                     User-Defined Errors for RSVP

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.

Abstract

   The Resource ReserVation Protocol (RSVP) defines an ERROR_SPEC object
   for communicating errors. That object has a defined format that
   permits the definition of 256 error codes. As RSVP has been
   developed and extended, the convention has been to be conservative in
   defining new error codes. Further, no provision for user-defined
   errors exists in RSVP.

   This document defines a USER_ERROR_SPEC to be used in addition to the
   ERROR_SPEC to carry additional user information related to errors.

1. Introduction

   The Resource ReserVation Protocol (RSVP) [RFC2205] defines an
   ERROR_SPEC object for communicating errors. That object has a
   defined format that permits the definition of 256 error codes. As
   RSVP has been developed and extended, the convention has been to be
   conservative in communicating errors. Further, no provision for user
   defined errors exists in RSVP.

   When developing extensions to RSVP, it is often useful for those
   implementing to define error messages to aid both in the initial
   debugging and in testing against older versions or other
   implementations.

   This document defines a new RSVP object to permit user-defined errors
   to be communicated. This will enable organizations to define errors
   that they can use for internal development. These error values could
   also be shared with the community at large to aid in promoting
   interoperability between diverse implementations.

RSVP PathErr and ResvErr messages require the presence of an
ERROR_SPEC object ([RFC2205]). [RFC3473] defines the Notify message
that also requires the presence of an ERROR_SPEC object. In order to
not change the mandatory contents of these messages, this document
defines a new error code value that indicates that the new object is
present and carries a user-defined error code.

Note that the ResvConf message defined in [RFC2205] also carries an
ERROR_SPEC object. But this usage of the object does not carry
meaningful Error Codes or Error Values and so the extensions defined
in this document are not applicable to that message.

1.1. Conventions

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 RFC 2119 [RFC2119].

2. User-Defined Error

A new Error Code is defined for use in an ERROR_SPEC object.

Error Code = 33: User Error Spec

This error code is used to signal the presence of a
USER_ERROR_SPEC. One Error Value is defined as follows.

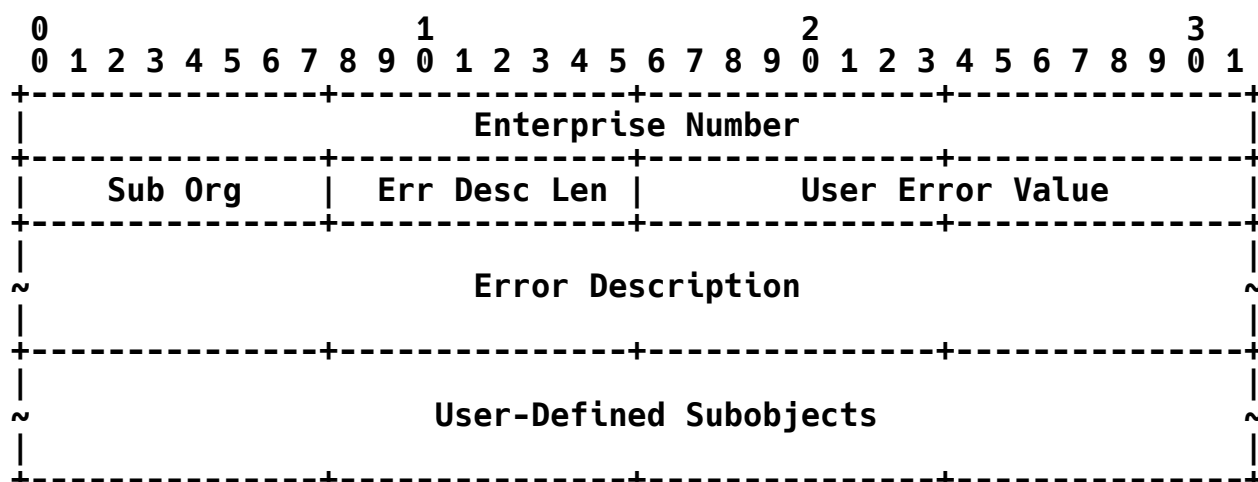Error Value 0 = Further details in User Error Spec

Further error values may be defined in future specifications.

When sending this error code, a USER_ERROR_SPEC object MUST be
included in the PathErr, ResvErr, or Notify message.

3. USER_ERROR_SPEC Class

A new RSVP object class called USER_ERROR_SPEC is defined. To
support backwards compatibility, its class number is in the range
192-247. As defined in [RFC2205], implementations that do not
understand such an object will forward it unmodified.

USER_ERROR_SPEC object: Class = 194, C-Type = 1

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +---------------+---------------+---------------+---------------+
   |                       Enterprise Number                       |
   +---------------+---------------+---------------+---------------+
   |    Sub Org    |  Err Desc Len |        User Error Value       |
   +---------------+---------------+---------------+---------------+
   |                                                               |
   ~                      Error Description                        ~
   |                                                               |
   +---------------+---------------+---------------+---------------+
   |                                                               |
   ~                    User-Defined Subobjects                    ~
   |                                                               |
   +---------------+---------------+---------------+---------------+
```

   Enterprise Number

      A unique identifier of an organization encoded as a 32-bit
      integer. Enterprise Numbers (sometimes known as Private
      Enterprise Numbers) are assigned by IANA and managed on a first
      come first served basis through the IANA registry named
      "Enterprise Numbers" [RFC2578].

   Sub Org

      A unique identifier of an organization encoded as an 8-bit
      integer. An organization MAY use this field to create
      independent Error Value spaces. This is intended to facilitate
      teams that are doing parallel development. If independent
      spaces are not required, this field SHOULD be set to zero.

   Err Desc Len

      The length of the error description in the Error Description
      field in bytes excluding any padding. Zero is a valid length
      if no error description is supplied.

   User Error Value

      A 16-bit integer. The meaning is specified by the
      (sub-)organization indicated by the Enterprise Number and Sub
      Org fields.

Error Description

    A string of characters padded with nulls (0x00) to a multiple
    of 4 bytes. According to the guidance in [RFC2277], this
    string MUST use UTF-8/Net-Unicode encoding [RFC5198].
    Furthermore, it is RECOMMENDED that implementations limit the
    strings that they generate to single-line printable US-ASCII
    [ASCII] whenever feasible to improve the likelihood of easy use
    by the recipient.

    If the Err Desc Len is zero, then no bytes are supplied.

    Note that the content of this field is implementation-specific.
    It is typically printable, but might not be shown to all users
    in all implementations (because of character set choice).
    Therefore, the content of the field SHOULD be limited to
    supplementary information and SHOULD NOT contain information
    critical to operating the network. Critical information is
    present in the User Error Value field.

User-Defined Subobjects

    User-defined subobjects MAY be included. The generic format of
    subobjects is specified in Section 3.1. The semantics of a
    subobject is indicated by the Type field, but the semantics,
    format, and contents of the Value field are specified by the
    (sub-)organization indicated by the Enterprise Number and Sub
    Org fields of this object.

3.1. Subobjects

   Each subobject is encoded as a TLV in the following format:

```
    0                   1
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+------------//---------------+
   |      Type      |     Length    | (Subobject contents)       |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+------------//---------------+
```

   Type

    An 8-bit number assigned by the (sub-)organization indicated by
    the Enterprise Number and Sub Org fields of the USER_ERROR_SPEC
    object.

Length

   The Length contains the total length of the subobject in bytes,
   including the Type and Length fields. The Length MUST be at
   least 4, and MUST be a multiple of 4.

4. Procedures for Using the User Error Spec

4.1. Procedures for Sending the User Error Spec

   A USER_ERROR_SPEC object MAY be included in any PathErr, ResvErr, or
   Notify message for any defined error code. The Enterprise Number
   MUST be a valid value assigned by IANA from the "Enterprise Numbers"
   registry.

   As specified in [RFC2205] and [RFC3473], an ERROR_SPEC object with a
   valid error code MUST be included in all PathErr, ResvErr, and Notify
   messages. This rule is not changed by these procedures even when a
   USER_ERROR_SPEC object is included. If no other error code applies,
   the Error Code in the ERROR_SPEC object MUST be set to "User Error
   Spec" as defined in Section 2 of this document. When the Error Code
   in the ERROR_SPEC object is set to "User Error Spec", the Error Value
   sub-code SHOULD be set to "Further details in User Error Spec" as
   defined in Section 2, but further Error Value sub-codes may be
   defined in future specifications.

4.2. Procedures for Receiving the User Error Spec

   It is RECOMMENDED that implementations that receive a PathErr,
   ResvErr, or Notify message carrying a USER_ERROR_SPEC object log (at
   a minimum) the Enterprise Number, Sub-organization, User Error Value,
   and Error Description. Note that the character set used for the
   Error Description may mean that it might not be suitable for display
   of logging in all systems. Implementations capable of interpreting
   the contents of the USER_ERROR_SPEC object SHOULD take further action
   based on the reported error.

   Implementations that are not UTF-8 capable and that receive a
   USER_ERROR_SPEC object SHOULD handle the Error Description according
   to the procedures set out in [RFC5137].

   If a message is received containing an ERROR_SPEC object using the
   "User Error Spec" error code, but not containing a USER_ERROR_SPEC
   object, the message MUST be treated as malformed and handled
   according to [RFC2205].

Implementations SHOULD ignore repeated occurrences of USER_ERROR_SPEC objects, and SHOULD forward them unchanged on any messages that they forward. This provides for forward compatibility.

Implementations receiving a USER_ERROR_SPEC object on some message other than a PathErr, ResvErr, or Notify message MUST treat the error as a malformed message and process according to [RFC2205].

5. IANA Considerations

5.1. RSVP Error Codes

This document makes the following assignments from the RSVP Error Codes and Globally-Defined Error Value Sub-Codes registry:

Error Code	Meaning
33	User Error Spec

One Error Value sub-code is defined for use with this Error Code as follows:

0 = Further details in User Error Spec

5.2. RSVP Objects

This document makes the following assignments from the RSVP Class Names, Class Numbers, and Class Types registry:

Number Space	Value	Name
Class Numbers	194	USER_ERROR_SPEC
Class Type	1	User-Defined Error

6. Security Considerations

This document makes no changes to the basic message exchanges of [RFC2205] and [RFC3473]. It will result in a small increase in the number of error messages sent in cases where messages were previously silently dropped due to the lack of an appropriate error code.

The mechanisms defined in this document may be used by implementations to report additional error conditions and information arising from security issues and attacks on the RSVP network.

Note that the use of a character string that will be displayed or logged opens the potential for certain security attacks through the use of overruns or embedded control characters. Implementations SHOULD take precautions against overruns, and (especially where the full character set of [RFC5198] is not supported, SHOULD use the procedures set out in [RFC5137] to handle unexpected or unknown control characters.

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8. References

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8.2. Informative References

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