IETF fax WG
Internet draft

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9 March 2000
Expires: September 2000

# Content Negotiation for Facsimile Using Internet Mail

**<draft-ietf-fax-content-negotiation-01.txt>**

## Status of this memo



## Copyright Notice



## Abstract

This memo describes a mechanism for e-mail content negotiation that allows Internet fax to transfer enhanced image data in a fashion comparable with traditional facsimile.

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.

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## 1. Introduction

This memo describes a mechanism for e-mail content negotiation to provide an Internet fax facility comparable to that of traditional facsimile.

"Extended Facsimile using Internet Mail" [1] specifies the transfer of image data using Internet e-mail protocols. "Indicating Supported Media Features Using Extensions to DSN and MDN" [2] describes a mechanism for providing the sender with 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 e-mail (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 stored 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 replacing the message data originally transmitted.

When the sender does not have 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 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 conjunction with other content negotiation protocols. This may be moved to a separate document.

Section 5 describes extensions to the Message Disposition Notification (MDN) framework [4] that are used to allow negotiation between the communicating parties.

### 1.2 Document terminology and conventions

#### 1.2.1 Terminology

Content negotiation

Capability exchange

Capability identification

[[[FROM RFC 2703]]]

[[[Others?]]]

#### 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.

[[[Editorial comments and questions about outstanding issues are provided in triple brackets like this. These working comments should be resolved and removed prior to final publication.]]]

## 1.3 Discussion of this document

Discussion of this document should take place on the Internet fax mailing list hosted by the Internet Mail Consortium (IMC). Please send comments regarding this document to:

ietf-fax@imc.org

To subscribe to this list, send a message with the body 'subscribe' to "ietf-fax-request@imc.org".

To see what has gone on before you subscribed, please see the mailing list archive at:

http://www.imc.org/ietf-fax/

# 2. Background and goals

## 2.1 Background

### 2.1.1 Fax and e-mail

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 e-mail 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 less

constrained 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 negotation is to permit better-than baseline capabilities to be employed where available.

One of challenges addressed by this specification is how to adapt the e-mail 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 e-mail message. There are some important uses of e-mail 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 e-mail model.

### 2.1.2 Current facilities in Internet Fax

"Extended Facsimile using Internet Mail" [1] provides for 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 mechanism.

## 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.

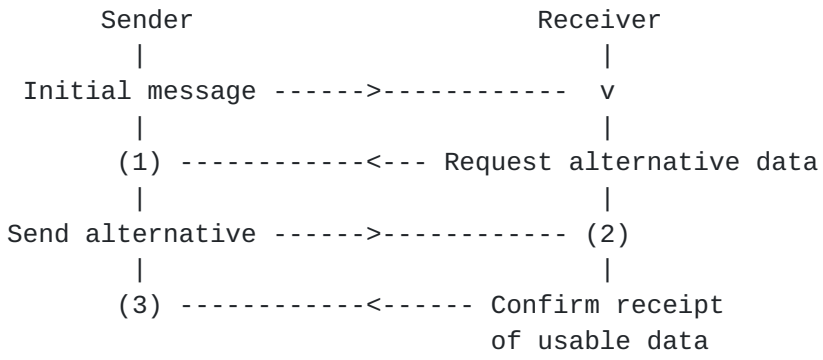
Many Internet e-mail agents are not designed to participate in a closed loop process, and thus have no responsibility to respond to receipt of a message. Later additions to Internet standards, notably Delivery Service Notification [18] and Message Disposition Notification [4], specify means for certain 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 makes some response to the sender. Since content negotiation must retro-fit a closed-loop environment over Internet mail's voluntary and high-latency environment, a challenge for content negotiation in e-mail is to establish that consenting parties can recognize a closed loop situation, and hence their responsibilities to close the loop.

Three different loops can be identified in a content negotiation:



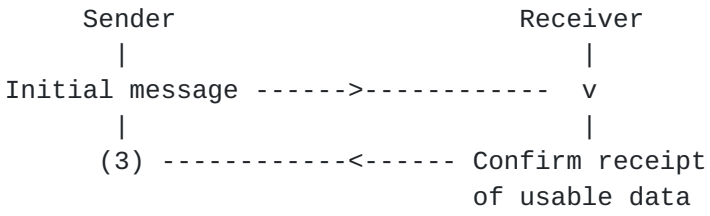

(1) Sender receives acknowledgement that negotable content has been received

(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 e-mail clients.

The term "interwork" used above means that the mechansism 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 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 e-mail 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 a single version to be displayed.

(e) Minimize {2} round trips needed to complete a transmission. Ideally {3} every enhanced trasmission 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. TIFF-S and some other format), but the capability exchange mechanism selected must not depend on such behaviour.

(g) The solution adopted should {2} be applicable to other Internet e-mail based applications; e.g. regular e-mail, VPIM, unified messaging, etc.

(h) 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 far as possible, existing e-mail 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 other best 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).

   [[[Discuss concept of "receiver request" (response retransmission) -- is it a "request" or a "declaration"?]]]

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.

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 e-mail, and follows the same pattern as 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 e-mail using "multipart/alternative" and "message/external-body" MIME types [15].

[[[?Require use of Original-recipient header. Only receivers that match this may request alternative data formats. This reinforces the 1:1 nature of a negotiation transaction? (This is spec.ed for gateways and may be inappropriate here.)]]]

[[[?Consider whether to handle case of forwarded message?]]]

[[[?To ensure consistency of results, require content-id with body part to which alternative capabilities are attached, to be noted in MDN response?]]]

### 3.1 Send data with an indication of alternatives

A sender that is prepared to provide alternative message data formats sends:

(a) a default message data format,

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

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

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

(e) 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 will presumably hold the necessary information for some time, to allow the receiver an opportunity to request such data. But the sender is not expected to hold this information indefinitely; the exact length of time such information should be hed 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 avalable. If message transfer 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.

[[[Use feature expression parameter to indicate TTL? Or use parameter on MDN request?]]]

### 3.1.1 Choice of default data format

Choice of the default format sent is essentially the same as that available to a simple mode Internet Fax sender, per RFC 2305 [12]. This essentially requires that TIFF Profile S [11] be sent unless the sender has prior knowledge of other TIFF fields or values supported by the recipient.

"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 proposed 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].

### 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 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.

> NOTE: the sender is not necessarily expected to describe every single alternative format that is avalable -- 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 avalable.
>
> 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 might be used with some completely different content negototiation protocol that is nothing to do with e-mail or MDN.
>
> Thus, the 'Content-alternative' header provides information about alternative data formats without actually indicating if and 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 shows how the 'Content-features:' and 'Content-alternative:' MIME headers may be used to describe the content provided and available alternatives.

[[[Q-factor values, per RFC 2533, in the 'Content-alternative:' expressions might be used to distinguish between "definitive" and "approximate" alternatives.]]]

[[[Expiration time on alternatives list. Else recipient is in non-deterministic position. Also, cache control on recipient capabilities?]]]

### 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 e-mail 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 e-mail 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 similar to 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.

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 MUST be sent containing:

- an 'Alternative-preferred' disposition modifier [9] indicating that some data format other than that originally sent is preferred, 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.

> 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 eclared 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 e-mail 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.

[[[Need to address issues of receiver maintaining state; specifically, what happens if the MDN response is lost in transit? If the receiver does not maintain state then the original message data is effectively lost, but the sender cannot infer this from the lack of response. If the receiver does maintain state, it can (a) resend the MDN response, (b) generate an error response indicating loss of data, (c) present the data originally supplied (if it is still available). Option (c) is incompatible with a low-memory receiver.]]]

### 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.

If the alternative message data is the same as that originally sent, it SHOULD still be retransmitted 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 not an 'Alternative-available' option.

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 sender indicating the failure.

[[[Discuss this last paragraph.]]]

[[[When sending alternative data, should this fact be indicated? How is the resend tied to the original send.]]]

[[[The mechanisms are described above in terms of the entire message. With MDN extensions that are being considered for finer-grained disposition notification at the level of individual message body parts (e.g. the separate parts of a MIME multipart/mixed), this mechanism can be extended to provide independent negotiation for each body part, because the 'Content-features:' and 'Content-alternative:' can be applied to inner body parts.]]]

[[[Does it make sense to do a partial retransmission? I think this would be a receiver option, based on which message parts it indicates have been discarded. If it can buffer then partial retransmission is sensible.]]]

### 3.4 Implementation issues

[[[TBD]]]

-- Sender state

[[[Maintenance of information about outsanding offers of alternative data formats.]]]

-- Receiver state

[[[One of the constraints is that some receivers may have limited memory, insufficient to buffer an entire message. For receivers

that can buffer a message then I think we can accommodate mechanisms to prevent loss of data. When the receiver is really memory constrained then message loss remains a possibility, but the mechanisms should ensure that it never happens silently.]]]

[[[Discuss ways to bound receiver memory budget. Note that a receiver may choose to switch on-the-fly from "full mode" negotation to "extended mode" if an incoming message exceeds available buffer capacity.]]]

-- Timeout of offer of alternatives

[[[Expand on note at end of section 3.1. Sender alternatives and choices? Consider facility to indicate expiry of alternatives.]]]

-- Timeout of receiver capabilities

[[[Consider facility to indicate expiry of receiver capabilities. Also, cache-control options, for temporary capabilities.]]]

-- Relationship to timely delivery

[[[What optimizations are possible (if any) when delivery and response is known to take no more than a few seconds?]]]

-- Ephemeral capabilities

[[[Consider the case of selection of a particular variant which may depend on an ephemeral setting. Imagine someone sending a basic fax to a color fax machine and 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. (This may sound stretched, but consider it from the email client in a phone with sound on/off as a related problem).]]]

-- Partial vs whole-message resend

-- Recipient is fax machine vs e-mail UA

-- Reinforce situations where MDNs must not be auto-generated

-- Fax offramp issues

## 4. The Content-alternative header

[[[May be moved to a separate document.]]]

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.

[[[Define 'ext-param' for feature cache control/expiry?]]]

[[[Should this be defined as comma-separated list, to allow multiple values on a single header?]]]

[[[Need to consider how to express composite document capabilities, specifically to assert a number of feature expressions that must be simultaneously satisfied for a document to be processed, as in the case of an MRC containing hi-res B/W and low-res colour. The approach currently under consideration is a metalogic level encapsulating media feature expressions]]]

[[[Discuss use with 'message/partial'?]]]

## 5. MDN extension for alternative data

[[[May be moved to a separate document]]]

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].

### 5.1 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,(TRUE)
```

[[[Is the parameter value really mandatory? RFC2298 syntax says so. If so, what value should be used (what variations might be required). Think carefully, this is a solution looking for a problem. For now, I would prefer the option value to be optional. If the value is required, its syntax should not preclude useful extensions later. Use parameter to indicate return mailbox? Note that RFC2298 allows auto-response to a single mailbox only.]]]

[[[Use the parameter value to indicate an expiry time?]]]

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

### 5.2 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 discards message data because it prefers 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.

[[[Discuss constraints on sending this response automatically.]]]

[[[Add E164 address type for fax offramp to fax machine as final recipient?]]]

## 6. Internet Fax Considerations

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 e-mail context, any valid media features MAY be used.

## 7. Examples

### 7.1 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@huge.com>
Message-Id: <199509200019.12345@huge.com>
Subject: Internet FAX Full Mode Content Negotiation
To: Tom Recipient <Tom_Recipient@mega.edu>
Disposition-Notification-To: Jane_Sender@huge.com
Disposition-Notification-Options:
    Alternative-available=optional,[[[xxx]]]
MIME-Version: 1.0
Content-Type: multipart/mixed;
              boundary="RAA14128.773615765/ huge.com"

--RAA14128.773615765/ huge.com
Content-type: image/tiff; application=faxbw
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/ huge.com--
```

Receiver sends MDN response to initial message:

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

    --RAA14128.773615766/mega.edu

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

    --RAA14128.773615766/mega.edu
    Content-Type: message/disposition-notification

    Reporting-UA: Toms-pc.cs.mega.edu; IFAX-FullMode
    Original-Recipient: rfc822;Tom-Recipient@mega.edu
    Final-Recipient: rfc822;Tom-Recipient@mega.edu
    Original-Message-ID: <199509200019.12345@huge.com>
    Disposition: automatic-action/MDN-sent-automatically;
                 deleted/alternative-preferred
```

```
    Media-Accept-Features:
        (& (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/mega.edu--
```

Sender's message with enhanced content:

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

    --RAA14128.773615768/ huge.com
    Content-type: image/tiff; application=faxbw
    Content-Transfer-Encoding: base64

    [TIFF-FX profile-F message goes here]

    --RAA14128.773615768/ huge.com--
```

Receiver sends MDN confirmation of enhanced message content:

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

--RAA14128.773615769/mega.edu

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

--RAA14128.773615769/mega.edu
Content-Type: message/disposition-notification

Reporting-UA: Toms-pc.cs.mega.edu; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@mega.edu
Final-Recipient: rfc822;Tom-Recipient@mega.edu
Original-Message-ID: <199509200021.12345@huge.com>
Disposition: automatic-action/MDN-sent-automatically; processed
Media-Accept-Features:
    (& (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/mega.edu--
```

### 7.2 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@huge.com>
Message-Id: <199509200019.12345@huge.com>
Subject: Internet FAX Full Mode Content Negotiation
To: Tom Recipient <Tom_Recipient@mega.edu>
Disposition-Notification-To: Jane_Sender@huge.com
Disposition-Notification-Options:
    Alternative-available=optional,[[[xxx]]]
MIME-Version: 1.0
```

```
     Content-Type: multipart/mixed;
                   boundary="RAA14128.773615765/ huge.com"
```

```
    --RAA14128.773615765/ huge.com
    Content-type: image/tiff; application=faxbw
    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/ huge.com--
```

Receiver sends MDN confirmation of received message content:

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

    --RAA14128.773615769/mega.edu

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

    --RAA14128.773615769/mega.edu
    Content-Type: message/disposition-notification
```

```
Reporting-UA: Toms-pc.cs.mega.edu; IFAX-FullMode
Original-Recipient: rfc822;Tom-Recipient@mega.edu
Final-Recipient: rfc822;Tom-Recipient@mega.edu
Original-Message-ID: <199509200021.12345@huge.com>
Disposition: automatic-action/MDN-sent-automatically; processed
Media-Accept-Features:
    (& (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/mega.edu--
```

### 7.3 Other example???

[[[Showing negotiate-down]]]

## 8. IANA Considerations

[[[TBD: MIME header and MDN extension registrations]]]

[[[See RFC 2298, section 10]]]

## 9. Internationalization considerations

[[[TBD?]]]

## 10. Security considerations

[[[TBD]]]

## 11. Acknowledgements

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

Helpful comments on the first draft were provided by Mr Hiroshi Tamura and Ted Hardie.

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## Appendix A: Amendment history

| | | |
|---|---|---|
| 00a | 30-Sep-1999 | Memo initially created. |
| 00b | 15-Oct-1999 | Incorporated co-author material. Added examples. Added background section about open- and closed-loop operations. Cleaned up some text. Develop section describing the MDN extensions. Complete reference details. |
| 00c | 19-Oct-1999 | Acknowledgement and editorial changes. Re-written abstract and revised introductory text. |
| 01a | 12-Nov-1999 | Make consistent date and time values in the examples. Fix mailing list description. |
| 01b | 09-Mar-2000 | Add text clarifying the role of sender and receiver in selecting alternative formats, the use of multiple 'Content-alternative' headers. Also add some notes about sender behaviour when sending an alternative data format. Updated author contact information. Added reference to multipart/alternative in the introduction. Added text in section 3.1 about retention of data by the sender. Added some comments to the implementation notes section. Added emphemeral capability scenario suggested by Ted Hardie for consideration under implementation notes. |

TODO:

- Review use of RFC 2119 language
- Review issues of receiver state maintenance, particularly w.r.t. low memory receivers.

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