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Request for Comments: 4142   Brandenburg
Category: Standards Track   G. Klyne
                                                        Nine by Nine
                                                       November 2005

             Full-mode Fax Profile for Internet Mail (FFPIM)

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Abstract

   Classic facsimile document exchange represents both a set of
   technical specifications and a class of service. Previous work has
   replicated some of that service class as a profile within Internet
   mail. The current specification defines "full mode" carriage of
   facsimile data over the Internet, building upon that previous work
   and adding the remaining functionality necessary for achieving
   reliability and capability negotiation for Internet mail, on a par
   with classic T.30 facsimile. These additional features are designed
   to provide the highest level of interoperability with the
   standards-compliant email infrastructure and mail user agents, while
   providing a level of service that approximates what is currently
   enjoyed by fax users.

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1. Introduction

   This specification defines "full mode" carriage of facsimile data
   over the Internet, building upon previous work in A Simple Mode of
   Facsimile Using Internet Mail [RFC3965] and Extended Facsimile Using
   Internet Mail [RFC2532]. This specification also adds the remaining
   functionality necessary to achieve reliable and capable negotiation
   for Internet mail, on par with classic [T30] facsimile. These
   additional features are designed to provide the highest level of
   interoperability with the standards-compliant email infrastructure
   and mail user agents, while providing a level of service that closely
   approximates the level of service currently enjoyed by fax users.

   Basic terminology is discussed in [RFC2542]. Implementations that
   conform to this specification MUST also conform to [RFC3965] and
   [RFC2532].

   The new features are designed to be interoperable with the existing
   base of mail transfer agents (MTAs) and mail user agents (MUAs), and
   to take advantage of existing standards for optional functionality
   (e.g., positive delivery confirmation and disposition notification).
   Enhancements described in this document utilize the existing Internet
   email messaging infrastructure, where possible, instead of creating
   fax-specific features that are unlikely to be implemented in non-fax
   messaging software.

   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 [RFC2119].

2. Content Negotiation

   Classic facsimile service is interactive, such that a sending station
   can discover the capabilities of the receiving station, prior to
   sending a facsimile of a document. This permits the sender to
   transmit the best quality of facsimile supported by both the sending
   station and the receiving station. Internet mail is
   store-and-forward, with potentially long latency, such that
   before-the-fact negotiation is problematic.

   Use of a negotiation mechanism permits senders to transfer a richer
   document form than is permitted when using the safer-but-universal
   default form. Without this mechanism, the sender of a document
   cannot be certain that the receiving station will be able to support
   the form.

   The capabilities that can be negotiated by an FFPIM participant are
   specified in [RFC2534] and [RFC2879]. Implementations that are
   conformant to FFPIM MUST support content negotiation as described
   there.

2.1. UA-based Content Negotiation

   One method for exchanging the capabilities information uses a
   post-hoc technique, which permits an originator to send the best
   version known to be supported by the recipient, and to also send a
   better suited version if the recipient requests it. This mechanism
   is specified in [RFC3297]. FFPIM implementations MUST support this
   mechanism.

2.2. ESMTP-based Content Negotiation

   Another method uses an ESMTP option specified in [RFC4141]. It
   requires support for content negotiation along the entire path the
   email travels. Using this mechanism, receiving ESMTP servers are
   able to report capabilities of the addresses (mailboxes) they
   support, and sending email clients are able to signal both permission
   and constraints on conversions.

   FFPIM participants MAY support this mechanism.

   NOTE: This specification provides for content conversion by
      unspecified intermediaries. Use of this mechanism carries
      significant risk. Although intermediaries always have the ability
      to perform damaging transformations, use of this specification
      could result in more exploitation of that potential and,
      therefore, more misbehavior. Use of intermediaries is discussed
      in [RFC3238].

2.3. Interactions between UA and ESMTP Negotiation Mechanisms

   FFPIM participants must ensure that their use of the UA and ESMTP
   methods for content negotiation is compatible. For example, two
   mechanisms might consult two different repositories of capabilities
   information, and those repositories might contain different
   information. Presumably, this means that at least one of these
   repositories is inaccurate. Therefore, the larger problem is one of
   correctness, rather than synchronization.

   This specification does not require a particular method of using the
   mechanisms together.

3. Content Format

   FFPIM allows the transfer of enhanced TIFF data relative to [RFC3965]
   and [RFC2532]. The details for these enhancements are contained in
   [RFC3949]. Implementations that are conformant to FFPIM SHOULD
   support TIFF enhancements.

   It should also be noted that the content negotiation mechanism
   permits a sender to know the full range of content types that are
   supported by the recipient. Therefore, requirements for support of
   TIFF represent a functional minimum for FFPIM.

4. Security Considerations

   As this document is an extension of [RFC3965] and [RFC2532], the
   Security Considerations sections of [RFC3965] and [RFC2532] apply to
   this document, including discussion of PGP and S/MIME use for
   authentication and privacy.

   It appears that the mechanisms added by this specification do not
   introduce new security considerations. However, the concerns raised
   in [RFC2532] are particularly salient for these new mechanisms.

   Use of this specification should occur with particular attention to
   the following security concerns:

   * Negotiation can be used as a denial of service attack.

   * Negotiation may lead to the use of an unsafe data format.

   * Negotiation discloses information and therefore raises privacy
     concerns.

   Use of the ESMTP CONNEG option permits content transformation by an
   intermediary, along the mail transfer path. When the contents are
   encrypted, the intermediary cannot perform the conversion, because it
   is not expected to have access to the relevant secret keying
   material. When the contents are signed, but not encrypted,
   conversion will invalidate the signature. Therefore, permission to
   convert SHOULD NOT normally be used with signed or sealed messages.

5. References

5.1. Normative References

   [RFC4141] Toyoda, K. and D. Crocker, "SMTP and MIME Extensions for
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   [RFC3949] Buckley, R., Venable, D., McIntyre, L., Parsons, G., and J.
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   [RFC2532] Masinter, L. and D. Wing, " Extended Facsimile Using
             Internet Mail", RFC 2532, March 1999.

   [RFC2534] Masinter, L., Wing, D., Mutz, A., and K. Holtman, "Media
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   [RFC2542] Masinter, L., "Terminology and Goals for Internet Fax", RFC
             2542, March 1999.

   [RFC2879] Klyne, G. and L. McIntyre, "Content Feature Schema for
             Internet Fax (V2)", RFC 2879, August 2000.

   [RFC3297] Klyne, G., Iwazaki, R., and D. Crocker, "Content
             Negotiation for Messaging Services based on Email", RFC
             3297, July 2002.

   [RFC3965] Toyoda, K., Ohno, H., Murai, J., and D. Wing, "A Simple
             Mode of Facsimile Using Internet Mail", RFC 3965, December
             2004.

5.2. Informative References

   [RFC3238] Floyd, S. and L. Daigle, "IAB Architectural and Policy
             Considerations for Open Pluggable Edge Services", RFC 3238,
             January 2002.

   [T30]   ITU-T (CCITT), "Procedures for Document Facsimile
             Transmission in the General Switched Telephone Network",
             Recommendation T.30, July 1996.

Appendix A. Direct Mode

   Email is a store-and-forward service, typically with highly variable
   delay between the time a message leaves the sender's realm and the
   time it arrives in the receiver's realm. The number of relays
   between sender and receiver is also unknown and variable. By
   contrast, facsimile is generally considered to be direct and
   immediate.

   An email profile that fully emulates facsimile must solve several
   different problems. One is to ensure that the document
   representation semantics are faithful. Another is that the
   interaction between sender and receiver is similar to that of
   telephony-based facsimile. In particular, it must ensure the
   timeliness of the interaction. The specifications for FFPIM and its
   predecessors enable email to emulate the former, the information
   (semantics) activities of facsimile.

   The ESMTP CONNEG option sets the stage for achieving the latter, with
   email-based facsimile transfer that has interactive negotiations, on
   a par with telephony-based facsimile. The key, additional
   requirement is to achieve timeliness. Ultimately, timeliness
   requires configuring sender and receiver email servers to interact
   directly. The sender's MTA must directly contact the receiver's MTA.
   With typical email service configurations, the content and
   interaction semantics of facsimile can be emulated quite well, but
   timeliness cannot be assured.

   To achieve direct sending, the originating MTA must not use
   sending-side intermediaries such as outbound enterprise MTAs.
   Instead, it must be configured to do transmissions directly to hosts
   specified in email addresses, based on queries to the public DNS. To
   achieve direct receiving, the target MTAs must have DNS A records,
   without MX records. That is, they also must be configured not to use
   intermediaries.

   The sender may then use ESMTP Conneg to determine the capabilities of
   the receiver. Afterwards the sender will use the capabilities
   information to tailor the TIFF message content it sends.

Appendix B.   Acknowledgements

   The IETF Fax working group, in collaboration with the IETF and the
   ITU, has diligently participated in a multi-year effort to produce
   Internet-based emulation of classic facsimile via email profiles.
   The effort benefited from the group's willingness to provide an
   initial, minimal mechanism, and then develop the specification to
   include more facsimile features as implementation and operation
   experience was gained.

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