        An Extensible Message Format for Delivery Status Notifications

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

   This memo defines a MIME content-type that may be used by a message
   transfer agent (MTA) or electronic mail gateway to report the result
   of an attempt to deliver a message to one or more recipients. This
   content-type is intended as a machine-processable replacement for the
   various types of delivery status notifications currently used in
   Internet electronic mail.

   Because many messages are sent between the Internet and other
   messaging systems (such as X.400 or the so-called "LAN-based"
   systems), the DSN protocol is designed to be useful in a multi-
   protocol messaging environment. To this end, the protocol described
   in this memo provides for the carriage of "foreign" addresses and
   error codes, in addition to those normally used in Internet mail.
   Additional attributes may also be defined to support "tunneling" of
   foreign notifications through Internet mail.

   Any questions, comments, and reports of defects or ambiguities in
   this specification may be sent to the mailing list for the NOTARY
   working group of the IETF, using the address
   <notifications@cs.utk.edu>. Requests to subscribe to the mailing
   list should be addressed to <notifications-request@cs.utk.edu>.
   Implementors of this specification are encouraged to subscribe to the
   mailing list, so that they will quickly be informed of any problems
   which might hinder interoperability.

   NOTE: This document is a Proposed Standard. If and when this
   protocol is submitted for Draft Standard status, any normative text
   (phrases containing SHOULD, SHOULD NOT, MUST, MUST NOT, or MAY) in
   this document will be re-evaluated in light of implementation

experience, and are thus subject to change.

1. Introduction

   This memo defines a MIME [1] content-type for delivery status
   notifications (DSNs). A DSN can be used to notify the sender of a
   message of any of several conditions: failed delivery, delayed
   delivery, successful delivery, or the gatewaying of a message into an
   environment that may not support DSNs. The "message/delivery-status"
   content-type defined herein is intended for use within the framework
   of the "multipart/report" content type defined in [2].

   This memo defines only the format of the notifications. An extension
   to the Simple Message Transfer Protocol (SMTP) [3] to fully support
   such notifications is the subject of a separate memo [4].

1.1 Purposes

   The DSNs defined in this memo are expected to serve several purposes:

(a) Inform human beings of the status of message delivery processing, as
    well as the reasons for any delivery problems or outright failures,
    in a manner which is largely independent of human language;

(b) Allow mail user agents to keep track of the delivery status of
    messages sent, by associating returned DSNs with earlier message
    transmissions;

(c) Allow mailing list exploders to automatically maintain their
    subscriber lists when delivery attempts repeatedly fail;

(d) Convey delivery and non-delivery notifications resulting from
    attempts to deliver messages to "foreign" mail systems via a
    gateway;

(e) Allow "foreign" notifications to be tunneled through a MIME-capable
    message system and back into the original messaging system that
    issued the original notification, or even to a third messaging
    system;

(f) Allow language-independent, yet reasonably precise, indications of
    the reason for the failure of a message to be delivered (once status
    codes of sufficient precision are defined); and

(g) Provide sufficient information to remote MTA maintainers (via
    "trouble tickets") so that they can understand the nature of
    reported errors. This feature is used in the case that failure to
    deliver a message is due to the malfunction of a remote MTA and the

sender wants to report the problem to the remote MTA administrator.

1.2 Requirements

    These purposes place the following constraints on the notification
    protocol:

(a) It must be readable by humans as well as being machine-parsable.

(b) It must provide enough information to allow message senders (or the
    user agents) to unambiguously associate a DSN with the message that
    was sent and the original recipient address for which the DSN is
    issued (if such information is available), even if the message was
    forwarded to another recipient address.

(c) It must be able to preserve the reason for the success or failure of
    a delivery attempt in a remote messaging system, using the
    "language" (mailbox addresses and status codes) of that remote
    system.

(d) It must also be able to describe the reason for the success or
    failure of a delivery attempt, independent of any particular human
    language or of the "language" of any particular mail system.

(e) It must preserve enough information to allow the maintainer of a
    remote MTA to understand (and if possible, reproduce) the conditions
    that caused a delivery failure at that MTA.

(f) For any notifications issued by foreign mail systems, which are
    translated by a mail gateway to the DSN format, the DSN must
    preserve the "type" of the foreign addresses and error codes, so
    that these may be correctly interpreted by gateways.

    A DSN contains a set of per-message fields which identify the message
    and the transaction during which the message was submitted, along
    with other fields that apply to all delivery attempts described by
    the DSN. The DSN also includes a set of per-recipient fields to
    convey the result of the attempt to deliver the message to each of
    one or more recipients.

1.3 Terminology

    A message may be transmitted through several message transfer agents
    (MTAs) on its way to a recipient. For a variety of reasons,
    recipient addresses may be rewritten during this process, so each MTA
    may potentially see a different recipient address. Depending on the
    purpose for which a DSN is used, different formats of a particular
    recipient address will be needed.

Several DSN fields are defined in terms of the view from a particular
MTA in the transmission. The MTAs are assigned the following names:

(a) Original MTA

The Original MTA is the one to which the message is submitted for
delivery by the sender of the message.

(b) Reporting MTA

For any DSN, the Reporting MTA is the one which is reporting the
results of delivery attempts described in the DSN.

If the delivery attempts described occurred in a "foreign" (non-
Internet) mail system, and the DSN was produced by translating the
foreign notice into DSN format, the Reporting MTA will still identify
the "foreign" MTA where the delivery attempts occurred.

(c) Received-From MTA

The Received-From MTA is the MTA from which the Reporting MTA
received the message, and accepted responsibility for delivery of the
message.

(d) Remote MTA

If an MTA determines that it must relay a message to one or more
recipients, but the message cannot be transferred to its "next hop"
MTA, or if the "next hop" MTA refuses to accept responsibility for
delivery of the message to one or more of its intended recipients,
the relaying MTA may need to issue a DSN on behalf of the recipients
for whom the message cannot be delivered. In this case the relaying
MTA is the Reporting MTA, and the "next hop" MTA is known as the
Remote MTA.

Figure 1 illustrates the relationship between the various MTAs.

```
+-----+     +--------+              +---------+     +---------+      +------+
|     |     |        |              |Received-|     |         |      |      |
|     | =>  |Original| => ... =>    |  From   | =>  |Reporting| ===> |Remote|
| user|     |  MTA   |              |   MTA   |     |   MTA   | <No! |  MTA |
|agent|     +--------+              +---------+     +----v----+      +------+
|     |                                                  |
|     |     <--------------------------------------------+
+-----+          (DSN returned to sender by Reporting MTA)
```
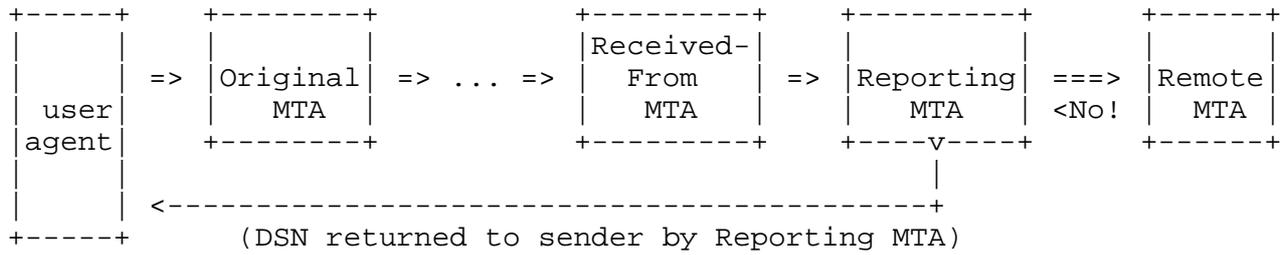
          Figure 1. Original, Received-From, Reporting and Remote MTAs

     Each of these MTAs may provide information which is useful in a DSN:

+ Ideally, the DSN will contain the address of each recipient as
  originally specified to the Original MTA by the sender of the message.
  This version of the address is needed (rather than a forwarding
  address or some modified version of the original address) so that the
  sender may compare the recipient address in the DSN with the address
  in the sender's records (e.g. an address book for an individual, the
  list of subscribers for a mailing list) and take appropriate action.

  Similarly, the DSN might contain an "envelope identifier" that was
  known to both the sender's user agent and the Original MTA at the time
  of message submission, and which, if included in the DSN, can be used
  by the sender to keep track of which messages were or were not
  delivered.

+ If a message was (a) forwarded to a different address than that
  specified by the sender, (b) gatewayed to a different mail system than
  that used by the sender, or (c) subjected to address rewriting during
  transmission, the "final" form of the recipient address (i.e. the one
  seen by the Reporting MTA) will be different than the original
  (sender-specified) recipient address. Just as the sender's user agent
  (or the sender) prefers the original recipient address, so the "final"
  address is needed when reporting a problem to the postmaster of the
  site where message delivery failed, because only the final recipient
  address will allow her to reproduce the conditions that caused the
  failure.

+ A "failed" DSN should contain the most accurate explanation for the
  delivery failure that is available. For ease of interpretation, this
  information should be a format which is independent of the mail
  transport system that issued the DSN. However, if a foreign error

code is translated into some transport-independent format, some
information may be lost. It is therefore desirable to provide both a
transport-independent status code and a mechanism for reporting
transport-specific codes. Depending on the circumstances that
produced delivery failure, the transport-specific code might be
obtained from either the Reporting MTA or the Remote MTA.

Since different values for "recipient address" and "delivery status
code" are needed according to the circumstance in which a DSN will be
used, and since the MTA that issues the DSN cannot anticipate those
circumstances, the DSN format described here may contain both the
original and final forms of a recipient address, and both a
transport-independent and a transport-specific indication of delivery
status.

Extension fields may also be added by the Reporting MTA as needed to
provide additional information for use in a trouble ticket or to
preserve information for tunneling of foreign delivery reports
through Internet DSNs.

The Original, Reporting, and Remote MTAs may exist in very different
environments and use dissimilar transport protocols, MTA names,
address formats, and delivery status codes. DSNs therefore do not
assume any particular format for mailbox addresses, MTA names, or
transport-specific status codes. Instead, the various DSN fields
that carry such quantities consist of a "type" subfield followed by a
subfield whose contents are ordinary text characters, and the format
of which is indicated by the "type" subfield. This allows a DSN to
convey these quantities regardless of format.

2. Format of a Delivery Status Notification

A DSN is a MIME message with a top-level content-type of
multipart/report (defined in [2]). When a multipart/report content
is used to transmit a DSN:

(a) The report-type parameter of the multipart/report content is
    "delivery-status".

(b) The first component of the multipart/report contains a human-
    readable explanation of the DSN, as described in [2].

(c) The second component of the multipart/report is of content-type
    message/delivery-status, described in section 2.1 of this document.

(d) If the original message or a portion of the message is to be
    returned to the sender, it appears as the third component of the
    multipart/report.

     NOTE: For delivery status notifications gatewayed from foreign
     systems, the headers of the original message may not be available.
     In this case the third component of the DSN may be omitted, or it
     may contain "simulated" RFC 822 headers which contain equivalent
     information. In particular, it is very desirable to preserve the
     subject, date, and message-id (or equivalent) fields from the
     original message.

   The DSN MUST be addressed (in both the message header and the
   transport envelope) to the return address from the transport envelope
   which accompanied the original message for which the DSN was
   generated. (For a message that arrived via SMTP, the envelope return
   address appears in the MAIL FROM command.)

   The From field of the message header of the DSN SHOULD contain the
   address of a human who is responsible for maintaining the mail system
   at the Reporting MTA site (e.g. Postmaster), so that a reply to the
   DSN will reach that person. Exception: if a DSN is translated from a
   foreign delivery report, and the gateway performing the translation
   cannot determine the appropriate address, the From field of the DSN
   MAY be the address of a human who is responsible for maintaining the
   gateway.

   The envelope sender address of the DSN SHOULD be chosen to ensure
   that no delivery status reports will be issued in response to the DSN
   itself, and MUST be chosen so that DSNs will not generate mail loops.
   Whenever an SMTP transaction is used to send a DSN, the MAIL FROM
   command MUST use a NULL return address, i.e. "MAIL FROM:<>".

   A particular DSN describes the delivery status for exactly one
   message. However, an MTA MAY report on the delivery status for
   several recipients of the same message in a single DSN. Due to the
   nature of the mail transport system (where responsibility for
   delivery of a message to its recipients may be split among several
   MTAs, and delivery to any particular recipient may be delayed),
   multiple DSNs may be still be issued in response to a single message
   submission.

2.1 The message/delivery-status content-type

   The message/delivery-status content-type is defined as follows:

      MIME type name: message
      MIME subtype name: delivery-status
      Optional parameters: none
      Encoding considerations: "7bit" encoding is sufficient and
                                        MUST be used to maintain readability
                                        when viewed by non-MIME mail
                                        readers.
      Security considerations: discussed in section 4 of this memo.

   The message/delivery-status report type for use in the
   multipart/report is "delivery-status".

   The body of a message/delivery-status consists of one or more
   "fields" formatted according to the ABNF of RFC 822 header "fields"
   (see [6]). The per-message fields appear first, followed by a blank
   line. Following the per-message fields are one or more groups of
   per-recipient fields. Each group of per-recipient fields is preceded
   by a blank line. Using the ABNF of RFC 822, the syntax of the
   message/delivery-status content is as follows:

      delivery-status-content =
           per-message-fields 1*(CRLF per-recipient-fields)

   The per-message fields are described in section 2.2. The per-
   recipient fields are described in section 2.3.

2.1.1 General conventions for DSN fields

   Since these fields are defined according to the rules of RFC 822, the
   same conventions for continuation lines and comments apply.
   Notification fields may be continued onto multiple lines by beginning
   each additional line with a SPACE or HTAB. Text which appears in
   parentheses is considered a comment and not part of the contents of
   that notification field. Field names are case-insensitive, so the
   names of notification fields may be spelled in any combination of
   upper and lower case letters. Comments in DSN fields may use the
   "encoded-word" construct defined in [7].

   A number of DSN fields are defined to have a portion of a field body
   of "xtext". "xtext" is used to allow encoding sequences of octets
   which contain values outside the range [1-127 decimal] of traditional
   ASCII characters, and also to allow comments to be inserted in the
   data. Any octet may be encoded as "+" followed by two upper case

hexadecimal digits. (The "+" character MUST be encoded as "+2B".)
With certain exceptions, octets that correspond to ASCII characters
may be represented as themselves. SPACE and HTAB characters are
ignored. Comments may be included by enclosing them in parenthesis.
Except within comments, encoded-words such as defined in [7] may NOT
be used in xtext.

"xtext" is formally defined as follows:

   xtext = *(xchar / hexchar / linear-white-space / comment)

   xchar = any ASCII CHAR between "!" (33) and "~" (126) inclusive,
        except for "+", "\" and "(".

"hexchar"s are intended to encode octets that cannot be represented
as plain text, either because they are reserved, or because they are
non-printable. However, any octet value may be represented by a
"hexchar".

   hexchar = ASCII "+" immediately followed by two upper case
        hexadecimal digits

When encoding an octet sequence as xtext:

+ Any ASCII CHAR between "!" and "~" inclusive, except for "+", "\",
  and "(", MAY be encoded as itself. (Some CHARs in this range may
  also be encoded as "hexchar"s, at the implementor's discretion.)

+ ASCII CHARs that fall outside the range above must be encoded as
  "hexchar".

+ Line breaks (CR LF SPACE) MAY be inserted as necessary to keep line
  lengths from becoming excessive.

+ Comments MAY be added to clarify the meaning for human readers.

2.1.2 "*-type" subfields

   Several DSN fields consist of a "-type" subfield, followed by a
   semicolon, followed by "*text". For these fields, the keyword used
   in the address-type, diagnostic-type, or MTA-name-type subfield
   indicates the expected format of the address, status-code, or MTA-
   name which follows.

The "-type" subfields are defined as follows:

(a) An "address-type" specifies the format of a mailbox address. For
    example, Internet mail addresses use the "rfc822" address-type.

        address-type = atom

(b) A "diagnostic-type" specifies the format of a status code. For
    example, when a DSN field contains a reply code reported via the
    Simple Mail Transfer Protocol [3], the "smtp" diagnostic-type is
    used.

        diagnostic-type = atom

(c) An "MTA-name-type" specifies the format of an MTA name. For
    example, for an SMTP server on an Internet host, the MTA name is the
    domain name of that host, and the "dns" MTA-name-type is used.

        mta-name-type = atom

   Values for address-type, diagnostic-type, and MTA-name-type are
   case-insensitive. Thus address-type values of "RFC822" and "rfc822"
   are equivalent.

   The Internet Assigned Numbers Authority (IANA) will maintain a
   registry of address-types, diagnostic-types, and MTA-name-types,
   along with descriptions of the meanings and acceptable values of
   each, or a reference to a one or more specifications that provide
   such descriptions. (The "rfc822" address-type, "smtp" diagnostic-
   type, and "dns" MTA-name-type are defined in [4].) Registration
   forms for address-type, diagnostic-type, and MTA-name-type appear in
   section 8 of this document.

   IANA will not accept registrations for any address-type, diagnostic-
   type, or MTA-name-type name that begins with "X-". These type names
   are reserved for experimental use.

2.1.3 Lexical tokens imported from RFC 822

   The following lexical tokens, defined in [6], are used in the ABNF
   grammar for DSNs: atom, CHAR, comment, CR, CRLF, DIGIT, LF, linear-
   white-space, SPACE, text. The date-time lexical token is defined in
   [8].

2.2 Per-Message DSN Fields

   Some fields of a DSN apply to all of the delivery attempts described
   by that DSN. These fields may appear at most once in any DSN. These
   fields are used to correlate the DSN with the original message
   transaction and to provide additional information which may be useful
   to gateways.

      per-message-fields =
            [original-envelope-id-field CRLF]
            reporting-mta-field CRLF
            [dsn-gateway-field CRLF]
            [received-from-mta-field CRLF]
            [arrival-date-field CRLF]
            *(extension-field CRLF)

2.2.1 The Original-Envelope-Id field

   The optional Original-Envelope-Id field contains an "envelope
   identifier" which uniquely identifies the transaction during which
   the message was submitted, and was either (a) specified by the sender
   and supplied to the sender's MTA, or (b) generated by the sender's
   MTA and made available to the sender when the message was submitted.
   Its purpose is to allow the sender (or her user agent) to associate
   the returned DSN with the specific transaction in which the message
   was sent.

   If such an envelope identifier was present in the envelope which
   accompanied the message when it arrived at the Reporting MTA, it
   SHOULD be supplied in the Original-Envelope-Id field of any DSNs
   issued as a result of an attempt to deliver the message. Except when
   a DSN is issued by the sender's MTA, an MTA MUST NOT supply this
   field unless there is an envelope-identifier field in the envelope
   which accompanied this message on its arrival at the Reporting MTA.

   The Original-Envelope-Id field is defined as follows:

      original-envelope-id-field =
            "Original-Envelope-Id" ":" envelope-id

      envelope-id = *text

   There may be at most one Original-Envelope-Id field per DSN.

   The envelope-id is CASE-SENSITIVE. The DSN MUST preserve the
   original case and spelling of the envelope-id.

   NOTE: The Original-Envelope-Id is NOT the same as the Message-Id from
   the message header. The Message-Id identifies the content of the
   message, while the Original-Envelope-Id identifies the transaction in
   which the message is sent.

2.2.2 The Reporting-MTA DSN field

    reporting-mta-field =
         "Reporting-MTA" ":" mta-name-type ";" mta-name

    mta-name = *text

   The Reporting-MTA field is defined as follows:

   A DSN describes the results of attempts to deliver, relay, or gateway
   a message to one or more recipients. In all cases, the Reporting-MTA
   is the MTA which attempted to perform the delivery, relay, or gateway
   operation described in the DSN. This field is required.

   Note that if an SMTP client attempts to relay a message to an SMTP
   server and receives an error reply to a RCPT command, the client is
   responsible for generating the DSN, and the client's domain name will
   appear in the Reporting-MTA field. (The server's domain name will
   appear in the Remote-MTA field.)

   Note that the Reporting-MTA is not necessarily the MTA which actually
   issued the DSN. For example, if an attempt to deliver a message
   outside of the Internet resulted in a nondelivery notification which
   was gatewayed back into Internet mail, the Reporting-MTA field of the
   resulting DSN would be that of the MTA that originally reported the
   delivery failure, not that of the gateway which converted the foreign
   notification into a DSN. See Figure 2.

sender's environment   recipient's environment
....
                            : :
                     (1) : :   (2)
   +-----+ +--------+ +--------+ +---------+ +---------+   +------+
						Received-				
		=>	Original	=>				-->	Reporting	-->	Remote
user		MTA					MTA		<No	MTA
agent	+--------+		+--------+ +----v----+ +------+
				Gateway	
		<===========			<-----------------+
   +-----+ | | |(4)   (3)
                     +--------+
                            : :
..........................: :.......................................
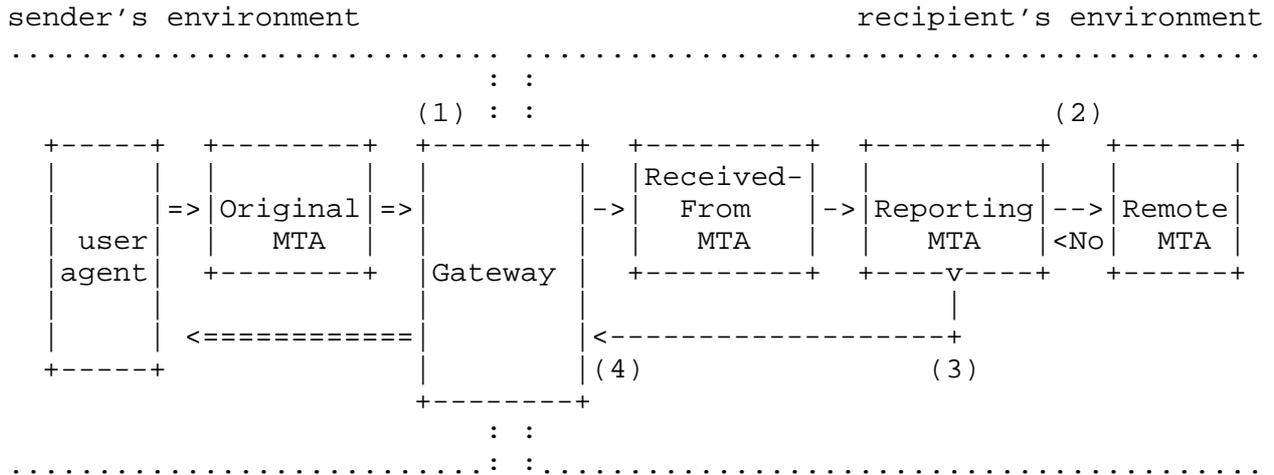
                Figure 2. DSNs in the presence of gateways

        (1) message is gatewayed into recipient's environment
        (2) attempt to relay message fails
        (3) reporting-mta (in recipient's environment) returns nondelivery
            notification
        (4) gateway translates foreign notification into a DSN

   The mta-name portion of the Reporting-MTA field is formatted
   according to the conventions indicated by the mta-name-type subfield.
   If an MTA functions as a gateway between dissimilar mail environments
   and thus is known by multiple names depending on the environment, the
   mta-name subfield SHOULD contain the name used by the environment
   from which the message was accepted by the Reporting-MTA.

   Because the exact spelling of an MTA name may be significant in a
   particular environment, MTA names are CASE-SENSITIVE.

2.2.3 The DSN-Gateway field

   The DSN-Gateway field indicates the name of the gateway or MTA which
   translated a foreign (non-Internet) delivery status notification into
   this DSN. This field MUST appear in any DSN which was translated by
   a gateway from a foreign system into DSN format, and MUST NOT appear
   otherwise.

   dsn-gateway-field = "DSN-Gateway" ":" mta-name-type ";" mta-name

   For gateways into Internet mail, the MTA-name-type will normally be
   "smtp", and the mta-name will be the Internet domain name of the
   gateway.

2.2.4 The Received-From-MTA DSN field

   The optional Received-From-MTA field indicates the name of the MTA
   from which the message was received.

      received-from-mta-field =
          "Received-From-MTA" ":" mta-name-type ";" mta-name

   If the message was received from an Internet host via SMTP, the
   contents of the mta-name subfield SHOULD be the Internet domain name
   supplied in the HELO or EHLO command, and the network address used by
   the SMTP client SHOULD be included as a comment enclosed in
   parentheses. (In this case, the MTA-name-type will be "smtp".)

   The mta-name portion of the Received-From-MTA field is formatted
   according to the conventions indicated by the MTA-name-type subfield.

   Since case is significant in some mail systems, the exact spelling,
   including case, of the MTA name SHOULD be preserved.

2.2.5 The Arrival-Date DSN field

   The optional Arrival-Date field indicates the date and time at which
   the message arrived at the Reporting MTA. If the Last-Attempt-Date
   field is also provided in a per-recipient field, this can be used to
   determine the interval between when the message arrived at the
   Reporting MTA and when the report was issued for that recipient.

      arrival-date-field = "Arrival-Date" ":" date-time

   The date and time are expressed in RFC 822 'date-time' format, as
   modified by [8]. Numeric timezones ([+/-]HHMM format) MUST be used.

2.3 Per-Recipient DSN fields

   A DSN contains information about attempts to deliver a message to one
   or more recipients. The delivery information for any particular
   recipient is contained in a group of contiguous per-recipient fields.
   Each group of per-recipient fields is preceded by a blank line.

The syntax for the group of per-recipient fields is as follows:


```
per-recipient-fields =
    [ original-recipient-field CRLF ]
    final-recipient-field CRLF
    action-field CRLF
    status-field CRLF
    [ remote-mta-field CRLF ]
    [ diagnostic-code-field CRLF ]
    [ last-attempt-date-field CRLF ]
    [ will-retry-until-field CRLF ]
    *( extension-field CRLF )
```

2.3.1 Original-Recipient field

   The Original-Recipient field indicates the original recipient address
   as specified by the sender of the message for which the DSN is being
   issued.

```
original-recipient-field =
    "Original-Recipient" ":" address-type ";" generic-address

generic-address = *text
```

   The address-type field indicates the type of the original recipient
   address. If the message originated within the Internet, the
   address-type field field will normally be "rfc822", and the address
   will be according to the syntax specified in [6]. The value
   "unknown" should be used if the Reporting MTA cannot determine the
   type of the original recipient address from the message envelope.

   This field is optional. It should be included only if the sender-
   specified recipient address was present in the message envelope, such
   as by the SMTP extensions defined in [4]. This address is the same
   as that provided by the sender and can be used to automatically
   correlate DSN reports and message transactions.

2.3.2 Final-Recipient field

   The Final-Recipient field indicates the recipient for which this set
   of per-recipient fields applies. This field MUST be present in each
   set of per-recipient data.

The syntax of the field is as follows:

```
final-recipient-field =
     "Final-Recipient" ":" address-type ";" generic-address
```

The generic-address subfield of the Final-Recipient field MUST
contain the mailbox address of the recipient (from the transport
envelope) as it was when the message was accepted for delivery by the
Reporting MTA.

The Final-Recipient address may differ from the address originally
provided by the sender, because it may have been transformed during
forwarding and gatewaying into an totally unrecognizable mess.
However, in the absence of the optional Original-Recipient field, the
Final-Recipient field and any returned content may be the only
information available with which to correlate the DSN with a
particular message submission.

The address-type subfield indicates the type of address expected by
the reporting MTA in that context. Recipient addresses obtained via
SMTP will normally be of address-type "rfc822".

NOTE: The Reporting MTA is not expected to ensure that the address
actually conforms to the syntax conventions of the address-type.
Instead, it MUST report exactly the address received in the envelope,
unless that address contains characters such as CR or LF which may
not appear in a DSN field.

Since mailbox addresses (including those used in the Internet) may be
case sensitive, the case of alphabetic characters in the address MUST
be preserved.

2.3.3 Action field

The Action field indicates the action performed by the Reporting-MTA
as a result of its attempt to deliver the message to this recipient
address. This field MUST be present for each recipient named in the
DSN.

The syntax for the action-field is:

```
action-field = "Action" ":" action-value

action-value =
     "failed" / "delayed" / "delivered" / "relayed" / "expanded"
```

   The action-value may be spelled in any combination of upper and lower
   case characters.

"failed"   indicates that the message could not be delivered to the
               recipient. The Reporting MTA has abandoned any attempts to
               deliver the message to this recipient. No further
               notifications should be expected.

"delayed"   indicates that the Reporting MTA has so far been unable to
               deliver or relay the message, but it will continue to
               attempt to do so. Additional notification messages may be
               issued as the message is further delayed or successfully
               delivered, or if delivery attempts are later abandoned.

"delivered"   indicates that the message was successfully delivered to
               the recipient address specified by the sender, which
               includes "delivery" to a mailing list exploder. It does
               not indicate that the message has been read. This is a
               terminal state and no further DSN for this recipient should
               be expected.

"relayed"   indicates that the message has been relayed or gatewayed
               into an environment that does not accept responsibility for
               generating DSNs upon successful delivery. This action-
               value SHOULD NOT be used unless the sender has requested
               notification of successful delivery for this recipient.

"expanded"   indicates that the message has been successfully delivered
               to the recipient address as specified by the sender, and
               forwarded by the Reporting-MTA beyond that destination to
               multiple additional recipient addresses. An action-value
               of "expanded" differs from "delivered" in that "expanded"
               is not a terminal state. Further "failed" and/or "delayed"
               notifications may be provided.

               Using the terms "mailing list" and "alias" as defined in
               [4], section 7.2.7: An action-value of "expanded" is only
               to be used when the message is delivered to a multiple-
               recipient "alias". An action-value of "expanded" SHOULD
               NOT be used with a DSN issued on delivery of a message to a
               "mailing list".

   NOTE ON ACTION VS. STATUS CODES: Although the 'action' field might
   seem to be redundant with the 'status' field, this is not the case.
   In particular, a "temporary failure" ("4") status code could be used
   with an action-value of either "delayed" or "failed". For example,
   assume that an SMTP client repeatedly tries to relay a message to the
   mail exchanger for a recipient, but fails because a query to a domain

name server timed out. After a few hours, it might issue a "delayed"
DSN to inform the sender that the message had not yet been delivered.
After a few days, the MTA might abandon its attempt to deliver the
message and return a "failed" DSN. The status code (which would
begin with a "4" to indicate "temporary failure") would be the same
for both DSNs.

Another example for which the action and status codes may appear
contradictory: If an MTA or mail gateway cannot deliver a message
because doing so would entail conversions resulting in an
unacceptable loss of information, it would issue a DSN with the
'action' field of "failure" and a status code of 'XXX'. If the
message had instead been relayed, but with some loss of information,
it might generate a DSN with the same XXX status-code, but with an
action field of "relayed".

2.3.4 Status field

   The per-recipient Status field contains a transport-independent
   status code which indicates the delivery status of the message to
   that recipient. This field MUST be present for each delivery attempt
   which is described by a DSN.

   The syntax of the status field is:

      status-field = "Status" ":" status-code

      status-code = DIGIT "." 1*3DIGIT "." 1*3DIGIT

            ; White-space characters and comments are NOT allowed within a
            ; status-code, though a comment enclosed in parentheses MAY follow
            ; the last numeric subfield of the status-code. Each numeric
            ; subfield within the status-code MUST be expressed without
            ; leading zero digits.

   Status codes thus consist of three numerical fields separated by ".".
   The first sub-field indicates whether the delivery attempt was
   successful (2 = success, 4 = persistent temporary failure, 5 =
   permanent failure). The second sub-field indicates the probable
   source of any delivery anomalies, and the third sub-field denotes a
   precise error condition, if known.

   The initial set of status-codes is defined in [5].

2.3.5 Remote-MTA field

   The value associated with the Remote-MTA DSN field is a printable
   ASCII representation of the name of the "remote" MTA that reported
   delivery status to the "reporting" MTA.

      remote-mta-field = "Remote-MTA" ":" mta-name-type ";" mta-name

   NOTE: The Remote-MTA field preserves the "while talking to"
   information that was provided in some pre-existing nondelivery
   reports.

   This field is optional. It MUST NOT be included if no remote MTA was
   involved in the attempted delivery of the message to that recipient.

2.3.6 Diagnostic-Code field

   For a "failed" or "delayed" recipient, the Diagnostic-Code DSN field
   contains the actual diagnostic code issued by the mail transport.
   Since such codes vary from one mail transport to another, the
   diagnostic-type subfield is needed to specify which type of
   diagnostic code is represented.

      diagnostic-code-field =
           "Diagnostic-Code" ":" diagnostic-type ";" *text

   NOTE: The information in the Diagnostic-Code field may be somewhat
   redundant with that from the Status field. The Status field is
   needed so that any DSN, regardless of origin, may be understood by
   any user agent or gateway that parses DSNs. Since the Status code
   will sometimes be less precise than the actual transport diagnostic
   code, the Diagnostic-Code field is provided to retain the latter
   information. Such information may be useful in a trouble ticket sent
   to the administrator of the Reporting MTA, or when tunneling foreign
   nondelivery reports through DSNs.

   If the Diagnostic Code was obtained from a Remote MTA during an
   attempt to relay the message to that MTA, the Remote-MTA field should
   be present. When interpreting a DSN, the presence of a Remote-MTA
   field indicates that the Diagnostic Code was issued by the Remote
   MTA. The absence of a Remote-MTA indicates that the Diagnostic Code
   was issued by the Reporting MTA.

   In addition to the Diagnostic-Code itself, additional textual
   description of the diagnostic, MAY appear in a comment enclosed in
   parentheses.

This field is optional, because some mail systems supply no
additional information beyond that which is returned in the 'action'
and 'status' fields. However, this field SHOULD be included if
transport-specific diagnostic information is available.

2.3.7 Last-Attempt-Date field

The Last-Attempt-Date field gives the date and time of the last
attempt to relay, gateway, or deliver the message (whether successful
or unsuccessful) by the Reporting MTA. This is not necessarily the
same as the value of the Date field from the header of the message
used to transmit this delivery status notification: In cases where
the DSN was generated by a gateway, the Date field in the message
header contains the time the DSN was sent by the gateway and the DSN
Last-Attempt-Date field contains the time the last delivery attempt
occurred.

    last-attempt-date-field = "Last-Attempt-Date" ":" date-time

This field is optional. It MUST NOT be included if the actual date
and time of the last delivery attempt are not available (which might
be the case if the DSN were being issued by a gateway).

The date and time are expressed in RFC 822 'date-time' format, as
modified by [8]. Numeric timezones ([+/-]HHMM format) MUST be used.

3.2.1.5 final-log-id field

The "final-log-id" field gives the final-log-id of the message that
was used by the final-mta. This can be useful as an index to the
final-mta's log entry for that delivery attempt.

    final-log-id-field = "Final-Log-ID" ":" *text

This field is optional.

2.3.8 Will-Retry-Until field

For DSNs of type "delayed", the Will-Retry-Until field gives the date
after which the Reporting MTA expects to abandon all attempts to
deliver the message to that recipient. The Will-Retry-Until field is
optional for "delay" DSNs, and MUST NOT appear in other DSNs.

    will-retry-until-field = "Will-Retry-Until" ":" date-time

The date and time are expressed in RFC 822 'date-time' format, as
modified by [8]. Numeric timezones ([+/-]HHMM format) MUST be used.

2.4 Extension fields

   Additional per-message or per-recipient DSN fields may be defined in
   the future by later revisions or extensions to this specification.
   Extension-field names beginning with "X-" will never be defined as
   standard fields; such names are reserved for experimental use. DSN
   field names NOT beginning with "X-" MUST be registered with the
   Internet Assigned Numbers Authority (IANA) and published in an RFC.

   Extension DSN fields may be defined for the following reasons:

   (a) To allow additional information from foreign delivery status
       reports to be tunneled through Internet DSNs. The names of such
       DSN fields should begin with an indication of the foreign
       environment name (e.g. X400-Physical-Forwarding-Address).

   (b) To allow the transmission of diagnostic information which is
       specific to a particular mail transport protocol. The names of
       such DSN fields should begin with an indication of the mail
       transport being used (e.g. SMTP-Remote-Recipient-Address). Such
       fields should be used for diagnostic purposes only and not by
       user agents or mail gateways.

   (c) To allow transmission of diagnostic information which is specific
       to a particular message transfer agent (MTA). The names of such
       DSN fields should begin with an indication of the MTA
       implementation which produced the DSN. (e.g. Foomail-Queue-ID).

   MTA implementors are encouraged to provide adequate information, via
   extension fields if necessary, to allow an MTA maintainer to
   understand the nature of correctable delivery failures and how to fix
   them. For example, if message delivery attempts are logged, the DSN
   might include information which allows the MTA maintainer to easily
   find the log entry for a failed delivery attempt.

   If an MTA developer does not wish to register the meanings of such
   extension fields, "X-" fields may be used for this purpose. To avoid
   name collisions, the name of the MTA implementation should follow the
   "X-", (e.g. "X-Foomail-Log-ID").

3. Conformance and Usage Requirements

   An MTA or gateway conforms to this specification if it generates DSNs
   according to the protocol defined in this memo. For MTAs and
   gateways that do not support requests for positive delivery
   notification (such as in [4]), it is sufficient that delivery failure
   reports use this protocol.

A minimal implementation of this specification need generate only the
Reporting-MTA per-message field, and the Final-Recipient, Action, and
Status fields for each attempt to deliver a message to a recipient
described by the DSN. Generation of the other fields, when
appropriate, is strongly recommended.

MTAs and gateways MUST NOT generate the Original-Recipient field of a
DSN unless the mail transfer protocol provides the address originally
specified by the sender at the time of submission. (Ordinary SMTP
does not make that guarantee, but the SMTP extension defined in [4]
permits such information to be carried in the envelope if it is
available.)

Each sender-specified recipient address SHOULD result in at most one
"delivered" or "failed" DSN for that recipient. If a positive DSN is
requested (e.g. one using NOTIFY=SUCCESS in SMTP) for a recipient
that is forwarded to multiple recipients of an "alias" (as defined in
[4], section 7.2.7), the forwarding MTA SHOULD normally issue a
"expanded" DSN for the originally-specified recipient and not
propagate the request for a DSN to the forwarding addresses.
Alternatively, the forwarding MTA MAY relay the request for a DSN to
exactly one of the forwarding addresses and not propagate the request
to the others.

By contrast, successful submission of a message to a mailing list
exploder is considered final delivery of the message. Upon delivery
of a message to a recipient address corresponding to a mailing list
exploder, the Reporting MTA SHOULD issue an appropriate DSN exactly
as if the recipient address were that of an ordinary mailbox.

NOTE: This is actually intended to make DSNs usable by mailing lists
themselves. Any message sent to a mailing list subscriber should
have its envelope return address pointing to the list maintainer [see
RFC 1123, section 5.3.7(E)]. Since DSNs are sent to the envelope
return address, all DSNs resulting from delivery to the recipients of
a mailing list will be sent to the list maintainer. The list
maintainer may elect to mechanically process DSNs upon receipt, and
thus automatically delete invalid addresses from the list. (See
section 7 of this memo.)

This specification places no restrictions on the processing of DSNs
received by user agents or distribution lists.

4. Security Considerations

The following security considerations apply when using DSNs:

4.1 Forgery

   DSNs may be forged as easily as ordinary Internet electronic mail.
   User agents and automatic mail handling facilities (such as mail
   distribution list exploders) that wish to make automatic use of DSNs
   should take appropriate precautions to minimize the potential damage
   from denial-of-service attacks.

   Security threats related to forged DSNs include the sending of:

(a) A falsified delivery notification when the message is not delivered
    to the indicated recipient,
(b) A falsified non-delivery notification when the message was in fact
    delivered to the indicated recipient,
(c) A falsified Final-Recipient address,
(d) A falsified Remote-MTA identification,
(e) A falsified relay notification when the message is "dead ended".
(f) Unsolicited DSNs

4.2 Confidentiality

   Another dimension of security is confidentiality. There may be cases
   in which a message recipient is autoforwarding messages but does not
   wish to divulge the address to which the messages are autoforwarded.
   The desire for such confidentiality will probably be heightened as
   "wireless mailboxes", such as pagers, become more widely used as
   autoforward addresses.

   MTA authors are encouraged to provide a mechanism which enables the
   end user to preserve the confidentiality of a forwarding address.
   Depending on the degree of confidentiality required, and the nature
   of the environment to which a message were being forwarded, this
   might be accomplished by one or more of:

(a) issuing a "relayed" DSN (if a positive DSN was requested) when a
    message is forwarded to a confidential forwarding address, and
    disabling requests for positive DSNs for the forwarded message,

(b) declaring the message to be delivered, issuing a "delivered" DSN,
    re-sending the message to the confidential forwarding address, and
    arranging for no DSNs to be issued for the re-sent message,

(c) omitting "Remote-*" or extension fields of a DSN whenever they would
    otherwise contain confidential information (such as a confidential
    forwarding address),

(d) for messages forwarded to a confidential address, setting the
    envelope return address (e.g. SMTP MAIL FROM address) to the NULL

reverse-path ("<>") (so that no DSNs would be sent from a downstream
MTA to the original sender),

(e) for messages forwarded to a confidential address, disabling delivery
notifications for the forwarded message (e.g. if the "next-hop" MTA
uses ESMTP and supports the DSN extension, by using the NOTIFY=NEVER
parameter to the RCPT command), or

(f) when forwarding mail to a confidential address, having the
forwarding MTA rewrite the envelope return address for the forwarded
message and attempt delivery of that message as if the forwarding
MTA were the originator. On its receipt of final delivery status,
the forwarding MTA would issue a DSN to the original sender.

In general, any optional DSN field may be omitted if the Reporting
MTA site determines that inclusion of the field would impose too
great a compromise of site confidentiality. The need for such
confidentiality must be balanced against the utility of the omitted
information in trouble reports and DSNs gatewayed to foreign
environments.

Implementors are cautioned that many existing MTAs will send
nondelivery notifications to a return address in the message header
(rather than to the one in the envelope), in violation of SMTP and
other protocols. If a message is forwarded through such an MTA, no
reasonable action on the part of the forwarding MTA will prevent the
downstream MTA from compromising the forwarding address. Likewise,
if the recipient's MTA automatically responds to messages based on a
request in the message header (such as the nonstandard, but widely
used, Return-Receipt-To extension header), it will also compromise
the forwarding address.

4.3 Non-Repudiation

Within the framework of today's internet mail, the DSNs defined in
this memo provide valuable information to the mail user; however,
even a "failed" DSN can not be relied upon as a guarantee that a
message was not received by the recipient. Even if DSNs are not
actively forged, conditions exist under which a message can be
delivered despite the fact that a failure DSN was issued.

For example, a race condition in the SMTP protocol allows for the
duplication of messages if the connection is dropped following a
completed DATA command, but before a response is seen by the SMTP
client. This will cause the SMTP client to retransmit the message,
even though the SMTP server has already accepted it.[9] If one of
those delivery attempts succeeds and the other one fails, a "failed"
DSN could be issued even though the message actually reached the
recipient.

5. Appendix - collected grammar

   NOTE: The following lexical tokens are defined in RFC 822: atom,
   CHAR, comment, CR, CRLF, DIGIT, LF, linear-white-space, SPACE, text.
   The date-time lexical token is defined in [8].

```
action-field = "Action" ":" action-value

action-value =
     "failed" / "delayed" / "delivered" / "relayed" / "expanded"

address-type = atom

arrival-date-field = "Arrival-Date" ":" date-time

delivery-status-content =
     per-message-fields 1*( CRLF per-recipient-fields )

diagnostic-code-field =
     "Diagnostic-Code" ":" diagnostic-type ";" *text

diagnostic-type = atom

dsn-gateway-field = "DSN-Gateway" ":" mta-name-type ";" mta-name

envelope-id = *text

extension-field = extension-field-name ":" *text

extension-field-name = atom

final-recipient-field =
     "Final-Recipient" ":" address-type ";" generic-address

generic-address = *text

last-attempt-date-field = "Last-Attempt-Date" ":" date-time

mta-name = *text

mta-name-type = atom

original-envelope-id-field =
     "Original-Envelope-Id" ":" envelope-id

original-recipient-field =
     "Original-Recipient" ":" address-type ";" generic-address
```

```
per-message-fields =
      [ original-envelope-id-field CRLF ]
      reporting-mta-field CRLF
      [ dsn-gateway-field CRLF ]
      [ received-from-mta-field CRLF ]
      [ arrival-date-field CRLF ]
      *( extension-field CRLF )

per-recipient-fields =
      [ original-recipient-field CRLF ]
      final-recipient-field CRLF
      action-field CRLF
      status-field CRLF
      [ remote-mta-field CRLF ]
      [ diagnostic-code-field CRLF ]
      [ last-attempt-date-field CRLF ]
      [ will-retry-until-field CRLF ]
      *( extension-field CRLF )

received-from-mta-field =
      "Received-From-MTA" ":" mta-name-type ";" mta-name

remote-mta-field = "Remote-MTA" ":" mta-name-type ";" mta-name

reporting-mta-field =
      "Reporting-MTA" ":" mta-name-type ";" mta-name

status-code = DIGIT "." 1*3DIGIT "." 1*3DIGIT

      ; White-space characters and comments are NOT allowed within a
      ; status-code, though a comment enclosed in parentheses MAY follow
      ; the last numeric subfield of the status-code.  Each numeric
      ; subfield within the status-code MUST be expressed without
      ; leading zero digits.

status-field = "Status" ":" status-code

will-retry-until-field = "Will-Retry-Until" ":" date-time
```

6. Appendix - Guidelines for gatewaying DSNs

   NOTE: This section provides non-binding recommendations for the
   construction of mail gateways that wish to provide semi-transparent
   delivery reports between the Internet and another electronic mail
   system. Specific DSN gateway requirements for a particular pair of
   mail systems may be defined by other documents.

6.1 Gatewaying from other mail systems to DSNs

   A mail gateway may issue a DSN to convey the contents of a "foreign"
   delivery or non-delivery notification over Internet mail. When there
   are appropriate mappings from the foreign notification elements to
   DSN fields, the information may be transmitted in those DSN fields.
   Additional information (such as might be useful in a trouble ticket
   or needed to tunnel the foreign notification through the Internet)
   may be defined in extension DSN fields. (Such fields should be given
   names that identify the foreign mail protocol, e.g. X400-* for X.400
   NDN or DN protocol elements)

   The gateway must attempt to supply reasonable values for the
   Reporting-MTA, Final-Recipient, Action, and Status fields. These
   will normally be obtained by translating the values from the remote
   delivery or non-delivery notification into their Internet-style
   equivalents. However, some loss of information is to be expected.
   For example, the set of status-codes defined for DSNs may not be
   adequate to fully convey the delivery diagnostic code from the
   foreign system. The gateway should assign the most precise code
   which describes the failure condition, falling back on "generic"
   codes such as 2.0.0 (success), 4.0.0 (temporary failure), and 5.0.0
   (permanent failure) when necessary. The actual foreign diagnostic
   code should be retained in the Diagnostic-Code field (with an
   appropriate diagnostic-type value) for use in trouble tickets or
   tunneling.

   The sender-specified recipient address, and the original envelope-id,
   if present in the foreign transport envelope, should be preserved in
   the Original-Recipient and Original-Envelope-ID fields.

   The gateway should also attempt to preserve the "final" recipient
   addresses and MTA names from the foreign system. Whenever possible,
   foreign protocol elements should be encoded as meaningful printable
   ASCII strings.

   For DSNs produced from foreign delivery or nondelivery notifications,
   the name of the gateway MUST appear in the DSN-Gateway field of the
   DSN.

6.2 Gatewaying from DSNs to other mail systems

   It may be possible to gateway DSNs from the Internet into a foreign
   mail system. The primary purpose of such gatewaying is to convey
   delivery status information in a form that is usable by the
   destination system. A secondary purpose is to allow "tunneling" of
   DSNs through foreign mail systems, in case the DSN may be gatewayed
   back into the Internet.

   In general, the recipient of the DSN (i.e., the sender of the
   original message) will want to know, for each recipient: the closest
   available approximation to the original recipient address, the
   delivery status (success, failure, or temporary failure), and for
   failed deliveries, a diagnostic code that describes the reason for
   the failure.

   If possible, the gateway should attempt to preserve the Original-
   Recipient address and Original-Envelope-ID (if present), in the
   resulting foreign delivery status report.

   When reporting delivery failures, if the diagnostic-type subfield of
   the Diagnostic-Code field indicates that the original diagnostic code
   is understood by the destination environment, the information from
   the Diagnostic-Code field should be used. Failing that, the
   information in the Status field should be mapped into the closest
   available diagnostic code used in the destination environment.

   If it is possible to tunnel a DSN through the destination
   environment, the gateway specification may define a means of
   preserving the DSN information in the delivery status reports used by
   that environment.

7. Appendix - Guidelines for use of DSNs by mailing list exploders

   NOTE: This section pertains only to the use of DSNs by "mailing
   lists" as defined in [4], section 7.2.7.

   DSNs are designed to be used by mailing list exploders to allow them
   to detect and automatically delete recipients for whom mail delivery
   fails repeatedly.

   When forwarding a message to list subscribers, the mailing list
   exploder should always set the envelope return address (e.g. SMTP
   MAIL FROM address) to point to a special address which is set up to
   received nondelivery reports. A "smart" mailing list exploder can
   therefore intercept such nondelivery reports, and if they are in the
   DSN format, automatically examine them to determine for which
   recipients a message delivery failed or was delayed.

   The Original-Recipient field should be used if available, since it
   should exactly match the subscriber address known to the list. If
   the Original-Recipient field is not available, the recipient field
   may resemble the list subscriber address. Often, however, the list
   subscriber will have forwarded his mail to a different address, or
   the address may be subject to some re-writing, so heuristics may be
   required to successfully match an address from the recipient field.
   Care is needed in this case to minimize the possibility of false
   matches.

   The reason for delivery failure can be obtained from the Status and
   Action fields, and from the Diagnostic-Code field (if the status-type
   is recognized). Reports for recipients with action values other than
   "failed" can generally be ignored; in particular, subscribers should
   not be removed from a list due to "delayed" reports.

   In general, almost any failure status code (even a "permanent" one)
   can result from a temporary condition. It is therefore recommended
   that a list exploder not delete a subscriber based on any single
   failure DSN (regardless of the status code), but only on the
   persistence of delivery failure over a period of time.

   However, some kinds of failures are less likely than others to have
   been caused by temporary conditions, and some kinds of failures are
   more likely to be noticed and corrected quickly than others. Once
   more precise status codes are defined, it may be useful to
   differentiate between the status codes when deciding whether to
   delete a subscriber. For example, on a list with a high message
   volume, it might be desirable to temporarily suspend delivery to a
   recipient address which causes repeated "temporary" failures, rather
   than simply deleting the recipient. The duration of the suspension

might depend on the type of error. On the other hand, a "user
unknown" error which persisted for several days could be considered a
reliable indication that address were no longer valid.

8. Appendix - IANA registration forms for DSN types

   The forms below are for use when registering a new address-type,
   diagnostic-type, or MTA-name-type with the Internet Assigned Numbers
   Authority (IANA). Each piece of information requested by a
   registration form may be satisfied either by providing the
   information on the form itself, or by including a reference to a
   published, publicly available specification which includes the
   necessary information.   IANA MAY reject DSN type registrations
   because of incomplete registration forms, imprecise specifications,
   or inappropriate type names.

   To register a DSN type, complete the applicable form below and send
   it via Internet electronic mail to <IANA@IANA.ORG>.

8.1 IANA registration form for address-type

   A registration for a DSN address-type MUST include the following
   information:

(a) The proposed address-type name.

(b) The syntax for mailbox addresses of this type, specified using BNF,
    regular expressions, ASN.1, or other non-ambiguous language.

(c) If addresses of this type are not composed entirely of graphic
    characters from the US-ASCII repertoire, a specification for how
    they are to be encoded as graphic US-ASCII characters in a DSN
    Original-Recipient or Final-Recipient DSN field.

(d) [optional] A specification for how addresses of this type are to be
    translated to and from Internet electronic mail addresses.

8.2 IANA registration form for diagnostic-type

   A registration for a DSN address-type MUST include the following
   information:

(a) The proposed diagnostic-type name.

(b) A description of the syntax to be used for expressing diagnostic
    codes of this type as graphic characters from the US-ASCII
    repertoire.

(c) A list of valid diagnostic codes of this type and the meaning of
    each code.

(d) [optional] A specification for mapping from diagnostic codes of this
    type to DSN status codes (as defined in [5]).

8.3 IANA registration form for MTA-name-type

   A registration for a DSN MTA-name-type must include the following
   information:

(a) The proposed MTA-name-type name.

(b) A description of the syntax of MTA names of this type, using BNF,
    regular expressions, ASN.1, or other non-ambiguous language.

(c) If MTA names of this type do not consist entirely of graphic
    characters from the US-ASCII repertoire, a specification for how an
    MTA name of this type should be expressed as a sequence of graphic
    US-ASCII characters.

9. Appendix - Examples

   NOTE: These examples are provided as illustration only, and are not
   considered part of the DSN protocol specification. If an example
   conflicts with the protocol definition above, the example is wrong.

   Likewise, the use of *-type subfield names or extension fields in
   these examples is not to be construed as a definition for those type
   names or extension fields.

   These examples were manually translated from bounced messages using
   whatever information was available.

9.1 This is a simple DSN issued after repeated attempts
     to deliver a message failed. In this case, the DSN is
     issued by the same MTA from which the message was originated.

   Date: Thu, 7 Jul 1994 17:16:05 -0400
   From: Mail Delivery Subsystem <MAILER-DAEMON@CS.UTK.EDU>
   Message-Id: <199407072116.RAA14128@CS.UTK.EDU>
   Subject: Returned mail: Cannot send message for 5 days
   To: <owner-info-mime@cs.utk.edu>
   MIME-Version: 1.0
   Content-Type: multipart/report; report-type=delivery-status;
        boundary="RAA14128.773615765/CS.UTK.EDU"

   --RAA14128.773615765/CS.UTK.EDU

   The original message was received at Sat, 2 Jul 1994 17:10:28 -0400
   from root@localhost

      ----- The following addresses had delivery problems -----
   <louisl@larry.slip.umd.edu> (unrecoverable error)

      ----- Transcript of session follows -----
   <louisl@larry.slip.umd.edu>... Deferred: Connection timed out
        with larry.slip.umd.edu.
   Message could not be delivered for 5 days
   Message will be deleted from queue

   --RAA14128.773615765/CS.UTK.EDU
   content-type: message/delivery-status

   Reporting-MTA: dns; cs.utk.edu

   Original-Recipient: rfc822;louisl@larry.slip.umd.edu
   Final-Recipient: rfc822;louisl@larry.slip.umd.edu
   Action: failed
   Status: 4.0.0
   Diagnostic-Code: smtp; 426 connection timed out
   Last-Attempt-Date: Thu, 7 Jul 1994 17:15:49 -0400

   --RAA14128.773615765/CS.UTK.EDU
   content-type: message/rfc822

   [original message goes here]
   --RAA14128.773615765/CS.UTK.EDU--

9.2 This is another DSN issued by the sender's MTA, which
     contains details of multiple delivery attempts. Some of
     these were detected locally, and others by a remote MTA.

   Date: Fri, 8 Jul 1994 09:21:47 -0400
   From: Mail Delivery Subsystem <MAILER-DAEMON@CS.UTK.EDU>
   Subject: Returned mail: User unknown
   To: <owner-ups-mib@CS.UTK.EDU>
   MIME-Version: 1.0
   Content-Type: multipart/report; report-type=delivery-status;
        boundary="JAA13167.773673707/CS.UTK.EDU"

   --JAA13167.773673707/CS.UTK.EDU
   content-type: text/plain; charset=us-ascii

      ----- The following addresses had delivery problems -----
   <arathib@vnet.ibm.com> (unrecoverable error)
   <wsnell@sdcc13.ucsd.edu> (unrecoverable error)

   --JAA13167.773673707/CS.UTK.EDU
   content-type: message/delivery-status

   Reporting-MTA: dns; cs.utk.edu

   Original-Recipient: rfc822;arathib@vnet.ibm.com
   Final-Recipient: rfc822;arathib@vnet.ibm.com
   Action: failed
   Status: 5.0.0 (permanent failure)
   Diagnostic-Code: smtp;
    550 'arathib@vnet.IBM.COM' is not a registered gateway user
   Remote-MTA: dns; vnet.ibm.com

   Original-Recipient: rfc822;johnh@hpnjld.njd.hp.com
   Final-Recipient: rfc822;johnh@hpnjld.njd.hp.com
   Action: delayed
   Status: 4.0.0 (hpnjld.njd.jp.com: host name lookup failure)

   Original-Recipient: rfc822;wsnell@sdcc13.ucsd.edu
   Final-Recipient: rfc822;wsnell@sdcc13.ucsd.edu
   Action: failed
   Status: 5.0.0
   Diagnostic-Code: smtp; 550 user unknown
   Remote-MTA: dns; sdcc13.ucsd.edu

   --JAA13167.773673707/CS.UTK.EDU
   content-type: message/rfc822

```
   [original message goes here]
   --JAA13167.773673707/CS.UTK.EDU--
```

9.3 A delivery report generated by Message Router (MAILBUS) and
    gatewayed by PMDF_MR to a DSN. In this case the gateway did not
    have sufficient information to supply an original-recipient address.

```
   Disclose-recipients: prohibited
   Date: Fri, 08 Jul 1994 09:21:25 -0400 (EDT)
   From: Message Router Submission Agent <AMMGR@corp.timeplex.com>
   Subject: Status of : Re: Battery current sense
   To: owner-ups-mib@CS.UTK.EDU
   Message-id: <01HEGJ0WNBY28Y95LN@mr.timeplex.com>
   MIME-version: 1.0
   content-type: multipart/report; report-type=delivery-status;
        boundary="84229080704991.122306.SYS30"

   --84229080704991.122306.SYS30
   content-type: text/plain

   Invalid address - nair_s
   %DIR-E-NODIRMTCH, No matching Directory Entry found

   --84229080704991.122306.SYS30
   content-type: message/delivery-status

   Reporting-MTA: mailbus; SYS30

   Final-Recipient: unknown; nair_s
   Status: 5.0.0 (unknown permanent failure)
   Action: failed

   --84229080704991.122306.SYS30--
```

9.4 A delay report from a multiprotocol MTA. Note that there is no
    returned content, so no third body part appears in the DSN.

    From: <postmaster@nsfnet-relay.ac.uk>
    Message-Id: <199407092338.TAA23293@CS.UTK.EDU>
    Received: from nsfnet-relay.ac.uk by sun2.nsfnet-relay.ac.uk
            id <g.12954-0@sun2.nsfnet-relay.ac.uk>;
    Sun, 10 Jul 1994 00:36:51 +0100
    To: owner-info-mime@cs.utk.edu
    Date: Sun, 10 Jul 1994 00:36:51 +0100
    Subject: WARNING: message delayed at "nsfnet-relay.ac.uk"
    content-type: multipart/report; report-type=delivery-status;
         boundary=foobar

    --foobar
    content-type: text/plain

    The following message:

    UA-ID: Reliable PC (...
    Q-ID: sun2.nsf:77/msg.11820-0

    has not been delivered to the intended recipient:

    thomas@de-montfort.ac.uk

    despite repeated delivery attempts over the past 24 hours.

    The usual cause of this problem is that the remote system is
    temporarily unavailable.

    Delivery will continue to be attempted up to a total elapsed
    time of 168 hours, ie 7 days.

    You will be informed if delivery proves to be impossible
    within this time.

    Please quote the Q-ID in any queries regarding this mail.

    --foobar
    content-type: message/delivery-status

    Reporting-MTA: dns; sun2.nsfnet-relay.ac.uk

    Final-Recipient: rfc822;thomas@de-montfort.ac.uk
    Status: 4.0.0 (unknown temporary failure)
    Action: delayed

       --foobar--

10. Acknowledgments

   The authors wish to thank the following people for their reviews of
   earlier drafts of this document and their suggestions for
   improvement: Eric Allman, Harald Alvestrand, Allan Cargille, Jim
   Conklin, Peter Cowen, Dave Crocker, Roger Fajman, Ned Freed, Marko
   Kaittola, Steve Kille, John Klensin, John Gardiner Myers, Mark
   Nahabedian, Julian Onions, Jacob Palme, Jean Charles Roy, and Gregory
   Sheehan.

11. References

[1] Borenstein, N., Freed, N. "Multipurpose Internet Mail Extensions",
    RFC 1521, Bellcore, Innosoft, September 1993.

[2] Vaudreuil, G., "The Multipart/Report Content Type for the Reporting
    of Mail System Administrative Messages", RFC 1892, Octal Network
    Services, January 1996.

[3] Postel, J., "Simple Mail Transfer Protocol", STD 10, RFC 821,
    USC/Information Sciences Institute, August 1982.

[4] Moore, K., "SMTP Service Extension for Delivery Status
    Notifications", RFC 1891, University of Tennessee, January 1996.

[5] Vaudreuil, G., "Enhanced Mail System Status Codes", RFC 1893, Octal
    Network Services, January 1996.

[6] Crocker, D., "Standard for the Format of ARPA Internet Text
    Messages", STD 11, RFC 822, UDEL, August 1982.

[7] Moore, K. "MIME (Multipurpose Internet Mail Extensions) Part Two:
    Message Header Extensions for Non-Ascii Text", RFC 1522, University
    of Tennessee, September 1993.

[8] Braden, R. (ed.) "Requirements for Internet Hosts - Application and
    Support", STD 3, RFC 1123, USC/Information Sciences Institute,
    October 1989.

[9] Partridge, C., "Duplicate Messages and SMTP", RFC 1047, BBN,
    February 1988.

11. Authors' Addresses

Keith Moore
University of Tennessee
107 Ayres Hall
Knoxville, TN 37996-1301
USA

EMail: moore@cs.utk.edu
Phone: +1 615 974 3126
Fax: +1 615 974 8296

Gregory M. Vaudreuil
Octel Network Services
17080 Dallas Parkway
Dallas, TX 75248-1905
USA

EMail: Greg.Vaudreuil@Octel.Com