IPP Fax Project

IPP Fax Protocol

Revision	Date	Author	Notes
1	1/16/01	Paul Moore, Netreon	Initial version

Abstract

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

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

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

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64 **1   Introduction.**

65 Note - It is assumed that the reader is familiar with IPP. IPP Fax (IFX) is primarily
66 intended as a method of supporting a secure, high quality document distribution protocol
67 over the Internet. It therefore discusses paper, pages, scanning and printing, etc. There is
68 however no requirement that the input documents come from actual paper nor is there a
69 requirement that the output of the process be printed paper. The only conformance
70 requirements are those associated with the exchange of data over the network.

71 *1.1   Namespace used*

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

74 *1.2   Model*

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

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

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

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

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

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

84 'IFX Job'. An IPP job submitted by a sender.

85 'Combined Device'. This is a software / hardware combination that is both a sender and a
86 receiver. This is expected to be a common configuration. There are specific requirements
87 for this type of device – see 'Combined Devices'.

88 *1.3   Typical exchange*

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

93 ➢ The sending user loads the document into the sender, indicates the receiver's address
94   and starts the exchange.

95 ➢ The sender determines whether or not the receiver is a IFX capable device – see 'IFX
96   detection'

97 ➢ The following identities are determined and exchanged: sender, sending user, receiver
98   and receiving user – see 'Identity exchange'

99 ➢ The sender scans the documents and converts them into an acceptable data format –
100   see 'data formats'

101 ➢ This data is transmitted to the receiver – see 'Data Transmission'.

102 ➢ The sending user receives a confirmation that the receiver received the document –
103   see 'Confirmation'. In addition the sender may choose to receive notification that the
104   document has been successfully delivered – see 'Notification'

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

108 ## *1.4   Gateways*

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

111 # **2   IFX detection**

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

113   a) A valid IPP destination

114   b) A IFX receiver (not all IPP destinations are IFX receivers)

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

117 To perform the second validation a sender SHOULD execute an IPP 'get-printer-
118 attributes' operation to retrieve the 'IFX-receiver' attribute.

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

121 ## *2.1   Degraded Mode*

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

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

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

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

3   Data formats

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

A receiver may support other formats.

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

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

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

4   Identity exchange

4.1   Sending user

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

4.2   Receiving User

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

4.3   Sender

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

The value of this identity is not specified but SHOULD be a value that can reasonably be expected to uniquely identify the device. A value derived from the MAC address would be a reasonable starting point.

4.4   Receiver

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

The same rules apply as for the sender identity.

165 # 5   Data Exchange

166 ## *5.1   Addressing*

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

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

169 ## *5.2   Transmission*

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

172 The sender MAY include any valid job description or job template attributes.

173 ## *5.3   Confirmation*

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

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

178 ## *5.4   Notification*

179 An IFX receiver MUST support the 'ippget' notification mechanism[xx,xx].

180 A sender MAY use this to request that the receiver send it notification regarding the
181 delivery of the document.

182 ## *5.5   Cover Pages*

183 A receiver MAY create a cover page to be placed at the beginning of the received
184 document. This mechanism replaces (and uses the same attributes) the IPP job sheet
185 system.

186 The format of the cover page is not specified by this document but SHOULD include:-

187   -   The sending users details – from 'IFX-sending-user-identity'

188   -   The receiving user details – from 'IFX-receiving-user-identity'

189   -   The sender's identity – from 'IFX-sender-identity'

190   -   The receiver's identity – from 'IFX-receiver-identity'

191   -   The local date and time

192   -   The subject – from job-description

193   -   The page count – from job-media-sheets if it was supplied

194 In some cases a client may not want a cover page to be automatically generated (there
195 might already be a cover page included in the document). It MAY therefore set the job-
196 sheets job attribute to 'none' to indicate that it does not want a cover page.

5.6   Identity Stamping

198 The receiver MUST place the sender's identity at the top of at least the first page of the
199 received document.

200 The receiver MAY include additional data (sending user, date, time, receiver identity,
201 etc.)

202 The receiver MAY place this information on other pages.

5.7   Combined Devices

204 If a device implements both a sender and a receiver then there are certain things it is
205 required to do.

206 The IFX-sender-identity' MUST be the same as the 'IFX-receiver-identity'. That means
207 that they match byte for byte.

208 The sender MUST include the address of its receiver component in every request. It does
209 this with a new IPP job attribute, 'IFX-return-address'.

210 A non-combined device MAY include a 'IFX-return-address' in a request.

6   IPP Implementation

212 The receiver MUST implement a fully conformant IPP1.1 printer object. There is no
213 requirement for the receiver to implement any of the optional features of IPP unless
214 explicitly stated elsewhere in this document.

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

6.1   Canceling jobs

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

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

222 The receiver MUST reject cancel job operations targeted at IFX jobs. (The receiver can
223 determine that this is an IFX job by the presence of the mandatory 'IFX-sender-identity'
224 job attribute). The 'cancel-job' operation therefore becomes a privileged operation on all
225 IFX-jobs. This is a change to the IPP behavior.

226 ### *6.2   Querying jobs*

227 The public nature of IFX interactions make it inappropriate for a sender to be able to
228 query a receiver for information about jobs that it did not send.

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

231   -   job-id, job-URI

232   -   job-k-octets, job-k-octets-completed

233   -   job-media-sheets, job-media-sheets-completed,

234   -   time-at-creation, time-at-processing

235   -   job-state, job-state-reasons

236   -   number-of-intervening-jobs

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

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

241 An IPP administrator may read all attributes.

242 ### *6.3   Job submission*

243 A receiver MUST NOT support any of the optional job submission operations. What this
244 means is that the IPP printer object must not allow 'IFX-sender-identity' on any operation
245 other than 'print-job'.

246 A receiver MUST reject an operation (other than 'print-job') that contains a 'IFXsender-
247 identity' job attribute. It does this by returning a '401 not authorized' error

248 ### *6.4   Other Operations*

249 All other IPP operations MUST be treated as administrative by the receiver even in the
250 case where IPP would normally permit them. For example the hold-job operation cannot
251 be used by a sender except in the case where the sending user is identified as an IPP
252 administrator.

253 # 7   Security considerations

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

259 *7.1 Privacy*

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

264 *7.2 Spoof-proofing*

265 It is unlikely that large numbers of IFX devices will have certificates that will allow for
266 mutual trusted authentication. This presents the problem of how one can guarantee that
267 the IFX identities that are exchanged are valid.

268 The best solution to this would be to use digital signatures – this is beyond the scope of
269 this document.

270 *7.3 Access control*

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

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

277 *7.4 Reduced feature set*

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

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

283 **8 Gateways to other systems**

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

286 *8.1 On-Ramps*

287 'On-ramp' means that the user with a document to send uses a IFX sender to transmit a
288 document to a IFX receiver that in turn transmits it to some other destination.

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

293 The on-ramping receiver SHOULD indicate to the sender the addressing schemes it
294 supports for 'IFX-destination-URI'. It does this with the 'IFX-destination-schemes-
295 supported' attribute.

8.2   Off-ramps

297 'Off-ramp' means that the user originally sends the document using some other
298 mechanism. The intermediate agent then uses IFX to transmit the document to its final
299 destination. IFX has no specific support for off-ramps.

9   Formal Attribute Definition

9.1   IFX-sending-user-identity

302 Format: octetString(1023)

303 Type: job description

304 Description: This attribute is used by the sender to indicate the sending user's identity to
305 the receiver. It is in vcard format. Note that a valid vcard identity block could exceed
306 1023 octets in length. The sender implementation must ensure that the actual value is
307 1023 or less in length.

308 Conformance: A QD receiver MUST support this attribute. A sender SHOULD send this
309 attribute

310 Example:
```
311      BEGIN:VCARD
312      VERSION:2.1
313      N:Moore;Paul
314      FN:Paul Moore
315      ORG:Peerless Systems Networking
316      TEL;CELL;VOICE:(206) 251-7008
317      ADR;WORK:;;10900  NE  8th  St;Bellvue;WA;98004;United   States   of
318      America
319      EMAIL;PREF;INTERNET:pmoore@peerless.com
320      REV:19991207T215341Z
321      END:VCARD
```

9.2   IFX-receiving-user-identity

323 Format: octetString(1023)

324 Type: Job description

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

328 Conformance: A IFX receiver MUST support this attribute. A sender SHOULD send this
329 attribute

330 **9.3   IFX-sender-identity**

331   Format: name

332   Type: Job description

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

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

337 **9.4   IFX-receiver-identity**

338   Format: name

339   Type: Printer description

340   Description: This attribute uniquely identifies the receiver.

341   Conformance: A receiver MUST implement this attribute.

342 **9.5   IFX-destination-scheme-supported**

343   Format: 1setOf type2 keyword

344   Type: Printer Description

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

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

349 **9.6   IFX-destination-URI**

350   Format: URI

351   Type: Job description

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

355   Conformance: An on-ramping receiver MUST support this attribute.

356 **9.7   IFX-receiver**

357   Format: Boolean

358   Type: Printer description

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

360   Conformance: An IFX receiver must support this value and it must have the value TRUE.

361 ### *9.8   IFX-return-address*

362 Format: URI

363 Type: Job description

364 Description: A combined device uses this attribute to indicate the address of its receiver
365 when sending a job.

366 Conformance: A receiver MUST support this attribute (note that this does not mean it
367 necessarily does anything useful with it). A combined device SHOULD send this
368 attribute.

369 # 10   references

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377   and Transport", RFC2911

378 [6]   Hastings, Manros, ,Kugler, Holst, "Internet Printing Protocol/1.1: Implementer's
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385 [10]   Dawson, Howes, "vCard MIME Directory Profile", RFC 2426