A Project of the PWG IPPFAX Working Group

4 ISSUES are highlighted like this.

IPPFAX Protocol

IEEE-ISTO Printer Working Group
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Abstract

This standard specifies the IPPFAX protocol. The IPPFAX requirements [ifx-req] are derived from the requirements for Internet Fax [internet-fax-goals].

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 Internet FAX protocol specified in [RFC2305] and [RFC2532] that uses the SMTP mail protocol as a transport.

The IPPFAX protocol is a specialization of the IPP/1.1 [RFC2911], [RFC2910] protocol. The IPPFAX protocol uses the 'ippfax' URL scheme (instead of the 'ipp' URL scheme) to create and manage IPPFAX Jobs. An IPPFAX Printer is called a Receiver. A Receiver MUST support at least the UIF S Profile as specified in [ifx-uif] which is defined for the 'image/tiff' document format MIME type and MAY support additional UIF Profiles for the 'image/tiff' and 'image/tiffx' document format MIME types. A Printer implementation MAY be configured to support both the IPPFAX and IPP protocols concurrently.

This document also defines a "printer-alternate-uri" (uri) operation attribute intended for use with both the IPP and IPPFAX protocols when an implementation supports more than one URL. It allows an administrator to specify an Effective URL Context in which the management operation is to be performed.

This document is a draft of an IEEE-ISTO PWG Proposed Standard and is in full conformance with all provisions of the PWG Process (see: ftp://ftp.pwg.org/pub/pwg/general/pwg-process.pdf). PWG Proposed Standards are working documents of the IEEE-ISTO PWG and its working groups. The list of current PWG projects and drafts can be obtained at http://www.pwg.org.

When approved as a PWG standard, this document will be available from:
ftp://ftp.pwg.org/pub/pwg/standards/pwg5102.1.pdf, .doc, .rtf

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1 Introduction

This standard specifies the IPPFAX protocol. The IPPFAX requirements [ifx-req] are derived from the requirements for Internet Fax [internet-fax-goals].

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 Internet FAX protocol specified in [RFC2305] and [RFC2532] that uses the SMTP mail protocol as a transport.

IPPFAX is primarily intended as a method of supporting a synchronous, 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.

The IPPFAX protocol is a specialization of the IPP/1.1 [RFC2911], [RFC2910] protocol. The IPPFAX protocol uses the ‘ippfax’ URL scheme (instead of the ‘ipp’ URL scheme) to create and manage IPPFAX Jobs. An IPPFAX Printer is called a Receiver. A Receiver MUST support at least the UIF (Universal Image Format) S Profile [ifx-uif] which is defined for the ‘image/tiff’ document format MIME type and MAY support additional UIF Profiles for the ‘image/tiff’ and ‘image/tiffx’ document format MIME types. A Printer implementation MAY be configured to support both the IPPFAX and IPP protocols concurrently. Note - It is assumed that the reader is familiar with IPP/1.1 [RFC2911],[RFC2910],[ipp-iig].

This document also defines a “printer-alternate-uri” (uri) operation attribute intended for use with both the IPP and IPPFAX protocols when an implementation supports more than one URL. It allows an administrator to specify an Effective URL Context in which the management operation is to be performed.

1.1 Namespace used

The extension specified in this standard uses the prefix 'ippfax-' for all new IPP attributes defined.

2 Terminology

This section defines the following additional terms that are used throughout this standard.

2.1 Conformance Terminology

Capitalized terms, such as **MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED NOT,** and **OPTIONAL**, have special meaning relating to conformance to this specification. These terms are defined in [RFC2911] section 13.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

2.2 Other Terminology

This standard defines a logical model of an IPPFAX interchange. The following terms are introduced and capitalized in order to indicate their specific meaning:

IPP Protocol The protocol defined in [RFC2911] and [RFC2910]. For the IPP Protocol each operation request MUST use the 'ipp' URL scheme.

IPPFAX Protocol The protocol defined in this document. For the IPPFAX Protocol each operation request MUST use the 'ippfax' URL scheme (see section 3.1).

Effective URL Context The context in which a Printer object performs operations. Each context is identified by a unique URL supported by the Printer object. If a Printer object supports multiple protocols, each protocol has a separate context by definition. For a given protocol, a Printer object can support multiple contexts which have some configured differences as established by an administrator. In this case, each context also has a unique URL (with the same scheme). Example: A Printer object that supports the 3 URLs: ipp://www.acme.com/printer1, ippfax://www.acme.com/printer2, ippfax://www.acme.com/printer3 is supporting three contexts.

> The client MUST supply the target "printer-uri" operation attribute (section 3.1) in each operation. This attribute specifies the transfer path to the Receiver for the operation. It also specifies the Effective URL Context unless that client also supplies the additional "printer-alternate-uri" operation attribute (section 3.2). Administrative clients supply the "printer-alternate-uri" operation attribute in order to be able to configure and control multiple contexts with a single authenticated connection.

Printer object (or Printer) A software entity that accepts protocol operation requests and returns protocol responses. A Printer object MAY be: (1) an IPP Printer object, (2) an IPPFAX Printer object, or (3) both, depending on implementation (see section 2.3). However, this document uses the term "Receiver" instead of "IPPFAX Printer object". This document uses the term "Printer object" (and "Printer") when the statement is intended to apply to a Printer object that MAY support the IPP protocol, the IPPFAX protocol, or both protocols.

IPP Printer object A Printer object that supports the IPP protocol.

Receiver The Printer object (which can be software, hardware or some combination) that accepts IPPFAX protocol operations and receives the Document sent by the Sender. In this document the term "Receiver" indicates the semantics when the Printer object accepts an IPPFAX protocol operation. A

Printer object implementation MAY support both the IPP and IPPFAX protocols concurrently. In this case the Printer object is behaving a both an IPP Printer object and a Receiver.

client A hardware and/or software entity that initiates protocol operation requests and accepts responses. A client MAY be: (1) an IPP client, (2) an IPPFAX client, or (3) both. However, this document uses the term “Sender”, instead of “IPPFAX client”. This document uses the term “client” when the statement is intended to apply to a client that MAY support the IPP protocol, the IPPFAX protocol, or both protocols.

IPP client A client that uses the IPP protocol.

Sender A client that uses the IPPFAX protocol to query a Receiver and transmit a Document to that Receiver.

Document The electronic representation of 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 by the Sender to the Receiver.

Attribute Coloring The changing of attributes and/or values returned by a single Printer object in a Get-Printer-Attributes response depending on operation attributes supplied in the request, specifically the “document-format”, the entire target URL value in the “printer-uri”, and the “ippfax-uif-profiles” operation attributes.

Job Creation Operation The IPP or IPPFAX operations that creates IPP or IPPFAX Jobs, respectively, i.e., the Print-Job, Print-URI, and Create-Job operations (see [RFC2911]).

IPP Job A job submitted by an IPP client to an IPP Printer object using the IPP Protocol.

IPPFAX Job A job submitted by a Sender to a Receiver using the IPPFAX Protocol.

TIFF The Tag Image File Format defined by [TIFF].

TIFF-FX The file format defined in [RFC2301] as extensions to [TIFF] commonly known as TIFF-FX. [RFC2301] formally defines minimal, extended and lossless JBIG modes (Profiles S, F, J) for black-and-white fax, and base JPEG, lossless JBIG and Mixed Raster Content modes (Profiles C, L, M) for color and grayscale fax. These modes or profiles correspond to the content of the applicable ITU-T Recommendations.

UIF Profile (Universal Image Format Profile) A TIFF-FX profile with higher conformance requirements and relaxed constraints for improved quality (see [ifx-uif]).

Delivered The Receiver has either printed the Document and delivered the last sheet to the output bin or has forwarded the Document to some other system.

The terminology defined in [RFC2911], such as **attribute**, **operation**, **request**, **response**, **operation attribute**, **Printer Description attribute**, and **Job Description attribute** is also used in the standard with the same capitalization conventions.

2.3 Supporting both IPP and IPPFAX protocols in a single implementation

It is OPTIONAL for an IPPFAX implementation to also support the IPP protocol. However, if an implementation does support both protocols, there are two ways for an implementation to do so:

Method 1: Separate Printer objects: two distinct Printer objects (which each have their own URL Contexts by definition) with completely separate attributes, in which case all attributes are separate (though most attributes would have the same value for both objects, except for those that this document indicates MUST depend on the Effective URL Context), or

Method 2: Shared Printer object: only one Printer object in which case only the attributes that this documents indicates MUST depend on the Effective URL Context will have different values (so-called Attribute Coloring by URL).

This document specifies which Printer attributes MUST depend on the Effective URL Context (see Table 1 and Table 2), which MUST NOT, and which MAY. All the other attributes, such as "printer-state" and "printer-name", will appear to the client as either (1) completely separate or (2) shared, DEPENDING ON THE IMPLEMENTATION CHOICE above, respectively. So for these other attributes, which implementation choice is made, will *not* be transparent to the client, especially for an operator's client when using the Set-Printer-Attributes operation.

With either Method, an implementation MAY allow an administrator to configure any number of distinct 'ippfax' URLs with separate access control and differing "xxx-supported" Printer attributes for differing services. This approach may help a scenario where each URL has a different designated user with operator privileges and default notification of the completion of IPPFAX jobs.

Note that this same implementation choice (Method 1 versus Method 2) faces an IPP protocol implementer that supports more than one URL Context, i.e., multiple 'ipp' URLs, say, for different security, including a completely anonymous access.

For an IPPFAX implementation that also supports the IPP protocol using Method 2 (Shared Printer object), an IPP client (suitably authenticated) MAY be able to use the IPP protocol as a so-called "universal protocol" to query and/or affect some of the IPPFAX-specific jobs and attributes (attributes that are defined in this document that begin with the "ippfax-" prefix), just as the IPP protocol MAY be used to examine and control jobs submitted by other protocols, such as LPD [RFC1179].

2.4 Required exchange

The Sending User determines the network location of the Receiver (value of the "printer-uri" operation attribute) – see section 3.1. This standard 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. See section 17 for the Generic Directory Schema for IPPFAX.

1. The Sending User either (1) loads the Document into the Sender or (2) causes the Sender to generate the Document data by means outside the scope of this standard, indicates the Receiver's network location and starts the exchange.

2. The Sender determines whether or not the Receiver is an IPPFAX capable device and is currently configured to perform IPPFAX operations and accept IPPFAX jobs – see sections 5.1 and 5.2. If the Receiver is not configured to accept IPPFAX operations, the Sender MUST query the Sending User to determine whether to fallback to the IPP protocol and semantics – see section 7.2.

3. The Sender determines the rest of the capabilities of the Receiver (see rest of section 7.1).

4. The following identities are determined and exchanged: Sender, Sending User, Receiver, and Receiving User – see section 6.

5. The Sender decides on the most appropriate data format depending on the Receiver’s capabilities. This is described in detail in the [ifx-uif].

6. The Sender SHOULD validate whether or not the Receiver will accept the IPPFAX Job from this Sending User using the Validate-Job operation. See section 7.1.2. If the Receiver rejects the Validate-Job operation, the Sender can avoid sending the data.

7. The Sender either (1) scans the Document and converts it into an acceptable data format or (2) generates or forwards the Document representation in an acceptable data format – see section 5.5.

8. This Document data is transmitted to the Receiver – see section 7.3.

9. The Sending User receives a confirmation that the Receiver received the Document – see section 7.5.

10. In addition the Sender MAY choose to receive notification that the Document has been successfully Delivered – see section 7.6

If the Sender is unable to initiate or complete the exchange then it is assumed that the Sender will perform some form of retry. The mechanisms used and the user-visible behavior in this case is an implementer's choice and beyond the scope of this standard.

3 Common IPPFAX Operation Semantics

This section describes the IPPFAX semantics that are common to all operation. IPPFAX does not define any new operations. Instead, IPPFAX semantics are provided using existing IPP operations [RFC2911], [ipp-get-method], [ipp-ntfy], [ipp-set-ops], etc.] with increased conformance requirements as specified in this document. This section describes the general semantics for all IPPFAX operations. Section 4 describes the Get-Printer-Attributes operation in particular. Section 7 describes the IPPFAX

semantics for the Job Creation operations and section 8 describes the IPPFAX semantics for all other operations.

3.1 printer-uri operation attribute ([RFC2911] section 3.1.5)

This operation attribute specifies the transfer path to the Receiver for the operation. It also specifies the Effective URL Context unless that client also supplies the additional “printer-alternate-uri” operation attribute (section 3.2). The client MUST supply the “printer-uri” operation attribute in every IPP (see [RFC2911] section 3.1.5) and IPPFAX request. For IPPFAX, the attribute value MUST be the Receiver's network location and MUST be a URL using the 'ippfax' scheme (see section 14). Unlike IPP/1.1, the Receiver MUST validate that the “printer-uri” operation attribute matches one of its “printer-uri-supported” values.

An example target “printer-uri” operation attribute and “printer-uri-supported” Printer Description attribute value:

ippfax://www.acme.com/ippfax-printers/printer5

As in all URLs, the scheme identifies the protocol. For example, if a client supports both the IPP and IPPFAX protocols, then the URL scheme in the “printer-uri” operation attribute that the client supplies indicates the protocol and determines whether the client intends the Printer to use IPP or IPPFAX semantics. Similarly, if a Printer object supports both the IPP and IPPFAX protocols, then the URL scheme in the target “printer-uri” operation attribute that the client supplies MUST determine the protocol and the semantics that the Printer performs.

For each operation, the Receiver MUST validate that the “printer-uri” operation attribute value supplied by the Sender matches one of the Receiver’s “printer-uri-supported” Printer Description attribute (see section 5.1). For URI matching rules see section 14.7. If the URI value supplied does not match any value of the Receiver’s “printer-uri-supported” Printer Description attribute, the Receiver MUST reject the request, return the ‘client-error-attributes-or-values-not-supported’ status code, and return the attribute and value in the Unsupported Attributes Group.

If the client omitted this attribute, the Receiver MUST reject the request and return the ‘client-error-bad-request’ status code (see [RFC2911] section 13.1.4.1). Note: [RFC2911] does not require the IPP Printer to validate the “printer-uri” operation attribute.

3.2 printer-alternate-uri (uri) operation attribute

This operation attribute specifies the Effective URL Context that the Printer MUST use for the operation, instead of the context specified by the target “printer-uri” operation attribute (see section 3.1). This operation attribute is intended to be used by both the IPP and IPPFAX protocols. A client that performs administrative operations, such as Disable-Printer, Purge-Jobs, and Set-Printer-attributes, SHOULD support this operation attribute and MAY supply it for those administrative operations. If the Printer object supports multiple contexts and supports suitably-authenticated administrative operations for controlling them, then the Printer object MUST accept this operation attribute.

The value of this attribute MUST be one of the values of the Printer's "printer-uri-supported" Printer Description attribute ([RFC2911] section 4.4.1). If the client supplies this attribute and the value is not one of the values of the Printer's "printer-uri-supported" Printer Description attribute, the Printer MUST reject the operation, return the 'client-error-attributes-or-values-not-supported' status code ([RFC2911] section 13.1.4.12), and return the supplied attribute and value in the Unsupported Attributes Group.

If the client omits this attribute, then the single Effective URL Context of the operation MUST be the context defined by the target "printer-uri" operation attribute (see section 3.1) supplied by the client (rather than all contexts).

This attribute permits an administrator to configure each of the Printer's contexts separately with potentially different values as needed by the separate contexts with a single established administrative connection.

3.3 version-number parameter ([RFC2911] section 3.1.8)

This IPP/1.1 operation parameter [RFC2911] section 3.1.8) specifies version of the IPP protocol. As in IPP/1.1, the Sender MUST supply this parameter in every request and the Receiver MUST return this parameter in every response. For the IPPFAX protocol, this parameter specifies the version number of IPP protocol and encoding for which the IPPFAX protocol is a specialization. For IPPFAX version 1.0, the value of the "version-number" parameter MUST be '1.1'.

3.4 ippfax-version-number (type2 keyword) operation attribute

This operation attribute MUST be present in all IPPFAX operation requests and responses and MUST be placed in the Operation Attributes Group *immediately* after the operation attributes whose order is specified in IPP/1.1 [RFC2911]. The value indicates the version of the IPPFAX protocol that the Sender is requesting and the Receiver is returning. The semantics of the "ippfax-version-number" attribute serves the same purpose for the IPPFAX protocol as the IPP/1.1 "version-number" parameter serves for the IPP protocol (see [RFC2911] section 3.1.8).

Each operation request and response MUST contain a "ippfax-version-number" operation attribute. Each value of the "ippfax-version-number" is a keyword in the form 'm.n' where m is the major version number and n is the minor version number. For IPPFAX version '1.1' defined by this document, this keyword value '1.1' MUST be used. By including a version number in the client request, it allows the Sender to identify which version of IPPFAX it is interested in using, i.e., the version whose conformance requirements the Sender may be depending upon the Receiver to meet.

If the Receiver does not support the major version number supplied by the Sender, i.e., the major version field of the "ippfax-version-number" attribute does not match any of the values of the Printer's "ippfax-versions-supported" (see section 5.2), the object MUST respond with a status code of 'server-error-version-not-supported' along with the closest version number that is supported (see [RFC2911] section 13.1.5.4). If the major version number is supported, but the minor version number is not, the

Receiver SHOULD accept and attempt to perform the request (or reject the request if the operation is not supported), else it rejects the request and returns the ‘server-error-version-not-supported’ status code. In all cases, the Receiver MUST return the “ippfax-version-number” attribute with the value that it supports that is closest to the version number supplied by the client in the request.

There is no version negotiation per se. However, if after receiving a ‘server-error-version-not-supported’ status code from a Receiver, a Sender SHOULD try again with a different version number. A Sender MAY also determine the versions supported either from a directory that conforms to Appendix E (see section 16) or by querying the Printer object's "ipp-versions-supported" attribute (see section 17) to determine which versions are supported.

A Receiver implementation MUST support version '1.0', i.e., meet the conformance requirements for IPPFAX/1.0 as specified in this document and [RFC2910]. It is recommended that a Receiver implementations accept any request with the major version '1' (or reject the request if the operation is not supported).

4 Get-Printer-Attributes operation semantics

This section describes the IPPFAX operation attributes and the enhancements to existing operation attributes of the Get-Printer-Attributes operation for the IPPFAX protocol. The Receiver MUST support the Get-Printer-Attributes operation as defined in [RFC2911] as extended by the semantics defined in this section.

4.1 document-format (mimeMediaType) operation attribute ([RFC2911] section 3.2.5.1)

This attribute identifies the document-format for which the Receiver returns the supported values. The Sender SHOULD supply the “document-format” operation attribute in the Get-Printer-Attributes request (see [RFC2911 section 3.2.5.1]); as in IPP/1.1, the Receiver MUST support this operation attribute in a Get-Printer-Attributes operation.

As in IPP/1.1, if the document format supplied by the Sender is not supported (value is not contained in the Receiver’s “document-format-supported” Printer Description attribute - see [RFC2911] section 4.4.22), the Receiver MUST reject the Get-Printer-Attributes request and return the ‘client-error-document-format-not-supported’ status code.

The Receiver MUST perform Attribute Coloring for the attributes returned as indicated in Table 1 and Table 2 depending on the document-format supplied by the Sender. In addition, the values returned MUST depend on the Effective URL Context supplied by the Sender as indicated in Table 1 and Table 2. Note: IPP/1.1 [RFC2911] only RECOMMENDED Attribute coloring (see [RFC2911] section 3.2.5.1).

If the Sender omits the “document-format” operation attribute, the Receiver assumes its “document-format-default” value (see [RFC2911] section 4.4.21) and performs Attribute Coloring for that format.

Standard mimeMediaType values are defined in section 5.5.

4.2 ippfax-uif-profile-requested (type2 keyword) operation attribute

This attribute specifies one UIF Profile (see [ifx-uif]). The Sender SHOULD supply the "ippfax-uif-profile-requested" operation attribute in the Get-Printer-Attributes request if the document-format supplied is either 'image/tiff' or 'image/tiffx'; the Receiver MUST support this operation attribute in a Get-Printer-Attributes operation.

If the UIF Profile supplied by the Sender is not supported (value not contained in the Receiver's "ippfax-uif-profiles-supported" Printer Description attribute - see section 5.6), the Receiver MUST reject the operation and return the 'client-error-document-format-not-supported' status code. The Receiver MUST perform Attribute Coloring for the Printer attributes indicated in [RFC2911] (see Get-Printer-Attributes request section 3.2.5.1 under the "document-format" operation attribute description) depending on the UIF Profile supplied by the Sender in this attribute. See Table 1 and Table 2.

The Receiver MUST perform Attribute Coloring for the attributes returned as indicated in Table 1 and Table 2 depending on the profile supplied by the Sender. In addition, the values returned MUST depend on the Effective URL Context supplied by the Sender as indicated in Table 1 and Table 2.

If the Sender omits this attribute, the Receiver responds as if the Sender had supplied the UIF S Profile (keyword value 'uif-s') that is REQUIRED for all Receivers to support and performs Attribute Coloring for that profile. There is no "ippfax-uif-profile-default" attribute defined.

Standard keyword values are defined in section 5.6.

5 IPPFAX Printer Description Attributes

This section defines the IPPFAX Printer Description attributes and the IPP Printer Description attributes whose semantics are affected by IPPFAX.

Table 1 lists the IPPFAX conformance requirements for Printer Description attributes discussed in this document. The Receiver conformance requirements for attribute coloring in the Get-Printer-Attributes response that depends on the "document-format" supplied by the client is indicated in the column labeled "Attribute coloring by document-format". The Receiver conformance requirements for returning values in the Get-Printer-Attributes response that depends on the Effective URL Context supplied by the client are indicated in the column labeled "Depends on Effective URL Context".

Table 2 lists the other Printer Description attributes defined in IPP/1.1 [RFC2911] or IPP Notifications [ipp-ntfy] or elsewhere. They have the same conformance requirements as in IPP/1.1, plus the additional IPPFAX conformance requirements shown in Table 2.

See section 7.4 for the Receiver conformance requirements for the "xxx-supported", "xxx-default", and "xxx-ready" Job Template Printer attributes.

Table 1 - IPPFAX Printer Description attributes conformance requirements

Attribute Name (attribute syntax)	Receiver support	Attribute coloring by document-format	Depends on Effective URL Context	Section
printer-uri-supported (1setOf uri)	MUST	MUST NOT	MUST NOT	5.1
ippfax-versions-supported (1setOf type2 keyword)	MUST	MUST NOT	MUST	5.2
printer-is-accepting-jobs (boolean)	MUST	MUST NOT	MUST	5.3
operations-supported (1setOf type2 enum)	MUST	MUST NOT	MUST	5.4
document-format-supported (1setOf mimeMediaType)	MUST	MUST NOT	MUST	5.5
ippfax-uif-profiles-supported (1setOf type2 keyword)	MUST	MUST	MUST	5.6
ippfax-uif-profile-capabilities (1setOf text(MAX))	MUST	MUST	MUST	5.7
ippfax-auto-notify (boolean)	MAY	MUST NOT	MUST	5.8

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Attribute Name (attribute syntax)	Receiver support	Attribute coloring by document-format	Depends on Effective URL Context	Spec
uri-authentication-supported (1setOf type2 keyword)	MUST	MUST NOT	MUST NOT	[RFC2911]
uri-security-supported (1setOf type2 keyword)	MUST	MUST NOT	MUST NOT	[RFC2911]
printer-name (name(127))	MUST	MUST NOT	MUST NOT	[RFC2911]
printer-location (text(127))	MAY	MUST NOT	MUST NOT	[RFC2911]
printer-info (text(127))	MAY	MUST NOT	MUST NOT	[RFC2911]
printer-more-info (uri)	MAY	MUST NOT	MUST NOT	[RFC2911]
printer-driver-installer (uri)	MAY	MAY	MUST NOT	[RFC2911]
printer-make-and-model (text(127))	MAY	MUST NOT	MUST NOT	[RFC2911]
printer-more-info-manufacturer (uri)	MAY	MUST NOT	MUST NOT	[RFC2911]
printer-state (type1 enum)	MUST	MUST NOT	MUST NOT	[RFC2911]
printer-state-reasons (1setOf type2 keyword)	MUST	MUST NOT	MUST NOT	[RFC2911]
printer-state-message (text(MAX))	MAY	MUST NOT	MUST NOT	[RFC2911]
ipp-versions-supported (1setOf type2 keyword)	MUST	MUST NOT	MUST NOT	[RFC2911]
multiple-document-jobs-supported (boolean)	MAY	MUST NOT	MAY	[RFC2911]
charset-configured (charset)	MUST	MUST NOT	MUST NOT	[RFC2911]
charset-supported (1setOf charset)	MUST	MUST NOT	MUST NOT	[RFC2911]
natural-language-configured (naturalLanguage)	MUST	MUST NOT	MUST NOT	[RFC2911]
generated-natural-language-supported (1setOf naturalLanguage)	MUST	MUST NOT	MUST NOT	[RFC2911]
document-format-default (mimeMediaType)	MUST	MUST NOT	MUST	[RFC2911]
queued-job-count (integer(0:MAX))	MUST	MUST NOT	MUST NOT	[RFC2911]
printer-message-from-operator (text(127))	MAY	MUST NOT	MUST NOT	[RFC2911]
color-supported (boolean)	MAY	MAY	MAY	[RFC2911]
reference-uri-schemes-supported (1setOf uriScheme)	MAY	MAY	MAY	[RFC2911]
pdl-override-supported (type2 keyword)	MUST	MAY	MAY	[RFC2911]
printer-up-time (integer(1:MAX))	MUST	MUST NOT	MUST NOT	[RFC2911]
printer-current-time (dateTime)	MAY	MUST NOT	MUST NOT	[RFC2911]
multiple-operation-time-out (integer(1:MAX))	MAY	MUST NOT	MAY	[RFC2911]
compression-supported (1setOf type3 keyword)	MUST	MAY	MAY	[RFC2911]
job-k-octets-supported (rangeOfInteger(0:MAX))	MAY	MAY	MAY	[RFC2911]
job-impressions-supported (rangeOfInteger(0:MAX))	MAY	MAY	MAY	[RFC2911]
job-media-sheets-supported (rangeOfInteger(0:MAX))	MAY	MAY	MAY	[RFC2911]
pages-per-minute (integer(0:MAX))	MAY	MUST NOT	MUST NOT	[RFC2911]
pages-per-minute-color (integer(0:MAX))	MAY	MUST NOT	MUST NOT	[RFC2911]

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5.1 printer-uri-supported (1setOf uri) [RFC 2911 section 4.4.1]

This attribute contains the set of target URIs that the Printer object supports, i.e., the URI values that a client can supply as values of the "printer-uri" target operation attribute in requests. As in IPP/1.1, the Receiver MUST support this Printer Description attribute (see [RFC2911] section 4.4.1).

The values of this attribute MUST NOT depend on the Effective URL Context. Thus a client can determine all the URI supported by the Printer object using any 'ipp' or 'ippfax' URL, if Method 2 (Shared Printer object) is used to support IPP and IPPFAX (see section 2.3).

If an implementation supports both the IPP and IPPFAX protocols with the same security and authorization regimes, it is RECOMMENDED that the implementation support target URIs that differ only in the scheme. Then a client that queries the "printer-uri-supported" with one of these two protocols, can query the same implementation with the other protocol just by changing the scheme to see if the other protocol is supported no matter whether the implementation used Method 1 (Separate Printer objects) or Method 2 (Shared Printer object) - see section 2.3.

The Receiver MUST support the 'ippfax' URL scheme (see section 14) for this attribute.

5.2 ippfax-versions-supported (1setOf type2 keyword)

This attribute identifies the version or versions of the IPPFAX protocol that this Receiver supports, including major and minor versions, i.e., the version numbers for which this Receiver implementation meets the conformance requirements. The Receiver MUST support this Printer Description attribute.

The values of this attribute MUST depend on the Effective URL Context. If this attribute is not returned in a Get-Printer-Attributes response when requested with an 'ippfax' scheme, then the Printer is NOT an IPPFAX Receiver.

Standard keyword values are:

'1.0': Meets the conformance requirements of IPPFAX version 1.0 as specified in this document.

5.3 printer-is-accepting-jobs (boolean) [RFC 2911 section 4.4.23]

This attribute indicates whether or not the Printer object is currently accepting Job Creation requests. As in IPP/1.1, the Receiver MUST support this Printer Description attribute (see [RFC2911] section 4.4.23).

The values of this attribute MUST depend on the Effective URL Context.

See section 8.4 for a discussion of how the Enable-Printer and Disable-Printer administrative operations, if implemented, affect the value of this attribute.

5.4 operations-supported (1setOf type2 enum) [RFC 2911 section 4.4.15]

This attribute identifies the set of supported operations for this Printer object and contained Job objects. As in IPP/1.1, the Receiver MUST support this Printer Description attribute (see [RFC2911] section 4.4.15).

The values of this attribute MUST depend on the URL Context. For example, if the Receiver does not support the Cancel-Job operation for IPPFAX Jobs (see section 8.2), then the Cancel-Job enum is not returned as the value of the "operations-supported" attribute when queried with an 'ippfax' uri.

5.5 document-format-supported (1setOf mimeMediaType) [RFC 2911 section 4.4.22]

This attribute identifies which document formats the Receiver supports. As in IPP/1.1, the Receiver MUST support this Printer Description attribute (see [RFC2911] section 4.4.22).

The values of this attribute MUST depend on the URL Context. For example, if the client supplies the 'ipp' or 'ippfax' scheme, then the values returned indicate the document formats supported for IPP or IPPFAX jobs, respectively. Since most document formats don't give the guarantee of fidelity for all implementations and configurations, the IPPFAX document formats supported MUST be a subset of the IPP document formats supported.

Standard mimeMediaType values for IPPFAX jobs include:

Table 3 - Document Format MIME Media Types

mimeMediaType	Description	Sender support	Receiver support
image/tiff	TIFF format	MUST	MUST
image/tiffx *	TIFF-FX format	MAY	MAY
application/octet-stream	auto-sensing ([RFC2911] section 4.1.9.1)	MUST NOT	MUST NOT
any other MIME types	such as 'application/pdf' (see [IANA-MT])	MAY	MAY

* Note: TIFF-FX [RFC2301] will be getting a new MIME media type, to distinguish it from the TIFF-6 S and F profiles. For the purposes of this draft, the 'image/tiffx' MIME type is shown as a working name, since it has been suggested in the email discussion by the Internet FAX WG. When the proper MIME type is agreed by the Internet FAX WG, this document will be updated.

The Sender is not restricted to sending UIF Profile formats to the Receiver and MAY send any format that the Receiver supports for IPPFAX Jobs. It is the Sender's choice; the Receiver has no way of indicating preferred formats from amongst the formats that the Receiver supports for IPPFAX Jobs.

5.6 ippfax-uif-profiles-supported (1setOf type2 keyword)

This attribute identifies which black/white, grayscale, and color UIF Profiles the Receiver supports. A Receiver MUST support this Printer Description attribute. This attribute does not apply to additional document formats and profiles besides the UIF Profiles of the 'image/tiff' and 'image/tiffx' document formats.

The returned values of this attribute MUST depend on the URL Context. If this attribute is not returned in a Get-Printer-Attributes response when requested with an 'ippfax' scheme, then the Printer is NOT an IPPFAX Receiver.

See [ifx-uif] for the definition of each of these UIF Profiles and the inter-dependency requirements for UIF Profile support. The values of this attribute MUST conform to the inter-dependency requirements in [ifx-uif] for UIF Profile support (for example, UIF Profile S MUST be supported and UIF Profile C MUST be supported if UIF Profile L is supported, so the 'uif-s' keyword MUST always be present and the 'uif-c' keyword MUST be present if the 'uif-l' keyword is present).

Standard keyword values are shown in Table 4:

Table 4 - UIF Profile keywords

Keyword	MIME Type	File name extension suffix	Description (see [ifx-uif])	Sender support	Receiver support
uif-s	image/tiff	.tiff, .tif	UIF Profile S	MUST	MUST
uif-f	image/tiff	.tiff, .tif	UIF Profile F	MAY	MAY
uif-j	image/tiffx *	.tfx *	UIF Profile J	MAY	MAY
uif-c	image/tiffx *	.tfx *	UIF Profile C	MAY	MAY
uif-cg	image/tiffx *	.tfx *	UIF Profile C with gray-scale subset	MAY	MAY
uif-l	image/tiffx *	.tfx *	UIF Profile L	MAY	MAY
uif-lg	image/tiffx *	.tfx *	UIF Profile L with gray-scale subset	MAY	MAY
uif-m	image/tiffx *	.tfx *	UIF Profile M	MAY	MAY

* Note: the image/tiffx and .tfx are working names as seen on the Internet WG mailing list for the new MIME Media Type and file name extension suffix for TIFF-FX. When the names are finalized, this document will be updated.

5.7 ippfax-uif-profile-capabilities (1setOf text(MAX))

This attribute contains a CONNEG capability string expression as defined in [ifx-uif]. A Receiver MUST support this Printer Description attribute.

The returned values of this attribute MUST depend on the URL Context. If this attribute is not returned in a Get-Printer-Attributes response when requested with an 'ippfax' scheme, then the Printer is NOT an IPPFAX Receiver.

Each value MUST end with explicit White Space where CONNEG allows White Space to occur. However, there is no need to break a CONNEG expression into more than one value if it all fits into 1023 octets.

The values taken together MUST conform to the minimum value in [ifx-uif], plus any additional capabilities that the Receiver supports. Thus a Sender can determine additional capabilities above the minimum for the UIF Profiles that the Receiver supports (see section 5.6).

5.8 ippfax-auto-notify (boolean)

This attribute indicates whether or not the Receiver automatically notifies the Receiving User when the IPPFAX Job completes in some IMPLEMENTATION DEFINED manner, examples of which include:

1. Each Printer URL is configured for a Receiving User or a Group of Receiving Users and has a configured Per-Printer Subscription object or equivalent that is subscribed to 'job-completed' events and uses a supported Event Notification Delivery Method to deliver the notification to the configured user or a designated individual for the Group, respectively.

2. Each Printer object has a pre-allocated Per-Printer Subscription Object that is subscribed to 'job-completed' events and that an operator application uses to examine Job attributes, such as the “job-printer-uri” Job Description attribute and/or any fields in the Job's “ippfax-receiving-user-vcard” operation/Job Description attribute and automatically notifies the Receiving User by email, telephone, or pager.

3. An operator/secretary launches an application that creates a Per-Printer Subscription object that notifies the operator/secretary by some supported Delivery Method (ippget, indp, or mailto).

4. That application could examine Job attributes, such as the “job-printer-uri” Job Description attribute and/or any fields in the Job's “ippfax-receiving-user-vcard” operation/Job Description attribute (see section 6.2) supplied by the Sender and automatically notify the Receiving User by email, telephone, or pager.

5. That application could access a central data base or directory for the Receiving User as indicated in the “ippfax-receiving-user-vcard” attribute (see section 6.2) supplied by the Sender and use the method indicated in the data base.

6. A person sits next to the Receiver and reads the start page and delivers the documents to the Receiving User.

The returned value of this attribute MUST depend on the URL Context.

If the returned value is ‘true’, then the Receiver is responsible for notifying the Receiving User by any means when an IPPFAX Job completes and the Sender SHOULD NOT also notify the Receiving User, thereby causing annoying duplicate notifications to the Receiving User.

If this attribute is not returned in a Get-Printer-Attributes response when requested with an 'ippfax' scheme or the value returned is 'false', then the Receiver MUST NOT automatically notify recipients when IPPFAX Jobs complete. Then the Sender knows that that it has the responsibility for notifying the Receiving User in some manner, such as:

1. by sending an email message to the Receiving User (before or after the IPPFAX job completes, depending on the wishes of the Sending User)

2. if the Receiver supports an appropriate "push" Event Notification delivery method, such as 'mailto' [ipp-mailto-method] or 'indp' [ipp-indp-method], use IPP Event Notification as part of the Job Creation operation (see section 7.7) supplying the "notify-recipient-uri" (uri) attribute with the value of the Receiving User.

6 Identity exchange

This section defines the attributes used by the Sender and the Recipient to identify the other. Table 5 lists these attributes and shows the Sender and Receiver conformance requirements for Validate-Job and Job Creation operations.

Table 5 - Summary of Identify Exchange attributes

Attribute	Sender supplies	Receiver supports
ippfax-sending-user-vcard (text(MAX))	MAY	MUST
ippfax-receiving-user-vcard (text(MAX))	SHOULD	MUST
ippfax-sender-uri (uri)	MUST	MUST
printer-uri-supported	MUST query	MUST

6.1 ippfax-sending-user-vcard (text(MAX)) operation/Job Description attribute

This attribute identifies the Sending User in MIME vCard v3.0 [RFC2426, RFC2425] format. The Sender MAY send this operation attribute in an IPPFAX Job Creation operation; a Receiver MUST support this Job Creation and Validate-Job operation attribute according to the vCard v3.0 specification. The Receiver MUST support MAX (1023) octets of text. However, the Receiver MAY ignore any image, logo, and sound parts, in which case it MUST still accept the Job Creation request and return the 'successful-ok-ignored-or-substituted-attributes' status code (see [RFC2911] section 13.1.2.2), but NEED NOT return the attribute and its ignored values in the Unsupported Attributes Group.

For a sample vCard see section 16. If the Sender supplies the attribute, then the Receiver MUST use its value to populate the Job object's corresponding Job Description attribute of the same name.

The Receiver MAY choose to use this information on a job start and end sheet (banner page) for the job. As in IPP/1.1, whether or not the Receiver prints a separate job start sheet depends on the "job-

sheets" Job Template attribute. The Sender can request the Receiver to print a separate start sheet if the Receiver's "job-sheets-supported" Printer attribute (see [RFC2911] section 4.2.3) contains a value other than 'none'. The Sender can suppress the Receiver's separate start sheet if the Receiver's "job-sheets-supported" Printer attribute contains the 'none' value. If the Sender omits the "job-sheets" Job Template attribute, the Receiver's "job-sheets-default" value will be used.

6.2 ippfax-receiving-user-vcard (text(MAX)) operation/Job Description attribute

This attribute identifies the intended Receiving User in MIME vCard format[RFC2426, RFC2425]. The Sender SHOULD send this operation attribute in an IPPFAX Job Creation or Validate-Job operation; a Receiver MUST support this Job Creation operation attribute. The Receiver MUST support MAX (1023) octets of text. However, the Receiver MAY ignore any image, logo, and sound parts, in which case it MUST still accept the Job Creation request and return the 'successful-ok-ignored-or-substituted-attributes' status code (see [RFC2911] section 13.1.2.2), but NEED NOT return the attribute and its ignored values in the Unsupported Attributes Group.

For a sample vCard see section 16. If the Sender supplies the attribute, then the Receiver MUST use its value to populate the Job object's corresponding Job Description attribute of the same name.

The Receiver MAY choose to use this information on a job start and end sheet (banner page) for the job. See discussion under section 6.1.

6.3 ippfax-sender-uri (uri) operation/Job Description attribute

This attribute identifies the Sender in a similar manner to the way a Sending Station ID is used in a GSTN fax device. The value of this identity is not specified in this document but MUST uniquely identify the Sender device and be traceable to the Sender. The manufacturer of the Sender MUST ensure that the customer configures the Sender with a value for this attribute that is a syntactically valid URI before first attempt to send an IPPFAX Job.

The Sender MUST send this operation attribute with the configured value in an IPPFAX Job Creation operation; a Receiver MUST support this Job Creation operation attribute.

The Receiver MUST use its value to populate the Job object's corresponding Job Description attribute of the same name. This value is only a comment (since it can be spoofed) and is used for logging purposes and has nothing to do with authentication (for which see section 9). This attribute is more akin to an email 'Reply-To' field.

6.4 printer-uri-supported (1setOf uri) Printer Description attribute ([RFC2911] section 4.4.1)

This IPP/1.1 Printer Description attribute (see [RFC2911] section 4.4.1) identifies the Receiving device, so that no new IPPFAX Printer Description attribute is needed. The Sender MUST query this attribute

using the Get-Printer-Attributes operation as specified in section 7.1.1 while supplying a target “printer-uri” operation attribute with the ‘ippfax’ scheme.

7 Data Exchange - IPPFAX Job Submission

This section describes how a Sender MUST submit an IPPFAX Job to a Receiver.

7.1 Sender Validation of the target Printer’s capabilities

A Sender MUST validate the Printer’s capabilities in order ensure that the Receiver is capable of rendering the document as intended by the Sender before submitting an IPPFAX job, either by:

a) querying the Printer Description attributes in Table 6 using the Get-Printer-Attributes operation (see section 4) while supplying the “printer-uri” target operation attribute with an ‘ippfax’ URI scheme (see section 3.1) OR

b) use a Validate-Job operation (see section 7.1.2) to validate the attributes indicated in Table 6 with an asterisk (*). The Sender MUST NOT rely solely on the IPPFAX Validate-Job operation followed by the IPPFAX Job Creation operation, since an IPP/1.1 Printer MAY accept both IPPFAX operations, since [RFC2911] does not require an IPP Printer to validate that the “printer-uri” operation scheme is ‘ipp’ or that the URL is one of its “printer-uri-supported” values. Also it might be risky for the Sender to depend on the IPP Printer to return the unknown IPPFAX operations attributes in the Unsupported Attributes Group (though [RFC2911] REQUIRES an IPP Printer to do so). Therefore, the Sender MUST still validate the attributes without an asterisk in Table 6 using the Get-Printer-Attributes operation.

7.1.1 Validating the Printer’s IPPFAX capabilities using the Get-Printer-Attributes operation

If the Sender requests these attributes using Get-Printer-Attributes and some of them are not returned, then the Sender MUST query the Sending User to inform that person that the Printer does not accept IPPFAX Jobs, so that the Sender has the opportunity to choose to abandon the exchange or to fallback to the IPP protocol and semantics (see section 7.2).

The order of presentation in Table 6 is the likely order that a Sender would check the values, though the Sender can request all of the attributes in a single Get-Printer-Attributes operation (and the Printer can return them in any order).

682 **Table 6 - Receiver Attributes that the Sender MUST validate**

Attribute	Section	Description and purpose
operation attributes:		
printer-uri	3.1	whether or not the Get-Printer-Attributes operation with a “printer-uri” target URL using the ‘ippfax’ scheme locates a valid Receiver destination
Printer Description attributes:		
printer-uri-supported	5.1, 3.1	Use the Get-Printer-Attributes operation with a “printer-uri” target URL containing the ‘ippfax’ scheme to locates a valid Receiver destination. From the response check whether the Printer supports the IPPFAX protocol on the target URL by comparing the target URL with one of the “printer-uri-supported” values, i.e., validate that the Printer is a Receiver
uri-authentication-supported		Check that the corresponding value is ‘digest’ or ‘certificate’
uri-security-supported		Check that the corresponding value is ‘ssl3’ or ‘tls’.
ippfax-versions-supported *	5.2, 3.4	Check what version(s) of IPPFAX the Receiver supports
printer-is-accepting-jobs *	5.3	Check whether the Receiver is currently configured to accept IPPFAX Jobs
operations-supported	5.4	If the Sender is going to use any Job Creation operations besides Print-Job, such as Print-URI, Create-Job, Send-Document, or Send-URI, the Sender MUST validate that the Receiver supports such operations
document-format-supported *	5.5	Check which document formats the Receiver supports
ippfax-uif-profiles-supported *	5.6	Check which UIF Profiles of the ‘image/tiff’ and ‘image/tiffx’ document formats the Receiver supports
ippfax-uif-profile-capabilities *	5.7	Check which OPTIONAL capabilities of each UIF Profile the Receiver supports if the Sender uses any feature that is OPTIONAL for a UIF Profile
ippfax-auto-notify	5.8	Check whether or not the Receiver automatically notifies the intended Receiving User when the IPPFAX Job completes.
Job Template Printer attributes:		
media-supported *	7.4.1.1	Check which media is supported
media-ready	7.4.1.1	Check which media is ready (loaded, i.e., needs no human intervention to use)
printer-resolutions-supported *	7.4.2.1	Check which resolutions are supported
xxx-supported *	7.4	Check any other Job Template attributes that the Sender is going to use

* indicate that the Sender can use a Validate-Job operation (see section 7.1.2) instead of (or in addition to) using the Get-Printer-Attributes operation in order to validate that the Printer will process the job as intended by the Sender using IPPFAX semantics.

7.1.2 Validating the Printer's IPPFAX capabilities using the Validate-Job operation

The Sender MUST either (1) validate the job attributes using the Validate-Job operation (that doesn't include any Document data) before sending the IPPFAX Job with the same attributes using an IPPFAX Job Creation operation that includes the Document data or query the Printer Description attributes indicated in section 7.1. For meaningful and complete job validation, the Sender MUST supply all the same operation and Job Template attributes in the Validate-Job request as it will supply in the subsequent Job Creation request (see section 7.3).

The Sender MUST supply the "ipp-attribute-fidelity" operation attribute with a 'true' value (see [RFC2911] section 3.2.1.1 and 15.1) in both the Validate-Job and the Job Creation operations. Then the Receiver will reject the request if any of the Job Template attributes and values are not supported, thereby ensuring that the document is printed as intended. If the Validate-Job is rejected because of the lack of support of one or more Job Template attributes, the Sender MUST query the user in order to proceed without these attributes. If the Validate-Job fails for more serious reasons, such as 'server-error-not-accepting-jobs ([RFC] section 13.1.5.7), the Sender MUST inform the Sending User so that person has the opportunity to choose to abandon the exchange or to fallback to the IPP protocol and semantics (see section 7.2).

7.2 Fallback to the IPP Protocol

If a Printer object fails any of the validation by the Sender in section 7.1 or 7.1.2 besides Job Template attributes not supported, the Sender MUST query the Sending User to inform that person that the Printer is not currently configured to accept IPPFAX requests, so that the Sender has the opportunity to choose to abandon the exchange or to fallback to use the IPP protocol and semantics. The main IPPFAX features that will be missing in the IPP protocol 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 (section 6): IPP does not provide the definitive identity exchange that IPPFAX does. In many cases this is acceptable.

7.3 Transmission using the Print-Job or other Job Creation operation

The Sender MUST support creating IPPFAX Jobs using the Print-Job operation and MAY support creating IPPFAX Jobs using other Job Creation operations (Print-URI, Create-Job) and Document Creation operations (Send-Document, Send-URI) as well. The Receiver MUST support creating

717 IPPFAX Jobs using the Print-Job operation and MAY support creating IPPFAX Jobs with other Job
718 Creation and Document Creation operations as well.

719 ### 7.3.1 IPP/1.1 Validate-Job and Job Creation operation attributes

720 Table 7 indicates which IPP/1.1 [RFC2911] operation attributes a Sender MUST or MAY supply in a
721 Validate-Job and a Job Creation request and a Receiver MUST or MAY support. Differences in
722 conformance from IPP/1.1 are indicated with footnotes.

723 **Table 7 - IPP/1.1 Validate-Job and Job Creation operation attributes**

Operation attribute	Section	Sender supplies	Receiver supports
attributes-charset (charset)		MUST	MUST
attributes-natural-language (naturalLanguage)		MUST	MUST
printer-uri (uri)	3.1	MUST	MUST
requesting-user-name (name(MAX))		SHOULD	MUST
job-name (name(MAX))		MAY	MUST
ipp-attribute-fidelity (boolean)		MUST with 'true' value[1]	MUST
document-name (name(MAX))		MAY	MUST
compression (type3 keyword)		MAY	MUST
document-format (mimeMediaType) *	7.3.1.1	MUST[2]	MUST
document-natural-language (naturalLanguage)		MAY	MAY
job-k-octets (integer(0:MAX))		MAY	MAY
job-impressions (integer(0:MAX))		MAY	MAY
job-media-sheets (integer(0:MAX))		MAY	MAY
ippfax-uif-profiles (1setOf type2 keyword)	7.3.1.2	MUST	MUST
ippfax-sending-user-vcard (1setOf text(MAX))	6.1	SHOULD	MUST
ippfax-receiving-user-vcard (text(MAX))	6.2	SHOULD	MUST
ippfax-sender-uri (name(MAX))	6.3	MUST	MUST

724 * As in IPP/1.1, these attributes are NOT Job Description attributes, only Operation attributes for
725 an IPPFAX Job Creation and Validate-Job operations.
726

[1] [RFC2911] does not require the client to supply the "ipp-attribute-fidelity" and allows the client to supply either the 'true' or 'false' value.

[2] The [RFC2911] does not require the IPP client to supply the "document-format" operation attribute.

7.3.1.1 document-format (mimeMediaType) operation attribute ([RFC2911] section 3.2.1.1)

This attribute identifies the MIME Media Type of the document that the Sender is sending. The Sender MUST supply this operation attribute in the Validate-Job and Job Creation operations; a Receiver MUST validate and support this operation attribute. Note: [RFC2911] does not REQUIRE the IPP Client to supply this operation attribute.

ISSUE 01: OK to REQUIRE the Sender to supply the "document-format" of the document being sent (unlike IPP/1.1)? What if the Sender didn't create the document and the Receiver supports multiple formats, such as image/tiffx and application/pdf or the Print System doesn't know even when its own Printer Driver creates the document, such as Windows? For Microsoft UPnP PrintBasic, we had to define a special default value, so that the Microsoft Print System could supply a value (UPnP REQUIRES that "document-format" be supplied). Or should we change this back to SHOULD as in IPP/1.1 and as we did for "ippfax-uif-profiles" (see next section)? Or should we still REQUIRE it, but allow the Sender to submit 'application/octet-stream'? (Currently, we do not allow 'application/octet-stream').

If the Sender does not supply this attribute, the Receiver MUST reject the operation, MUST return the 'client-error-bad-request' status code, and SHOULD return the 'document-format' attribute name keyword in the Unsupported Attributes Group (see section 12.1).

If the Sender supplies a value that the Receive does not support, i.e., not a value of the Receiver's "document-format-supported" Printer Description attribute, the Receiver MUST reject the operation and return the 'client-error-document-format-not-supported' status code (IPP conformance).

If the Sender supplies a value that the Receiver determines later is incorrect when processing the document data, the document data takes precedence. Only if the Receiver does not support the discovered document-format, MUST the Receiver abort the job.

Standard mimeMediaType values are defined in section 5.5.

7.3.1.2 ippfax-uif-profiles (1setOf type2 keyword) operation attribute

This attribute identifies the UIF Profiles of the document that the Sender is sending. The Sender SHOULD supply this operation attribute in the Validate-Job and Job Creation operations as a hint to the Receiver as to what the UIF Profiles are when the document format is 'image/tiff' or 'image/tiffx'; a Receiver MUST validate and support this operation attribute.

If the Sender does not supply this attribute, the Receiver MUST accept the job anyway and validate as soon as possible that the Receiver can successfully render the document data. If possible, it is RECOMMENDED that such validation happen by examining the first part of the data before returning the Job Creation response. .

If the Sender supplies a value that the Receive does not support, i.e., not a value of the Receiver's "ippfax-uif-profiles-supported" Printer Description attribute, the Receiver MUST reject the operation and return the 'client-error-document-format-not-supported' status code (IPP conformance).

If the Sender supplies a value that the Receiver determines later is incorrect when processing the document data, the document data takes precedence. Only if the Receiver does not support the discovered profile, MUST the Receiver abort the job.

Standard keyword values are defined in section 5.6.

7.4 Job Template Attributes

Table 8 lists all of the Job Template attributes defined in other IPP documents and shows their behavior for IPPFAX Jobs, i.e., Jobs created using an IPPFAX URL. As in [RFC2911], the term "Job Template attribute" is actually up to four attributes: the "xxx" Job attributes, and the "xxx-default", "xxx-supported", and possibly the "xxx-ready" Printer attributes.

The "Sender supplies" column contains the following values:

MUST - the Sender MUST supply this Job Template attribute in a Job Creation request.

MUST NOT - the Sender MUST NOT supply this Job Template attribute in a Job Creation request.

MAY - the Sender MAY supply this Job Template attribute in a Job Creation request.

The "Receiver supports" column contains the following values:

MUST - The Receiver MUST support the Job Template attribute for an IPPFAX Job, i.e., MUST support the "xxx", "xxx-default", "xxx-supported".

MUST NOT - The Receiver MUST NOT support the Job Template attribute for an IPPFAX Job (and the IPPFAX Sender MUST NOT supply). If these attributes are supplied in an IPPFAX Job, the Receiver MUST reject the Job Creation operation. When querying the Receiver with the Get-Printer-Attributes operation on an 'ippfax' URL, the corresponding "xxx-default" and "xxx-supported" MUST NOT be returned. Note: These are attributes which might degrade the appearance of the document or provide a significantly non-FAX feature, such as "number-up" or "copies", respectively.

MAY - if these Job Template attributes are supported by the Receiver and are supplied in an IPPFAX Job, the Job Creation operation MUST be performed as for IPP jobs using the IPP semantics specified in [RFC2911].

The "Attribute coloring by document-format" column indicates the Receiver conformance requirements for attribute coloring in the Get-Printer-Attributes response that depends on the "document-format" supplied by the client. Values: n/a, MUST, MAY.

794 The “Depends on URL Context” column indicates the Receiver conformance requirements for returning
795 values in the Get-Printer-Attributes response that depends on the URL Context supplied by the
796 client. Values: n/a, MUST, MAY.

797 **Table 8 - IPPFAX Semantics for Job Template Attributes**

Job Template attribute	Sender supply	Receiver support	Attribute coloring by document-format	Depends on URL Context	Reference
copies	MUST NOT	MUST NOT	n/a	n/a	[RFC2911]
cover-back	MAY	MAY	MAY	MAY	[ipp-prod-print]
cover-front	MAY	MAY	MAY	MAY	[ipp-prod-print]
document-overrides	MAY	MAY	MAY	MAY	[ipp-coll]
finishings	MAY	MAY	MAY	MAY	[RFC2911]
finishings-col	MAY	MAY	MAY	MAY	[ipp-prod-print]
force-front-side	MAY	MAY	MAY	MAY	[ipp-prod-print]
imposition-template	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
insert-sheet	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
job-account-id	MAY	MAY	MAY	MAY	[ipp-prod-print]
job-accounting-sheets	MAY	MAY	MAY	MAY	[ipp-prod-print]
job-accounting-user-id	MAY	MAY	MAY	MAY	[ipp-prod-print]
job-error-sheet	MAY	MAY	MAY	MAY	[ipp-prod-print]
job-hold-until	MUST NOT	MUST NOT	n/a	n/a	[RFC2911]
job-message-to-operator	MAY	MAY	MAY	MAY	[ipp-prod-print]
job-priority	MUST NOT	MUST NOT	n/a	n/a	[RFC2911]
job-sheet-message	MAY	MAY	MAY	MAY	[ipp-prod-print]
job-sheets	MAY	MAY	MAY	MAY	[RFC2911]
job-sheets-col	MAY	MAY	MAY	MAY	[ipp-prod-print]
media	MUST (see section 7.4.1)	MUST (see section 7.4.1)	MUST	MUST	[RFC2911]
media-col	MAY	MAY	MUST	MUST	[ipp-prod-print]
media-input-tray-check	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
multiple-document-handling	MAY	MAY	MAY	MAY	[RFC2911]
number-up	MUST NOT	MUST NOT	n/a	n/a	[RFC2911]
orientation-requested	MUST NOT	MUST NOT	n/a	n/a	[RFC2911]
output-bin	MUST NOT	MUST NOT	n/a	n/a	[ipp-output-bin]
page-delivery	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
page-order-received	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
page-overrides	MAY	MAY	MAY	MAY	[ipp-coll]
page-ranges	MUST NOT	MUST NOT	n/a	n/a	[RFC2911]
pages-per-subset	MUST NOT	MUST NOT	n/a	n/a	[ipp-coll]
presentation-direction-	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]

number-up					
print-quality	MUST NOT	MUST NOT	n/a	n/a	[RFC2911]
printer-resolution	MAY (see section 7.4.2)	MUST (see section 7.4.2)	MUST	MUST	[RFC2911]
separator-sheets	MAY	MAY	MAY	MAY	[ipp-prod-print]
sheet-collate	MUST NOT	MUST NOT	n/a	n/a	[ipp-job-prog]
sides	MAY	MAY	MAY	MAY	[RFC2911]
x-image-position	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
x-image-shift	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
x-side1-image-shift	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
x-side2-image-shift	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
y-image-position	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
y-image-shift	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
y-side1-image-shift	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]
y-side2-image-shift	MUST NOT	MUST NOT	n/a	n/a	[ipp-prod-print]

ISSUE 02: The Sender supply and the Receiver support columns have a lot of “MUST NOT”. Instead of not allowing these attributes at all, how about a MAY but restricted to the obvious default values, i.e., “copies”=1, “number-up”=1, “job-priority”=50, “insert-sheet”=’none’, x-image-shift=0, etc. Otherwise, there is some interworking problems with a client that supplies these attributes with their obvious default values.

7.4.1 media (type2 keyword | name(MAX)) Job Template attribute ([RFC2911] section 4.2.11)

This Job Template attribute ([RFC2911] section 4.2.11) identifies the medium to be used for all sheets of the job. The Sender MUST supply the “media” Job Template attribute in the Validate-Job and Job Creation requests and the Receiver MUST support it, along with the “media-default”, “media-ready”, and “media-supported” Printer attributes.

The UIF Profiles standard [ifx-uif] REQUIRES that both the Sender and the Receiver be able to determine the dimensions from the keyword value. Therefore, the keyword values MUST be Media Size Self Describing names defined in the PWG Standardized Name standard [pwg-media].

Standard keyword values (see [pwg-media]) include:

‘na_letter_8.5x11in’
‘iso_a4_210x297mm’

7.4.1.1 media-supported and media-ready Job Template Printer attributes

The Sender MUST query the values of the “media-supported” and “media-ready” attributes ([RFC2911] section 4.2.11), since the Sender MUST supply the “media” Job Template attribute in the Job Creation operation. The “media-ready” attribute indicates which media are currently loaded and will not require human intervention in order to be used.

Standard keyword values are defined in section 7.4.1.

7.4.2 printer-resolution (resolution) Job Template attribute ([RFC2911] section 4.2.12)

This Job Template attribute ([RFC2911] section 4.2.12) identifies the cross-feed and feed direction resolutions that Printer uses for the Job. The Sender MAY supply the "printer-resolution" Job Template attribute in the Validate-Job and Job Creation requests and the Receiver MUST support it, along with the "printer-resolution-default", and "printer-resolution-supported" Printer attributes.

If the Sender supplies the "printer-resolution" (resolution) Job Template attribute, the value MUST agree with the resolution of each of the pages of the UIF Profiles document. If the supplied value disagrees with the resolution of any of the pages of the UIF Profiles document, the Receiver MUST obey the resolution in the UIF document, on a page by page basis.

Note: The main purpose of requiring the Receiver to support the "printer-resolution" Job Template attribute is so that the Sender can query the corresponding "printer-resolution-supported" (1setOf resolution) Printer attribute to see what resolutions are supported in addition to the ones REQUIRED for the UIF Profiles supported. See section 7.4.2.1.

7.4.2.1 printer-resolution-supported Job Template Printer attribute

If the Sender is using a resolution for a UIF Profile that is not one of the REQUIRED resolutions for the UIF Profile being used, then the Sender SHOULD query the "printer-resolution-supported" Printer attribute. The Receiver MUST support Attribute Coloring by UIF profile for the 'image/tiff' and 'image/tiffx' document-formats. Thus this attribute allows the Sender to determine the additional resolutions supported in addition to the resolutions required for support of each of the UIF Profiles without having to interpret the CONNEG expression values of the "ippfax-uif-profile-capabilities" Printer Description attribute (see section 5.7).

7.5 Confirmation using the Document Creation response

The Sender knows when the Receiver has successfully received the entire Document when the Receiver returns the 'successful-ok' status code in the Print-Job, Send-Document, or Send-URI response; the Sender MUST then inform the Sending User by means outside the scope of this standard that the document has successfully been received. See section 7.6 for informing the Sending User when the document has been successfully printed.

7.6 notification-recipient-uri operation attribute and the Get-Notifications operation

This attribute [ipp-ntfy] indicates the delivery method and the notification recipient. A Sender MUST supply this attribute with the 'ippget' Delivery Method [ipp-get-method] to determine when the Document has been Delivered in order to give a positive acknowledgement to the Sending User; a Receiver MUST support the subset of the IPP Notification specification [ipp-ntfy] indicated in this

document and the ‘ippget’ notification delivery method [ipp-get-method]. The Receiver MUST support the ‘job-progress’ event (which is OPTIONAL in [ipp-ntfy]), as well as all of the REQUIRED events in [ipp-ntfy] ('none', 'printer-state-change', 'printer-stopped', 'job-state-change', 'job-created', and 'job-completed'). The Receiver MUST support the Get-Notifications operation as defined in [ipp-get-method]. If the Sender subscribes to the ‘job-progress’ event, the Receiver MUST generate an event for every sheet, as moderated by the Printer’s “notify-time-interval” attribute, which the Sender can obtain using the Get-Notifications request.

The Receiver MUST support Subscription Creation for the Job-Creations operations that it supports, but NEED NOT support any other notification operations, such as Create-Job-Subscriptions, Create-Printer-Subscriptions, Get-Subscription-Attributes, Get-Subscription-Attributes, Renew-Subscription, or Cancel-Subscription, even though [ipp-ntfy] requires all but the Create-Job-Subscriptions operation.

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, the ‘job-completed’ event notifications means that the Receiver has delivered the IPPFAX Job somewhere; either actually delivered printed sheets to the output bin or forwarded the job and document to some other system.

7.7 Subscription Template Attributes Conformance Requirements

Table 9 lists the conformance requirements for Subscription attributes on the Job Creation and Validate-Job requests. If the Receiver supports additional Job Creation and Document Creation operations, then these operation attributes have the same conformance on those operations.

Table 9 - Subscription Template attributes conformance requirements

Attribute Name (attribute syntax)	Sender Conformance in Job Creation operations	Receiver Conformance	Section
notify-recipient-uri (uri)	MAY *	MUST	7.6
notify-events (1setOf type2 keyword)	MAY	MUST	7.6
notify-attributes (1setOf type2 keyword)	MAY	MAY	7.6
notify-user-data (octetString(63))	MAY	MUST	7.6
notify-charset (charset)	MAY	MUST	7.6
notify-natural-language (naturalLanguage)	MAY	MUST	7.6
notify-lease-duration (integer(0:67108863))	MAY	MUST	7.6
notify-time-interval (integer(0:MAX))	MAY	MUST	7.6

* The Sender MUST supply at least this attribute in order to use Notification.

7.8 Notification Event Conformance Requirements

Table 10 lists the conformance requirements for notification events.

Table 10 - Notification Events conformance requirements

Event	Sender Conformance for Job Creation	Receiver Conformance	Section
none	MAY	MUST	7.6
job-state-changed	MAY	MUST	7.6
job-created	MAY	MUST	7.6
job-completed	MUST	MUST	7.6
job-progress	MAY	MUST *	7.6
printer-state-changed	MAY	MUST	7.6
printer-stopped	MAY	MUST	7.6

* The 'job-progress' event is OPTIONAL in [ipp-ntfy], but is REQUIRED for IPPFAX so that the Sender can give page by page feedback.

7.9 Sender URI Stamping

The Sender MUST place the Sender's URI, i.e., the value of the "ippfax-sender-uri" attribute (see section 6.3), along with the date and time, in one of the following places, DEPENDING ON IMPLEMENTATION:

1. On a cover page automatically generated by the Sender that is sent before the rest of the document.
2. Merged with the first page of the document.
3. At the top of every page of the sent Document.

The Sender MAY include additional data (Sending User, Receiver identity, etc.). As for regular FAX, it is RECOMMENDED that this information be represented as bit map data, so that it is more difficult for it to be modified before it gets to the Receiver.

8 IPP Implementation of other operations

Section 4 defined the Get-Printer-Attributes operation and section 7 defined the Validate-Job and Job Creation operations for IPPFAX. This section defines the semantics for other operations for IPPFAX.

IPPFAX restricts the use of IPP in certain cases in order to make attaching a Receiver to the Internet a safe option – see section 9.

The Receiver MUST fully support the Print-Job, Validate-Job, and Get-Printer-Attributes operations, as defined by this document and the Get-Notifications operation as defined in [ipp-get-method]. The following subsections define restrictions placed on the Cancel-Job, Get-Job-Attributes, and Get-Jobs operations. In a strict IPPFAX implementation, all other operations MUST NOT be accepted unless the issuer of the operation 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 standard. If a Receiver implementation allows other operations, for example, operations such as Print-URI, Create-Job, Create-Printer-Subscriptions, etc., then it MUST provide a method of restricting available operations for non-authorized clients to the operations specified herein.

8.1 Operation Conformance Requirements

Table 11 lists the conformance requirements for Printer operations for (1) an IPP Printer ('ipp' URL), (2) the non-privileged IPPFAX Sender, (3) an IPPFAX Receiver receiving a request from a non-privileged User, and (4) an IPPFAX Receiver receiving a request from an authenticated and authorized operator or administrator.

Table 12 lists the conformance requirements for Job and Subscription operations for (1) an IPP Printer ('ipp') URL, (2) the non-privileged IPPFAX Sender which MUST be on the same URL as the job was created (the target "printer-uri" MUST match the Job's "job-printer-uri" Job Description attribute), (3) an IPPFAX Receiver receiving a request from the Job or Subscription Object Owner, (4) from some other non-privileged user, and (5) if the operation is supported as all - from an authenticated and authorized operator or administrator.

Table 11 - Conformance for Printer Operations

Operation Name	IPP/1.1 Printer	IPPFAX Sender	IPPFAX Receiver from a User	IPPFAX Receiver from an Operator	Reference
Print-Job	MUST	MUST	MUST	MUST NOT	7.3
Print-URI	MAY	MAY	MAY	MUST NOT	[RFC2911]
Validate-Job	MUST	SHOULD	MUST	MUST NOT	7.1.2
Create-Job	MAY	MAY	MAY	MUST NOT	[RFC2911]
Get-Jobs	MUST	MAY	MAY*	MUST	8.3
Get-Printer-Attributes	MUST	MUST	MUST	MUST	4, 5
Pause-Printer	MAY	MUST NOT	MUST NOT	MAY	[RFC2911]
Resume-Printer	MAY	MUST NOT	MUST NOT	MAY	[RFC2911]
Purge-Jobs	MAY	MUST NOT	MUST NOT	MAY	[RFC2911]
Set-Printer-Attributes	MAY	MUST NOT	MUST NOT	MAY	[ipp-set-ops]
Get-Printer-Supported-Values	MAY	MUST NOT	MUST NOT	MAY	[ipp-set-ops]
Create-Printer-Subscription	MAY	MUST NOT	MUST NOT	MAY	[ipp-ntfy]
Get-Subscriptions	MAY	MAY	MUST NOT	MUST	[ipp-ntfy]
Send-Notifications	MAY	MUST NOT	MUST NOT	MAY	[ipp-indp-method]
Get-Print-Support-Files	MAY	MAY	MAY	MAY	[ipp-install]
Enable-Printer	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Disable-Printer	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Pause-Printer-After-Current-Job	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Hold-New-Jobs	MAY	MUST NOT	MUST NOT	MUST NOT	[ops-set2]
Release-Held-New-Jobs	MAY	MUST NOT	MUST NOT	MUST NOT	[ops-set2]
Deactivate-Printer	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Activate-Printer	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Restart-Printer	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Shutdown-Printer	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Startup-Printer	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Cancel-Current-Job	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]
Suspend-Current-Job	MAY	MUST NOT	MUST NOT	MAY	[ops-set2]

Legend:

MAY* - If supported, Get-Job-Attributes and Get-Jobs MUST restrict certain attributes, such as “job-name”, and “job-originating-user-name”. See section 8.3.

Table 12 - Conformance for Job and Subscription Operations

Operation Name	IPP Printer	IPPFAX Sender	IPPFAX Receiver from Job Owner	IPPFAX Receiver from Other User	IPPFAX Receiver from Operator	Reference
Send-Document	MAY	MAY	MAY	MUST NOT	MUST NOT	[RFC2911]
Send-URI	MAY	MAY	MAY	MUST NOT	MUST NOT	[RFC2911]
Cancel-Job	MUST	SHOULD NOT	MUST NOT	MUST NOT	MAY	8.2
Get-Job-Attributes	MUST	MAY	MAY	MAY*	MAY	8.3
Set-Job-Attributes	MUST	MAY	MUST NOT	MUST NOT	MAY	[ipp-set-ops]
Hold-Job	MAY	MUST NOT	MUST NOT	MUST NOT	MAY	[RFC2911]
Release-Job	MAY	MUST NOT	MUST NOT	MUST NOT	MAY	[RFC2911]
Restart-Job	MAY	MUST NOT	MUST NOT	MUST NOT	MAY**	[RFC2911]
Create-Job-Subscription	MAY	MAY	MAY	MUST NOT	MAY	[ipp-ntfy]
Get-Subscription-Attributes	MAY	MAY	MUST	MUST NOT	MUST	[ipp-ntfy]
Get-Subscriptions	MAY	MAY	MUST	MUST NOT	MUST	[ipp-ntfy]
Renew-Subscription	MAY	MUST NOT	n/a	MUST NOT	MAY	[ipp-ntfy]
Cancel-Subscription	MAY	MUST NOT	MAY	MUST NOT	MAY	[ipp-ntfy]
Get-Notifications	MAY	MUST	MUST	MUST NOT	MUST	7.6
Reprocess-Job	MAY	MUST NOT	MUST NOT	MUST NOT	MAY**	[ops-set2]
Resume-Job	MAY	MUST NOT	MUST NOT	MUST NOT	MAY	[ops-set2]
Promote-Job	MAY	MUST NOT	MUST NOT	MUST NOT	MAY	[ops-set2]
Schedule-Job-After	MAY	MUST NOT	MUST NOT	MUST NOT	MUST NOT	[ops-set2]

Legend:

MAY* - If supported, Get-Job-Attributes and Get-Jobs MUST restrict certain attributes, such as “job-name”, and “job-originating-user-name”. See section 8.3.

MAY** - Restart-Job and Reprocess-Job are for the operator to recover from a problem with the job, not to make additional copies.

Owner refers to the owner of the Job or Subscription object.

8.2 Cancel-Job operation ([RFC2911] section 3.3.3)

It is inappropriate for a Sender to transmit a Document as an IPPFAX Job, 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 either (1) reject Cancel-Job operations not issued by an administrator targeted at IPPFAX Jobs or (2) reject Cancel-Job operations targeted at IPPFAX Jobs altogether, depending on

implementation and/or policy. (The Receiver can distinguish IPPFAX Jobs from IPP Jobs by the presence of the mandatory 'ippfax' scheme in the target "printer-uri" operation attribute that created the job and that the Receiver MUST copy to the job's "job-printer-uri" REQUIRED IPP/1.1 Job Description attribute (see [RFC2911] section 4.3.3). The Cancel-Job operation therefore becomes a privileged operation on all IPPFAX Jobs or not supported. This behavior is a change to the IPP behavior. Which implementation choice MUST be reflected in the value of the "operations-supported" Printer attribute (see section 5.4).

If the issuer of the operation can be identified as an administrator, then the operation MUST behave as defined in [RFC2911].

8.3 Get-Job-Attributes and Get-Jobs operations ([RFC2911 sections 3.3.4 and 3.2.6)

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

The Receiver SHOULD restrict the job attributes that any Sender can request for any IPPFAX Job in a Get-Jobs or a Get-Job-Attributes operation to appropriate ones for a public service. For example, an implementation MAY return only the following Job attributes:

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

The exact choice of Job attributes that a client can query for IPPFAX Jobs, including not returning any, depends on implementation and security policy and is outside the scope of this standard (as in IPP/1.1).

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 [RFC2911] section 8.4 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.

8.4 Enable-Printer and Disable-Printer operations [ipp-admin-ops]

The Enable-Printer and Disable-Printer operations [ipp-admin-ops] allow a remote operator to change the value of the Receiver's "printer-is-accepting-jobs" (boolean) Printer Description attribute (see section 5.3) to 'true' or 'false', respectively. These operations are OPTIONAL for a Receiver to support.

When the client supplies the 'ipp' scheme in the "printer-uri" target operation attribute of these operations, the Printer MUST affect only IPP Job Creation requests. Similarly, when the client supplies the 'ippfax' scheme in the "printer-uri" target of these operations, the Printer MUST affect only IPPFAX Job Creation requests. Thus if the implementation supports both IPP and IPPFAX with a single Printer object (implementation choice 2 in section 2.3), this attribute and these operations MUST be colored by the scheme in the "printer-uri" target operation attribute so that which implementation choice will be transparent to clients for this attribute and these operations. Therefore, for either Printer implementation choice, a client will have to issue two of these operations in order to affect both IPP and IPPFAX jobs, one with the 'ipp' scheme and the other with the 'ippfax' URL scheme in the "printer-uri" target operation attribute or will have to use the "printer-alternate-uri" (uri) operation attribute (see section 3.2) in one of the operations with the other URL context.

9 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.

9.1 Privacy

Any exchange between a Sender and a Receiver MUST be carried using the privacy mechanism specified in IPP/1.1 namely TLS [rfc2246]. 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 MAY 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 and return the 'client-error-not-authenticated' status code.

A Sender can either use its own certificate or it can use one associated with the Sending User.

Senders and Receivers SHOULD do what current browsers do, namely, be deployed with the public keys of a number of the top Certificate Authorities. If a Sender gets a public key from a Receiver that it doesn't recognize, the Sender MUST query the Sending User to see if the Sending User trusts the Receiver before sending the IPPFAX job to the Receiver.

The distribution of private keys to Senders or Receivers is outside the scope of this document, but it is done over the network, it MUST be over a secure channel. See Internet Key Exchange (IKE) [RFC2409].

9.2 uri-authentication-supported (1setOf type2 keyword) ([RFC2911] section 4.4.2)

This attribute (see [RFC2911] section 4.4.2) identifies the Client Authentication mechanism associated with each URI listed in the "printer-uri-supported" attribute (see section 5.1).

Table 13 - Authentication Requirements

"uri-authentication-supported" keyword	Sender support and usage	Receiver support and usage
none	MUST NOT	MUST NOT ISSUE 03: What do we mean by "public mode" in section 9.5? If we mean TLS without client authentication, then Table 13 needs to allow 'none', doesn't it?
requesting-user-name	MUST NOT	MUST NOT
basic	MAY support and MAY use when the TLS channel is secured with Data Privacy using the cipher suites indicated below* or stronger.	MAY support and MAY use when the TLS channel is secured with Data Privacy using the cipher suites indicated below* or stronger.
digest	MUST support and MUST use, including the MD5 and MD5-sess algorithms and Message Integrity, unless using 'certificate'	MUST support and MAY use, including the MD5 and MD5-sess algorithms and Message Integrity
certificate	SHOULD support and MAY use when not using any of the above	MUST support and MAY use

* TLS_DHE_DSS_WITH_3DES_EDE_CBC_SHA mandated by [RFC2246].

Table 14 compares the Digest Authentication requirements for IPP clients, IPP Printers, IPPFAX Senders, and IPPFAX Receivers.

Table 14 - Digest Authentication Conformance Requirements

Feature	IPP Client	IPP Printer	IPPFAX Sender	IPPFAX Receiver
MD5 and MD5-sess	MUST support MUST use	SHOULD support SHOULD use	MUST support MUST use	MUST support MUST use
The Message Integrity feature	MUST support NEED NOT use	SHOULD support NEED NOT use	MUST support MUST use	MUST support MUST use

9.3 uri-security-supported (1setOf type2 keyword) ([RFC2911] section 4.4.3)

This attribute (see [RFC2911] section 4.4.3) identifies the security mechanisms used for each URI listed in the "printer-uri-supported" attribute (see section 5.1).

Table 15 - Security (Integrity and Privacy) Requirements

uri-security-supported	Sender support and usage	Receiver support and usage
none	MUST NOT	MUST NOT
ssl2	MUST NOT	MUST NOT
ssl3	MAY support and use for compatibility with deployed infrastructure	MAY support and use for compatibility with deployed infrastructure
tls	TLS Data Integrity - MUST support and MUST use	MUST support and MUST use
	TLS Data Privacy - MUST support and MAY use. The Sender MUST query the Sending User before omitting	MUST support and MAY use

Table 16 compares the TLS conformance requirements for IPP clients, IPP Printers, IPPFAX Senders, and IPPFAX Receivers.

Table 16 - Transport Layer Security (TLS) Conformance Requirements

TLS Feature	IPP Client	IPP Printer	IPPFAX Sender	IPPFAX Receiver
Server Authentication	MUST support SHOULD use	SHOULD support NEED NOT use	MUST support MUST use	MUST support MUST use
Client Authentication*	MAY support NEED NOT use	MAY support NEED NOT use	SHOULD support NEED NOT use	MUST support NEED NOT use
Data Integrity	MAY support NEED NOT use	SHOULD support SHOULD use	MUST support MUST use	MUST support MUST use
Data Privacy	MAY support NEED NOT use	SHOULD support NEED NOT use	MUST support NEED NOT** use.	MUST support NEED NOT use

* The 'certificate' keyword value for the "uri-authentication-supported" attribute [RFC2911].

** The Sender MUST query the Sending User before omitting the Data Privacy encryption.

Senders and Receivers MUST support the TLS_DHE_DSS_WITH_3DES_EDE_CBC_SHA cipher suite as mandated by RFC 2246 [RFC2246]. All stronger cipher suites are OPTIONAL; weaker cipher suites MUST NOT be supported or used.

A Receiver MAY support Basic Authentication (described in HTTP/1.1 [RFC2617]) for Client Authentication if the TLS channel is secured with Data Privacy. TLS with the above mandated cipher suite or stronger can provide such a secure channel.

9.4 Using IPPFAX with TLS

The Sender MUST use only TLS for all IPPFAX operations on the IPPFAX URL. The client MUST start the transaction in TLS, rather than using HTTP upgrade requests. The following paragraph of [RFC2818] further explains:

> The agent acting as the HTTP client should also act as the TLS client. It should initiate a connection to the server on the appropriate port and then send the TLS ClientHello to begin the TLS handshake. When the TLS handshake has finished. The client may then initiate the first HTTP request. All HTTP data MUST be sent as TLS "application data". Normal HTTP behavior, including retained connections should be followed.

Contrast this IPPFAX requirement with the IPP requirement in section 8.2 of [RFC2910]. The following client actions compare IPP with IPPFAX from a client's point of view:

IPP/1.1 sequence:

1. Start TCP connection
2. Zero or more HTTP/IPP requests
3. HTTP/IPP request with Upgrade to TLS header
4. TLS handshake
5. finish the HTTP/IPP request securely
6. Send more HTTP/IPP requests securely ...

IPPFAX sequence:

1. Start TCP connection
2. Send TLS ClientHello
3. rest of TLS handshake
4. Send HTTP/IPPFAX requests securely ... (which usually will be a Get-Printer-Attributes, followed by Validate-Job and/or Print-Job operations).

ISSUE 04: OK that we deleted the "ippfax-sending-user-certificate-uri (uri) operation/Job Description attribute? The client MUST pass the certificate, whether by value or by reference in the TLS record layer.

9.5 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 [RFC2911] (digest authentication [RFC2069] for example) to restrict access to any or all of its functionality.

ISSUE 03 (repeat): What do we mean by “public mode”. If we mean TLS without client authentication, then Table 13 needs to allow ‘none’, doesn’t it?

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

9.6 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 operations and does not accept IPP Jobs). 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 and return a ‘server-error-operation-not-supported’ error status code. For job operations attempted on IPPFAX Jobs, the Receiver SHOULD return the ‘client-error-not-authorized’ error status code, unless the Sender is authenticated as the system administrator and the Receiver supports such access.

10 Gateways to other systems

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

10.1 Off-Ramps

In the IPPFAX 'Off-ramp' scenario the user with a Document to send uses an IPPFAX Sender to transmit a Document to an IPPFAX Receiver within a gateway that in turn transmits it to some other destination, i.e. GSTN FAX. Handling Off-ramps is beyond the scope of this document, but may be a future IPPFAX extensions building on the Off-ramp work of the Internet FAX WG.

10.2 On-Ramps

In the IPPFAX On-Ramp scenario the user originally sent the Document using some other mechanism to some intermediate agent. The intermediate agent, acting as an IPPFAX Sender, then uses the IPPFAX protocol to transmit the Document to an Receiver which MAY be either a final destination or an Off-Ramp. IPPFAX has no specific support for on-ramps.

11 Attribute Syntaxes

No new attribute syntaxes are defined.

12 Status codes

In addition to the status codes defined in [RFC2911] and [ipp-get-method], the following additional semantics are defined for [RFC2911] status codes:

12.1 client-error-bad-request (0x0400) [RFC2911 section 13.1.4.1]

The client has failed to supply one or more attributes in a request which are REQUIRED to be supplied. The requirement can be because of the Printer's current configuration or because of some other attributes that the client supplied. The Printer MUST reject the request, MUST return the 'client-error-bad-request' status code, and SHOULD return the keyword attribute name(s) (but not the values) of the missing attribute(s) in the Unsupported Attributes Group in the response.

13 Conformance Requirements

This section summarizes the conformance requirements for IPPFAX Senders and IPPFAX Receivers that are defined elsewhere in this document.

1. The Sender MUST supply and the Receiver MUST support (1) the "printer-uri" operation attribute with the 'ippfax' scheme, (2) the "version-number" parameter with the IPP/1.1 '1.1' value, and (3) the "ippfax-version-number" with the IPPFAX '1.0' value in all operations to get the IPPFAX semantics as described in section 3.

2. If the Receiver supports multiple contexts (IPP and/or IPPFAX) and supports suitably-authenticated administrative operations for controlling them, then the Printer object MUST support the "printer-alternate-uri" attribute in such administrative operations as described in section 3.2.

3. The Receiver MUST support the Get-Printer-Attributes operation as described in sections 4.

4. The Receiver MUST support the Printer Description attributes as specified in section 5.

5. The Sender MUST validate that that target Printer's is IPPFAX capable using the Get-Printer-Attributes and Validate-Job operations as specified in section 7.1.

6. The Sender MUST supply and the Receiver MUST support the operation/Job Description attributes for Identify Exchange as described in section 6.

7. The Sender MUST support submitting and the Receiver MUST accept IPPFAX Jobs as defined in section 7.

8. The Sender MUST place the Sender's identity on every page as required in section 7.9.

9. The Sender and Receiver MUST support the operations as indicated in section 8.

10. The Sender and Receiver MUST support the IPP Notification for Job Creation operations, the 'ippget' Delivery Method, the Get-Notifications operation for the events indicated in sections 7.6, 7.7, and 7.8

11. The Sender and Receiver MUST support the security mechanisms indicated in section 9, including TLS.

14 IPPFAX URL Scheme

This section is intended for use in registering the 'ippfax' URL scheme with IANA and fully conforms to the requirements in [RFC2717].

14.1 IPPFAX URL Scheme Applicability and Intended Usage

This document defines the 'ippfax' URL (Uniform Resource Locator) scheme for specifying the location of an IPPFAX Receiver which implements the IPPFAX Protocol specified in this document.

The 'ippfax' URL scheme defined in this document is based on the ABNF for the basic hierarchical URL syntax in [RFC2396]; however relative URL forms, parameters, and/or query parts are NOT allowed in an IPPFAX URL. The 'ippfax' URL scheme is case-insensitive in the host name or host address part; however the path part is case-sensitive, as in [RFC2396]. Codepoints outside [US-ASCII] MUST be hex escaped by the mechanism defined in [RFC2396].

The intended usage of the 'ippfax' URL scheme is COMMON.

14.2 IPPFAX URL Scheme Associated IPPFAX Port

All IPPFAX URLs which do NOT explicitly specify a port MUST be used over IANA-assigned well-known system port xxx [TBA by IANA] for the IPPFAX protocol.

See: IANA Port Numbers Registry [IANA-PORTREG].

14.3 IPPFAX URL Scheme Associated MIME Type

All IPPFAX protocol operations (requests and responses) MUST be conveyed in an 'application/ipp' MIME media type [RFC2910] as registered in [IANA-MT]. IPPFAX URLs MUST refer to IPPFAX Receivers which support this 'application/ipp' operation encoding.

See: IANA MIME Media Types Registry [IANA-MT].

14.4 IPPFAX URL Scheme Character Encoding

The IPPFAX URL scheme defined in this document is based on the ABNF for the HTTP URL scheme defined in HTTP/1.1 [RFC2616], which is derived from the URI Generic Syntax [RFC2396] and further updated by [RFC2732] and [RFC2373] (for IPv6 addresses in URLs). The IPPFAX URL scheme is case-insensitive in the 'scheme' and 'host' (host name or host address) part; however, the 'abs_path' part is case-sensitive, as in [RFC2396]. Code points outside [US-ASCII] MUST be hex escaped by the mechanism specified in [RFC2396].

14.5 IPPFAX URL Scheme Syntax in ABNF

The IPP protocol places a limit of 1023 octets (NOT characters) on the length of a URI (see section 4.1.5 'uri' in [RFC2911]). An IPPFAX Receiver MUST return 'client-error-request-value-too-long' (see section 13.1.4.10 in [RFC2911]) when a URI received in a request is too long.

Note: IPPFAX Receivers ought to be cautious about depending on URI lengths above 255 bytes, because some older client or proxy implementations might not properly support these lengths.

IPPFAX URLs MUST be represented in absolute form. Absolute URLs always begin with a scheme name followed by a colon. For definitive information on URL syntax and semantics, see "Uniform Resource Identifiers (URI): Generic Syntax and Semantics" [RFC2396]. This specification adopts the definitions of "port", "host", "abs_path", and "query" from [RFC2396], as updated by [RFC2732] and [RFC2373] (for IPv6 addresses in URLs).

The IPPFAX URL scheme syntax in ABNF is as follows:

```
ippfax_URL = "ippfax:" "//" host [ ":" port ] [ abs_path [ "?" query ]]
```

If the port is empty or not given, IANA-assigned well-known system port xxx [TBA by IANA] is assumed. The semantics are that the identified resource (see section 5.1.2 of [RFC2616]) is located at the IPPFAX Notification Recipient listening for HTTP connections on that port of that host, and the Request-URI for the identified resource is 'abs_path'.

Note: The use of IP addresses in URLs SHOULD be avoided whenever possible (see [RFC1900]).

If the 'abs_path' is not present in the URL, it MUST be given as "/" when used as a Request-URI for a resource (see section 5.1.2 of [RFC2616]). If a proxy receives a host name which is not a fully qualified domain name, it MAY add its domain to the host name it received. If a proxy receives a fully qualified domain name, the proxy MUST NOT change the host name.

14.6 IPPFAX URL Examples

The following are examples of valid IPPFAX URLs for Notification Recipient objects (using DNS host names):

```
l176        ippfax://abc.com
l177        ippfax://abc.com/listener
l178
```

l179 Note: The use of IP addresses in URLs SHOULD be avoided whenever possible (see [RFC1900]).

l180 The following literal IPv4 addresses:

```
l181        192.9.5.5                   ; IPv4 address in IPv4 style
l182        186.7.8.9                   ; IPv4 address in IPv4 style
l183
```

l184 are represented in the following example IPPFAX URLs:

```
l185        ippfax://192.9.5.5/listener
l186        ippfax://186.7.8.9/listeners/tom
l187
```

l188 The following literal IPv6 addresses (conformant to [RFC2373]):

```
l189        ::192.9.5.5                 ; IPv4 address in IPv6 style
l190        ::FFFF:129.144.52.38        ; IPv4 address in IPv6 style
l191        2010:836B:4179::836B:4179   ; IPv6 address per RFC 2373
l192
```

l193 are represented in the following example IPPFAX URLs:

```
l194        ippfax://[::192.9.5.5]/listener
l195        ippfax://[::FFFF:129.144.52.38]/listener
l196        ippfax://[2010:836B:4179::836B:4179]/listeners/tom
l197
```

l198 14.7 IPPFAX URL Comparisons

l199 When comparing two IPPFAX URLs to decide if they match or not, the comparer MUST use the same
l200 rules as those defined for HTTP URI comparisons in [RFC2616], with the sole following exception:

- l201 A port that is empty or not given MUST be treated as equivalent to the well-known
l202 registered port (> 1024) xxx [TBA by IANA] for that IPPFAX URL;

l203 15 IANA Considerations

l204 IANA shall register the ippfax URL scheme as defined in section 14 according to the procedures of
l205 [RFC2717] and assign a registered (>1024) system port.

```
l206 Operation Attributes:
l207 printer-alternate-uri (uri) operation attribute  IEEE-ISTO 5102.1 3.2
l208 ippfax-version-number (type2 keyword)           IEEE-ISTO 5102.1 3.4
l209 ippfax-uif-profile-requested (type2 keyword)    IEEE-ISTO 5102.1 4.2
l210
l211 Printer Description Attributes:
l212 ippfax-versions-supported (1setOf type2 keyword) IEEE-ISTO 5102.1 5.2
```

```
ippfax-uif-profiles-supported (1setOf type2 keyword)
                                                    IEEE-ISTO 5102.1 5.6
ippfax-uif-profile-capabilities (1setOf text(MAX))
                                                    IEEE-ISTO 5102.1 5.7
ippfax-auto-notify (boolean)                        IEEE-ISTO 5102.1 5.8
```

16 Appendix B: vCard Example

The following ASCII text is a complete vCard v3.0 [RFC2426, RFC2425] example:

```
BEGIN:VCARD
VERSION:3.0
N:Moore;Paul
FN:Paul Moore
ORG:Peerless Systems Networking
TEL;CELL;VOICE:1+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
```

17 Appendix C: Generic Directory Schema for an IPPFAX Receiver

This section defines a generic schema for an entry in a directory service. A directory service is a means by which service users can locate service providers. In IPPFAX environments, this means that Receivers (IPPFAX Printers) can be registered (either automatically or with the help of an administrator) as entries of type PRINTER in the directory using an implementation specific mechanism such as entry attributes, entry type fields, specific branches, etc. Directory clients can search or browse for entries of type PRINTER. Clients use the directory service to find entries based on naming, organizational contexts, or filtered searches on attribute values of entries. For example, a client can find all printers in the "Local Department" context. Authentication and authorization are also often part of a directory service so that an administrator can place limits on end users so that they are only allowed to find entries to which they have certain access rights. IPPFAX itself does not require any specific directory service protocol or provider.

Note: Some directory implementations allow for the notion of "aliasing". That is, one directory entry object can appear as multiple directory entry objects with different names for each object. In each case, each alias refers to the same directory entry object which refers to a single IPPFAX Printer object.

The generic IPPFAX schema is a subset of IPPFAX Job Template and Printer Description attributes (Table 1, Table 2, and [RFC2911] sections 4.2 and 4.4). These attributes are identified as either RECOMMENDED or OPTIONAL for the directory entry itself. This conformance labeling is NOT the same conformance labeling applied to the attributes of IPPFAX Printers objects. The conformance labeling in this Appendix is intended to apply to directory templates and to IPPFAX Printer implementations that subscribe by adding one or more entries to a directory. RECOMMENDED attributes SHOULD be associated with each directory entry. OPTIONAL attributes MAY be

associated with the directory entry (if known or supported). In addition, all directory entry attributes SHOULD reflect the current attribute values for the corresponding IPPFAX Printer object.

The names of attributes in directory schema and entries SHOULD be the same as the IPPFAX Printer attribute names as shown, as much as possible.

In order to bridge between the directory service and the IPPFAX Printer object, one of the RECOMMENDED directory entry attributes is the Printer object's "printer-uri-supported" attribute. The directory client queries the "printer-uri-supported" attribute (or its equivalent) in the directory entry and then the IPPFAX client addresses the IPPFAX Printer object using one of its URIs. The "uri-security-supported" attribute identifies the protocol (if any) used to secure a channel. If a Printer object supports both IPP and IPPFAX, there should be two separate directory entries in order to represent these two services.

Table 17 defines the generic schema for directory entries of abstract type PRINTER. In the future this schema could also be directory entries of type FAX. In either case, the concrete type MUST be IPPFAX. If a Printer object supports both IPP and IPPFAX, there should be two separate directory entries in order to represent these two services, one with concrete type IPP and the other with concrete type IPPFAX, respectively.

Table 17 - Generic Schema Directory Entries

Attribute	Conformance	Reference
All of the attributes in [RFC2911] section 16 Appendix E Generic Directory Schema, plus:	As stated in [RFC2911] section 16	[RFC2911]
ippfax-versions-supported (1setOf type2 keyword)	RECOMMENDED	section 5.2
ippfax-uif-profiles (1setOf type2 keyword)	RECOMMENDED	section 5.6

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IPP Mailing List: ipp@pwg.org

To subscribe to the ipp mailing list, send the following email:
1) send it to majordomo@pwg.org
2) leave the subject line blank
3) put the following two lines in the message body:
subscribe ipp
end

Implementers of this specification document are encouraged to join the IPP Mailing List in order to participate in any discussions of clarification issues and review of registration proposals for additional attributes and values. In order to reduce spam the mailing list rejects mail from non-

subscribers, so you must subscribe to the mailing list in order to send a question or comment to the mailing list.

Other Participants:

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20 Revision History (to be removed when standard is approved)

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 Removed Cover page and combined device Added need for big text types
3	4/11/01	Gail Songer, Netreon	Move attribute definition to first reference
4	5/24/01	Tom Hastings	Editorially updated the document to follow the style of the IPP standard documents. Added 23 issues to be reviewed. Capitalized the special terms throughout without showing revisions in order to make the document with revisions more readable.
5	5/21/01	Tom Hastings, John Pulera, Ira McDonald	Updated from the 6/6/01 telecon agreements on most of the 23 issues. There are 20 issues remaining, mostly new.
6	7/27/01	Tom Hastings, Ira McDonald	Updated from the 6/29/01 telecon. There are 41 issues remaining, mostly new.
7	10/8/01	Tom Hastings, Ira	Updated with all the resolutions to the 41 ISSUES

		McDonald	from the August 1, 2001 IPPFAX WG meeting in Toronto, and the subsequent telecons: August, 9, 14, and 17, 2001. There are 4 (new) issues remaining.

1407