                      Internet Fax Gateway Requirements

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Abstract

   To allow connectivity between the General Switched Telephone Network
   facsimile service (GSTN fax) and the e-mail-based Internet Fax
   service (i-fax) an "Internet Fax Gateway" is required. This document
   provides recommendations for the functionality of Internet Fax
   Gateways. In this context, an "offramp gateway" provides facsimile
   data transmission from i-fax to GSTN fax; vice versa, an "onramp
   gateway" provides data transmission form GSTN fax to i-fax. The
   recommendations in this document apply to the integrated service
   including Internet Fax terminals, computers with i-fax software on
   the Internet, and GSTN Fax terminals on the GSTN.

1. Introduction

   An Internet Fax Gateway provides connectivity and translation between
   the General Switched Telephone Network facsimile service (GSTN fax)
   and the e-mail-based Internet Fax service (i-fax). This document
   defines the recommended behavior of an Internet Fax Gateway. An
   Internet Fax Gateway can be classified as "onramp", when a facsimile
   is transferred from GSTN fax to the Internet Fax, and as "offramp",
   when a facsimile is transferred from Internet Fax to GSTN fax. For a
   more detailed definition of "onramp" and "offramp" within i-fax
   service, see [1].

This document provides recommendations only for the specific case
hereunder:

1) the operational mode of the Internet Fax is "store and forward",
   as defined in Section 2.5 of [1].

2) The format of image data is the data format defined by "simple
   mode" in [4].

This document does not apply to the gateway functions for "real-time
Internet Fax", as described and defined in [3]. Additional
recommendations for optional functionality are described in [24].

1.1. Key Words

The key words "MUST", "SHOULD", "SHOULD NOT", and "MAY" in this
document are to be interpreted as described in [5].

2. Internet Fax Gateway Operations

An onramp gateway receives a facsimile from a GSTN fax device (which
may include an offramp gateway itself), and generates an Internet Fax
over the Internet, which is sent to any Internet Fax device.

An offramp gateway receives an Internet Fax over the Internet from
any Internet Fax-capable device (which may include an onramp gateway
or a PC), and generates a GSTN fax, which is sent to any GSTN fax
device.

In both of these cases, the Internet side of the gateway acts as an
Internet Fax device, as described in [4], while the GSTN side of the
gateway acts as a GSTN fax device, as described in [6].

In this document we will only thus recommend the actions that occur
while

1) the onramp gateway converts a fax received from GSTN and forwards
   it to the Internet Fax service;

2) the offramp gateway converts a fax received from the Internet and
   forwards it to the GSTN fax service.

3. The Offramp Gateway Operations

An offramp gateway MUST, as a minimal requirement, perform the
following functions:

- address translation/mapping,
- image format conversion, and
- error/return notification handling

and MAY also perform

- user authorization.

3.1. User Authorization

An offramp gateway MAY have a user authorization function to confirm
that a user is allowed to transmit its Internet Fax to the GSTN fax
service.

Because an Internet Fax is sent as a MIME e-mail message to the
offramp gateway, digital signatures can be used to authenticate and
authorize the user. S/MIME is one example of a protocol that
includes digital signature services. S/MIME is described in
[9][10][11][12][13]. Other methods of adding a digital signature to
a mail message (such as OpenPGP [17] [25]) MAY also be used to
authenticate and authorize the user.

The agent sending the Internet Fax (which may include an onramp
gateway) sends the digitally-signed S/MIME or OpenPGP Fax message to
the offramp gateway. The offramp gateway then compares the
credentials of the user to determine if he/she is authorized to send
faxes to the GSTN fax service. If the authorization process fails,
then the offramp gateway MUST generate an error delivery notification
for the sender of the Internet Fax.

3.2. Addressing

An Internet Fax may contain multiple e-mail addresses, both as
originators, and as recipients. For its forwarding function to GSTN
fax service, an offramp gateway MUST only consider those addresses
which are explicitly itself, i.e., those where the right-hand side of
the e-mail address corresponds to the offramp gateway.

Because addresses on the Internet Fax service are e-mail addresses,
in order to reach a destination in the GSTN fax service, the offramp
gateway MUST convert e-mail addresses into GSTN addresses.

The GSTN destination address SHOULD normally be encoded inside the
left-hand side of the e-mail address, according to [7]. However, an
offramp gateway MAY use locally implemented translation rules to map
left-hand side strings into GSTN addresses.

In any case, the offramp gateway MUST process the resultant GSTN
address and convert it to a "local-phone", in accordance with local
dialing rules.

"Global-phone" is defined in Section 2 of [7]. "Local-phone" is
defined in Section 2 of [8]. "Exit-code" is defined in Section 2.1
of [8].

The offramp gateway SHOULD also have a function to apply translation
to originator addresses and other addresses referred to into the
Internet Fax, in order to ensure a possible return path from GSTN fax
service to Internet Fax destinations, including other offramp
gateways. These functions MUST be compliant with the address
handling of onramp gateways that is described in Section 4.2 of this
document.

3.2.1. Examples of Local Dialing Rules Applied to GSTN Destination
        Addresses

The first example shows how an offramp gateway converts a "global-
phone" to a "local-phone" by removing the "+" and "44" (recognizing
the international country code is local), and then knowing it can
dial directly without an exit-code:

    global-phone: +441164960348

resulting in:

    local-phone: 1164960348

The next example shows how an offramp gateway converts a "global-
phone" to a "local-phone" by removing the "+" and "44" (recognizing
the international country code is local), and then adding the exit-
code "0" in front of the string:

    global-phone: +441164960348

resulting in:

    local-phone: 01164960348

The next example shows how an offramp gateway converts a "global-phone" to "local-phone" by removing the "+" and "44" (recognizing the international country code is local), and then adding the long distance "0" in front of the string:

    global-phone: +441164960348

resulting in:

    local-phone: 01164960348

The last example shows how an offramp gateway converts a "global-phone" to a "local-phone" by removing the "+", recognizing the international country code is non-local, and adding the local international dialing prefix "00" in front of the string:

    global-phone: +441164960348

resulting in:

    local-phone: 00441164960348

3.2.2. Support for Subaddress

An offramp gateway SHOULD support the subaddress. If a subaddress is encoded into the left-hand side of the e-mail address [7], then it MUST be used by the offramp gateway, as specified in T.33 [15], to reach the final GSTN fax recipient.

3.3. Image Format Conversion

An offramp gateway MUST convert the file format from TIFF Profile-S for Internet Fax (defined in [16]) into the GSTN fax image format. Other Internet Fax file formats are not considered in this document.

3.4. Error/Return Notification Handling

An offramp gateway SHOULD have a function that allows it to send a return notice to the originator Internet Fax device (defined in [4]) when a transmission error occurs over the GSTN fax service and the facsimile is not delivered to the destination. The return notice MUST be in Message Delivery Notification (MDN) format and delivered by the offramp gateway over the Internet e-mail transport service used by Internet Fax. The MDN disposition-type MUST be set as "processed", and the disposition-modifier MUST be set as an "error".

If the offramp gateway fails to transmit the MDN, the error
information MAY be recorded to a log, and processing MAY end, or the
administrator of the gateway system MAY be notified of these errors
through a specific method (for example, by an e-mail message).

The more complex case of Delivery Status Notification (DSN) requests
handling is not considered in this document.

4. The Onramp Gateway Operations

An onramp gateway MUST, as minimal requirement, perform the following
functions:

- address translation/mapping,
- image format conversion, and
- error/return notification handling,

and MAY also perform

- user authorization.

4.1. User Authorization

An onramp gateway MAY have a user authorization function to confirm
that the user is authorized to transmit a facsimile to the Internet
fax service. For example, user authorization may be accomplished by
getting a user-ID and password received by Dual Tone Multi-Frequency
(DTMF), or via a local authorization table based on the GSTN caller-
ID.

If the authorization process fails, then the onramp gateway MUST
generate an error message/code for the sender of the GSTN Fax.

4.2. Address Translation/Mapping

Addresses on Internet Fax service are e-mail addresses, thus a
recipient of an Internet Fax might be either an e-mail user, an
Internet Fax device with its own recipients/users, or an offramp
gateway. The onramp gateway SHOULD have a functionality in order to
receive from GSTN (via DTMF) destination addresses. However, there
are two categories of destination addresses:

- e-mail users and Internet Fax recipient/users
- real GSTN addresses reached via an offramp gateway

We define "indirect address mapping" as the functionality for the
first category, and "direct address mapping" as the functionality for
the second category.

4.2.1. Indirect Address Mapping

   The onramp gateway MAY implement local address mapping mechanisms
   (via a table, directory lookup, or something similar) that permit
   translation from addresses (called "indirect address numbers")
   received from the GSTN fax sending device into e-mail addresses. A
   single e-mail address or a list of e-mail addresses MAY correspond to
   a single indirect address number.

   Here is one mapping example:

   (1) An onramp gateway receives the indirect address number "1234"
       from the source GSTN facsimile by DTMF.

            1234

   (2) The destination address is looked up in the address mapping
       table.

            address mapping table
            1234 : ifax@example.com

   (3) An Internet Fax is sent to the address ("addr-spec")

            ifax@example.com

   "Addr-spec" is defined in Section 3.4.1 of [14].

   If the address mapping lookup fails, an error MUST be reported to the
   originating GSTN fax device.

4.2.2. Direct Address Mapping

   If the indirect address mapping specified in 4.2.1 is not
   implemented, then only "direct address mapping" can be used. The
   GSTN sending device SHOULD send the full numeric destination address
   to the onramp gateway via DTMF. Direct address mapping can also be
   used if indirect address mapping is implemented.

   An example:

   (1) An onramp gateway receives the destination telephone number
       "441164960348" from the source facsimile by DTMF.

            441164960348

   (2) The destination number is encoded as a "global-phone", so "+" is
       added to the head of the string.

         +441164960348

   (3) "FAX=" is added in order to build the "fax-mbox" address item

         FAX=+441164960348

   (4) The destination address is completed, adding the specification of
       the appropriate offramp gateway, which is supposed to handle the
       delivery of the fax message to a global-phone address.

         FAX=+441164960348@example.com

The procedure for choosing the domain name of an offramp gateway is
defined in Section 4.3 ("Relay Function").

"Global-phone", "fax-mbox", and "fax-address" are defined in Section
2 of [7]. "Mta-I-fax" is defined in Section 3 of [7]. "Fax-email"
is defined in Section 4 of [7].

4.2.3. Sender Address Handling

The onramp gateway SHOULD gather information about the GSTN fax
sender address (for example, via Caller-ID, if available) and encode
it as the sender of the Internet Fax, using the direct address
mapping (see Section 4.2.2 of this document). The sender address
SHOULD be completed using the onramp gateway address, unless the
onramp gateway has additional information with which to specify a
different return path.

If the onramp gateway does not have any sender address information,
the Internet Fax sender address SHOULD be set to either a "no-reply"
address or an appropriate default mailbox.

4.2.4. Support for Subaddress

An onramp gateway SHOULD support the subaddress. In the case of
direct address mapping, the subaddress is specified using the T.33
[15] specification, and encoded as given in [7]. In the case of
indirect address mapping, the subaddress MAY be contained inside the
address mapping table.

4.3. Relay Function

   The onramp gateway SHOULD provide functionality for choosing the
   destination offramp gateway by analyzing a destination fax number. A
   possible method to expand or acquire information from the onramp
   gateway about offramp gateways MAY include keeping cached information
   about sender addresses that was sent by other onramp gateways.

4.4. File Format Conversion

   An onramp gateway MUST convert the file format from a facsimile over
   the GSTN to the file format TIFF Profile-S for Internet Fax, as
   defined in [16].

4.6. Return Notice Handling

   When an onramp gateway receives and analyzes a return notice from the
   Internet Fax destination, it MAY have the functionality to send the
   delivery status to a suitable facsimile device on the GSTN through an
   appropriate offramp gateway. The generated notice sent via GSTN fax
   SHOULD contain both the human-readable notice information, and the
   original delivery codes.

   If the onramp gateway fails in the transmission of the return notice
   back to GSTN fax service, the information MAY be recorded into a log,
   and processing MAY end. As an alternate, the administrator of the
   gateway system MAY be notified of this notice with a specific method
   (for example, by sending an e-mail message to a mailbox).

5. Security Considerations

   Refer to Section 3.1 ("User Authorization") for authentication for an
   offramp gateway. OpenPGP [17] [25] can be used to provide
   authorization services instead of S/MIME. Refer to Section 4.1
   ("User Authorization") for authentication for an onramp gateway.

   S/MIME and OpenPGP can also be used to encrypt a message. A signed
   or encrypted message is protected while transported along the
   network; however, when a message reaches an Internet Fax Gateway,
   either onramp or offramp, this kind of protection cannot be applied
   anymore. Here, security must rely on trusted operations of the
   gateway itself. A gateway might have its own certificate/key to
   improve security operations when sending Internet Faxes, but, as with
   any gateway, it breaks the end-to-end security pattern of both S/MIME
   and PGP.

   Other security mechanisms, like IPsec [18][19][20][21][2] or TLS [23]
   also do not ensure a secure gateway operation.

Denial-of-service attacks are beyond the scope of this document.
Host compromise caused by flaws in the implementation is beyond the
scope of this document.

6. References

6.1. Informative References

   [1] Masinter, L., "Terminology and Goals for Internet Fax", RFC
        2542, March 1999.

   [2] Thayer, R., Doraswamy, N., and R. Glenn, "IP Security Document
        Roadmap", RFC 2411, November 1998.

6.2. Normative References

   [3] "Procedures for real-time Group 3 facsimile communication over
        IP networks", ITU-T Recommendation T.38, June 1998.

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

   [5] Bradner, S., "Key words for use in RFCs to Indicate Requirement
        Levels", BCP 14, RFC 2119, March 1997.

   [6] "Procedures for document facsimile transmission in the general
        switched telephone network", ITU-T Recommendation T.30, April
        1999.

   [7] Allocchio, C., "Minimal FAX address format in Internet Mail",
        RFC 3192, October 2001.

   [8] Allocchio, C., "GSTN Address Element Extensions in E-mail
        Services", RFC 2846, June 2000.

   [9] Housley, R., "Cryptographic Message Syntax (CMS)", RFC 3852,
        July 2004.

   [10] Rescorla, E., "Diffie-Hellman Key Agreement Method", RFC 2631,
        June 1999.

   [11] Ramsdell, B., "Secure/Multipurpose Internet Mail Extensions
        (S/MIME) Version 3.1 Certificate Handling", RFC 3850, July 2004.

   [12] Ramsdell, B., "Secure/Multipurpose Internet Mail Extensions
        (S/MIME) Version 3.1 Message Specification", RFC 3851, July
        2004.

[13] Hoffman, P., "Enhanced Security Services for S/MIME", RFC 2634, June 1999.

[14] Resnick, P., "Internet Message Format", RFC 2822, April 2001.

[15] "Facsimile routing utilizing the subaddress", ITU recommendation T.33, July 1996.

[16] Buckley, R., Venable, D., McIntyre, L., Parsons, G., and J. Rafferty, "File Format for Internet Fax", RFC 3949, February 2005.

[17] Callas, J., Donnerhacke, L., Finney, H., and R. Thayer, "OpenPGP Message Format", RFC 2440, November 1998.

[18] Kent, S. and R. Atkinson, "Security Architecture for the Internet Protocol", RFC 2401, November 1998.

[19] Kent, S. and R. Atkinson, "IP Authentication Header", RFC 2402, November 1998.

[20] Ramakrishnan, K., Floyd, S., and D. Black, "The Addition of Explicit Congestion Notification (ECN) to IP", RFC 3168, September 2001.

[21] Piper, D., "The Internet IP Security Domain of Interpretation for ISAKMP", RFC 2407, November 1998.

[23] Blake-Wilson, S., Nystrom, M., Hopwood, D., Mikkelsen, J., and T. Wright, "Transport Layer Security (TLS) Extensions", RFC 3546, June 2003.

[24] Mimura, K., Yokoyama, K., Satoh, T., Watanabe, K., and C. Kanaide, "Guidelines for Optional Services for Internet Fax Gateways", RFC 4161, August 2005.

[25] Elkins, M., Del Torto, D., Levien, R., and T. Roessler, "MIME Security with OpenPGP", RFC 3156, August 2001.

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