

Network Working Group
Request for Comments: 4160
Category: Informational

K. Mimura
K. Yokoyama
T. Satoh
C. Kanaide
TOYO Communication Equipment
C. Allocchio
Consortium GARR
August 2005

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 from 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

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Authors' Addresses

Katsuhiko Mimura
TOYO Communication Equipment CO., LTD.
2-1-1 Koyato, Samukawa-machi, Koza-gun
Kanagawa, Japan

Fax: +81 467 74 5743
EMail: mimu@miyabi-labo.net

Keiichi Yokoyama
TOYO Communication Equipment CO., LTD.
2-1-1 Koyato, Samukawa-machi, Koza-gun
Kanagawa, Japan

Fax: +81 467 74 5743
EMail: keiyoko@msn.com

Takahisa Satoh
TOYO Communication Equipment CO., LTD.
2-1-1 Koyato, Samukawa-machi, Koza-gun
Kanagawa, Japan

Fax: +81 467 74 5743
EMail: zsatou@t-ns.co.jp

Chie Kanaide
TOYO Communication Equipment CO., LTD.
2-1-1 Koyato, Samukawa-machi, Koza-gun
Kanagawa, Japan

Fax: +81 467 74 5743
EMail: icemilk77@yahoo.co.jp

Claudio Allocchio
Consortium GARR
Viale Palmiro Togliatti 1625
00155 Roma, Italy

Fax: +39 040 3758565
EMail: Claudio.Allocchio@garr.it

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Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

