1   INTERNET-DRAFT   Hugo Parra
2   <draft-ietf-ipp-indp-method-05.txt>   Novell, Inc.
3   [Target Category: standards track]   Tom Hastings
4   Xerox Corp.
5   April 5, 2001

6

7   **Internet Printing Protocol (IPP):**
8   **The 'indp' Delivery Method for Event Notifications and Protocol/1.0**

9

10   Copyright (C) The Internet Society (2001). All Rights Reserved.

11   Status of this Memo

12   This document is an Internet-Draft and is in full conformance with all provisions of Section 10 of [RFC2026].
13   Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its
14   working groups. Note that other groups may also distribute working documents as Internet-Drafts.

15   Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or
16   obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or
17   to cite them other than as "work in progress".

18   The list of current Internet-Drafts can be accessed at http://www.ietf.org/ietf/1id-abstracts.txt

19   The list of Internet-Draft Shadow Directories can be accessed as http://www.ietf.org/shadow.html.

20   **Abstract**

21   This document describes an extension to the Internet Printing Protocol/1.0 (IPP) [RFC2566, RFC2565] and
22   IPP/1.1 [RFC2911, RFC2910]. This document specifies the 'indp' Delivery Method and Protocol/1.0 for
23   use with the IPP Event Notification Specification [ipp-ntfy]. This Delivery Method is a simple protocol
24   consisting of a single operation: the Send-Notifications operation which uses the same encoding and transport
25   as IPP [RFC2565, RFC2910].

26   For this Delivery Method, when an Event occurs, the Printer immediately sends (pushes) an Event Notification
27   via the Send-Notifications operation to the Notification Recipient specified in the Subscription Object. The
28   Event Notification content consists of Machine Consumable attributes and a Human Consumable "notify-text"
29   attribute. The Notification Recipient returns a response to the Printer.

30

31

31

Table of Contents

Tables

95

1   Introduction

97   The "IPP Event Notification Specification" document [ipp-ntfy] defines an extension to Internet Printing
98   Protocol/1.0 (IPP) [RFC2566, RFC2565] and IPP/1.1 [RFC2911, RFC2910]. This extension defines
99   operations that a client can perform in order to create *Subscription Objects* in a Printer and carry out other
100   operations on them. A Subscription Object represents a Subscription abstraction. A client associates
101   Subscription Objects with a particular Job by performing the Create-Job-Subscriptions operation or by
102   submitting a Job with subscription information. A client associates Subscription Objects with the Printer by
103   performing a Create-Printer-Subscriptions operation. Four other operations are defined for Subscription
104   Objects: Get-Subscriptions-Attributes, Get-Subscriptions, Renew-Subscription, and Cancel-Subscription.
105   The Subscription Object specifies that when one of the specified *Events* occurs, the Printer sends an
106   asynchronous *Event Notification* to the specified *Notification Recipient* via the specified *Delivery Method*
107   (i.e., protocol).

108   The "IPP Event Notification Specification" document [ipp-ntfy] specifies that each Delivery Method is defined
109   in another document. This document is one such document, and it specifies the 'indp' Delivery Method. This
110   Delivery Method is a simple protocol consisting of a single operation: the Send-Notifications operation which
111   uses the same encoding and transport as IPP. This document defines version '1.0' of the protocol.

112   For the 'indp' Delivery Method, an IPP Printer sends (pushes) a Send-Notifications operation request
113   containing one or more Event Notifications to the Notification Recipient specified in the Subscription Object.
114   The Event Notification content consists of Machine Consumable attributes and a Human Consumable "notify-
115   text" attribute.

116   The Notification Recipient receives the Event Notification as a Send-Notifications operation, in the same way
117   as an IPP Printer receives IPP operations. The Notification Recipient returns a response to the Printer.

2   Terminology

119   This section defines the following terms that are used throughout this document:

120   Terms such as attributes, keywords, and support. These terms have special meaning and are defined in
121   the model terminology [RFC2911] section 12.2.

122   Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY,
123   NEED NOT, and OPTIONAL, have special meaning relating to conformance as specified in

124   RFC 2119 [RFC2119] and [RFC2911] section 12.1. These terms refer to conformance to
125   this document, if this document is implemented.

126   Capitalized terms, such as Notification Recipient, Event Notification, Printer, etc., that are defined in
127   [ipp-ntfy] with the same meanings and are not reproduced here.

128   **Event Notification Attributes Group** – The attributes group in a request that contains Event
129   Notification Attributes in a request or response.

3   Model and Operation

131   See [ipp-ntfy] for the description of the Event Notification Model and Operation. This Delivery Method takes
132   advantage of combining several Event Notifications into a single Compound Event Notification that is delivery
133   by a single Send-Notification operation to a single Notification Recipient.

134   When creating each Subscription object, the client supplies the "notify-recipient" (uri) Subscription Template
135   attribute. The "notify-recipient" attribute specifies both a single Notification Recipient that is to receive the
136   Notifications when subsequent events occur and the method for notification delivery that the IPP Printer is to
137   use. For the Notification Delivery Method defined in this document, the notification method is 'indp' and the
138   rest of the URI is the address of the Notification Recipient to which the IPP Printer will send the Send-
139   Notifications operation.

140   The 'indp' Notification Delivery Method defined in this document uses a client/server protocol paradigm. The
141   "client" in this relationship is the Printer described in [ipp-ntfy] while the "server" is the Notification Recipient.
142   The Printer invokes the Send-Notifications operation to communicate IPP Event Notification contents to the
143   Notification Recipient. The Notification Recipient only conveys information to the Printer in the form of
144   responses to the operations initiated by the Printer.

145   Printers that implement the 'indp' Notification Delivery Method will need to include an HTTP client stack while
146   Notification Recipients that implement this Delivery Method will need to support an HTTP server stack. See
147   section 10.2 for more details.

148   If the client wants the Printer to send Event Notifications via the 'indp' Delivery Method, the client MUST
149   choose a value for "notify-recipient-uri" attribute which conforms to the rules of section 5.2.1.

150   When an Event occurs, the Printer MUST immediately:

151   1. Find all pertinent Subscription Objects P according to the rules of section 9 of [ipp-ntfy], AND

152   2. Find the subset M of these Subscription Objects P whose "notify-recipient-uri" attribute has a scheme
153   value of 'indp', AND

154   3. For each Subscription Object in M, the Printer MUST

155   a)   generate a Send-Notifications request as specified in section 8.1.1 AND

156   b)   send the Send-Notifications request to the Notification Recipient specified by the address part of the
157   "notify-recipient-uri" attribute value (see section 5.2.1).

158   If several events occur sufficiently close to one another for the same or different Subscription objects, but with
159   the same Notification Recipient, the Printer MAY combine them into a single Send-Notifications request using
160   a separate Event Notification Attributes group for each event (see section 8.1.1).

161   **4   General Information**

162   If a Printer supports this Delivery Method, Table 1 lists its characteristics.

163   **Table 1 - Information about the Delivery Method**

Document Method conformance requirement	'indp' realization
1. What is the URL scheme name for the Delivery Method?	indp
2. Is the Delivery Method is REQUIRED, RECOMMENDED, or OPTIONAL for an IPP Printer to support?	RECOMMENDED
3. What transport and delivery protocol does the Printer use to deliver the Event Notification content, i.e., what is the entire network stack?	A Printer MUST support a complete HTTP/1.1 stack [RFC2616]
4. Can several Event Notifications be combined into a Compound Event Notification?	A Printer implementation MAY combine several Event Notifications into a single Event Notifications request as separate Event Notification Attributes Groups, see section 8.1.1
5. Is the Delivery Method initiated by the Notification Recipient (pull), or by the Printer (push)?	This Delivery Method is a push.
6. Is the Event Notification content Machine Consumable or Human Consumable?	Machine Consumable with the "notify-text" attribute being Human Consumable
7. What section in this document answers the following question? For a Machine Consumable Event Notification, what is the representation and encoding of values defined in section 9.1 of [ipp-ntfy] and the conformance requirements thereof? For a Human Consumable Event Notification, what is the representation and encoding of pieces of information defined in section 9.2 of [ipp-ntfy] and the conformance requirements thereof?	The representation and encoding is the same as IPP. See section 8.1.1
8. What are the latency and reliability of the transport and delivery protocol?	Same as for IPP/1.0 or IPP/1.1 itself (see [RFC2911]).
9. What are the security aspects of the transport and delivery protocol, e.g., how it is handled in firewalls?	See section 15
10. What are the content length restrictions?	They are the same as for IPP/1.0 and IPP/1.1 itself (see [RFC2911]).
11. What are the additional values or pieces of	A new Event Notifications attribute group (see

Document Method conformance requirement	'indp' realization
information that a Printer sends in an Event Notification and the conformance requirements thereof?	section 10.1) and additional status codes for use in the response (see section 9)
12. What are the additional Subscription Template and/or Subscription Description attributes and the conformance requirements thereof?	None
13. What are the additional Printer Description attributes and the conformance requirements thereof?	None

164

165 The remaining sections of this document parallel the sections of [ipp-ntfy].

166 **5   Subscription object attributes**

167 This section defines the Subscription object conformance requirements for Printers.

168 **5.1   Subscription Template Attribute Conformance**

169 The 'indp' Delivery Method has the same conformance requirements for Subscription Template attributes as
170 defined in [ipp-ntfy]. The 'indp' Delivery Method does not define any addition Subscription Template
171 attributes.

172 **5.2   Additional Information about Subscription Template Attributes**

173 This section defines additional information about Subscription Template attributes defined in [ipp-ntfy].

174 **5.2.1   notify-recipient-uri (uri)**

175 This section describes the syntax of the value of this attribute for the 'indp' Delivery Method. The syntax for
176 values of this attribute for other Delivery Method is defined in other Delivery Method Documents.

177 In order to support the 'indp' Delivery Method and Protocol, the Printer MUST support the following syntax:

178 The 'indp://' URI scheme. The remainder of the URI indicates the host name or host address (and
179 optional path) of the Notification Recipient that is to receive the Send-Notification operation. See
180 section 12 for a complete definition of the syntax of the INDP URL.

181 **5.3 Subscription Description Attribute Conformance**

182 The 'indp' Delivery Method has the same conformance requirements for Subscription Description attributes as
183 defined in [ipp-ntfy]. The 'indp' Delivery Method does not define any addition Subscription Description
184 attributes.

185 # 6 Printer Description Attributes

186 This section defines the Printer Description Attributes conformance requirements for Printers.

187 **6.1 Printer Description Attribute Conformance**

188 The 'indp' Delivery Method has the same conformance requirements for Printer Description attributes as
189 defined in [ipp-ntfy]. The 'indp' Delivery Method does not define any addition Printer Description attributes.

190 **6.2 New Values for Existing Printer Description Attributes**

191 This section defines additional values for existing Printer Description attributes.

192 **6.2.1 notify-schemes-supported (1setOf uriScheme)**

193 The following "notify-schemes-supported" value is added in order to support the new Delivery Method
194 defined in this document:

195 'indp' - The IPP Notification Delivery Method defined in this document.

196 **6.2.2 operations-supported (1setOf type2 enum)**

197 Table 2 lists the "operation-id" value added in order to support the new operation defined in this document.
198 The operation-id is assigned in the same name space as other operations that a Printer supports. However, a
199 Printer MUST NOT include this value in its "operations-supported" attribute unless it can accept the Send-
200 Notifications request.

201 **Table 2 – Operation-id assignments**

Value	Operation Name
0x001D	Send-Notifications

202

203 7 Attributes Only in Event Notifications

204   No additional attributes are defined only for use in Event Notifications besides those defined in [ipp-ntfy].

205 8 Operations for Notification

206   This section defines the operation for Event Notification using the 'indp' Delivery Method.

207   There is only one operation defined: Send-Notifications. Section 6.2.2 assigns of the "operation-id" for the
208   Send-Notifications operation and the following section defined the operation.

209 8.1 Send-Notifications operation

210   This REQUIRED operation allows a Printer to send one or more Event Notifications to a Notification
211   Recipient using HTTP.

212   The Printer composes the information defined for an IPP Notification [ipp-ntfy] and sends it using the Sent-
213   Notifications operation to the Notification Recipient supplied in the Subscription object.

214   The Send-Notifications operation uses the operations model defined by IPP [RFC2566]. This includes, the
215   use of a URI as the identifier for the target of each operation, the inclusion of a version number, operation-id,
216   and request-id in each request, and the definition of attribute groups. The Send-Notifications operation uses
217   the Operation Attributes group, but currently has no need for the Unsupported Attributes, Printer Object
218   Attributes, and Job-Object Attributes groups. However, it uses a new attribute group, the Event Notification
219   Attributes group.

220   The Notification Recipient MUST accept the request in any state. There is no state defined for the Notification
221   Recipient for this Delivery Method.

222   Access Rights: Notification Recipient MAY enforce access rights. If the Printer receives a rejection with
223   these status codes: 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized'
224   status code , the Printer SHOULD cancel the subscription.

225 8.1.1 Send-Notifications Request

226   Every operation request MUST contains the following parameters (see [RFC2911] section 3.1.1):

227   -   a "version-number"   '1.0' – the version of the 'indp' protocol is '1.0'.
228   -   an "operation-id" - the value defined in Table 2

229   -   a "request-id" - the request id (see [RFC2911] section 3.1.2).
230
231   The following groups of attributes MUST be part of the Send-Notifications Request:

232   Group 1: Operation Attributes
233   Natural Language and Character Set:
234   The "attributes-charset" and "attributes-natural-language" attributes as defined in [RFC2911] section
235   3.1.4.1.

236   The Printer MUST use the values of "notify-charset" and "notify-natural-language", respectively,
237   from one Subscription Object associated with the Event Notifications in this request.

238   Normally, there is only one matched Subscription Object, or the value of the "notify-charset" and
239   "notify-natural-language" attributes is the same in all Subscription Objects. If not, the Printer MUST
240   pick one Subscription Object from which to obtain the value of these attributes. The algorithm for
241   picking the Subscription Object is implementation dependent. The choice of natural language is not
242   critical because 'text' and 'name' values can override the "attributes-natural-language" Operation
243   attribute. The Printer's choice of charset is critical because a bad choice may leave it unable to send
244   some 'text' and 'name' values accurately.

245   Target:
246   A copy of the Subscription object's "notify-recipient-uri" (uri) attribute which is the target of this
247   operation as described in [RFC2911] section 3.1.5, i.e., the URI of the 'indp' Notification Recipient
248   (see section 5.2.1).

249   Group 2 to N: Event Notification Attributes

250   In each group 2 to N, each attribute is encoded using the IPP rules for encoding attributes
251   [RFC2910] and may be encoded in any order. Note: the Get-Jobs response in [RFC2911] acts as
252   a model for encoding multiple groups of attributes.

253   Each Event Notification Group MUST contain all of attributes specified in [ipp-ntfy] section 9.1
254   ("Content of Machine Consumable Event Notifications") with exceptions denoted by asterisks in the
255   tables below.

256   The tables below are copies of the tables in [ipp-ntfy] section 9.1 ("Content of Machine Consumable
257   Event Notifications") except that each cell in the "Sends" column is a "MUST".

258   For an Event Notification for all Events, the Printer sends the following attributes.

259   **Table 3 – Attributes in Event Notification Content**

Source Value	Sends	Source Object
notify-subscription-id (integer(1:MAX))	MUST	Subscription
notify-printer-uri (uri)	MUST	Subscription
notify-subscribed-event (type2 keyword)	MUST	Event Notification
printer-up-time (integer(MIN:MAX))	MUST	Printer
printer-current-time (dateTime)	MUST *	Printer
notify-sequence-number (integer (0:MAX))	MUST	Subscription
notify-charset (charset)	MUST	Subscription
notify-natural-language (naturalLanguage)	MUST	Subscription
notify-user-data (octetString(63))	MUST **	Subscription
notify-text (text (MAX))	MUST	Event Notification
attributes from the "notify-attributes" attribute, if any	MUST ***	Printer
attributes from the "notify-attributes" attribute, if any	MUST ***	Job
attributes from the "notify-attributes" attribute, if any	MUST ***	Subscription

260

261   * The Printer MUST send "printer-current-time" if and only if it supports the "printer-current-time"
262   attribute on the Printer object.

263   ** If the associated Subscription Object does not contain a "notify-user-data" attribute, the Printer
264   MUST send an octet-string of length 0.

265   *** If the "notify-attributes" attribute is present on the Subscription Object, the Printer MUST send
266   all attributes specified by the "notify-attributes" attribute. Note: if the Printer doesn't support the
267   "notify-attributes" attribute, it is not present on the associated Subscription Object and the Printer
268   does not send any client-requested attributes.

269   For Event Notifications for Job Events, the Printer sends the following additional attributes shown in
270   Table 4.

271 **Table 4 – Additional Attributes in Event Notification Content for Job Events**

Source Value	Sends	Source Object
job-id (integer(1:MAX))	MUST	Job
job-state (type1 enum)	MUST	Job
job-state-reasons (1setOf type2 keyword)	MUST	Job
job-impressions-completed (integer(0:MAX))	MUST *	Job

272

273 * The Printer MUST send the "job-impressions-completed" attribute in an Event Notification only
274 for the combinations of Events and Subscribed Events shown in Table 5.

275

276 **Table 5 – Combinations of Events and Subscribed Events for "job-impressions-completed"**

Job Event	Subscribed Job Event
'job-progress'	'job-progress'
'job-completed'	'job-completed'
'job-completed'	'job-state-changed'

277

278 For Event Notification for Printer Events, the Printer sends the following additional attributes shown
279 in Table 6.

280 **Table 6 – Additional Attributes in Event Notification Content for Printer Events**

Source Value	Sends	Source Object
printer-state (type1 enum)	MUST	Printer
printer-state-reasons (1setOf type2 keyword)	MUST	Printer
printer-is-accepting-jobs (boolean)	MUST	Printer

281

282 **8.1.2 Send-Notifications Response**

283 The Notification Recipient MUST return (to the client which is the Printer) the following sets of attributes as
284 part of a Send-Notifications response:

285 Every operation response contains the following REQUIRED parameters (see [RFC2911] section 3.1.1}:

286   -   a "version-number"
287   -   a "status-code"
288   -   the "request-id" that was supplied in the corresponding request
289
290   Group 1: Operation Attributes

291   Status Message:
292   As defined in [RFC2911].

293   The Notification Recipient can return any status codes defined in [RFC2911] and section 9.1 that
294   applies to all of the Event Notification Attribute groups. The following is a description of the
295   important status codes:

296   **'successful-ok':** the Notification Recipient received all of the Event Notification Attribute
297   Groups and was expecting each of them.

298   **'successful-ok-ignored-notifications':** the Notification Recipient was able to consume some,
299   but not all of the Event Notification Attributes Groups sent. The Event Notification
300   Attributes Groups with a "notify-status-code" attribute are the ones that were ignored or
301   are to be canceled.

302   **'client-error-ignored-all-notifications':** the Notification Recipient was unable to consume
303   any of the Event Notification Attributes Groups sent. The Event Notification Attributes
304   Groups with a "notify-status-code" attribute are the ones that were ignored or are to be
305   canceled.

306   Natural Language and Character Set:
307   The "attributes-charset" and "attributes-natural-language" attributes as defined in [RFC2911] section
308   3.1.4.1.

309   Group 2 to N: Notification Attributes

310   These groups MUST be returned if and only if the "status-code" parameter returned in Group 1 is anything but
311   the 'successful-ok' status code.

312   "notify-status-code" (type2 enum)
313   Indicates whether the Notification Recipient was able to consume the n-th Notification Report as
314   follows:

315   **'successful-ok'** - this Event Notification Attribute Group was consumed
316   **'client-error-not-found'** - this Event Notification Attribute Group was not able to be
317   consumed. The Printer MUST cancel the Subscription and MUST NOT attempt to send
318   any further Event Notifications from the associated Subscription object.
319   **'successful-ok-but-cancel-subscription'** - the Event Notification Attribute Group was
320   consumed, but the Notification Recipient wishes to cancel the Subscription object. The
321   Printer MUST cancel the Subscription and MUST NOT attempt to send any further Event
322   Notifications from the associated Subscription object.

9   Status Codes

324   This section lists status codes whose meaning have been extended and/or defined for returning in Event
325   Notification Attribute Groups as the value of the "notify-status-code" operation attribute. The code values are
326   allocated in the same space as the status codes in [RFC2911].

9.1   Additional Status Codes

328   The following status codes are defined as extensions for Notification and are returned as the value of the
329   "status-code" parameter in the Operation Attributes Group of a response (see [RFC2911] section 3.1.6.1).
330   Operations in this document can also return the status codes defined in section 13 of [RFC2911]. The
331   'successful-ok' status code is an example of such a status code.

9.1.1   successful-ok-ignored-notifications (0x0004)

333   The Notification Recipient was able to consume some, but not all, of the Event Notifications Attributes Groups
334   sent by the Printer in the Send-Notifications request. See section 8.1.2 for further details.

9.1.2   client-error-ignored-all-notifications (0x0416)

336   The Notification Recipient was unable to consume any of the Event Notification Attributes Groups sent by the
337   Printer. The Event Notification Attributes Groups with a "notify-status-code" attribute are the ones that were
338   ignored or are to be canceled. The Printer MAY remove subscriptions for future events which this client was
339   unable to consume.

340 **9.2   Status Codes returned in Event Notification Attributes Groups**

341 This section contains values of the "notify-status-code" attribute that the Notification Recipient returns in a
342 Event Notification Attributes Group in a response when the corresponding Event Notification Attributes
343 Group in the request:

344   1. was not consumed OR

345   2. was consumed, but the Notification Recipient wants to cancel the corresponding Subscription object

346 The following sections are ordered in decreasing order of importance of the status-codes.

347 **9.2.1   client-error-not-found (0x0406)**

348 This status code is defined in [RFC2911]. This document extends its meaning and allows it to be returned in
349 an Event Notification Attributes Group of a response.

350 The Notification Recipient was unable to consume this Event Notification Attributes Group because it was not
351 expected. See section 8.1.2 for further details.

352 **9.2.2   successful-ok-but-cancel-subscription (0x0006)**

353 The Notification Recipient was able to consume this Event Notification Attributes Group that the Printer sent,
354 but wants the corresponding Subscription object to be canceled none-the-less. See section 8.1.2 for further
355 details.

356 # 10 Encoding and Transport

357 This section defines the encoding and transport used by the 'indp' Delivery Method.

358 **10.1   Encoding of the Operation Layer**

359 The 'indp' Delivery Method uses the IPP operation layer encoding described in [RFC2910] and the Event
360 Notification Attributes Group tag allocated by [ipp-ntfy] as shown in Table 7:

361 **Table 7 – The "event-notification-attributes-tag" value**

Tag Value (Hex)	Meaning
0x07	"event-notification-attributes-tag"

362

363 **10.2 Encoding of Transport Layer**

364 The 'indp' Notification Delivery Method uses the IPP transport layer encoding described in [RFC2910].

365 It is REQUIRED that an 'indp' Notification Recipient implementation support HTTP over the IANA assigned
366 Well Known Port assigned to the 'indp' Delivery Method as its default port by IANA (see section 13), though
367 a Notification Recipient implementation MAY support HTTP over some other port as well.

368 # 11 Conformance Requirements

369 This section defines conformance requirements for Printers and Notification Recipients.

370 **11.1 Conformance Requirements for Printers**

371 The 'indp' Delivery Method is RECOMMENDED for a Printer to support.

372 IPP Printers that conform to this specification:

373 1. MUST meet the conformance requirements defined in [ipp-ntfy].

374 2. MUST support the conformance requirements for Subscription object attributes defined in section 5,
375 including the syntax for the "notify-recipient-uri" Subscription Object attribute defined in section 5.2.1.

376 3. MUST support the conformance requirements for Printer Description object attributes defined in section
377 6.

378 4. MUST support the 'indp' protocol by sending Event Notifications using the Send-Notifications operation
379 defined in section 8.1.

380 5. MUST send INDP URLs (e.g., in the "notify-recipient-uri" attribute in 'Send-Notifications') that conform
381 to the ABNF specified in section 12.5 of this document;

382 6. MUST send the Send-Notifications operation via the port specified in the INDP URL (if present) or
383 otherwise via IANA assigned well-known port [TBD];

384   7. MUST convert INDP URLs for use in the Send-Notifications operation to their corresponding HTTP
385   URL forms for use in the HTTP layer by the same rules used to convert IPP URLs to their corresponding
386   HTTP URL forms (see section 5 'IPP URL Scheme' in [RFC2910]).

11.2   Conformance Requirements for INDP Notification Recipients

INDP Notification Recipients that conform to this specification:

1. MUST accept Send-Notifications requests and return Send-Notifications responses as defined in sections
    8 and 9.

2. SHOULD reject received INDP URLs in "application/ipp" request bodies (e.g., in the "notify-recipient-
    uri" attribute in 'Send-Notifications') that do not conform to the ABNF for INDP URLs specified in
    section 12.5 of this document;

3. MUST listen for INDP operations on IANA-assigned well-known port [TBD], unless explicitly
    configured by system administrators or site policies;

4. SHOULD NOT listen for INDP operations on any other port, unless explicitly configured by system
    administrators or site policies.

12 INDP URL Scheme

12.1   INDP URL Scheme Applicability and Intended Usage

This section is intended for use in registering the "indp" URL scheme with IANA and fully conforms to the
requirements in [RFC2717]. This document defines the "indp" URL (Uniform Resource Locator) scheme for
specifying the location of an INDP Notification Recipient object which implements IPP Notification Delivery
Protocol (INDP) specified in this document.

The intended usage of the "indp" URL scheme is COMMON.

12.2   INDP URL Scheme Associated INDP Port

All INDP URLs which do NOT explicitly specify a port MUST be used over IANA-assigned well-known
port [TBD] for the INDP protocol.

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

409 **12.3 INDP URL Scheme Associated MIME Type**

410 All INDP protocol operations (requests and responses) MUST be conveyed in an "application/ipp" MIME
411 media type as registered in [IANA-MIMEREG]. INDP URLs MUST refer to INDP Notification Recipient
412 objects which support this "application/ipp" MIME media type.

413 See: IANA MIME Media Types Registry [IANA-MIMEREG].

414 **12.4 INDP URL Scheme Character Encoding**

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

421 **12.5 INDP URL Scheme Syntax in ABNF**

422 This section is intended for use in registering the "indp" URL scheme with IANA and fully conforms to the
423 requirements in [RFC2717]. This document defines the "indp" URL (Uniform Resource Locator) scheme for
424 specifying the location of an INDP Notification Recipient object which implements IPP Notification Delivery
425 Protocol (INDP) specified in this document.

426 The intended usage of the "indp" URL scheme is COMMON.

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

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

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

437 The INDP URL scheme syntax in ABNF is as follows:

```
438        indp_URL = "indp:" "//" host [ ":" port ] [ abs_path [ "?" query
439    ]]
```
440

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

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

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

450   **12.5.1   INDP URL Examples**

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

452   indp://abc.com
453   indp://abc.com/listener
454
455   Note: The use of IP addresses in URLs SHOULD be avoided whenever possible (see [RFC1900]).

456   The following literal IPv4 addresses:

457   192.9.5.5   ; IPv4 address in IPv4 style
458   186.7.8.9   ; IPv4 address in IPv4 style
459
460   are represented in the following example INDP URLs:

461   indp://192.9.5.5/listener
462   indp://186.7.8.9/listeners/tom
463
464   The following literal IPv6 addresses (conformant to [RFC2373]):

465   ::192.9.5.5   ; IPv4 address in IPv6 style
466   ::FFFF:129.144.52.38   ; IPv4 address in IPv6 style
467   2010:836B:4179::836B:4179   ; IPv6 address per RFC 2373
468
469   are represented in the following example INDP URLs:

```
470        indp://[::192.9.5.5]/listener
471        indp://[::FFFF:129.144.52.38]/listener
472        indp://[2010:836B:4179::836B:4179]/listeners/tom
473
```

12.5.2   INDP URL Comparisons

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

477 • A port that is empty or not given MUST be treated as equivalent to the well-known port for that INDP
478 URL (port [TBD]);

479

13 IANA Considerations

481 IANA is requested to register the indp URL scheme as defined in section 12.

482 IANA is requested to assign a default system port (less than 1024) for use with the indp URL as defined in
483 section 12.

484 The rest of this section contains the exact information for IANA to add to the IPP Registries according to the
485 procedures defined in RFC 2911 [RFC2911] section 6.

486 *Note to RFC Editors: Replace RFC NNNN below with the RFC number for this document, so that*
487 *it accurately reflects the content of the information for the IANA Registry.*

13.1   Operation Registrations

489 The operations defined in this document will be published by IANA according to the procedures in RFC 2911
490 [RFC2911] section 6.4 with the following path:

491 ftp.isi.edu/iana/assignments/ipp/operations/

492 The registry entry will contain the following information:

```
493   Operations:                                      Ref.    Section:
494   Send-Notifications operation                     RFC NNNN   8.1
495
```

13.2   Additional values of existing attributes

13.2.1   Additional values for the "notify-schemes-supported" Printer attribute

The "notify-schemes-supported" uriScheme attribute value defined in this document will be published by IANA according to the procedures in RFC 2911 [RFC2911] section 6.1 with the following path:

    ftp.isi.edu/iana/assignments/ipp/attribute-values/notify-schemes-supported/

The registry entry will contain the following information:

```
                                                    Ref.    Section:
    indp                                            RFC NNNN  6.2.1
```

13.2.2   Additional values for the "operations-supported" Printer attribute

The "operations-supported" type2 enum attribute value defined in this document will be published by IANA according to the procedures in RFC 2911 [RFC2911] section 6.1 with the following path:

    ftp.isi.edu/iana/assignments/ipp/attribute-values/operations-supported/

The registry entry will contain the following information:

```
                                        Value       Ref.    Section:
    Send-Notifications                  0x001D       RFC NNNN  6.2.1
```

13.3   Status code Registrations

The status codes defined in this document will be published by IANA according to the procedures in RFC 2911 [RFC2911] section 6.6 with the following path:

    ftp.isi.edu/iana/assignments/ipp/status-codes/

The registry entry will contain the following information:

```
Status codes:                                       Ref.    Section:
successful-ok-ignored-notifications (0x0004)    RFC NNNN    9.1.1
client-error-ignored-all-notifications (0x0416) RFC NNNN    9.1.2
```

520 14 Internationalization Considerations

521 When the client requests Human Consumable form by supplying the "notify-text-format" operation attribute
522 (see [ipp-ntfy]), the IPP Printer (or any Notification Service that the IPP Printer might be configured to use)
523 supplies and localizes the text value of the "human-readable-report" attribute in the Notification according to
524 the charset and natural language requested in the notification subscription.

525 15 Security Considerations

526 The IPP Model and Semantics document [RFC2911] discusses high level security requirements (Client
527 Authentication, Server Authentication and Operation Privacy). Client Authentication is the mechanism by
528 which the client proves its identity to the server in a secure manner. Server Authentication is the mechanism by
529 which the server proves its identity to the client in a secure manner. Operation Privacy is defined as a
530 mechanism for protecting operations from eavesdropping.

531 The Notification Recipient can cancel unwanted Subscriptions created by other parties without having to be
532 the owner of the subscription by returning the 'successful-ok-but-cancel-subscription' status code in the Send-
533 Notifications response returned to the Printer.

534 15.1 Security Conformance

535 Printers (client) MAY support Digest Authentication [RFC2617]. If Digest Authentication is supported, then
536 MD5 and MD5-sess MUST be supported, but the Message Integrity feature NEED NOT be supported.

537 Notification Recipient (server) MAY support Digest Authentication [RFC2617]. If Digest Authentication is
538 supported, then MD5 and MD5-sess MUST be supported, but the Message Integrity feature NEED NOT be
539 supported.

540 Notification Recipients MAY support TLS for client authentication, server authentication and operation
541 privacy. If a Notification Recipient supports TLS, it MUST support the
542 TLS_DHE_DSS_WITH_3DES_EDE_CBC_SHA cipher suite as mandated by RFC 2246 [RFC2246]. All
543 other cipher suites are OPTIONAL. Notification recipients MAY support Basic Authentication (described in
544 HTTP/1.1 [RFC2616]) for client authentication if the channel is secure. TLS with the above mandated cipher
545 suite can provide such a secure channel.

16 References

[ipp-iig]

    Hastings, T., Manros, C., Kugler, K, Holst H., Zehler, P., "Internet Printing Protocol/1.1: draft-ietf-ipp-implementers-guide-v11-02.txt, work in progress, January 25, 2001

[ipp-ntfy]

    Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., Bergman, R., "Internet Printing Protocol/1.1: IPP Event Notification Specification", <draft-ietf-ipp-not-spec-06.txt>, January 24, 2001.

[IANA-MIMEREG]

    IANA MIME Media Types Registry. ftp://ftp.isi.edu/in-notes/iana/assignments/media-types/

[IANA-PORTREG]

    IANA Port Numbers Registry. ftp://ftp.isi.edu/in-notes/iana/assignments/port-numbers

[RFC1900]

    B. Carpenter, Y. Rekhter. Renumbering Needs Work, RFC 1900, February 1996.

[RFC2026]

    S. Bradner, "The Internet Standards Process -- Revision 3", RFC 2026, October 1996.

[RFC2373]

    R. Hinden, S. Deering. IP Version 6 Addressing Architecture, RFC 2373, July 1998.

[RFC2396]

    Berners-Lee, T. et al. Uniform Resource Identifiers (URI): Generic Syntax, RFC 2396, August 1998

[RFC2565]

    Herriot, R., Butler, S., Moore, P., and R. Turner, "Internet Printing Protocol/1.0: Encoding and Transport", RFC 2565, April 1999.

[RFC2566]

    R. deBry, T. Hastings, R. Herriot, S. Isaacson, and P. Powell, "Internet Printing Protocol/1.0: Model and Semantics", RFC 2566, April 1999.

[RFC2567]

    Wright, D., "Design Goals for an Internet Printing Protocol", RFC 2567, April 1999.

[RFC2568]
    Zilles, S., "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol", RFC 2568, April 1999.

[RFC2569]
    Herriot, R., Hastings, T., Jacobs, N., Martin, J., "Mapping between LPD and IPP Protocols", RFC 2569, April 1999.

[RFC2616]
    R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee, "Hypertext Transfer Protocol - HTTP/1.1", RFC 2616, June 1999.

[RFC2617]
    J. Franks, P. Hallam-Baker, J. Hostetler, S. Lawrence, P. Leach, A. Luotonen, L. Stewart, "HTTP Authentication: Basic and Digest Access Authentication", RFC 2617, June 1999.

[RFC2717]
    R. Petke and I. King, "Registration Procedures for URL Scheme Names", RFC 2717, November 1999.

[RFC2732]
    R. Hinden, B. Carpenter, L. Masinter. Format for Literal IPv6 Addresses in URL's, RFC 2732, December 1999.

[RFC2910]
    Herriot, R., Butler, S., Moore, P., Tuner, R., "Internet Printing Protocol/1.1: Encoding and Transport", RFC 2910, September 2001.

[RFC2911]
    R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.1: Model and Semantics", RFC 2911, September 2001.

17 Author's Addresses

Hugo Parra
Novell, Inc.
1800 South Novell Place

 Provo, UT   84606

Phone: 801-861-3307
Fax: 801-861-2517

605   e-mail: hparra@novell.com
606
607   Tom Hastings
608   Xerox Corporation
609   737 Hawaii St. ESAE 231
610   El Segundo, CA   90245
611
612   Phone: 310-333-6413
613   Fax: 310-333-5514
614   e-mail: hastings@cp10.es.xerox.com
615

616 **18 Summary of Base IPP documents**

617   The base IPP documents includes:

618   Design Goals for an Internet Printing Protocol [RFC2567]
619   Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
620   Internet Printing Protocol/1.1: Model and Semantics [RFC2911]
621   Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]
622   Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]
623   Mapping between LPD and IPP Protocols [RFC2569]
624   Internet Printing Protocol (IPP): IPP Event Notification Specification [ipp-ntfy]
625

626   The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing
627   functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in a
628   printing protocol for the Internet. It identifies requirements for three types of users: end users, operators, and
629   administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0 [RFC2566,
630   RFC2565]. A few OPTIONAL operator operations have been added to IPP/1.1 [RFC2911, RFC2910].

631   The "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol" document
632   describes IPP from a high level view, defines a roadmap for the various documents that form the suite of IPP
633   specification documents, and gives background and rationale for the IETF working group's major decisions.

634   The "Internet Printing Protocol/1.1: Model and Semantics" document describes a simplified model with
635   abstract objects, their attributes, and their operations that are independent of encoding and transport. It
636   introduces a Printer and a Job object. The Job object optionally supports multiple documents per Job. It also
637   addresses security, internationalization, and directory issues.

638   The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract
639   operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding

640   rules for a new Internet MIME media type called "application/ipp". This document also defines the rules for
641   transporting a message body over HTTP whose Content-Type is "application/ipp". This document defines the
642   'ipp' scheme for identifying IPP printers and jobs.

643   The "Internet Printing Protocol/1.1: Implementer's Guide" document gives insight and advice to implementers
644   of IPP clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the considerations
645   that may assist them in the design of their client and/or IPP object implementations. For example, a typical
646   order of processing requests is given, including error checking. Motivation for some of the specification
647   decisions is also included.

648   The "Mapping between LPD and IPP Protocols" document gives some advice to implementers of gateways
649   between IPP and LPD (Line Printer Daemon) implementations.

650   The "Internet Printing Protocol (IPP): IPP Event Notification Specification" document defines an extension to
651   IPP/1.0 [RFC2566, RFC2565] and IPP/1.1 [RFC2911, RFC2910]. This extension allows a client to
652   subscribe to printing related Events by creating a *Subscription Object* and defines the semantics for delivering
653   asynchronous *Event Notifications* to the specified *Notification Recipient* via a specified *Delivery Method*
654   (i.e., protocols) defined in (separate) Delivery Method documents.

655 **19 Full Copyright Statement**

656   Copyright (C) The Internet Society (2001). All Rights Reserved.

672 **Acknowledgement**

673

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