agent (UA) or at congested router interfaces where more important
   sessions are to be completed at the expense of less important
   sessions. Which sessions are more or less important than others will
   not be discussed here. What is proposed here is a SIP [2] extension
   to synchronize SIP elements as to why a preemption event occurred and
   which type of preemption event occurred, as viewed by the element
   that performed the preemption of a session.

   The SIP Reason Header is an application layer feedback mechanism to
   synchronize SIP elements of events; the particular event explained
   here deals with preemption of a session. Q.850 [5] provides an

indication for preemption (cause=8) and for preemption "circuit reserved for reuse" (cause=9). Q.850 Cause=9 does not apply to IP, as IP has no concept of circuits. Some domains wish to differentiate appropriate IP reasons for preemption of sessions and to indicate topologically where the preemption event occurred. No other means exists today to give feedback as to why a session was torn down on preemption grounds.

In the event that a session is terminated for a specific reason that can (or should) be shared with SIP Servers and UAs sharing dialog, the Reason Header [1] was created to be included in the BYE Request. This was not the only Method for this new Header; [1] also discusses the CANCEL Method usage.

This document will define two use cases in which new preemption Reason values are necessary:

>   Access Preemption Event – This is when a UA receives a new SIP session request message with a valid R-P value that is higher than the one associated with the currently active session at that UA. The UA must discontinue the existing session in order to accept the new one (according to local policy of some domains).

>   Network Preemption Event – This is when a network element – such as a router – reaches capacity on a particular interface and has the ability to statefully choose which session(s) will remain active when a new session/reservation is signaled for under the parameters outlined in SIP Preconditions per [3] that would otherwise overload that interface (perhaps adversely affecting all sessions). In this case, the router must terminate one or more reservations of lower priority in order to allow this higher priority reservation access to the requested amount of bandwidth (according to local policy of some domains).

This document will cover the semantics for these two cases and request IANA registration of the new protocol value "Preemption" for the Reason Header field, with 4 cause values for the above preemption conditions. Additionally, this document will create a new IANA Registry for reason-text strings that are not currently defined through existing SIP Response codes or Q.850 cause codes. This new Registry will be useful for future protocols used by the SIP Reason header.

This document will emphasize an existing SIP RFC [3] as the starting point for network preemption events. RFC 3312 set rules surrounding SIP interaction using a reservation protocol for QoS preconditions,

using RSVP as the example protocol. That effort did not preclude
other preconditions or future protocol work from becoming a means of
preconditions. NSIS is a new reservation protocol effort that
specifies a preemption operation similar to RSVP's ResvErr message
involving the NSIS NOTIFY message in [8] with a Transient error code
0x04000005 (Resources Pre-empted).

Note that SIP itself does not cause RSVP or NSIS reservation
signaling to start or end. That operation is part of a separate API
within each UA.

1.1. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in [6].

2. Access Preemption Events

As mentioned previously, Access Preemption Events (APE) occur at the
user agent. It does not matter which UA in a unicast or multicast
session this happens to (the UAC or UAS of a session). If local
policy dictates in a particular domain rules regarding the
functionality of a UA, there must be a means by which that UA (not
the user) informs the other UA(s) why a session was just torn down
prematurely. The appropriate mechanism is the BYE Method. The user
of the other far side UA will not understand why that session "just
went away" without there being a means of informing the UA of what
occurred (if this event was purposeful). Through this type of
indication to the preempted UA, it can indicate to the user of that
device appropriately.

The rules within a domain surrounding the UA to be informed can be
different from the rules for informing the user. Local policy should
determine if the user should be informed of the specific reason.
This indication in SIP will provide a means for the UA to react in a
locally determined way, if appropriate (play a certain tone or tone
sequence, point towards a special announcement uri, cause the UA's
visual display to do something, etc.).

Figure 1 illustrates the scenario. UA1 invites UA2 to a session with
the Resource Priority level of 3 (levels 1 and 2 are higher is this
domain, and the namespace element is not necessary for this
discussion).

```
        UA1                    UA2                    UA3
         |                      |                      |
         |    INVITE (R-P:3)    |                      |
         |--------------------->|                      |
         |      200 OK          |                      |
         |<---------------------|                      |
         |       ACK            |                      |
         |--------------------->|                      |
         |       RTP            |                      |
         |<====================>|                      |
         |                      |    INVITE (R-P:2)    |
         |                      |<---------------------|
         |   BYE (Reason : ? )  |                      |
         |<---------------------|                      |
         |                      |       200 OK         |
         |                      |--------------------->|
         |       200 OK         |                      |
         |--------------------->|                      |
         |                      |        ACK           |
         |                      |<---------------------|
         |                      |        RTP           |
         |                      |<====================>|
         |                      |                      |
```
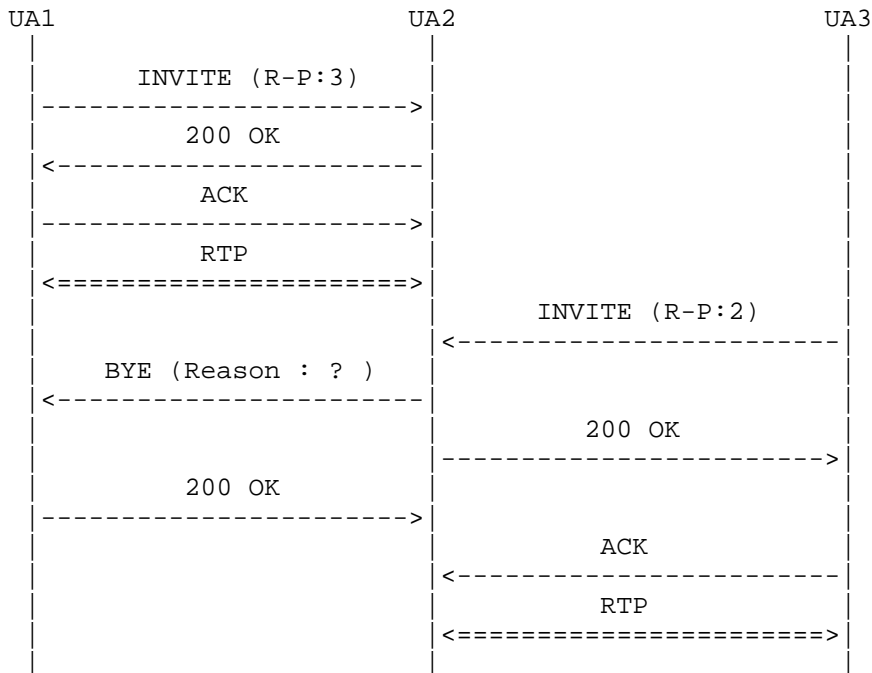
              Figure 1. Access Preemption with obscure Reason

   After the session between UA1 and UA2 is established, UA3 invites UA2
   to a new session with an R-P of 2 (a higher priority than the current
   session between UA1 and UA2). Local policy within this domain
   dictates that UA2 must preempt all existing calls of lower priority
   in order to accept a higher priority call.

   What Reason value could be inserted above to mean "preemption" at a
   UA? There are several choices: 410 "Gone", 480 "Temporarily
   Unavailable", 486 "Busy Here", and 503 "Service Unavailable". The
   use of any of these here is questionable because the session is
   already established. It is further complicated if there needs to be
   a difference in the Reason value for an Access versus a Network
   Preemption Event (which is a requirement here). The limits of Q.850
   [5] have been stated previously in this document.

   It should be possible to configure UAs receiving a preemption
   indication to indicate to the user that no particular type of
   preemption occurred. There are some domains that might prefer their
   users to remain unaware of the specifics of network behavior. This
   should not ever prevent a known preemption indication from being sent
   in a BYE from a UA.

2.1. Effects of Preemption at the User Agent

   If 2 UAs are in a session and one UA must preempt that session to
   accept another session, a BYE Method message is the appropriate
   mechanism to perform this task. However, taking this a step further,
   if a UA is the common point of a 3-way (or more) ad hoc conference
   and must preempt all sessions in that conference due to receipt of a
   higher-priority session request (that this UA must accept), then a
   BYE message must be sent to all UAs in that ad hoc conference.

2.2. Reason Header Requirements for Access Preemption Events

   The following is a list of requirements for adding an appropriate
   Reason value for an Access Preemption Event (APE) as described above
   and shown in Figure 1:

      APE_REQ#1 - create a means by which one UA can inform another UA
                  (within the same active session) that the active
                  session between the two devices is being purposely
                  preempted at one UA for a higher-priority session
                  request from another UA.

      APE_REQ#2 - create a means by which all relevant SIP elements can
                  be informed of this Access Preemption Event to a
                  specific session.

   For example: perhaps SIP Servers that have incorporated a Record-
   Route header into that session set up need to be informed of this
   occurrence.

      APE_REQ#3 - create a means of informing all participants in an ad
                  hoc conference that the primary UA (the mixer) has
                  preempted the conference by accepting a higher-
                  priority session request.

      APE_REQ#4 - create a separate indication for the access preemption
                  event than the one used for a Network Preemption Event
                  (described in the next section) in the session BYE
                  message.

      APE_REQ#5 - create a means to generate a specific indication of a
                  preemption event at the user agent to inform all
                  relevant SIP entities, yet have the ability to
                  generalize this indication (based on local policy) to
                  the receiving UA such that this UA cannot display more
                  information than the domain wants the user to see.

3. Network Preemption Events

   Network Preemption Events (NPE) are instances in which an
   intermediate router between SIP user agents preempts one or more
   sessions at one of its interfaces to place a higher-priority session
   through that interface. Within RSVP, there exists a means to execute
   this functionality per [7]: ResvErr messages, which travel downstream
   towards appropriate receivers. The ResvErr message has the ability
   to carry within it a code indicating why a reservation is being torn
   down. The ResvErr does not travel upstream to the other UA. This
   document proposes that a SIP message be generated to synchronize all
   relevant SIP elements to this preemption event, including the
   upstream UA. Creating another Reason value describing that a network
   element preempted the session is necessary in certain domains.

   Figures 2 and 3 illustrate a network preemption scenario with RSVP.
   NSIS, not shown in examples here, can be imagined from [8] with a
   NOTIFY error message indicating that a reservation has been preempted
   with the Transient ERROR_SPEC 0x04000005. SIP behavior will be
   identical using either reservation protocol.

   UA1 invites UA2 to a session with the Resource Priority level of 3
   (levels 1 and 2 are higher in this domain) and is accepted. This SIP
   signaling translated the Resource Priority value to an appropriate
   RSVP priority level for that flow. The link between Router 1 and
   Router 2 became saturated with this session reservation between UA1
   and UA2 (in this example).

```
         UA1                                    UA2
           \                                   /
            \                                 /
            +--------+            +--------+
            |        |            |        |
            | RTR1   |            | RTR2   |
            |          Int7-------Int5       |
            |        |            |        |
            +--------+            +--------+
           /                                 \
          /                                   \
         UA3                                    UA4
```

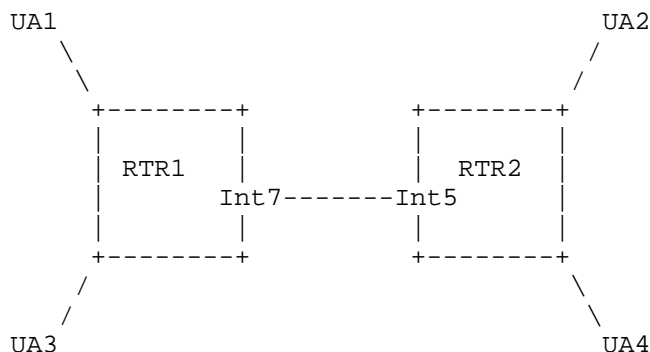   Figure 2. Network Diagram Scenario A

   After the session between UA1 and UA2 is established, UA3 invites UA4
   to a new session with a Resource Priority level of 2 (a higher
   priority than the current reservation between UA1 and UA2). Again,
   the priority value within the Resource-Priority header of this INVITE
   is translated into an appropriate RSVP priority (that is also higher

in relative priority to the UA1_UA2 session/RSVP flow). When this
second, higher-priority session is signaled, one Path message goes
from UA3 to UA4, resulting in the RESV message going from UA4 back to
UA3. Because this link between the two routers is at capacity (at
Int7 in Figure 5), Router 1 will (in this example) make the decision
or will communicate with another network entity that will make the
decision to preempt lower-priority BW to ensure that this higher-
priority session reservation is completed. A ResvErr message is sent
to UA2. The result is that UA2 will know that there has been a
preemption event in a router (because the ResvErr message has a error
code within it, stating "preemption"). At this point, UA1 will not
know anything of this preemption. If there are any SIP Proxies
between UAs 1 and 2 (perhaps that inserted a Record-Route Header),
each will also need to be informed as to why this reservation was
torn down.

Figure 3 shows the call flow with Router 2 from Figure 2 included at
the RSVP layer sending the ResvErr message. A complete call flow
including all UAs and Routers is not shown here for diagram
complexity reasons. The complete signaling between UA3 and UA4 is
also not included.

```
           UA1                      Rtr2                    UA2
            |                        |                       |
            |      INVITE with QoS Preconditions (R-P:3)     |
            |----------------------------------------------->|
            |   ******************************************   |
            |   *  - QoS Preconditions established UA1-UA2 * |
            |   *  - SIP signaling continues...           * |
            |   ******************************************   |
            |           200 OK                              |
            |<-----------------------------------------------|
            |           ACK                                 |
            |----------------------------------------------->|
            |           RTP                                 |
            |<=============================================>|
            |   ******************************************   |
            |   *  -UA3 sends INV with QoS Preconditions  * |
            |   *     to UA4 w/ RP:2;                      * |
            |   *  -Reservation set-up occurs between UA3  * |
            |   *     and UA4                             * |
            |   *  -Router 2 in Figure 2 must preempt     * |
            |   *     reservation between UA1 & UA2        * |
            |   * ******************************************  |
            |                        |                       |
            |                        |      ResvErr          |
            |                        |---------------------->|
            |                        |                       |
            |                        |                       |
            |            BYE (Reason : ? )                  |
            |<-----------------------------------------------|
            |            200 OK                             |
            |----------------------------------------------->|
            |                        |                       |
```
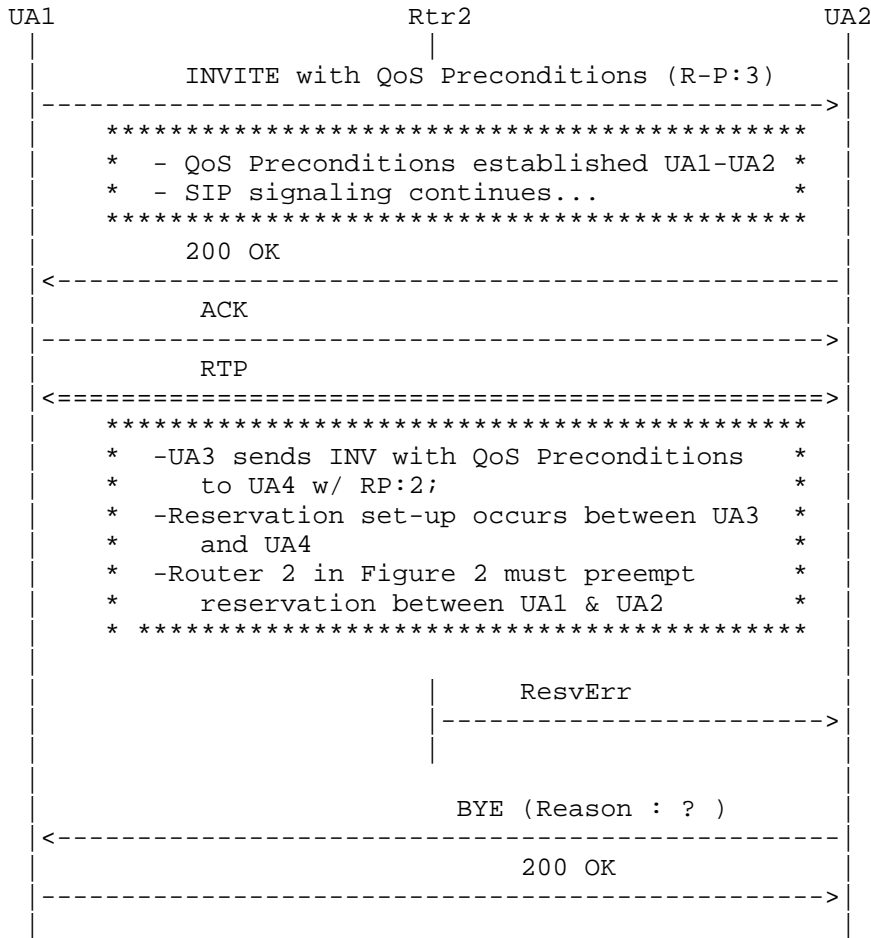
               Figure 3. Network Preemption with obscure Reason

   What Reason value could be inserted above to mean "preemption at a
   router interface"? There are several choices: 410 "Gone", 480
   "Temporarily Unavailable", 486 "Busy Here", and 503 "Service
   Unavailable". The use of any of these here is questionable because
   the session is already established. It is further complicated if
   there needs to be a difference between the Reason value for an Access
   Preemption Event versus a Network Preemption Event. The limits of
   Q.850 [5] have already been stated previously, showing there is
   nothing in that spec to indicate a problem in an IP network.

   To state that all preemptions are equal is possible, but will not
   provide adequate information. Therefore, another Reason Header value
   is necessary to differentiate the APE from the NPE.

3.1. Reason Header Requirements for Network Preemption Events

   The following are the requirements for the appropriate SIP signaling
   in reaction to a Network Preemption Event (NPE):

      NPE_REQ#1 - create a means of informing the far-end UA that a
                  Network Preemption Event has occurred in an
                  intermediate router.

      NPE_REQ#2 - create a means by which all relevant SIP elements can
                  be informed of a Network Preemption Event to a
                  specific session.

   For example: perhaps SIP Servers have incorporated a Record-Route
   header into that session set up.

      NPE_REQ#3 - create a means of informing all participants in an ad
                  hoc conference that the primary UA (the mixer) has
                  been preempted by a Network Preemption Event.

      NPE_REQ#4 - create a separate description of the Network
                  Preemption Event relative to an Access Preemption
                  Event in SIP.

4. Including a Hybrid Infrastructure

   If User 1 is in a non-IP portion of infrastructure (using a TDM
   phone) in a session with a UA through a SIP gateway, and if the TDM
   portion had the ability to preempt the session and indicate to the
   SIP gateway when it did such a preemption, the SIP GW would need to
   be able to convey this preemption event into the SIP portion of this
   session just as if User 1 were a UA in the session. Below is a
   diagram of this:

```
      **************************
      *        TDM network      *
      *                    +---------+
      *    User 1          |         |
      *      O    =========>| SIP GW1 |===============> UA2
      *     /|\   ^         |         |                  |
      *     / \   |         +---------+                  |
      *      |    |              *                       |
      *********|**************   |                       |
              |                  |   Preemption          |
          Preemption  --------> |--------------------->|
            Event                    Indication
```
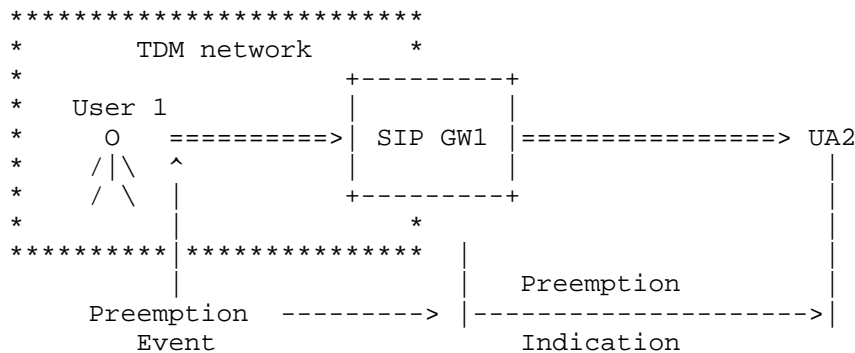
                   Figure 4. TDM/IP Preemption Event

4.1. Hybrid Infrastructure Requirements

   The following are the requirements unique to the topology involving
   both IP infrastructure and TDM (or non-IP) infrastructure.

      HYB_REQ#1 - create a means of informing the far-end UA in a dialog
                  through a SIP gateway with a non-IP phone that the TDM
                  portion of the session indicated to the SIP gateway
                  that a preemption event terminated the session.

      HYB_REQ#2 - create a means of identifying this preemption event
                  uniquely with respect to an access preemption and
                  network preemption event.

5. Preemption Reason Header Cause Codes and Semantics

   This document defines the following new protocol value for the
   protocol field of the Reason header field in RFC 3326 [1]:

      Preemption: The cause parameter contains a preemption cause code.

   We define the following preemption cause codes:

   Value   Default Text   Description

     1   UA Preemption   The session has been preempted by a UA.

     2   Reserved Resources   The session preemption has been
             Preempted   initiated within the network via a
                                   purposeful RSVP preemption occurrence,
                                   and not a link error.

     3   Generic Preemption   This is a limited-use preemption
                                   indication to be used on the final leg
                                   to the preempted UA to generalize the
                                   event.

     4   Non-IP Preemption   The session preemption has occurred in
                                   a non-IP portion of the infrastructure,
                                   and this is the Reason cause code given
                                   by the SIP Gateway.

   Example syntax for the above preemption types are as follows:

      Reason: preemption ;cause=1 ;text="UA Preemption"
      Reason: preemption ;cause=2 ;text="Reserved Resources Preempted"
      Reason: preemption ;cause=3 ;text="Generic Preemption"
      Reason: preemption ;cause=4 ;text="Non-IP Preemption"

Sections 5.1, 5.2, 5.3, and 5.4 provide use cases and extended
definitions for the above four cause codes with message flow
diagrams.

5.1. Access Preemption Event Reason Code

A more elaborate description of the Access Preemption Event cause=1
is as follows:

   A user agent in a session has purposely preempted a session and is
   informing the far-end user agent, or user agents (if part of a
   conference), and SIP Proxies (if stateful of the session's
   transactions)

An example usage of this header value would be:

   Reason: preemption ;cause=1 ;text="UA Preemption"

5.1.1. Access Preemption Event Call Flow

Figure 5 replicates the call flow from Figure 1, but with an
appropriate Reason value indication that was proposed in Section 4.1,
above:

```
         UA1                              UA2                  UA3
          |                                |                    |
          |           INVITE (R-P:3)       |                    |
          |------------------------------->|                    |
          |              200 OK            |                    |
          |<-------------------------------|                    |
          |               ACK              |                    |
          |------------------------------->|                    |
          |               RTP              |                    |
          |<==============================>|                    |
          |                                |   INVITE (R-P:2)   |
          |                                |<-------------------|
          |      BYE (Reason: Preemption ; |                    |
          |      cause=1 ;text="UA Preemption")                 |
          |<-------------------------------|                    |
          |                                |       200 OK       |
          |                                |------------------->|
          |              200 OK            |                    |
          |------------------------------->|                    |
          |                                |        ACK         |
          |                                |<-------------------|
          |                                |        RTP         |
          |                                |<=================>|
          |                                |                    |
```
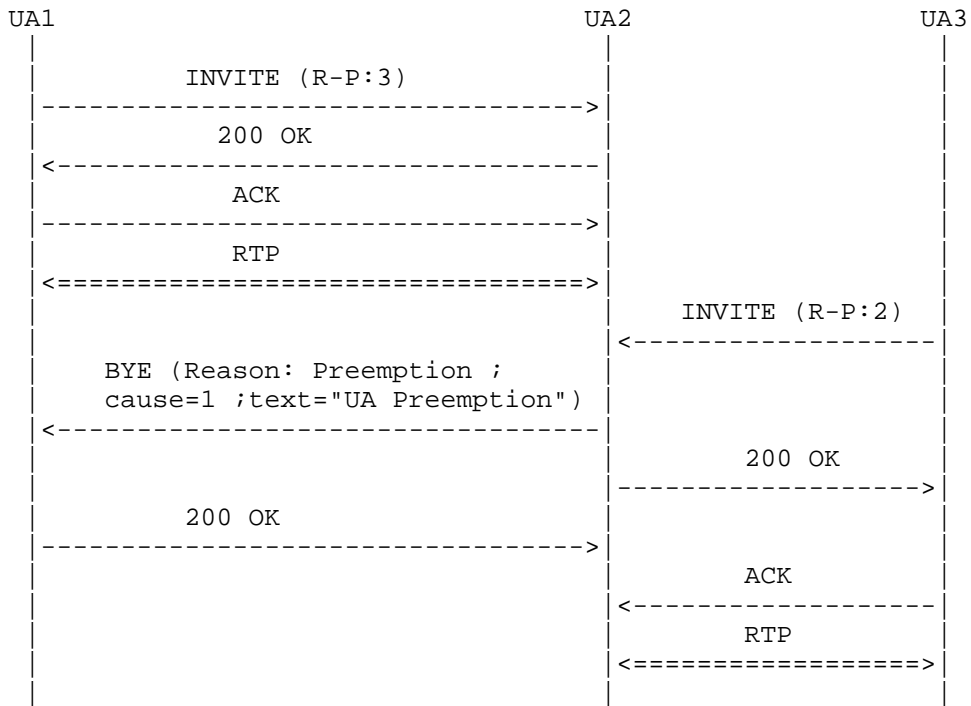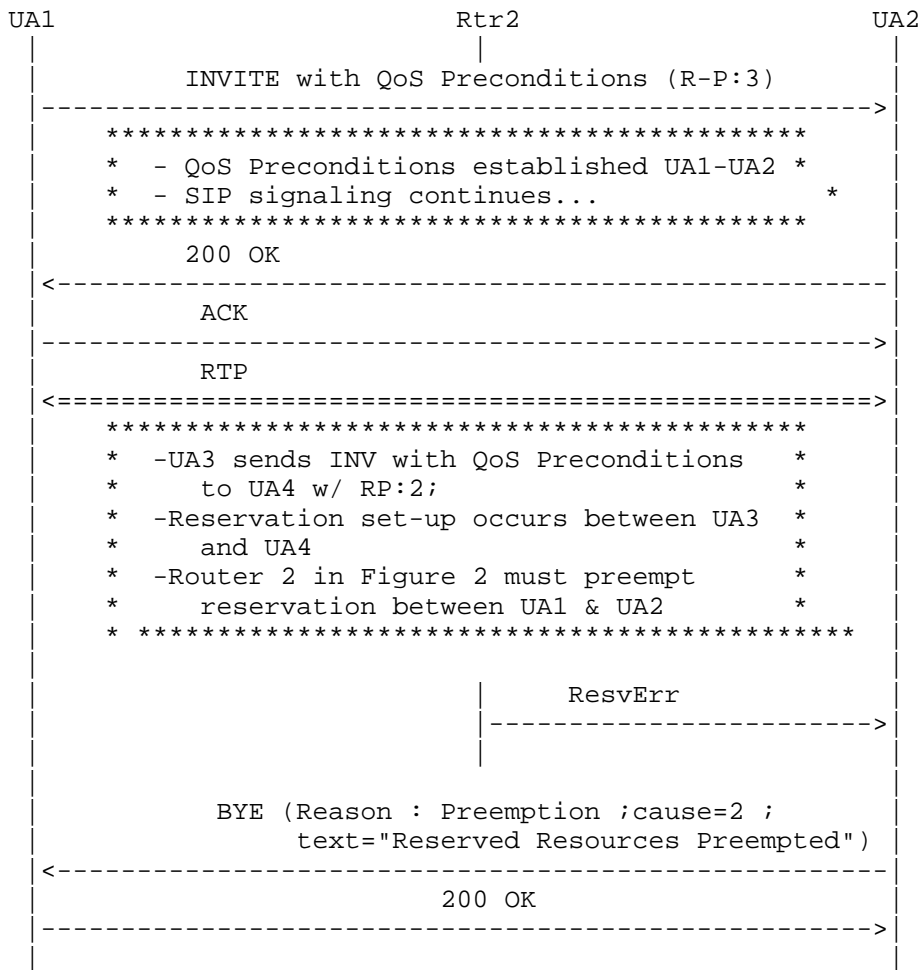
               Figure 5. Access Preemption with Reason: UA Preemption

   UA1 invites UA2 to a session with the Resource Priority level of 3
   (levels 1 and 2 are higher in this domain). After the session
   between UA1 and UA2 is established, UA3 invites UA2 to a new session
   with an R-P of 2 (a higher priority than the current session to UA1).
   Local policy within this domain dictates that UA2 must preempt all
   existing calls of lower priority in order to accept a higher-priority
   call.

   UA2 sends a BYE Request message with a Reason header with a value of
   UA Preemption. This will inform the far-end UA (UA1) and all
   relevant SIP elements (for example, SIP Proxies). The cause code is
   unique to what is proposed in the RSVP Preemption Event for
   differentiation purposes.

5.2. Network Preemption Events Reason Code

   A more elaborate description of the Reserved Resources Preempted
   Event cause=2 is as follows:

      A router has preempted a reservation flow and generated a
      reservation error message: a ResvErr traveling downstream in RSVP,
      and a NOTIFY in NSIS. The UA receiving the preemption error
      message generates a BYE request towards the far-side UA with a
      Reason Header with this value indicating that somewhere between
      two or more UAs, a router has administratively preempted this
      session.

   An example usage of this header value would be:

      Reason: Preemption :cause=2 ;text="Reserved Resources Preempted"

5.2.1. Network Preemption Event Call Flow

   Figure 6 replicates the call flow from Figure 5, but with an
   appropriate Reason value indication that was proposed in Section 4.2,
   above.

```
        UA1                          Rtr2                      UA2
         |                            |                         |
         |         INVITE with QoS Preconditions (R-P:3)        |
         |---------------------------------------------------->|
         |    *****************************************         |
         |    *  - QoS Preconditions established UA1-UA2 *      |
         |    *  - SIP signaling continues...           *      |
         |    *****************************************         |
         |         200 OK                                       |
         |<----------------------------------------------------|
         |         ACK                                          |
         |---------------------------------------------------->|
         |         RTP                                          |
         |<===================================================>|
         |    *****************************************         |
         |    *   -UA3 sends INV with QoS Preconditions  *     |
         |    *      to UA4 w/ RP:2;                      *     |
         |    *   -Reservation set-up occurs between UA3  *     |
         |    *      and UA4                              *     |
         |    *   -Router 2 in Figure 2 must preempt      *     |
         |    *      reservation between UA1 & UA2        *     |
         |    * *****************************************       |
         |                                                      |
         |                            |        ResvErr          |
         |                            |----------------------->|
         |                            |                         |
         |                                                      |
         |         BYE (Reason : Preemption ;cause=2 ;          |
         |                text="Reserved Resources Preempted")  |
         |<----------------------------------------------------|
         |                            200 OK                    |
         |---------------------------------------------------->|
         |                                                      |
```

      Figure 6. Network Preemption with "Reserved Resources Preempted"

   Above is the call flow with Router 2 from Figure 2 included at the
   RSVP layer sending the Resv messages. A complete call flow including
   all UAs and Routers is not included for diagram complexity reasons.
   The signaling between UA3 and UA4 is also not included.

Upon receipt of the ResvErr message with the preemption error code,
UA2 can now appropriately inform UA1 why this event occurred. This
BYE message will also inform all relevant SIP elements, synchronizing
them. The cause value is unique to that proposed in Section 4.1 for
Access Preemption Events for differentiation purposes.

5.3. Generic Preemption Event Reason Code

A more elaborate description of the Generic Preemption Event cause=3
is as follows:

   This cause code is for infrastructures that do not wish to provide
   the preempted UA with a more precise reason than just
   "preemption". It is possible that UAs will have code that will
   indicate the type of preemption event that is contained in the
   Reason header, and certain domains have expressed this as not
   being optimal, and wanted to generalize the indication. This MUST
   NOT be the initial indication within these domains, as valuable
   traffic analysis and other NM applications will be generalized as
   well. If this cause value is to be implemented, it SHOULD only be
   done at the final SIP Proxy in such a way that the cause value
   indicating which type of preemption event actually occurred is
   changed to this generalized preemption indication to be received
   by the preempted UA.

An example usage of this header value would be:

   Reason: preemption ;cause=3 ;text="Generic Preemption"

5.4. Non-IP Preemption Event Reason Code

A more elaborate description of the Non-IP Preemption Event cause=4
is as follows:

   A session exists in a hybrid IP/non-IP infrastructure and the
   preemption event occurs in the non-IP portion, and was indicated
   by that portion that this call termination was due to preemption.
   This is the indication that would be generated by a SIP Gateway
   towards the SIP UA that is being preempted, traversing whichever
   SIP Proxies are involved in session signaling (a question of
   server state).

An example usage of this header value would be:

   Reason: preemption ;cause=4 ;text="Non-IP Preemption"

5.4.1. Non-IP Preemption Event Call Flow

   Figure 7 is a simple call flow diagram of the Non-IP Preemption
   Event.

```
                                                     ............
       UA1                               SIP GW1     . User3    .
        |                                   |         .          .
        |         INVITE (R-P:1)            |         .          .
        |---------------------------------->|         .  Non-IP  .
        |            200 OK                 |         .          .
        |<----------------------------------|         .  Network .
        |             ACK                   |         .          .
        |---------------------------------->|         .          .
        |             RTP                   |         .          .
        |<=================================>|         .          .
        |                                   |         .          .
        |     BYE (Reason: Preemption ;     |<==Preemption Indication
        |     cause=4 ;text="Non-IP Preemption") |    .          .
        |<----------------------------------|         .          .
        |                                   |         ............
```
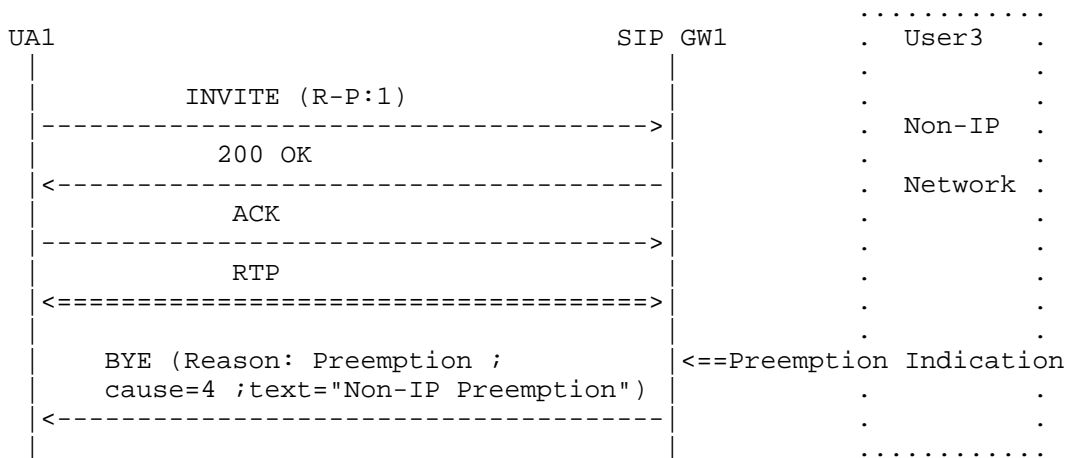
               Figure 7. Non-IP Preemption Flow

   In this case, UA1 signals User3 to a session. Once established,
   there is a preemption event in the non-IP portion of the
   session/call, and the TDM portion has the ability to inform the SIP
   GW of this type of event. This non-IP signal can be translated into
   SIP signaling (into the BYE session termination message). Within
   this BYE, there should be a Reason header indicating such an event to
   synchronize all SIP elements.

6. Security Considerations

   Eavesdropping on this header field should not prevent proper
   operation of the SIP protocol, although some domains utilizing this
   mechanism for notifying and synchronizing SIP elements will likely
   want the integrity to be assured. It is therefore RECOMMENDED that
   integrity protection be applied when using this header to prevent
   unwanted changes to the field and snooping of the messages. The
   accepted choices for providing integrity protection in SIP are TLS
   and S/MIME.

7. IANA Considerations

   This document adds to one existing IANA Registry and creates one new
   Registry. The existing IANA Registry for the SIP Reason Header is as
   follows:

```
Protocol Value    Protocol Cause             Reference
--------------    --------------             ---------
SIP               Status code                RFC 3261
Q.850             Cause value in decimal     ITU-T Q.850
```

This document adds to that Registry with the following entry
(including the '*' comment):

```
Protocol Value    Protocol Cause             Reference
--------------    --------------             ---------
Preemption        Cause value in decimal*    RFC 4411
```

* See the separate "Preemption" Registry for default reason-text
  strings.

The cause values created by the Preemption Protocol namespace in this
document are defined in Section 7.1. Each cause value has a Reason-
text string as a general description of what the cause value is for.
This is shown for the existing Reason header in Section 2 of RFC
3326. Before this document, the Reason-text was taken from the SIP
Response code string from all SIP Response codes, or the default
description from Q.850 cause codes. Currently, there is no place to
register new reason-text strings other than from those two sources.
Because this document defines a new Reason header protocol namespace,
a new IANA Registry is created in Section 7.2 just for this and
future Reason header protocol namespaces (other than SIP Response
codes or Q.850 cause values) to register their respective general
descriptive text strings. These text strings are non-binding and
merely the default for human understanding, but they are deemed
important enough to have their own Registry.

7.1. "Preemption" Namespace Registry

   RFC 4411 creates the new SIP "Reason Header" [1] protocol namespace:
   "Preemption", with 4 defined cause codes:

      In instances where this namespace is used to indicate preemption
      at a UA, the following syntax shall be used (the reason-text is a
      default string; it is not mandatory, and may be different):

         Reason: preemption ;cause=1 ;text="UA Preemption"

      Section 5.1 of this document describes in detail the semantics
      of this cause code.

      The default text above is part of a new IANA Registry for
      default text strings for any new protocol namespace cause code.
      See Section 7.2 for details.

In instances where this namespace is used to indicate preemption
because an RSVP ResvErr message was received at a SIP UA, the
following syntax shall be used (the reason-text is a default
string; it is not mandatory, and may be different):

Reason: preemption ;cause=2 ;text="Reserved Resources Preempted"

    Section 5.2 of this document describes in detail the semantics
    of this cause code.

    The default text above is part of a new IANA Registry for
    default text strings for any new protocol namespace cause code.
    See section 7.2 for details.

In instances where this namespace is used to indicate a
generalized preemption event to the destination UA from a Proxy
that modifies the Reason value only during this last SIP hop, the
following syntax shall be used (the reason-text is a default
string; it is not mandatory, and may be different):

    Reason: preemption ;cause=3 ;text="Generic Preemption"

    Section 5.3 of this document describes in detail the semantics
    of this cause code.

    The default text above is part of a new IANA Registry for
    default text strings for any new protocol namespace cause code.
    See Section 7.2 for details.

In instances where this namespace is used to indicate preemption
from a non-IP portion of a call leg, a SIP Gateway shall use the
following syntax to inform the SIP infrastructure of this event
(the reason-text is a default string; it is not mandatory, and may
be different):

    Reason: preemption ;cause=4 ;text=" Non-IP Preemption"

    Section 5.4 of this document describes in detail the semantics
    of this cause code.

    The default text above is part of a new IANA Registry for
    default text strings for any new protocol namespace cause code.
    See Section 7.2 for details.

Additional definitions of the preemption namespace and its cause
codes MUST be defined in Standards Track documents.

7.2. Default Reason-Text IANA Registry for the SIP Reason Header

   Below is a new IANA Registry for SIP Reason Header reason-text
   strings, associated with their respective protocol type and Reason-
   param cause values. Per RFC 3326, the Reason-text string is a quoted
   default string with only human understandability meant. These
   strings can be changed by local policy.

| | Reason- | | |
Protocol	param	Reason-Text	Reference
Preemption	Cause=1	UA Preemption	RFC 4411
Preemption	Cause=2	Reserved Resources Preempted	RFC 4411
Preemption	Cause=3	Generic Preemption	RFC 4411
Preemption	Cause=4	Non-IP Preemption	RFC 4411

8. Contributions

   The following individuals contributed to this effort:

      Subhasri Dhesikan
      Gonzalo Camarillo
      Dave Oran

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   this spec late in the process (before it was too late).

10. References

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