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Content Negotiation for Messaging Services based on Email

Status of this Memo

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Abstract

This memo describes a content negotiation mechanism for facsimile, voice and other messaging services that use Internet email.

Services such as facsimile and voice messaging need to cope with new message content formats, yet need to ensure that the content of any given message is renderable by the receiving agent. The mechanism described here aims to meet these needs in a fashion that is fully compatible with the current behaviour and expectations of Internet email.

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1. Introduction

This memo describes a mechanism for email based content negotiation which provides an Internet fax facility comparable to that of traditional facsimile, which may be used by other messaging services that need similar facilities.

"Extended Facsimile using Internet Mail" [1] specifies the transfer of image data using Internet email protocols. "Indicating Supported Media Features Using Extensions to DSN and MDN" [2] describes a mechanism for providing the sender with the details of a receiver's capabilities. The capability information thus provided, if stored by the sender, can be used in subsequent transfers between the same sender and receiver.

Many communications are one-off or infrequent transfers between a given sender and receiver, and cannot benefit from this "do better next time" approach.

An alternative facility available in email (though not widely implemented) is for the sender to use 'multipart/alternative' [15] to send a message in several different formats, and allow the receiver to choose. Apart from the obvious drawback of network bandwidth use, this approach does not of itself allow the sender to truly tailor its message to a given receiver, or to obtain confirmation that any of the alternatives sent was usable by the receiver.

This memo describes a mechanism that allows better-than-baseline data formats to be sent in the first communication between a sender and receiver. The same mechanism can also achieve a usable message transfer when the sender has based the initial transmission on incorrect information about the receiver's capabilities. It allows the sender of a message to indicate availability of alternative formats, and the receiver to indicate that an alternative format should be provided to replace the message data originally transmitted.

When the sender does not have the correct information about a receiver's capabilities, the mechanism described here may incur an additional message round trip. An important goal of this mechanism is to allow enough information to be provided to determine whether or not the extra round trip is required.

1.1 Structure of this document

The main part of this memo addresses the following areas:

Section 2 describes some of the background, and sets out some specific goals that are addressed in this specification.

Section 3 describes the proposed content negotiation framework, indicating the flow of information between a sender and receiver.

Section 4 contains a detailed description of the 'Content-alternative' header that is used to convey information about alternative available formats. This description is intended to stand independently of the rest of this specification, with a view to being usable in conjunction with other content negotiation protocols.

Section 5 describes a new mail message header, 'Original-Message-ID', which is used to correlate alternative data sent during negotiation with the original message data, and to distinguish the continuation of an old message transaction from the start of a new transaction.

Section 6 describes extensions to the Message Disposition Notification (MDN) framework [4] that support negotiation between the communicating parties.

1.2 Document terminology and conventions

1.2.1 Terminology

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 [22].

Capability exchange
: An exchange of information between communicating parties indicating the kinds of information they can generate or consume.

Capability identification
: Provision of information by the a receiving agent that indicates the kinds of message data that it can accept for presentation to a user.

Content negotiation
: An exchange of information (negotiation metadata) which leads to selection of the appropriate representation (variant) when transferring a data resource.

Message transaction

A sequence of exchanges between a message sender and receiver that accomplish the transfer of message data.

RFC 2703 [17] introduces several other terms related to content negotiation.

1.2.2 Design goals

In discussing the goals for content negotiation, {1}, {2}, {3} notation is used, per RFC 2542, "Terminology and Goals for Internet Fax" [3]. The meanings associated with these notations are:

{1} there is general agreement that this is a critical characteristic of any definition of content negotiation for Internet Fax.

{2} most believe that this is an important characteristic of content negotiation for Internet Fax.

{3} there is general belief that this is a useful feature of content negotiation for Internet Fax, but that other factors might override; a definition that does not provide this element is acceptable.

1.2.3 Other document conventions

NOTE: Comments like this provide additional nonessential information about the rationale behind this document. Such information is not needed for building a conformant implementation, but may help those who wish to understand the design in greater depth.

2. Background and goals

2.1 Background

2.1.1 Fax and email

One of the goals of the work to define a facsimile service using Internet mail has been to deliver benefits of the traditional Group 3 Fax service in an email environment. Traditional Group 3 Fax leans heavily on the idea that an online exchange of information discloses a receiver’s capabilities to the sender before any message data is transmitted.

By contrast, Internet mail has been developed to operate in a different fashion, without any expectation that the sender and receiver will exchange information prior to message transfer. One consequence of this is that all mail messages must contain some kind of meaningful message data: messages that are sent simply to elicit information from a receiving message handling agent are not generally acceptable in the Internet mail environment.

To guarantee some level of interoperability, Group 3 Fax and Internet mail rely on all receivers being able to deal with some baseline format (i.e., a basic image format or plain ASCII text, respectively). The role of capability exchange or content negotiation is to permit better-than baseline capabilities to be employed where available.

One of the challenges addressed by this specification is how to adapt the email environment to provide a fax-like service. A sender must not make any a priori assumption that the receiver can recognize anything other than a simple email message. There are some important uses of email that are fundamentally incompatible with the fax model of message passing and content negotiation (notably mailing lists). So we need to have a way of recognizing when content negotiation is possible, without breaking the existing email model.

2.1.2 Current facilities in Internet Fax

"Extended Facsimile using Internet Mail" [1] provides for a limited provision of receiver capability information to the sender of a message, using an extension to Message Disposition Notifications [2,4], employing media feature tags [5] and media feature expressions [6].

This mechanism provides for receiver capabilities to be disclosed after a message has been received and processed. This information can be used for subsequent transmissions to the same receiver. But many communications are one-off messages from a given sender to a given receiver, and cannot benefit from this.

2.2 Closing the loop

Classic Internet mail is an "open loop" process: no information is returned back to the point from which the message is sent. This has been unkindly --but accurately-- characterized as "send and pray", since it lacks confirmation.

Sending a message and obtaining confirmation that the message has been received is a "closed loop" process: the confirmation sent back to the sender creates a loop around which information is passed.

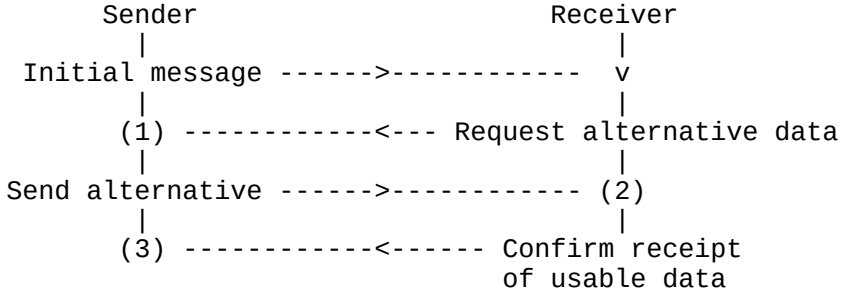
Many Internet email agents are not designed to participate in a closed loop process, and thus have no responsibility to respond to receipt of a message. Later additions to Internet standards, notably Delivery Service Notification [18] and Message Disposition Notification [4], specify means for certain confirmation responses to be sent back to the sender, thereby closing the loop. However conformance to these enhancements is optional and full deployment is in the future.

DSN must be fully implemented by the entire infrastructure; further when support is lacking, the message is still sent on in open-loop fashion. Sometimes, transmission and delivery should instead be aborted and the fact be reported to the sender.

Due to privacy considerations for end-users, MDN usage is entirely voluntary.

Content negotiation is a closed loop function (for the purposes of this proposal -- see section 2.3, item (f)), and requires that the recipient of a message make some response to the sender. Since content negotiation must retro-fit a closed-loop function over Internet mail's voluntary and high-latency environment, a challenge for content negotiation in email is to establish that consenting parties can recognize a closed loop situation, and hence recognize their responsibilities to close the loop.

Three different loops can be identified in a content negotiation:



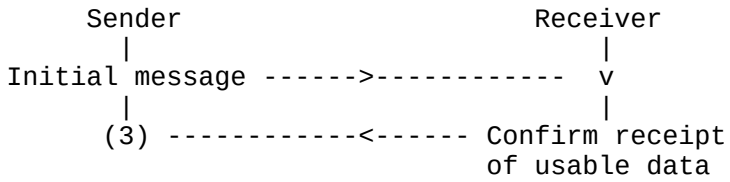
(1) Sender receives acknowledgement that negotiable content has been received

(2) Receiver receives confirmation that its request for data has been received.

(3) Sender receives confirmation that received data is processable, or has been processed.

Although the content negotiation process is initiated by the sender, it is not established until loop (1) is closed with an indication that the receiver desires alternative content.

If content sent with the original message from the sender is processable by the receiver, and a confirmation is sent, then the entire process is reduced to a simple send/confirm loop:



2.3 Goals for content negotiation

The primary goal {1} is to provide a mechanism that allows arbitrary enhanced content features to be used with Internet fax systems. The mechanism should {2} support introduction of new features over time, particularly those that are adopted for Group 3 fax.

Further goals are:

(a) Must {1} interwork with existing simple mode Internet fax systems.

(b) Must {1} interwork with existing email clients.

The term "interwork" used above means that the mechanism must be introduced in a way that may be ignored by existing systems, and systems enhanced to use the negotiation mechanisms will behave in a fashion that is expected by existing systems. (I.e., existing clients are not expected in any way to participate in or be aware of content negotiation.)

(c) Must {1} avoid transmission of "administrative non messages". (I.e., only messages that contain meaningful content for the end user may be sent unless it is known that the receiving system will interpret them, and not attempt to display them.) This requirement has been stated very strongly by the email community.

This means that a sender must not assume that a receiver can understand the capability exchange protocol elements, so must always start by sending some meaningful message data.

(d) Avoid {1} multiple renderings of a message. In situations where multiple versions of a message are transferred, the receiver must be able to reliably decide on a single version to be displayed.

(e) Minimize {2} round trips needed to complete a transmission. Ideally {3} every enhanced transmission will result in simply sending data that the recipient can process, and receiving a confirmation response.

(f) The solution adopted should not {3} transmit multiple versions of the same data. In particular, it must not {1} rely on routinely sending multiple instances of the same data in a single message.

This does not prohibit sending multiple versions of the same data, but it must not be a requirement to do so. A sender may choose to send multiple versions together (e.g., plain text and some other format), but the capability exchange mechanism selected must not depend on such behaviour.

(g) The solution adopted should {2} be consistent with and applicable to other Internet email based applications; e.g., regular email, voice messaging, unified messaging, etc.

(h) Allow for a graceful recovery from stale cache information. A sender might use historic information to send non-baseline data with an initial message. If this turns out to be unusable by the recipient, it should still be possible {3} for the baseline data, or some other acceptable format, to be selected and transferred.

(i) The mechanism defined should {2} operate cleanly in conjunction with the mechanisms already defined for extended mode Internet fax (extended DSN and MDN [2], etc.).

(j) As much as possible, existing email mechanisms should {3} be used rather than inventing new ones. (It is clear that some new mechanisms will be needed, but they should be defined cautiously.)

(k) The mechanism should {2} be implementable in low memory devices. That is, it should not depend on any party being able to buffer arbitrary amounts of message data.

(It may not be possible to completely satisfy this goal in a sending system. But if the sender does not have enough memory to buffer some given message, it can choose to not offer content negotiation.)

3. Framework for content negotiation

This section starts with an outline of the negotiation process, and provides greater detail about each stage in following sub-sections.

1. Sender sends initial message data with an indication of alternative formats available (section 3.1). Initial data MAY be a baseline or some other guess of what the recipient can handle.

2. The receiver has three main options:

   (a) Does not recognize the optional alternative formats, and passively accepts the data as sent (section 3.2.1).

   (b) Does recognize the alternatives offered, and actively accepts the data as sent (section 3.2.2).

   (c) Recognizes the alternatives offered, and determines that it prefers to receive an alternative format. An MDN response is sent (i) indicating that the original data was not processed, and (ii) containing receiver capability information so that the sender may select a suitable alternative (section 3.2.3).

   Note that only recipients named in 'to:', 'cc:' or 'bcc:' headers in the original message may request alternative data formats in this way. Recipients not named in the original message headers MUST NOT attempt to initiate content negotiation.

   NOTE: the prohibition on initiation of negotiation by recipients other than those explicitly addressed is to avoid the sender from having to deal with negotiation requests from unexpected parties.

3. On receipt of an MDN response indicating preference for an alternative data format, the sender MUST select and transmit message data matched to the receiver's declared capabilities, or send an indication that the receiver's request cannot be honoured. When sending alternative data, the sender suppresses the indication that alternative data is available, so the negotiation process cannot loop.

4. On receipt of final data from the sender, the receiver sends an MDN response indicating acceptance (or otherwise) of the data received.

   NOTE: the receiver does not choose the particular data format to be received; that choice rests with the sender. We find that this approach is simpler than having the receiver choose an alternative, because it builds upon existing mechanisms in email, and follows the same pattern as a traditional Group 3 fax. Further, it deals with situations where the range of alternatives may be difficult to describe.

   This approach is similar to server driven negotiation in HTTP using "Accept" headers [13]. This is distinct to the agent-driven style of negotiation provided for HTTP as part of Transparent Content Negotiation [14], or which might be constructed in email using "multipart/alternative" and "message/external-body" MIME types [15].

3.1 Send data with an indication of alternatives

A sender that is prepared to provide alternative message data formats MUST send the following message elements:

(a) a default message data format,

(b) message identification, in the form of a Message-ID header.

(c) appropriate 'Content-features' header(s) [7] describing the default message data sent,

(d) a request for Message Disposition Notification [4],

(e) an indication that it is prepared to send different message data, using an 'Alternative-available' MDN option field [9], and

(f) an indication of the alternative data formats available, in the form of 'Content-alternative' header(s) [8]. Note: more than one Content-alternative' header MAY be specified; see section 3.1.3 for more information.

Having indicated the availability of alternative data formats, the sender is expected to hold the necessary information for some time, allowing the receiver an opportunity to request such data. But, unless it so indicates (see [9]), the sender is not expected to hold this information indefinitely; the exact length of time such information should be held is not specified here. Thus, the

possibility exists that a request for alternative information may arrive too late, and the sender will then send an indication that the data is no longer available. If message transference is being completed within a predetermined time interval (e.g., using [21]), then the sender should normally maintain the data for at least that period.

3.1.1 Choice of default data format

The normal default format is text/plain. This is the format sent unless the sender has prior knowledge or expectation of other content formats supported by the recipient. Some uses of email presume some other default format (e.g. Intenet fax [1] has TIFF profile S [11] as its default format; see section 7 of this document).

"Extended Facsimile Using Internet Mail" [1] and "Indicating Supported Media Features Using Extensions to DSN and MDN" [2] indicate a possible mechanism for a sender to have prior knowledge of receiver capabilities. This specification builds upon the mechanism described there.

As always, the sender may gather information about the receiver in other ways beyond the scope of this document (e.g., a directory service or the suggested RESCAP protocol).

3.1.2 MDN request indicating alternate data formats

When a sender is indicating preparedness to send alternative message data, it MUST request a Message Disposition Notification (MDN) [4].

It indicates its readiness to send alternative message data by including the MDN option 'Alternative-available' [9] with the MDN request. Presence of this MDN request option simply indicates that the sender is prepared to send some different data format if it has more accurate or up-to-date information about the receiver's capabilities. Of itself, this option does not indicate whether the alternatives are likely to be better or worse than the default data sent -- that information is provided by the "Content-alternative" header(s) [8].

When using the 'Alternative-available' option in an MDN request, the message MUST also contain a 'Message-ID:' header with a unique message identifier.

3.1.3 Information about alternative data formats

A sender can provide information about the alternative message data available by applying one or more 'Content-alternative' headers to message body parts for which alternative data is available, each indicating media features [5,6] of an available alternative.

The purpose of this information is to allow a receiver to decide whether any of the available alternatives are preferable, or likely to be preferable, to the default message data provided.

Not every available alternative is required to be described in this way, but the sender should include enough information to allow a receiver to determine whether or not it can expect more useful message data if it chooses to indicate a preference for some alternative that matches its capabilities.

Alternative formats will often be variations of the content-type originally sent. When different content-types can be provided, they should be indicated in a corresponding content-alternative header using the 'type' media feature tag [24]. (See example 8.4.)

> NOTE: the sender is not necessarily expected to describe every single alternative format that is available -- indeed, in cases where content is generated on-the-fly rather than simply selected from an enumeration of possibilities, this may be infeasible. The sender is expected to use one or more 'Content-alternative' headers to reasonably indicate the range of alternative formats available.
>
> The final format actually sent will always be selected by the sender, based on the receiver's capabilities. The 'Content-alternative' headers are provided here simply to allow the receiver to make a reasonable decision about whether to request an alternative format that better matches its capabilities.
>
> ALSO NOTE: this header is intended to be usable independently of the MDN extension that indicates the sender is prepared to send alternative formats. It could be used with a different protocol having nothing to do with email or MDN. Thus, the 'Content-alternative' header provides information about alternative data formats without actually indicating if or how they might be obtained.
>
> Further, the 'Content-alternative' header applies to a MIME body part, where the MDN 'Alternative-available' option applies to the message as a whole.

The example sections of this memo show how the 'Content-features:' and 'Content-alternative:' MIME headers may be used to describe the content provided and available alternatives.

3.2 Receiver options

A negotiation-aware system receiving message data without an indication of alternative data formats MUST process that message in the same way as a standard Internet fax system or email user agent.

Given an indication of alternative data format options, the receiver has three primary options:

(a) do not recognize the alternatives: passively accept what is provided,

(b) do not prefer the alternatives: actively accept what is provided, or

(c) prefer some alternative format.

3.2.1 Alternatives not recognized

This corresponds to the case that the receiver is a simple mode Internet fax recipient [12], or a traditional email user agent.

The receiver does not recognize the alternatives offered, or chooses not to recognize them, and simply accepts the data as sent. A standard MDN response [4] or an extended MDN response [2] MAY be generated at the receiver's option.

3.2.2 Alternative not desired

The receiver does recognize the alternatives offered, but specifically chooses to accept the data originally offered. An MDN response SHOULD be sent indicating acceptance of the data and also containing the receiver's capabilities.

This is the same as the defined behaviour of an Extended Internet Fax receiver [1,2].

3.2.3 Alternative preferred

This case extends the behaviour of Extended Internet Fax [1,2] to allow an alternative form of data for the current message to be transferred. This option may be followed ONLY if the original message contains an 'Alternative-available' MDN option (alternative

data re-sends may not use this option). Further, this option may be followed ONLY if the recipient is explicitly addressed in the message headers ('to:', 'cc:' or 'bcc:').

The receiver recognizes that alternative data is available, and based on the information provided determines that an alternative format would be preferable. An MDN response [4] is sent, which MUST contain the following:

- an 'Alternative-preferred' disposition modifier [9] indicating that some data format other than that originally sent is preferred,
- an 'Original-Message-ID:' field [4] with the message identifier from the received message, and
- receiver capabilities, per RFC 2530 [2].

On sending such an MDN response, the receiver MAY discard the message data provided, in the expectation that some alternative will be sent. But if the sender has indicated a limited lifetime for the alternative data, and the original data received is within the receiver's capability to display, the receiver SHOULD NOT discard it. Lacking sufficient memory to hold the original data for a period of time within which alternative data would reasonably be received, the receiver SHOULD accept and display the original data. In the case that the original data is not within the receiver's capability to display then it SHOULD discard the original data and request an alternative format.

> NOTE: the above rules are meant to ensure that the content negotiation framework does not result in the loss of data that would otherwise be received and displayed.

Having requested alternative data and not displayed the original data, the receiver MUST remember this fact and be prepared to take corrective action if alternative data is not received within a reasonable time (e.g., if the MDN response or transmission of alternative data is lost in transit).

Corrective action might be any of the following:

(a) re-send the MDN response, and continue waiting for an alternative,

(b) present the data originally supplied (if it is still available), or

(c) generate an error response indicating loss of data.

On concluding that alternative data is not forthcoming, the preferred option is (b), but this may not be possible for receivers with limited memory.

See Appendix A for further discussion of receiver behaviour options.

NOTE: A cache control indicator on recipient capabilities has been considered, but is not included in this specification. (Sometimes, a recipient may want to offer certain capabilities only under certain circumstances, and does not wish them to be remembered for future use; e.g., not wanting to receive colour images for routine communications.)

NOTE: the receiver does not actually get to select any specific data format offered by the sender. The final choice of data format is always made by the sender, based on the receiver's declared capabilities. This approach:

(a) more closely matches the style of T.30 content negotiation,

(b) provides for clean integration with the current extended mode Internet fax specification,

(c) builds upon existing email mechanisms in a consistent fashion, and

(d) allows for cases (e.g., dynamically generated content) where it is not feasible for the sender to enumerate the alternatives available.

3.3 Send alternative message data

Having offered to provide alternative data by including an 'Alternative-available' option with the original MDN request, and on receipt of an MDN response indicating 'Alternative-preferred', the sender SHOULD transmit alternative message data that best matches the receiver's declared capabilities. (In the exceptional case that the response requesting an alternative data format does not contain receiver capabilities, a baseline format should be selected.)

If any part of the best available message data matching the receiver capabilities is the same as that originally sent, it MUST still be re-transmitted because the receiver may have discarded the original data. Any data sent as a result of receiving an 'Alternative-preferred' response should include an MDN request but SHOULD NOT include an 'Alternative-available' disposition notification modifier.

If the sender is no longer able to send message data for any reason, it MUST send a message to the receiver indicating a failed transfer. It SHOULD also generate a report for the receiver indicating the failure, containing an MDN request and including an 'Alternative-not-available' disposition notification modifier.

Any message sent to a receiver in response to a request for alternative data MUST include an 'Original-Message-ID:' header [23] containing the Original-message-ID value from the received disposition notification message (which is the 'Message-ID:' from the original message). This header serves to correlate the re-send (or failure message) with the original message, and also to distinguish a re-send from an original message.

3.4 Confirm receipt of resent message data

When resent data is received (indicated by presence of an 'original-message-ID:' header field), the receiver processes that data and generates an MDN response indicating the final disposition of the data received, and also indicating capabilities that may be used for future messages, per RFC 2530 [2] and RFC 2532 [1].

If the re-send indicates that alternative data is no longer available (by including an 'Alternative-not-available' disposition notification modifier), and the receiver still holds the original data sent, it should display or process the original data and send an MDN response indicating the final disposition of that data. Thus, the response to an 'Alternative-not-available' indication may be a successful disposition notification.

If the re-send indicates that alternative data is no longer available (by including an 'Alternative-not-available' disposition notification modifier), and the receiver has discarded the original data sent, it SHOULD:

(a) display or process the failure message received, OR

(b) construct and display a message indicating that message data has been lost, preferably indicating the sender, time, subject, message identifier and other information that may help the recipient user to identify the missing message.

and send a message disposition response indicating a final message disposition of "deleted".

4. The Content-alternative header

The 'Content-alternative:' header is a MIME header that can be attached to a MIME body part to indicate availability of some alternative form of the data it contains. This header does not, of itself, indicate how the alternative form of data may be accessed.

Using the ABNF notation of RFC 2234 [10], the syntax of a 'Content-alternative' header is defined as:

```
Content-alternative-header =
    "Content-alternative" ":" Alternative-feature-expression

Alternative-feature-expression =
    <As defined for 'Filter' by RFC 2533 [6]>
```

More than one 'Content-alternative:' header may be applied to a MIME body part, in which case each one is taken to describe a separate alternative data format that is available.

A content-alternative header is used with some MIME-encapsulated data, and is interpreted in that context. The intent is to indicate possible variations of that data, and it is not necessarily expected to be a complete free-standing description of a specific available data. Enough information should be provided for a receiver to be able to decide whether or not the alternative thus described (a) is likely to be an improvement over the actual data provided, and (b) is likely to be processable by the receiver.

Thus, when interpreting a Content-alternative header value, a receiver may assume that features not explicitly mentioned are not different in the indicated alternative from the supplied data. For example, if a Content-alternative header does not mention an alternative MIME content-type, the receiver may assume that the available alternative uses the same content-type as the supplied data.

See also the example in section 8.4.

5. The Original-Message-ID message header

The 'Original-Message-ID' header is used to correlate any message response or re-send with the original message to which it relates (see also sections 3.2.3, 3.3). A re-send is distinct from the original message, so it MUST have its own unique Message-ID value (per RFC 2822, section 3.6.4).

The syntax for this header is:

"Original-Message-ID" ":" msg-id

where 'msg-id' is defined by RFC 2822 as:

msg-id = "<" id-left "@" id-right ">"

The 'msg-id' value given must be identical to that supplied in the Message-ID: header of the original message for which the current message is a response or re-send.

6. MDN extension for alternative data

Here, we define two extensions to the Message Disposition Notification (MDN) protocol [4] to allow a sender to indicate readiness to send alternative message data formats, and to allow a receiver to indicate a preference for some alternative format.

Indication of what alternatives may be available or preferred are not covered here. This functionality is provided by the 'Content-alternative' MIME header [8] and "Indicating Supported Media Features Using Extensions to DSN and MDN" [2].

6.1 Indicating readiness to send alternative data

A sender wishing to indicate its readiness to send alternative message data formats must request an MDN response using the MDN 'Disposition-Notification-To:' header [4].

The MDN request is accompanied by a 'Disposition-Notification-Options:' header containing the parameter 'Alternative-available' with an importance value of 'optional'. (The significance of 'optional' is that receiving agents unaware of this option do not generate inappropriate failure responses.)

This specification defines a value for 'attribute' to be used in an MDN 'Disposition-Notification-Options:' header [4]:

attribute =/ "Alternative-available"

Thus, a sender includes the following headers to indicate that alternative message data is available:

```
Disposition-Notification-To:
    <sender-address>
Disposition-Notification-Options:
    Alternative-available=optional,<lifetime>
```

where <lifetime> is "transient" or "permanent", indicating whether the alternative data will be made available for just a short while, or for an indefinite period. A value of "permanent" indicates that the data is held on long term storage and can be expected to be available for at least several days, and probably weeks or months. A value of "transient" indicates that the alternative data may be discarded at any time, though it would normally be held for the expected duration of a message transaction.

NOTE: the <lifetime> parameter is provided to help low-memory receivers (which are unable to store received data) avoid loss of information through requesting an alternative data format that may become unavailable.

A message sent with a request for an MDN with an 'Alternative-available' option MUST also contain a 'Message-ID:' header field [20].

6.2 Indicating a preference for alternative data

The MDN specification [4] defines a number of message disposition options that may be reported by the receiver of a message:

```
disposition-type = "displayed"
                 / "dispatched"
                 / "processed"
                 / "deleted"
                 / "denied"
                 / "failed"

disposition-modifier = ( "error" / "warning" )
                     / ( "superseded" / "expired" /
                         "mailbox-terminated" )
                     / disposition-modifier-extension
```

This specification defines an additional value for 'disposition-modifier-extension':

```
disposition-modifier-extension =/
    "Alternative-preferred"
```

When a receiver requests that an alternative format be sent, it sends a message disposition notification message containing the following disposition field:

```
Disposition:
  <action-mode>/<sending-mode>,
  deleted/alternative-preferred
```

For example, an automatically generated response might contain:

```
Disposition:
  automatic-action/MDN-sent-automatically,
  deleted/alternative-preferred
```

An MDN response containing an 'alternative-preferred' disposition modifier MUST also contain an 'Original-message-ID:' field [4] with the 'Message-ID:' value from the original message.

An MDN response containing an 'alternative-preferred' disposition modifier SHOULD also contain a 'Media-accept-features:' field [2] indicating the capabilities that the sender should use in selecting an alternative form of message data. If this field is not supplied, the sender should assume some baseline feature capabilities. Receiver capabilities supplied with an alternative-preferred disposition notification MUST NOT be cached: they may apply to the current transaction only.

6.3 Indicating alternative data is no longer available

A sender that receives a request for alternative data that is no longer available, or is unable to provide alternative data matching the receiver's capabilities, MUST respond with an indication of this fact, sending a message containing data describing the failure.

Such a message MUST specify the MDN 'Disposition-Notification-To:' header [4], accompanied by a 'Disposition-Notification-Options:' header containing the parameter 'Alternative-not-available' with an importance value of 'required'.

This specification defines a value for 'attribute' to be used in an MDN 'Disposition-Notification-Options:' header [4]:

```
attribute =/ "Alternative-not-available"
```

Thus, a sender includes the following headers to indicate that the alternative message data previously offered is no longer available:

```
Disposition-Notification-To:
    <sender-address>
Disposition-Notification-Options:
    Alternative-not-available=required,(TRUE)
```

A message sent with a request for an MDN with an 'Alternative-not-available' option MUST also contain an 'Original-message-ID:' header [23] containing the value from the 'Message-ID:' header of the original message.

6.4 Indicating loss of original data

This specification defines an additional value for 'disposition-modifier-extension':

```
disposition-modifier-extension =/
    "original-lost"
```

When a receiver loses message data because it lacks memory to store the original while waiting for an alternative to be sent, it sends a message disposition notification containing the following field:

```
Disposition:
  <action-mode>/<sending-mode>,
  deleted/original-lost
```

For example, an automatically generated response might contain:

```
Disposition:
  automatic-action/MDN-sent-automatically,
  deleted/original-lost
```

An MDN response containing an 'original-lost' disposition modifier MUST also contain an 'Original-message-ID:' field [4] with the 'Message-ID:' value from the resent message, or from the original message (if no re-send has been received).

6.5 Automatic sending of MDN responses

In sending an MDN response that requests alternative data, the security concerns stated in RFC 2298 [4] (sections 2.1 and 6.2) regarding automatic MDN responses must be respected. In particular, a system capable of performing content negotiation MUST have an option for its user to disable negotiation responses, either generally, on a per-message basis, or both.

7. Internet Fax Considerations

Internet fax is an application that uses email to exchange document images (see RFC RFC 2305 [12] and RFC 2532 [1]).

Both sender and receiver parts of this specification involve the use of media feature expressions. In the context of Internet fax, any such expressions SHOULD employ feature tags defined by "Content feature schema for Internet fax" [16]. In a wider email context, any valid media features MAY be used.

For Internet fax [12], "image/tiff" is the assumed content-type for message data. In particular, all Internet fax devices are presumed to be capable of sending and receiving the TIFF profile S capabilities (Section 3 of [11]). When communication is between Internet fax devices, this capability may be assumed. But when dealing with devices that go beyond these capabilities defined for Internet fax (e.g. generic email agents with fax capabilities) it would be better not to assume fax capabilities, and for the negotiating parties to be explicit with respect to all their capabilities.

It would be better if even Internet fax devices do not assume that they are communicating with other such devices. When using Internet email, there is no reliable way to establish this fact. Therefore, for any Internet fax device that may reasonably be expected to exchange messages with any other email agent, it is RECOMMENDED that Internet fax capabilities (such as image/tiff baseline format handling) are not assumed but stated explicitly.

In particular, the 'Media-Accept-Features:' header in receiver MDN responses SHOULD explicitly indicate (type="image/tiff") and baseline TIFF capabilities, rather than just assuming that they are understood.

8. Examples

8.1 Sending enhanced Internet Fax image

An Internet fax sender has a profile-F (A4, 400x400dpi, MMR) image to send to a receiver. The baseline for Internet fax is 200x200dpi and MH image compression.

Sender's initial message:

```
Date: Wed,20 Sep 1995 00:18:00 (EDT)-0400
From: Jane Sender <Jane_Sender@example.com>
Message-Id: <199509200019.12345@example.com>
Subject: Internet FAX Full Mode Content Negotiation
To: Tom Recipient <Tom_Recipient@example.org>
Disposition-Notification-To: Jane_Sender@example.com
Disposition-Notification-Options:
    Alternative-available=optional,permanent
MIME-Version: 1.0
Content-Type: multipart/mixed;
              boundary="RAA14128.773615765/ example.com"
```

```
      --RAA14128.773615765/ example.com
      Content-type: image/tiff
      Content-Transfer-Encoding: base64
      Content-features:
          (& (color=Binary)
             (image-file-structure=TIFF-minimal)
             (dpi=200)
             (dpi-xyratio=1)
             (paper-size=A4)
             (image-coding=MH)
             (MRC-mode=0)
             (ua-media=stationery) )
      Content-alternative:
          (& (color=Binary)
             (image-file-structure=TIFF-limited)
             (dpi=400)
             (dpi-xyratio=1)
             (paper-size=A4)
             (image-coding=MMR)
             (MRC-mode=0)
             (ua-media=stationery) )

      [TIFF-FX Profile-S message goes here]

      --RAA14128.773615765/ example.com--
```

Receiver sends MDN response to initial message:

```
      Date: Wed,20 Sep 1995 00:19:00 (EDT)-0400
      From: Tom Recipient <Tom_Recipient@example.org>
      Message-Id: <199509200020.12345@example.org>
      Subject: Re: Internet FAX Full Mode Content Negotiation
      To: Jane Sender <Jane_Sender@example.com>
      MIME-Version: 1.0
      Content-Type: multipart/report;
                    report-type=disposition-notification;
                    boundary="RAA14128.773615766/example.org"

      --RAA14128.773615766/example.org

      The message sent on 1995 Sep 20 at 00:18:00 (EDT) -0400 to
      Tom Recipient <Tom_Recipient@example.org> with subject "Internet
      FAX Full Mode Content Negotiation" has been received.  An
      alternative form of the message data is requested.
```

```
--RAA14128.773615766/example.org
Content-Type: message/disposition-notification

Reporting-UA: Toms-pc.cs.example.org; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@example.org
Final-Recipient: rfc822;Tom-Recipient@example.org
Original-Message-ID: <199509200019.12345@example.com>
Disposition: automatic-action/MDN-sent-automatically;
             deleted/alternative-preferred
Media-Accept-Features:
    (& (type="image/tiff")
       (color=Binary)
       (image-file-structure=TIFF)
       (| (& (dpi=200) (dpi-xyratio=200/100) )
          (& (dpi=200) (dpi-xyratio=1) )
          (& (dpi=400) (dpi-xyratio=1) ) )
       (| (image-coding=[MH,MR,MMR])
          (& (image-coding=JBIG)
             (image-coding-constraint=JBIG-T85)
             (JBIG-stripe-size=128) ) )
       (MRC-mode=0)
       (paper-size=[A4,B4])
       (ua-media=stationery) )

--RAA14128.773615766/example.org--
```

Sender's message with enhanced content:

```
Date: Wed,20 Sep 1995 00:21:00 (EDT)-0400
From: Jane Sender <Jane_Sender@example.com>
Message-Id: <199509200021.12345@example.com>
Original-Message-Id: <199509200019.12345@example.com>
Subject: Internet FAX Full Mode Image Transmission
To: Tom Recipient <Tom_Recipient@example.org>
Disposition-Notification-To: Jane_Sender@example.com
MIME-Version: 1.0
Content-Type: multipart/mixed;
              boundary="RAA14128.773615768/ example.com"

--RAA14128.773615768/ example.com
Content-type: image/tiff
Content-Transfer-Encoding: base64

[TIFF-FX profile-F message goes here]

--RAA14128.773615768/ example.com--
```

Receiver sends MDN confirmation of enhanced message content:

```
Date: Wed,20 Sep 1995 00:22:00 (EDT)-0400
From: Tom Recipient <Tom_Recipient@example.org>
Message-Id: <199509200022.12345@example.org>
Subject: Re: Internet FAX Full Mode Image Transmission
To: Jane Sender <Jane_Sender@example.com>
MIME-Version: 1.0
Content-Type: multipart/report;
              report-type=disposition-notification;
              boundary="RAA14128.773615769/example.org"

--RAA14128.773615769/example.org

The message sent on 1995 Sep 20 at 00:21:00 (EDT) -0400 to Tom
Recipient <Tom_Recipient@example.org> with subject " Internet FAX
Full Mode Image Transmission" has been processed in Internet FAX
Full Mode.

--RAA14128.773615769/example.org
Content-Type: message/disposition-notification

Reporting-UA: Toms-pc.cs.example.org; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@example.org
Final-Recipient: rfc822;Tom-Recipient@example.org
Original-Message-ID: <199509200021.12345@example.com>
Disposition: automatic-action/MDN-sent-automatically; processed
Media-Accept-Features:
    (& (type="image/tiff")
       (color=Binary)
       (image-file-structure=TIFF)
       (| (& (dpi=200) (dpi-xyratio=200/100) )
          (& (dpi=200) (dpi-xyratio=1) )
          (& (dpi=400) (dpi-xyratio=1) ) )
       (| (image-coding=[MH,MR,MMR])
          (& (image-coding=JBIG)
             (image-coding-constraint=JBIG-T85)
             (JBIG-stripe-size=128) ) )
       (MRC-mode=0)
       (paper-size=[A4,B4])
       (ua-media=stationery) )

--RAA14128.773615769/example.org--
```

8.2 Internet fax with initial data usable

This example shows how the second and subsequent transfers between the systems in the previous example might be conducted. Using knowledge gained from the previous exchange, the sender includes profile-F data with its first contact.

Sender's initial message:

```
Date: Wed,20 Sep 1995 00:19:00 (EDT)-0400
From: Jane Sender <Jane_Sender@example.com>
Message-Id: <199509200019.12345@example.com>
Subject: Internet FAX Full Mode Content Negotiation
To: Tom Recipient <Tom_Recipient@example.org>
Disposition-Notification-To: Jane_Sender@example.com
Disposition-Notification-Options:
    Alternative-available=optional,permanent
MIME-Version: 1.0
Content-Type: multipart/mixed;
              boundary="RAA14128.773615765/ example.com"

--RAA14128.773615765/ example.com
Content-type: image/tiff
Content-Transfer-Encoding: base64
Content-features:
    (& (color=Binary)
       (image-file-structure=TIFF-limited)
       (dpi=400)
       (dpi-xyratio=1)
       (paper-size=A4)
       (image-coding=MMR)
       (MRC-mode=0)
       (ua-media=stationery) )
Content-alternative:
    (& (color=Binary)
       (image-file-structure=TIFF-minimal)
       (dpi=200)
       (dpi-xyratio=1)
       (paper-size=A4)
       (image-coding=MH)
       (MRC-mode=0)
       (ua-media=stationery) )

[TIFF-FX Profile-F message goes here]

--RAA14128.773615765/ example.com--
```

Receiver sends MDN confirmation of received message content:

```
Date: Wed,20 Sep 1995 00:22:00 (EDT)-0400
From: Tom Recipient <Tom_Recipient@example.org>
Message-Id: <199509200022.12345@example.org>
Subject: Re: Internet FAX Full Mode Image Transmission
To: Jane Sender <Jane_Sender@example.com>
MIME-Version: 1.0
Content-Type: multipart/report;
              report-type=disposition-notification;
              boundary="RAA14128.773615769/example.org"

--RAA14128.773615769/example.org

The message sent on 1995 Sep 20 at 00:19:00 (EDT) -0400 to Tom
Recipient <Tom_Recipient@example.org> with subject "Internet FAX
Full Mode Image Transmission" has been processed in Internet FAX
Full Mode.

--RAA14128.773615769/example.org
Content-Type: message/disposition-notification

Reporting-UA: Toms-pc.cs.example.org; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@example.org
Final-Recipient: rfc822;Tom-Recipient@example.org
Original-Message-ID: <199509200021.12345@example.com>
Disposition: automatic-action/MDN-sent-automatically; processed
Media-Accept-Features:
    (& (type="image/tiff")
       (color=Binary)
       (image-file-structure=TIFF)
       (| (& (dpi=200) (dpi-xyratio=200/100) )
          (& (dpi=200) (dpi-xyratio=1) )
          (& (dpi=400) (dpi-xyratio=1) ) )
       (| (image-coding=[MH,MR,MMR])
          (& (image-coding=JBIG)
             (image-coding-constraint=JBIG-T85)
             (JBIG-stripe-size=128) ) )
       (MRC-mode=0)
       (paper-size=[A4,B4])
       (ua-media=stationery) )

--RAA14128.773615769/example.org--
```

8.3 Negotiate to lower receiver capability

In this example, the sender has incorrectly assumed that the receiver has a higher capability, and must re-send lower capability data in response to the receiver's response showing lesser capability.

An Internet fax sends a profile-F (A4, 400x400dpi, MMR) image. When the receiver cannot handle this, it falls back to baseline profile-S. As this is a baseline format, it is not necessary to declare that capability with the original message. When a receiver is faced with data it cannot process from a negotiating sender, it can do no better than to respond with a description of its actual capabilities and let the sender determine the outcome.

Sender's initial message:

```
Date: Wed, 20 Sep 1995 00:18:00 (EDT)-0400
From: Jane Sender <Jane_Sender@example.com>
Message-Id: <199509200019.12345@example.com>
Subject: Internet FAX Full Mode Negotiate Down
To: Tom Recipient <Tom_Recipient@example.org>
Disposition-Notification-To: Jane_Sender@example.com
Disposition-Notification-Options:
    Alternative-available=optional,permanent
MIME-Version: 1.0
Content-Type: multipart/mixed;
              boundary="RAA14128.773615765/ example.com"

--RAA14128.773615765/ example.com
Content-type: image/tiff
Content-Transfer-Encoding: base64
Content-features:
    (& (color=Binary)
       (image-file-structure=TIFF-limited)
       (dpi=400)
       (dpi-xyratio=1)
       (paper-size=A4)
       (image-coding=MMR)
       (MRC-mode=0)
       (ua-media=stationery) )

[TIFF-FX Profile-F message goes here]

--RAA14128.773615765/ example.com--
```

Receiver sends MDN response to initial message:

```
Date: Wed,20 Sep 1995 00:19:00 (EDT)-0400
From: Tom Recipient <Tom_Recipient@example.org>
Message-Id: <199509200020.12345@example.org>
Subject: Re: Internet FAX Full Mode Negotiate Down
To: Jane Sender <Jane_Sender@example.com>
MIME-Version: 1.0
Content-Type: multipart/report;
              report-type=disposition-notification;
              boundary="RAA14128.773615766/example.org"

--RAA14128.773615766/example.org

The message sent on 1995 Sep 20 at 00:18:00 (EDT) -0400 to
Tom Recipient <Tom_Recipient@example.org> with subject "Internet
FAX Full Mode Content Negotiation" has been received.  An
alternative form of the message data is requested.

--RAA14128.773615766/example.org
Content-Type: message/disposition-notification

Reporting-UA: Toms-pc.cs.example.org; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@example.org
Final-Recipient: rfc822;Tom-Recipient@example.org
Original-Message-ID: <199509200019.12345@example.com>
Disposition: automatic-action/MDN-sent-automatically;
             deleted/alternative-preferred
Media-Accept-Features:
    (& (type="image/tiff")
       (color=Binary)
       (image-file-structure=TIFF-minimal)
       (dpi=200)
       (dpi-xyratio=1)
       (paper-size=A4)
       (image-coding=MH)
       (MRC-mode=0)
       (ua-media=stationery) )

--RAA14128.773615766/example.org--
```

Sender's message with baseline content:

```
Date: Wed,20 Sep 1995 00:21:00 (EDT)-0400
From: Jane Sender <Jane_Sender@example.com>
Message-Id: <199509200021.12345@example.com>
Original-Message-Id: <199509200019.12345@example.com>
Subject: Internet FAX Full Mode Image Transmission
To: Tom Recipient <Tom_Recipient@example.org>
Disposition-Notification-To: Jane_Sender@example.com
MIME-Version: 1.0
Content-Type: multipart/mixed;
              boundary="RAA14128.773615768/ example.com"

--RAA14128.773615768/ example.com
Content-type: image/tiff
Content-Transfer-Encoding: base64

[TIFF-FX profile-S message goes here]

--RAA14128.773615768/ example.com--
```

Receiver sends MDN confirmation of impoverished message content:

```
Date: Wed,20 Sep 1995 00:22:00 (EDT)-0400
From: Tom Recipient <Tom_Recipient@example.org>
Message-Id: <199509200022.12345@example.org>
Subject: Re: Internet FAX Full Mode Image Transmission
To: Jane Sender <Jane_Sender@example.com>
MIME-Version: 1.0
Content-Type: multipart/report;
              report-type=disposition-notification;
              boundary="RAA14128.773615769/example.org"

--RAA14128.773615769/example.org

The message sent on 1995 Sep 20 at 00:21:00 (EDT) -0400 to Tom
Recipient <Tom_Recipient@example.org> with subject " Internet FAX
Full Mode Image Transmission" has been processed in Internet FAX
Full Mode.

--RAA14128.773615769/example.org
Content-Type: message/disposition-notification
```

```
Reporting-UA: Toms-pc.cs.example.org; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@example.org
Final-Recipient: rfc822;Tom-Recipient@example.org
Original-Message-ID: <199509200021.12345@example.com>
Disposition: automatic-action/MDN-sent-automatically; processed
Media-Accept-Features:
    (& (color=Binary)
       (image-file-structure=TIFF-minimal)
       (dpi=200)
       (dpi-xyratio=1)
       (paper-size=A4)
       (image-coding=MH)
       (MRC-mode=0)
       (ua-media=stationery) )

--RAA14128.773615769/example.org--
```

8.4 Sending an alternative content type

As noted in section 4, the sender can offer the data using a different MIME content-type. This example shows a profile-F (A4, 400x400dpi, MMR) image and a limited-colour PDF document offered as alternatives to a baseline image/TIFF.

Sender's initial message:

(Note that the MIME content type is not specified for the image/tiff alternative, being the same as that provided, but is mentioned for the application/pdf alternative.)

```
Date: Wed,20 Sep 1995 00:18:00 (EDT)-0400
From: Jane Sender <Jane_Sender@example.com>
Message-Id: <199509200019.12345@example.com>
Subject: Internet FAX Full Mode Content Negotiation
To: Tom Recipient <Tom_Recipient@example.org>
Disposition-Notification-To: Jane_Sender@example.com
Disposition-Notification-Options:
    Alternative-available=optional,permanent
MIME-Version: 1.0
Content-Type: multipart/mixed;
              boundary="RAA14128.773615765/ example.com"

--RAA14128.773615765/ example.com
Content-type: image/tiff
Content-Transfer-Encoding: base64
Content-features:
    (& (color=Binary)
       (image-file-structure=TIFF-minimal)
```

```
            (dpi=200)
            (dpi-xyratio=1)
            (paper-size=A4)
            (image-coding=MH)
            (MRC-mode=0)
            (ua-media=stationery) )
      Content-alternative:
          (& (color=Binary)
            (image-file-structure=TIFF-limited)
            (dpi=400)
            (dpi-xyratio=1)
            (paper-size=A4)
            (image-coding=MMR)
            (MRC-mode=0)
            (ua-media=stationery) )
      Content-alternative:
          (& (type="application/pdf")
            (color=Limited)
            (dpi=400)
            (paper-size=A4)
            (ua-media=stationery) )

      [TIFF-FX Profile-S message goes here]

      --RAA14128.773615765/ example.com--
```

Receiver sends MDN response to initial message:

(Note that this response indicates an ability to handle the PDF MIME content-types, but with only binary colour.)

```
      Date: Wed,20 Sep 1995 00:19:00 (EDT)-0400
      From: Tom Recipient <Tom_Recipient@example.org>
      Message-Id: <199509200020.12345@example.org>
      Subject: Re: Internet FAX Full Mode Content Negotiation
      To: Jane Sender <Jane_Sender@example.com>
      MIME-Version: 1.0
      Content-Type: multipart/report;
                    report-type=disposition-notification;
                    boundary="RAA14128.773615766/example.org"

      --RAA14128.773615766/example.org

      The message sent on 1995 Sep 20 at 00:18:00 (EDT) -0400 to
      Tom Recipient <Tom_Recipient@example.org> with subject "Internet
      FAX Full Mode Content Negotiation" has been received.  An
      alternative form of the message data is requested.
```

```
      --RAA14128.773615766/example.org
      Content-Type: message/disposition-notification

      Reporting-UA: Toms-pc.cs.example.org; IFAX-FullMode
      Original-Recipient: rfc822;Tom-Recipient@example.org
      Final-Recipient: rfc822;Tom-Recipient@example.org
      Original-Message-ID: <199509200019.12345@example.com>
      Disposition: automatic-action/MDN-sent-automatically;
                   deleted/alternative-preferred
      Media-Accept-Features:
          (| (& (type="image/tiff")
                (color=Binary)
                (image-file-structure=TIFF-minimal)
                (dpi=200)
                (dpi-xyratio=1)
                (image-coding=MH)
                (MRC-mode=0)
                (paper-size=A4)
                (ua-media=stationery) )
             (& (type="application/pdf")
                (color=Binary)
                (dpi-xyratio=1)
                (dpi=[200,400])
                (paper-size=[A4,B4])
                (ua-media=stationery) ) )

      --RAA14128.773615766/example.org--
```

Resend with alternative content-type:

```
      Date: Wed,20 Sep 1995 00:21:00 (EDT)-0400
      From: Jane Sender <Jane_Sender@example.com>
      Message-Id: <199509200021.12345@example.com>
      Original-Message-Id: <199509200019.12345@example.com>
      Subject: Internet FAX Full Mode Image Transmission
      To: Tom Recipient <Tom_Recipient@example.org>
      Disposition-Notification-To: Jane_Sender@example.com
      MIME-Version: 1.0
      Content-Type: multipart/mixed;
                    boundary="RAA14128.773615768/ example.com"

      --RAA14128.773615768/ example.com
      Content-type: application/pdf
      Content-Transfer-Encoding: base64

      [PDF data goes here]

      --RAA14128.773615768/ example.com--
```

Receiver sends MDN confirmation of enhanced message content:

(Also indicating the PDF capability for future messages.)

```
Date: Wed,20 Sep 1995 00:22:00 (EDT)-0400
From: Tom Recipient <Tom_Recipient@example.org>
Message-Id: <199509200022.12345@example.org>
Subject: Re: Internet FAX Full Mode Image Transmission
To: Jane Sender <Jane_Sender@example.com>
MIME-Version: 1.0
Content-Type: multipart/report;
              report-type=disposition-notification;
              boundary="RAA14128.773615769/example.org"

--RAA14128.773615769/example.org

The message sent on 1995 Sep 20 at 00:21:00 (EDT) -0400 to Tom
Recipient <Tom_Recipient@example.org> with subject " Internet FAX
Full Mode Image Transmission" has been processed in Internet FAX
Full Mode.

--RAA14128.773615769/example.org
Content-Type: message/disposition-notification

Reporting-UA: Toms-pc.cs.example.org; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@example.org
Final-Recipient: rfc822;Tom-Recipient@example.org
Original-Message-ID: <199509200021.12345@example.com>
Disposition: automatic-action/MDN-sent-automatically; processed
Media-Accept-Features:
    (| (& (type="image/tiff")
          (color=Binary)
          (image-file-structure=TIFF-minimal)
          (dpi=200)
          (dpi-xyratio=1)
          (image-coding=MH)
          (MRC-mode=0)
          (paper-size=A4)
          (ua-media=stationery) )
       (& (type="application/pdf")
          (color=Binary)
          (dpi-xyratio=1)
          (dpi=[200,400])
          (paper-size=[A4,B4])
          (ua-media=stationery) ) )

--RAA14128.773615769/example.org--
```

9. IANA Considerations

9.1 New message headers

This specification defines new email/MIME message headers:

Content-alternative
Original-Message-ID

As such, there being no registry of email headers, it is an update to the specifications of RFC 2822 and RFC 2045.

9.2 MDN extensions

This specification defines extensions to the Message Disposition Notification (MDN) protocol. The sections below are the registration templates for these extensions, as required by RFC 2298 [4], section 10.

9.2.1 Notification option 'Alternative-available'

(a) Disposition-notification-option name:
Alternative-available

(b) Syntax:
(see this document, section 6.1)

(c) Character-encoding:
US-ASCII characters only are used

(d) Semantics:
(see this document, section 6.1)

9.2.2 Notification option 'Alternative-not-available'

(a) Disposition-notification-option name:
Alternative-not-available

(b) Syntax:
(see this document, section 6.1)

(c) Character-encoding:
US-ASCII characters only are used

(d) Semantics
(see this document, section 6.3)

9.2.3 Disposition modifier 'Alternative-preferred'

(a) Disposition-modifier name:
Alternative-preferred

(b) Semantics:
(see this document, section 6.2)

9.2.4 Disposition modifier 'Original-lost'

(a) Disposition-modifier name:
Original-lost

(b) Semantics:
(see this document, section 6.4)

10. Internationalization considerations

This specification deals with protocol exchanges between mail user agents, and as such does not deal primarily with human readable text. But not all user agents may automatically handle the protocol elements defined here, and may attempt to display text from the protocol elements to the user.

The main candidate for this treatment is the text accompanying a disposition notification response that requests alternative information. In normal use, the protocol design ensures that the recipient can process this response automatically; exceptionally, a receiving agent may display it to a user.

11. Security Considerations

Security considerations of this specification can be divided into two main areas:

- Privacy concerns with automated MDN response generation: see section 6.5 of this document, and the security considerations section of RFC 2298 [4].

- Risks of negotiation: see the security considerations section transaction. If alternative data arrives subsequently, it may be ignored or possibly also displayed or printed. A successful completion MDN may be sent to the sender.

12. Acknowledgements

The basic structure of the negotiation described here was first documented in a draft by Mr. Toru Maeda of Canon.

Helpful comments on earlier drafts were provided by Mr Hiroshi Tamura, Ted Hardie and Larry Masinter.

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Appendix A: Implementation issues

This section is not a normative part of this specification. Rather, it discusses some of the issues that were considered during its design in a way that we hope will be useful to implementers.

A.1 Receiver state

Probably the biggest implication for implementers of this proposal compared with standard mail user agents is the need to maintain some kind of state information at the receiver while content is being negotiated.

By "receiver state", we mean that a receiver needs to remember that it has received an initial message AND that it has requested an alternative form of data. Without this, when a receiver responds with a request for an alternative data format there is a possibility (if the response does not reach the sender) that the message will be silently lost, despite its having been delivered to the receiving MTA.

The matter of maintaining receiver state is particularly germane because of the requirement to allow low-memory systems to participate in the content negotiation. Unlike traditional T.30 facsimile, where the negotiation takes place within the duration of a single connection, an extended time may be taken to complete a negotiation in email. State information must be maintained for all negotiations outstanding at any time, and there is no theoretical upper bound on how many there may be.

Keeping receiver state is probably not a problem for systems with high capacity storage devices to hold message data and state information. The remainder of this section discusses strategies that small-system designers might employ to place an upper bound on memory that must be reserved for this information. When a receiver is really memory constrained then message loss remains a possibility, but the mechanisms described here should ensure that it never happens silently.

So what is this "receiver state"? It must contain, as a minimum:

- the fact that message data was received, and alternative data has been requested,
- a unique message identifier, and
- the time at which an alternative format request was sent.

This allows the receiver to re-issue a request, or to report an error, if requested alternative data does not arrive in a reasonable time.

Receiver state may also include:

- a copy of the data originally received. This allows the receiver to display the original data if an alternative is not received.

- details of the data format supplied, and alternatives offered. This permits improved diagnostics if alternative data is not received.

If a receiver of a message with alternative content available does not have enough memory to hold new negotiation state information, it may fall back to non-negotiation behaviour, accept the data received and send an MDN indicating disposition of that data (see sections 3.2.1, 3.2.2).

If a receiving system runs low on memory after entering into a negotiation, a number of options may be possible:

- display or print buffered data, if available, and complete the transaction. If alternative data arrives subsequently, it may be ignored or possibly also displayed or printed. A successful completion MDN may be sent to the sender.

- discard any buffered data, and continue waiting for alternative data. If alternative data does not subsequently arrive, a message transfer failure should be declared.

- abort the transfer and declare a message transfer failure: a diagnostic message must be displayed to the local user, and a failure notification sent to the sender.

A.2 Receiver buffering of message data

If a receiver is capable of buffering received message data while waiting for an alternative, this is to be preferred because it retains the option to display that data if an alternative is not received (see above).

Partial message data should not be buffered for this purpose: displaying part of the original message is not an allowable substitute for displaying all of the received data. (There may be some value in keeping some of the original message data for diagnostic purposes.)

If a receiver starts to buffer message data pending negotiation, then finds that the entire message is too large to buffer, it may choose to fall back to "extended mode" and display the incoming data as it is received.

When a sender indicates availability of alternative data, it also indicates whether it is permanently or transiently available. The intent of this is that if alternative data is transient, a receiver should not discard original data received. If necessary, it should simply display the original data without requesting an alternative.

A.3 Sender state

When a sender indicates that it can offer an alternative format of message content, it accepts some responsibility for trying to ensure that alternative is available if requested. Thus, the message content (both original and any alternative) should be stored for a reasonable period, together with any corresponding Message-ID value(s).

A request for retransmission must be accompanied by an Original-Message-ID value that the sender can use to correlate with the message data originally sent.

A.4 Timeout of offer of alternatives

If the sender is operating with a high capacity message storage device (e.g., a disk drive), and normally holds the data for extended periods (several days or weeks) then it should indicate that the alternative data is permanently available (see 6.1): a recipient seeing this may discard the original data, assuming that the sender will most likely be able to re-transmit.

If the sender has limited memory capacity, and is likely to be able to hold the data for no more than a few minutes or hours, it should indicate that the alternative data is transiently available (see 6.1). If there is doubt about a sender’s ability to keep the message content, it should indicate that availability of any alternative is transient.

A.5 Timeout of receiver capabilities

It should not be assumed that receiver capabilities declared during negotiation are available indefinitely.

In particular, any receiver capabilities declared on a final message confirmation should be regarded as definitive, even if they differ from the capabilities associated with the message just accepted. These may be stored for future use.

Any receiver capabilities declared when requesting an alternative format should not be stored for future use, as the receiver might be selective about the purposes for which those capabilities may be used.

A.6 Relationship to timely delivery

Some of the issues of sender state maintenance may be simplified if content negotiation is used in conjunction with a facility for timely delivery (e.g., [21]). If there is a known time window within which a response should be received, the sender may be less conservative about keeping information about outstanding offers of alternative data for extended periods. A sender that exploits timely delivery in this way should indicate that the alternative is transiently available.

A.7 Ephemeral capabilities

Ephemeral capabilities may present some special problems. Consider the case of selection of a particular content variant that may depend on an ephemeral setting.

Imagine someone sending a basic fax to a color fax machine, indicating that a color alternative is available. The color fax discards the content and sends an MDN which says "deleted/alternative-preferred" to the originator. It then runs out of colored ink. The originating fax then sends a new message which the colored fax cannot print.

Or consider an the email client in a phone with sound on/off as a related problem. When sound is ON, the phone may be able to accept voice messages by email.

This negotiation framework has not been designed with ephemeral capabilities in mind, but, with care, may be adaptable to deal with them.

A.8 Situations where MDNs must not be auto-generated

Bearing in mind privacy concerns, implementers should be careful that systems do not automatically enter into a negotiation exchange in a way that may disclose the recipient's whereabouts without first having obtained explicit permission. For example, if receiving a message depends in any way on the user's physical presence, automatic negotiation should not be performed.

While it may be OK for an unattended fax machine to perform automated negotiation, it is not OK for a PC software package to do so without the users explicit permission as the PC may be switched on only when the user is present. This suggests that default settings in this regard should take account of the type of system.

Appendix B: Candidates for further enhancements

This appendix lists some possible features of content negotiation that were considered, but not included in the current specification. In most cases the reasons for exclusion were (a) that they could introduce unanticipated additional complexities, and (b) no compelling requirement was recognized.

- Cache control indicator for recipient capabilities. This would instruct the sender, or other message system component, that capability information in the current message is for the current transaction only, and should NOT be remembered for future transactions. E.g., a recipient may not wish colour capability to be used for routine communications. (See also section A.5 above.)

- Use of q-values [6] in media feature expressions for indicating preference among alternatives available and/or receiver preferences.

- Partial re-sends. There are proposals being developed for "partial MDN" responses that can indicate disposition status on a per-message-part basis. This opens the possibility of partial re-sends when alternative formats are requested for only some of the message body parts. The current specification assumes that either none or all of message is re-sent when content negotiation is used.

- Allow negotiation with parties other than originally addressed recipients of a message.

- Negotiation response might indicate different receiver endpoint with different capabilities.

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