
# IPP Fax Project

## *IPP Fax Protocol*

| Revision | Date | Author | Notes |
|---|---|---|---|
| 1 | 1/16/01 | Paul Moore, Netreon | Initial version |
| 2 | 2/27/01 | Paul Moore, Gail Songer, Netreon | Specify TLS as MUST<br>Removed Cover page and combined device<br>Added need for big text types |


## Abstract

This document specifies the IPP Fax (IPPFAX) protocol. The IPPFAX requirements are derived from the requirements for Internet Fax [1].

In summary IPPFAX is used to provide a synchronous, reliable exchange of image documents between clients and servers. The primary use envisaged of this protocol is to provide a synchronous image transmission service for the Internet. Contrast this with the store and forward fax-like protocol specified in [2] and [3].

This document proposes that the IPPFAX protocol should use an extended version of IPP1.1 [4], [5].

# 1 Introduction.

Note - It is assumed that the reader is familiar with IPP[4],[5],[6].

IPP Fax (IPPFAX) is primarily intended as a method of supporting a secure, high quality document distribution protocol over the Internet. It therefore discusses paper, pages, scanning and printing, etc. There is however no requirement that the input documents comes from actual paper nor is there a requirement that the output of the process be printed paper. The only conformance requirements are those associated with the exchange of data over the network.

## *1.1 Namespace used*

The extension specified in this document uses the prefix 'ippfax-' for all new IPP elements created.

## *1.2 Model*

This proposal defines a logical model of a IPPFAX interchange. The following terms are introduced: -

'Sender'. This is the agent (software, hardware or some combination) that is used to transmit a document to a receiver.

'Receiver'. This is the agent that receives the document sent by the sender.

'Document'. A document is a set of one or more pages that the sender sends to the receiver.

'Sending user'. The person interacting with the sender.

'Receiving user'. The intended human recipient of the document being sent.

'IPPFAX Job'. An IPP job submitted by a sender.

## *1.3 Typical exchange*

The sending user determines the address of the receiver – see 'Addressing'. This document does not specify how the sending user does this. Possible methods include directory lookup, search engines, business cards, network enumeration protocols such as SLP, etc.

- The sending user loads the document into the sender, indicates the receiver's address and starts the exchange.
- The sender determines whether or not the receiver is a IPPFAX capable device – see 'IPPFAX detection'
- The following identities are determined and exchanged: sender, sending user, receiver and receiving user – see 'Identity exchange'
- The sender and receiver decide on the most appropriate data format. This is described in detail in the UIF specification.

- The sender scans the document and converts it into an acceptable data format – see 'data formats'
- This data is transmitted to the receiver – see 'Data Transmission'.
- The sending user receives a confirmation that the receiver received the document – see 'Confirmation'. In addition the sender may choose to receive notification that the document has been successfully delivered – see ‘Notification’
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If the sender is unable to initiate or complete the exchange then it is assumed that it will perform some form of retry. The mechanisms used and the user-visible behavior in this case is an implementer's choice beyond the scope of this document.

### *1.4 Gateways*

The IPPFAX protocol may be used as a gateway protocol to or from other image transmission systems. See 'Gateways to other systems' later.

# 2 IPPFAX detection

A sender needs to determine whether or not the destination URL it has represents:-

a) A valid IPP destination

b) A IPPFAX receiver (not all IPP destinations are IPPFAX receivers)

This document does not specify how to perform the first validation. Refer to the IPP implementer's guide [6].

To perform the second validation a sender SHOULD execute an IPP 'get-printer-attributes' operation to retrieve the ‘ippfax-receiver' attribute. If the value of this 0 then the device is not currently operating as an IPPFAX receiver. Any other value indicates the version of IPPFAX supported. This specification defines the support required for version 1.

If the IPP printer supports this attribute then sender can be sure that it is a IPPFAX receiver. If not then the sender may choose to abandon the exchange or to enter degraded mode.

### *2.1 Degraded Mode*

IPPFAX describes a variation of IPP – it is perfectly possible for a complete ippfax-like exchange to take place between a IPPFAX client and an IPP printer.

From the viewpoint of IPPFAX this is a degraded mode of operation. The main features that will be missing are:-

Guaranteed exchange: Since IPP does not mandate any data formats it is possible that the sender may not be able to discover a common data format that both it and the printer support.

Identity exchange: IPP does not provide the definitive identity exchange that IPPFAX does. In many cases however this is acceptable

# 3 Data formats

In order to usefully exchange documents between arbitrary IPPFAX end points there must be some agreement on what formats are used to represent the data. To this end an IPPFAX receiver MUST support UIF[xx].

A receiver may support other formats.

Note that a sender MAY use any means it chooses to determine what format to send. It may have a-priori knowledge of the receiver, it may read the IPP printer-description attribute document-format-supported or determine that it can support other data formats using some other mechanism (for example it can read the receiver's manufacturer and model and therefore determine the formats supported). The sender SHOULD NOT send any data format that the receiver does not support. If it does so the receiver will reject it (IPP conformance).

The sender MAY send any supported format to the receiver. It is the sender's choice; the receiver has no way of indicating preferred formats

The sender MUST specify the data format being sent by including the (optional in IPP) job attribute 'document-format'

# 4 Identity exchange

## *4.1 Sending user*

The sending user identity SHOULD be sent to the receiver. The identity is specified in a new IPP job attribute – 'ippfax-sending-user-identity'. This is in MIME vcard [12] format.

## *4.2 Receiving User*

The identity of the intended receiving user SHOULD be included in a request. The identity is specified in a new IPP job attribute, 'ippfax-receiving-user-identity'. This is in MIME vcard format[12].

## *4.3 Sender*

The sender MUST have an identity in the same way that a fax machine has a sending station ID. The sender's identity MUST be sent to the receiver using a new IPP job attribute, 'ippfax-sender-identity'.

The value of this identity is not specified but MUST uniquely identify the device. A value derived from the MAC address would be a reasonable starting point.

### 4.4 Receiver

The receiver MUST have an identity that the sender MAY read. The receiver MUST make this available via a new IPP printer attribute, 'ippfax-receiver-identity'.

The same rules apply as for the sender identity.

# 5 Data Exchange

### 5.1 Addressing

The receiver's address MUST be an IPP1.1 URL using the 'ipp' scheme.

Example: <ipp://www.acme.com/ipp/print5>

See [xxxx] ipp url scheme

### 5.2 Transmission

Documents MUST be sent using the IPP print-job operation. There is no requirement for the receiver to support any other IPP job submission operations.

The sender MAY include any valid operation attributes or job template attributes.

### 5.3 Confirmation

The sender knows when the receiver has successfully received the entire document, the sender can then inform the sending user.

The sender SHOULD use the successful end of the print-job operation as an indication that the receiver has received the document.

### 5.4 Notification

An IPPFAX receiver MUST support the ‘ippget’ notification mechanism[xx,xx].

A sender MAY use this to request that the receiver send it notification regarding the delivery of the document. The receiver MUST support the Subscription Creation Operation for the print-job command.

If a receiver chooses to allow other IPP notification operations then it SHOULD provide a method of restricting all other notification operations to authenticated administrators.

For the purposes of IPPFAX ‘printing complete’ notifications means that the receiver has delivered it somewhere; either actually printed it or forwarded it to some other system

### 5.5 Identity Stamping

The sender MUST place the sender's identity, date and time at the top of every page of the sent document. The sender MAY include additional data (sending user, receiver identity, etc.)

### 5.6 Return address

The sender MAY include the address of its receiver component in every request. It does this with a new IPP print-job operation attribute, 'ippfax-return-uri'

## 6 IPP Implementation

The receiver MUST fully support print-job, validate-job, get-printer-attributes, as defined by IPP1.1 [4]. The following subsections define restrictions placed the IPP1.1 commands cancel-job, get-job-attributes, and get-jobs. In a strict IPPFAX implementation, all other IPP1.1 commands are forbidden except if the issuer of the command can be identified as an administrator. There is no requirement for the receiver to implement any of the optional features of IPP unless explicitly stated elsewhere in this document. If a receiver chooses to allow other IPP operations then it SHOULD provide a method of restricting available operations for non-authorized clients to the operations specified herein.

IPPFAX restricts the use of IPP in certain cases. One aim is to make attaching a receiver to the Internet a safe option – see 'security considerations'

### 6.1 Canceling jobs

It is inappropriate for a sender to transmit a document, receive confirmation of its arrival and then cancel it. Therefore: -

The sender SHOULD NOT attempt to cancel the print job once it has been sent to the receiver.

The receiver MUST reject cancel job operations not issued by an administrator targeted at IPPFAX jobs. (The receiver can determine that this is an IPPFAX job by the presence of the mandatory 'ippfax-sender-identity' job attribute). The 'cancel-job' operation therefore becomes a privileged operation on all ippfax-jobs. This is a change to the IPP behavior.

If the issuer of the command can be identified as an administrator, then the command should behave as defined in [4]

### 6.2 Querying jobs

The public nature of IPPFAX interactions make it inappropriate for a IPP client to be able to query a receiver for certain information about jobs that it did not send.

The receiver MUST restrict the job attributes that any sender can request for any IPPFAX job in a 'get-jobs' or 'get-job-attributes' operation to: -

- job-id, job-URI
- job-k-octets, job-k-octets-completed
- job-media-sheets, job-media-sheets-completed,
- time-at-creation, time-at-processing
- job-state, job-state-reasons
- number-of-intervening-jobs

This attribute set allows a client to determine the load on a receiver (and perhaps choose an alternative destination or warn the sending user).

See the discussion in section 8.4 of [4] for a description of how a receiver must behave if it receives a request for an attribute outside this set.

An IPP administrator may read all attributes.

Clarify this is for un-auth users

### *6.3 Job submission*

Jobs MUST be sent to the receiver using the print-job operation.

# 7 Security considerations

IPPFAX presents an interesting challenge of balancing security and openness. Many of the envisaged uses of IPPFAX require confidentiality of the data – at the same time the receiver typically has no prior knowledge of the sender or the sending user. This last point will normally rule out all user-based authentication and access control. This is the reason for the restriction placed on querying and canceling IPPFAX jobs.

### *7.1 Privacy*

Any exchange between a sender and a receiver MUST be carried using the privacy mechanism specified in IPP1.1 namely TLS [9]. In some cases this will also result in mutual authentication of the sender and receiver (in the case where both sides have certificates).

The receiver MUST have a TLS certificate.

The sender MAY have a certificate. A receiver MAY decide to reject requests that come from senders that do not have a certificate.

A sender can either use its own certificate or it can use one associated with the sending user.

### 7.2 Spoof-proofing

The use of TLS assures the sender and the sending user that the receiver is what it claims to be.

The use of sending side certificates can assure the receiver that the sender is who it claims to be (if the receiver chooses to enforce the requirement that the sender must have a certificate).

### 7.3 Access control

It is expected that the majority of IPPFAX receivers will operate in a public mode. However a receiver MAY protect itself using any method specified in [4] (digest authentication [11] for example) to restrict access to any or all of its functionality.

However the primary intent of IPP Fax is to create a controlled public access mode. It therefore does not really make much sense to combine IPPFAX and user authentication there are achieving the same thing.

### 7.4 Reduced feature set

An administrator or device implementer may choose to setup up a device so that it only works as a IPPFAX receiver (i.e., offers no 'native' IPP features). In this mode it offers a restricted set of features and may be more safely connected to the Internet.

A receiver that is operating in this mode SHOULD do so by rejecting any non-IPPFAX request with a '401 not authorized' error code.

## 8 Gateways to other systems

A common scenario will be where IPPFAX acts as an on-ramp or off-ramp to other document transmission systems.

### 8.1 Off-Ramps

'Off-ramp' means that the user with a document to send uses an IPPFAX sender to transmit a document to an IPPFAX receiver that in turn transmits it to some other destination.

In order that the intermediate gateway should know where to send the document the sender needs to tell the gateway where to send the document. The sender uses the 'ippfax-destination-uri' job description attribute for this purpose. Note that this is only useful in the on-ramp case.

The on-ramping receiver SHOULD indicate to the sender the addressing schemes it supports for 'ippfax-destination-uri'. It does this with the 'ippfax-destination-schemes-supported' attribute. If this attribute is empty then the receiver does not act as an off-ramp.

### 8.2 On-ramps

'On-ramp' means that the user originally sends the document using some other mechanism. The intermediate agent then uses IPPFAX to transmit the document to its final destination. IPPFAX has no specific support for on-ramps.

# 9 Attribute Syntax

### 9.1 'octetString32k'

The 'octetString32k' attribute syntax is a sequence of octets encoded in a maximum of 32,767 octets which is indicated in sub-section headers using the notation: octetString32k(MAX). This syntax type is used for opaque data.

# 10 Formal Attribute Definition

### 10.1 ippfax-sending-user-identity

Format: octetString32k(MAX)

Type: job description attribute

Operation attribute for print-job and validate-job

Description: This optional operation attribute is used by the sender to indicate the sending user's identity to the receiver. If the client supplies the attribute, then value of the attribute is used to populate the Job object's "ippfax-sending-user-identity" Job Description attribute. It is in vcard formatConformance: A ippfax receiver MUST support this attribute. A sender SHOULD send this attribute

Example:

```
BEGIN:VCARD
VERSION:2.1
N:Moore;Paul
FN:Paul Moore
ORG:Peerless Systems Networking
TEL;CELL;VOICE:(206) 251-7008
ADR;WORK:;;10900 NE 8th St;Bellvue;WA;98004;United States of
America
EMAIL;PREF;INTERNET:pmoore@peerless.com
REV:19991207T215341Z
END:VCARD
```

### 10.2 ippfax-receiving-user-identity

Format: octetString32k(MAX)

Type: Job description attribute

Operation attribute for print-job and validate-job

Description: This attribute is used by the sender to indicate the identity of the intended human recipient. Refer to the description of ippfax-sending-user-identity for a discussion of the length of this attribute.

Conformance: A IPPFAX receiver MUST support this attribute. A sender SHOULD send this attribute

## *10.3 ippfax-sending-user-certificate*

Format: octetString32k(MAX)

Type: Operation attribute for print-job and validate-job

Description: If supplied this attribute MUST contain the TLS certificate which identifies the user and is used by the receiver to positively identify the sender. The receiver MAY require this attribute to be supplied. If required but not supplied then the receiver MUST respond with the operation response “status-code” of “client-error-ippfax-user-certificate-required”.

Conformance: A receiver MUST support this attribute. A sender MAY send this attribute

## *10.4 ippfax-sender-identity*

Format: name(255)

Type: Job description attribute

Operation attribute for print-job and validate-job

Description: This attribute is used by the sender to identify itself. The presence of this job description attribute also marks the job as an IPPFAX job.

This attribute is human readable text.

Conformance: A receiver MUST support this attribute. A sender MUST send this attribute

## *10.5 ippfax-receiver-identity*

Format: name(255)

Type: Printer description

Description: This attribute uniquely identifies the receiver.

Conformance: A receiver MUST implement this attribute.

## *10.6 ippfax-destination-scheme-supported*

Format: 1setOf type2 keyword

Type: Printer Description

Description: This attribute is used by the receiver to indicate what formats it supports for the 'ippfax-destination-URI' attribute. The values in this list are URI scheme names without their trailing ':' – i.e. 'ipp', 'mailto', …

Conformance: A receiver SHOULD implement this attribute if it is acting as an on-ramp.

### *10.7 ippfax-destination-URI*

Format: URI

Type: Job description attribute

Operation attribute for print-job and validate-job

Description: A sender SHOULD include this attribute in a job in the case where it knows that the receiver is not the final destination. The scheme of this URI MUST be one of those specified by 'ippfax-destination-scheme-supported'.

Conformance: An off-ramping receiver MUST support this attribute.

### *10.8 ippfax-receiver*

Format: Integer version

Type: Printer description

Description: A receiver uses this attribute to indicate that it is an IPPFAX receiver.

Conformance: An IPPFAX receiver must support this value and it must have the value 1.

### *10.9 ippfax-return-uri*

Format: URI

Type: Job description attribute

Operation attribute for print-job and validate-job

Description: A sender MAY include the ippfax uri of its receiver component as an operation attribute on a print-job or validate-job command. Conformance: A receiver MUST support this attribute (note that this does not mean it necessarily does anything useful with it).

## 11 references

[1] Masinter , "Terminology and Goals for Internet Fax", RFC2542

[2] Toyoda, Ohno, Murai, Wing "A Simple Mode of Facsimile Using Internet Mail" RFC2305

[3] Masinter, Wing, "Extended Facsimile Using Internet Mail", RFC2532

[4] deBry, Hastings, Herriot, Isaacson, Powell, "Internet Printing Protocol/1.1: Model and Semantics", RFC2910

[5] Herriot, Butler , Moore, Turner, Wenn. "Internet Printing Protocol/1.1: Encoding and Transport", RFC2911

[6] Hastings, Manros, ,Kugler, Holst, "Internet Printing Protocol/1.1: Implementer's Guide", draft-ietf-ipp-implementers-guide-v11-00.txt

[7] Dierks, Allen "The TLS Protocol Version 1.0",RFC 2246

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[10] Dawson, Howes, "vCard MIME Directory Profile", RFC 2426