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8 Internet Printing Protocol (IPP):  
9 **The ‘ippget’ Delivery Method for Event Notifications**

10  
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12

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22 **Abstract**

23 This document describes an extension to the Internet Printing Protocol/1.0 (IPP) [RFC2566, RFC2565] and  
24 IPP/1.1 [RFC2911, RFC2910]. This document specifies the ‘ippget’ Delivery Method for use with the IPP  
25 Event Notification Specification [ipp-ntfy]. The ‘ippget’ Delivery Method is a ‘pull and push’ Delivery Method.  
26 That is, when an Event occurs, the Printer saves the Event Notification for a period of time called the *Event*  
27 *Notification Lease Time*. The Notification Recipient fetches (pulls) Event Notifications using the Get-  
28 Notifications operation. If the Notification Recipient has selected the option to wait for additional Event  
29 Notifications, the Printer continues to return (push) Event Notifications to the Notification Recipient as Get-  
30 Notification responses as Events occur.

31

31

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## 88 1 Introduction

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

100 The "IPP Event Notification Specification" document [ipp-ntfy] specifies that each Delivery Method is defined  
101 in another document. This document is one such document, and it specifies the 'ippget' delivery method.

102 The 'ippget' Delivery Method is a 'pull and push' Delivery Method. That is, when an Event occurs, the  
103 Printer saves the Event Notification for a period of time called the *Event Notification Lease Time*. The  
104 Notification Recipient fetches (pulls) the Event Notifications using the Get-Notifications operation. This  
105 operation causes the Printer to return all Event Notifications held for the Notification Recipient. If the  
106 Notification Recipient has selected the option to wait for additional Event Notifications, the Printer continues  
107 to return (push) Event Notifications to the Notification Recipient as Get-Notification responses as Events  
108 occur.

## 109 2 Terminology

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

111 Capitalized terms, such as **MUST**, **MUST NOT**, **REQUIRED**, **SHOULD**, **SHOULD NOT**, **MAY**,  
112 **NEED NOT**, and **OPTIONAL**, have special meaning relating to conformance to this specification. These  
113 terms are defined in [RFC2911 section 13.1 on conformance terminology, most of which is taken from RFC  
114 2119 [RFC2119].

115 **Event Notification Lease:** The lease that is associated with an Event Notification. When the lease expires,  
116 the Printer discards the associated Event Notification.

117 **Event Notification Lease Time:** The expiration time assigned to a lease that is associated with an Event  
118 Notification.

119 **Event Notification Attributes Group:** The attributes group in a response that contains attributes that are  
120 part of an Event Notification.

121 For other capitalized terms that appear in this document, see [ipp-ntfy].

### 122 **3 Model and Operation**

123 In a Subscription Creation Operation, when the value of the "notify-recipient-uri" attribute has the scheme  
124 'ippget', the client is requesting that the Printer use the 'ippget' Delivery Method for the Event Notifications  
125 associated with the new Subscription Object. The client SHOULD choose a value for the address part of the  
126 "notify-recipient-uri" attribute that uniquely identifies the Notification Recipient.

127 When an Event occurs, the Printer MUST generate an Event Notification and MUST assign it the Event  
128 Notification Lease Time. The Printer MUST hold an Event Notification for its assigned Event Notification  
129 Lease Time. The Printer MUST assign the same Event Notification Lease Time to each Event Notification.

130 When a Notification Recipient wants to receive Event Notifications, it performs the Get-Notifications  
131 operation, which causes the Printer to return all un-expired Event Notifications held for the Notification  
132 Recipient. If the Notification Recipient has selected the option to wait for additional Event Notifications, the  
133 response to the Get-Notifications request continues indefinitely as the Printer continues to send Event  
134 Notifications in the response as Events occur. For the Get-Notification operation, the Printer sends only those  
135 Event Notifications that are generated from Subscription Objects whose "notify-recipient-uri" attribute value  
136 equals the value of the "notify-recipient-uri" Operation Attribute in the Get-Notifications operation.

137 If a Notification Recipient performs the Get-Notifications operation twice in quick succession, it will receive  
138 nearly the same Event Notification both times because most of the Event Notifications are those that the  
139 Printer saves for a few seconds after the Event occurs. There are two possible differences. Some old Event  
140 Notifications may not be present in the second response because their Event Notification Leases have expired.  
141 Some new Event Notifications may be present in the second response but not the first response.

142 When the Notification Recipient requests Event Notifications for per-Job Subscription Objects, the  
143 Notification Recipient typically performs the Get-Notifications operation within a second of performing the  
144 Subscription Creation operation. Because the Printer is likely to save Event Notifications for several seconds,  
145 the Notification Recipient is unlikely to miss any Event Notifications that occur between the Subscription  
146 Creation and the Get-Notifications operation.

### 147 **4 General Information**

148 If a Printer supports this Delivery Method, the following are its characteristics.

**Table 1 – Information about the Delivery Method**

Document Method Conformance Requirement	Delivery Method Realization
1. What is the URL scheme name for the Delivery Method?	ippget
2. Is the Delivery Method REQUIRED, RECOMMENDED or OPTIONAL for an IPP Printer to support?	RECOMMENDED
3. What transport and delivery protocols does the Printer use to deliver the Event Notification Content, i.e., what is the entire network stack?	IPP with one new operation.
4. Can several Event Notifications be combined into a Compound Event Notification?	Yes.
5. Is the Delivery Method initiated by the Notification Recipient (pull), or by the Printer (push)?	This Delivery Method is a pull and a push.
6. Is the Event Notification content Machine Consumable or Human Consumable?	Machine 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?	Section 5
8. What are the latency and reliability of the transport and delivery protocol?	Same as IPP and the underlying HTTP transport
9. What are the security aspects of the transport and delivery protocol, e.g., how it is handled in firewalls?	Same as IPP and the underlying HTTP transport
10. What are the content length restrictions?	None
11. What are the additional values or pieces of information that a Printer sends in an Event Notification content and the conformance requirements thereof?	None
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
--	------

150

## 151 5 Get-Notifications operation

152 This operation causes the Printer to return all Event Notifications held for the Notification Recipient.

153 A Printer MUST support this operation.

154 When a Printer performs this operation, it MUST return all and only those Event Notifications:

- 155 1. Whose associated Subscription Object's "notify-recipient-uri" attribute equals the "notify-recipient-  
156 uri" Operation attribute AND
- 157 2. Whose associated Subscription Object's "notify-recipient-uri" attribute has a scheme value of 'ippget'  
158 AND
- 159 3. Whose Event Notification Lease Time has not yet expired AND
- 160 4. Where the Notification Recipient is the owner of or has read-access rights to the associated  
161 Subscription Object.

162 The Printer MUST respond to this operation immediately with whatever Event Notifications it currently holds.  
163 If the Notification Recipient has selected the option to wait for additional Event Notifications, the Printer  
164 MUST continue to send Event Notifications as they occur until all of the associated Subscription Objects are  
165 cancelled. A Subscription Object is cancelled either via the Cancel-Subscription operation or by the Printer  
166 (e.g. the Subscription Object is cancelled when the associated Job completes).

167 Note, the Printer terminates the operation in the same way that it normally terminates IPP operations. For  
168 example, if the Printer is sending chunked data, it can send a 0 length chunk to denote the end of the operation  
169 or it can close the connection. If the Notification Recipient wishes to terminate the Get-Notifications  
170 operation, it can close the connection.

171 The Printer MUST accept the request in any state (see [RFC2911] "printer-state" and "printer-state-reasons"  
172 attributes) and MUST remain in the same state with the same "printer-state-reasons" values.

173 *Access Rights:* If the policy of the Printer is to allow all users to access all Event Notifications, then the Printer  
174 MUST accept this operation from any user. Otherwise, the authenticated user (see [RFC2911] section 8.3)  
175 performing this operation MUST either be the owner of each Subscription Object identified by the "notify-  
176 recipient-uri" Operation attribute (as determined during a Subscription Creation Operation) or an operator or  
177 administrator of the Printer (see [RFC2911] Sections 1 and 8.5). Otherwise, the IPP object MUST reject

178 the operation and return: 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-  
179 authorized' status code as appropriate.

## 180 5.1 Get-Notifications Request

181 The following groups of attributes are part of the Get-Notifications Request:

### 182 Group 1: Operation Attributes

183 Natural Language and Character Set:

184 The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]  
185 section 3.1.4.1.

186

187 Target:

188 The "printer-uri" (uri) operation attribute which is the target for this operation as described in  
189 [RFC2911] section 3.1.5.

190

191 Requesting User Name:

192 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as  
193 described in [RFC2911] section 8.3.

194

195 "notify-recipient-uri" (url):

196 The client MUST supply this attribute. The Printer object MUST support this attribute. The Printer  
197 matches the value of this attribute (byte for byte with no case conversion) against the value of the  
198 "notify-recipient-uri" in each Subscription Object in the Printer. If there are no matches, the IPP  
199 Printer MUST return the 'client-error-not-found' status code. For each matched Subscription  
200 Object, the IPP Printer MUST return all unexpired Event Notifications associated with it. The  
201 Printer MUST send additional Event Notifications as Events occur if and only if the value of the  
202 "notify-no-wait" attribute is 'false' or not supplied by the client (see the next attribute below).

203

204 Note: this attribute allows a subscribing client to pick URLs that are unique, e.g. the client's own  
205 URL or a friend's URL, which in both cases is likely the URL of the person's host. An application  
206 could make a URL unique for each application.

207

208 "notify-no-wait" (boolean):

209 The client MAY supply this attribute. The Printer object MUST support this attribute. If the value  
210 of this attribute is 'false', the Printer MUST send all un-expired Event Notifications (as defined in the  
211 previous attribute) and it MUST continue to send responses for as long as the Subscription Objects  
212 associated with the specified "notify-recipient-uri" continue to exist. If the value of this attribute is  
213 'true', the Printer MUST send all un-expired Event Notifications (as defined in the previous attribute)  
214 and the Printer MUST conclude the operation without waiting for any additional Events to occur. If  
215 the client doesn't supply this attribute, the Printer MUST behave as if the client had supplied this  
216 attribute with the value of 'false'.



## 217 5.2 Get-Notifications Response

218 The following groups of attributes are part of the Get-Notifications Response:

219 Group 1: Operation Attributes

220 Status Message:

221 In addition to the REQUIRED status code returned in every response, the response OPTIONALLY  
222 includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation  
223 attribute as described in [RFC2911] sections 13 and 3.1.6.

224

225 The Printer can return any status codes defined in [RFC2911]. If the status code is not 'successful-',  
226 the Printer MUST NOT return any Event Notification Attribute groups. The following is a  
227 description of the important status codes:

228

229 **successful-ok:** the response contains all Event Notification associated with the specified  
230 "notify-recipient-uri". If the specified Subscription Objects have no associated Event  
231 Notification, the response MUST contain zero Event Notifications.

232 **client-error-not-found:** The Printer has no Subscription Object's whose "notify-recipient-uri"  
233 attribute equals the "notify-recipient-uri" Operation attribute.

234 **server-error-busy:** The Printer is too busy to accept this operation. If the "suggested-ask-  
235 again-time-interval" operation attribute is present in the Operation Attributes of the  
236 response, then the Notification Recipient SHOULD wait for the number of seconds  
237 specified by the "suggested-ask-again-time-interval" attribute before performing this  
238 operation again. If the "suggested-ask-again-time-interval" Operation Attribute is not  
239 present, the Notification Recipient should use the normal network back-off algorithms for  
240 determining when to perform this operation again.

241 **redirection-other-site:** The Printer does not handle this operation and requests the  
242 Notification Recipient to perform the operation with the uri specified by the "notify-ippget-  
243 redirect" Operation Attribute in the response.

244

245 Natural Language and Character Set:

246 The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]  
247 section 3.1.4.2.

248

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

251

252 Normally, there is only one matched Subscription Object, or the value of the "notify-charset" and  
253 "notify-natural-language" attributes is the same in all Subscription Objects. If not, the Printer MUST  
254 pick one Subscription Object from which to obtain the value of these attributes. The algorithm for  
255 picking the Subscription Object is implementation dependent. The choice of natural language is not  
256 critical because 'text' and 'name' values can override the "attributes-natural-language" Operation

257 attribute. The Printer's choice of charset is critical because a bad choice may leave it unable to send  
258 some 'text' and 'name' values accurately.

259

260 "printer-up-time" (integer(0:MAX)):

261 The value of this attribute is the Printer's "printer-up-time" attribute at the time the Printer sends this  
262 response. Because each Event Notification also contains the value of this attribute when the event  
263 occurred, the value of this attribute lets a Notification Recipient know when each Event Notification  
264 occurred relative to the time of this response.

265

266 "suggested-ask-again-time-interval" (integer(0:MAX)):

267 The value of this attribute is the number of seconds that the Notification Recipient SHOULD wait  
268 before trying this operation again when

- 269 a) the Printer returns the 'server-error-busy' status code OR  
270 b) the Printer returns the 'successful-ok' status code and the client supplied the "notify-no-  
271 wait" attribute with a value of 'true'.

272 This value is intended to help the client be a good network citizen.

273

274 "notify-ippget-redirect" (uri):

275 The value of this attribute is uri that the Notification Recipient MUST use for the Get-Notifications  
276 operation. This attribute is present in the Operation Attributes if and only if the status code has the  
277 value 'redirection-other-site'.

278

279 Group 2: Unsupported Attributes

280 See [RFC2911] section 3.1.7 for details on returning Unsupported Attributes.

281

282 If the "subscription-ids" attribute contained subscription-ids that do not exist, the Printer returns them  
283 in this group as value of the "subscription-ids" attribute.

284

285 Group 3 through N: Event Notification Attributes

286 The Printer responds with one Event Notification Attributes Group per matched Event Notification.  
287 The initial matched Event Notifications are all un-expired Event Notification associated with the  
288 matched Subscription Objects. If the Notification Recipient has selected the option to wait for  
289 additional Event Notifications, the Printer the subsequent Event Notifications in the response are  
290 Event Notifications associated with the matched Subscription Objects as the corresponding Event  
291 occurs.

292

293 From the Notification Recipient's view, the response appears as an initial burst of data, which  
294 includes the Operation Attributes Group and one Event Notification Attributes Groups per Event  
295 Notification that the Printer is holding. After the initial burst of data, if the Notification Recipient has  
296 selected the option to wait for additional Event Notifications, the Notification Recipient receives  
297 occasional Event Notification Attribute Groups. Proxy servers may delay some Event Notifications

298 or cause time-outs to occur. The client MUST be prepared to perform the Get-Notifications  
 299 operation again when time-outs occur.

300  
 301 Each Event Notification Group MUST start with an 'event-notification-attributes-tag' (see the  
 302 section "Encodings of Additional Attribute Tags" in [ipp-ntfy]).

303  
 304 Each attribute is encoded using the IPP rules for encoding attributes [RFC2910] and may be  
 305 encoded in any order. Note: the Get-Jobs response in [RFC2911] acts as a model for encoding  
 306 multiple groups of attributes.

307  
 308 Each Event Notification Group MUST contain all of attributes specified in section 9.1 ("Content of  
 309 Machine Consumable Event Notifications") of [ipp-ntfy] with exceptions denoted by asterisks in the  
 310 tables below.

311  
 312 The tables below are copies of the tables in section 9.1 ("Content of Machine Consumable Event  
 313 Notifications") of [ipp-ntfy] except that each cell in the "Sends" column is a "MUST".

314  
 315 For an Event Notification for all Events, the Printer includes the attributes shown in Table 2.

316 **Table 2 – 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)	MUST	Event Notification
attributes from the "notify-attributes" attribute	MUST ***	Printer
attributes from the "notify-attributes" attribute	MUST ***	Job
attributes from the "notify-attributes" attribute	MUST ***	Subscription

317  
 318 \* The Printer MUST send the "printer-current-time" attribute if and only if it supports the "printer-  
 319 current-time" attribute on the Printer object.

320  
 321 \*\* If the associated Subscription Object does not contain a "notify-user-data" attribute, the Printer  
 322 MUST send an octet-string of length 0.

323

324 \*\*\* If the “notify-attributes” attribute is present on the Subscription Object, the Printer MUST send  
 325 all attributes specified by the “notify-attributes” attribute. Note: if the Printer doesn’t support the  
 326 “notify-attributes” attribute, it is not present on the associated Subscription Object.  
 327

328 For Event Notifications for Job Events, the Printer includes the additional attributes shown in Table  
 329 3.

330 **Table 3 – 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

331  
 332 \* The Printer MUST send the “job-impressions-completed” attribute in an Event Notification only  
 333 for the combinations of Events and Subscribed Events shown in Table 4.  
 334

335 **Table 4 – 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’

336  
 337  
 338 For Event Notification for Printer Events, the Printer includes the additional attributes shown in Table  
 339 5.

340 **Table 5 – 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

## 341 6 Subscription Template Attributes

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

## 343 **6.1 Subscription Template Attribute Conformance**

344 The 'ippget' Delivery Method has the same conformance requirements for Subscription Template attributes as  
345 defined in [ipp-ntfy]. The 'ippget' Delivery Method does not define any addition Subscription Template  
346 attributes.

## 347 **6.2 Additional Information about Subscription Template Attributes**

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

### 349 **6.2.1 notify-recipient-uri (uri)**

350 This section describes the syntax of the value of this attribute for the 'ippget' Delivery Method. The syntax for  
351 values of this attribute for other Delivery Method is defined in other Delivery Method Documents.

352 In order to support the 'ippget' Delivery Method and Protocol, the Printer MUST support the following  
353 syntax:

354 The 'ippget://' URI scheme. The remainder of the URI indicates something unique about the Notification  
355 Recipient, such as its host name or host address (and optional path) that the Printer uses to match the  
356 "notify-recipient-uri" Operation attribute supplied in the Get-Notifications request. See section 9 for a  
357 complete definition of the syntax of the IPPGET URL.

## 358 **6.3 Subscription Description Attribute Conformance**

359 The 'ippget' Delivery Method has the same conformance requirements for Subscription Description attributes  
360 as defined in [ipp-ntfy]. The 'ippget' Delivery Method does not define any addition Subscription Description  
361 attributes.

## 362 **7 Additional Printer Description Attributes**

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

### 364 **7.1 Printer Description Attribute Conformance**

365 The 'ippget' Delivery Method has the same conformance requirements for Printer Description attributes as  
366 defined in [ipp-ntfy]. The 'ippget' Delivery Method does not define any addition Printer Description  
367 attributes.

## 368 7.2 New Values for Existing Printer Description Attributes

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

### 370 7.2.1 notify-schemes-supported (1setOf uriScheme)

371 The following value for the "notify-schemes-supported" attribute is added in order to support the new Delivery  
372 Method defined in this document:

373 'ippget' - The IPP Notification Delivery Method defined in this document.

### 374 7.2.2 operations-supported (1setOf type2 enum)

375 Table 6 lists the "operation-id" value defined in order to support the new Get-Notifications operation defined  
376 in this document.

377 **Table 6 – Operation-id assignments**

Value	Operation Name
0x001C	Get-Notifications

378

## 379 7.3 begin-to-expire-time-interval (integer(0:MAX))

380 This Printer Description attribute specifies the number of seconds that a Printer keeps an Event Notification  
381 that is associated with the 'ippget' Delivery Method.

382 The Printer MUST support this attribute if it supports the 'ippget' Delivery Method.

383 The value of this attribute is the minimum number of seconds that MUST elapse between the time the Printer  
384 creates an Event Notification object for the 'ippget' Delivery Method and the time the Printer discards the  
385 same Event Notification.

386 For example, assume the following:

- 387 1. a client performs a Job Creation operation that creates a Subscription Object associated with this  
388 Delivery Method, AND
- 389 2. an Event associated with the new Job occurs immediately after the Subscription Object is created,  
390 AND
- 391 3. the same client or some other client performs a Get-Notifications operation N seconds after the Job  
392 Creation operation.

393 Then, if N is less than the value of this attribute, the client performing the Get-Notifications operations can  
394 expect not to miss any Event-Notifications, barring some unforeseen lack of memory space in the Printer.

## 395 **8 New Status Codes**

396 The following status codes are defined as extensions for this Delivery Method and are returned as the status  
397 code of the Get-Notifications operation.

### 398 **8.1 redirection-other-site (0x300)**

399 This status code means that the Printer doesn't perform that Get-Notifications operation and that the "notify-  
400 ippget-redirect" Operation Attribute in the response contains the uri that the Notification Recipient MUST use  
401 for performing the Get-Notifications operation.

## 402 **9 The IPPGET URL Scheme**

403 This section defines the 'ippget' URL and the conformance requirements for using it.

### 404 **9.1 The IPPGET URL Scheme Applicability and Intended Usage**

405 This section is intended for use in registering the 'ippget' URL scheme with IANA and fully conforms to the  
406 requirements in [RFC2717]. This document defines the 'ippget' URL (Uniform Resource Locator) scheme  
407 for specifying a unique identifier for an IPP Client which implements the IPP Get-Notifications operation  
408 specified in this document (see section 5).

409 The intended usage of the 'ippget' URL scheme is COMMON.

### 410 **9.2 The IPPGET URL Scheme Associated Port**

411 None.

412 An 'ippget' URL behaves as a unique identifier for IPP Clients and is NOT used to initiate any over-the-wire  
413 protocol associations.

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

### 415 9.3 The IPPGET URL Scheme Associated MIME Type

416 All IPP Get-Notifications operations (requests and responses) MUST be conveyed in an 'application/ipp'  
417 MIME media type as registered in [IANA-MIMEREG]. An 'ippget' URL MUST uniquely identify an IPP  
418 Client that support this 'application/ipp' MIME media type.

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

### 420 9.4 The IPPGET URL Scheme Character Encoding

421 The 'ippget' URL scheme defined in this document is based on the ABNF for the URI Generic Syntax  
422 [RFC2396] and further updated by [RFC2732] and [RFC2373] (for IPv6 addresses in URLs). The 'ippget'  
423 URL scheme is case-insensitive in the scheme and 'authority' part; however, the 'abs\_path' part is case-  
424 sensitive, as in [RFC2396]. Code points outside [US-ASCII] MUST be hex escaped by the mechanism  
425 specified in [RFC2396].

### 426 9.5 The IPPGET URL Scheme Syntax in ABNF

427 This document is intended for use in registering the 'ippget' URL scheme with IANA and fully conforms to the  
428 requirements in [RFC2717]. This document defines the 'ippget' URL (Uniform Resource Locator) scheme  
429 for specifying a unique identifier for an IPP Client which implements IPP 'Get-Notifications' operation  
430 specified in this document.

431 The intended usage of the 'ippget' URL scheme is COMMON.

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

435 *Note: IPP Clients and IPP Printers ought to be cautious about depending on URI lengths above*  
436 *255 bytes, because some older client or proxy implementations might not properly support these*  
437 *lengths.*

438 An 'ippget' URL MUST be represented in absolute form. Absolute URLs always begin with a scheme name  
439 followed by a colon. For definitive information on URL syntax and semantics, see "Uniform Resource  
440 Identifiers (URI): Generic Syntax and Semantics" [RFC2396]. This specification adopts the definitions of  
441 "authority", "abs\_path", "query", "reg\_name", "server", "userinfo", and "hostport" from [RFC2396], as  
442 updated by [RFC2732] and [RFC2373] (for IPv6 addresses in URLs).

443 The 'ippget' URL scheme syntax in ABNF is as follows:

```
444 ippget_URL = "ippget:" "//" authority [ abs_path [ "?" query ] ]  
445 authority = server | reg_name
```



```

446     reg_name     = 1*( unreserved | escaped | "$" | ", " |
447                       ";" | ":" | "@" | "&" | "=" | "+" )
448     server       = [ [ userinfo "@" ] hostport ]
449     userinfo     = *( unreserved | escaped |
450                       ";" | ":" | "&" | "=" | "+" | "$" | ", " )
451     hostport     = host [ ":" port ]
452     abs_path     = "/" path_segments
453

```

454 If the port is empty or not given, then no port is assumed. The semantics are that the 'ippget' URL is a unique  
 455 identifier for an IPP Client that will retrieve IPP event notifications via the IPP Get-Notifications operation.

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

### 457 9.5.1 IPPGET URL Examples

458 The following are examples of valid 'ippget' URLs for IPP Clients (using DNS host names):

```

459     ippget://abc.com
460     ippget://abc.com/listener
461     ippget://bob@abc.com/listener/1232
462

```

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

464 The IPP Client that creates the Subscription object and the Notification Recipient have to agree on a unique  
 465 IPPGET URL value in order for the Get-Notifications operations to retrieve the proper Event Notifications.  
 466 Therefore, the choice of 'userinfo@hostport' versus the simpler 'hostport' production in an 'ippget' URL may  
 467 be influenced by the intended usage.

468 If a given IPP Client creates an IPP Subscription object for event notifications intended for retrieval by the  
 469 same IPP Client, then the simple 'hostport' production may be most appropriate. In this case, the IPP Client  
 470 and the Notification Recipient both know the 'hostport' of the client.

471 On the other hand, if a given IPP Client creates an IPP Subscription object for event notifications intended for  
 472 retrieval by a *different* IPP Client, then the 'userinfo@hostport' production (using, for example, the right-hand  
 473 side of a 'mailto:' URL, see [RFC2368]) may be most appropriate. For this case, a mail address serves as  
 474 the prior agreement on the IPPGET URL value between the IPP Client and the Notification Recipient.

### 475 9.5.2 IPPGET URL Comparisons

476 When comparing two 'ippget' URLs to decide if they match or not, an IPP Client or IPP Printer  
 477 MUST use the same rules as those defined for HTTP URI comparisons in [RFC2616].

## 478 10 Encoding

479 This notification delivery method uses the IPP transport and encoding [RFC2910] for the Get-Notifications  
480 operation with one extension allocated in [ipp-ntfy]:

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

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

## 483 11 Conformance Requirements

### 484 11.1 Conformance for IPP Printers

485 IPP Printers that conform to this specification:

- 486 1. MUST meet the conformance requirements defined in [ipp-ntfy];
- 487 2. MUST support the Get-Notifications operation defined in section 5;
- 488 3. MUST support the Subscription object attributes as defined in section 6;
- 489 4. MUST support the additional values for IPP/1.1 Printer Description attributes defined in section 7.2;
- 490 5. MUST support the "begin-to-expire-time-interval" Printer Description attribute defined in section 7.3;
- 491 6. MUST support the "redirection-other-site" status code defined 8.1;
- 492 7. SHOULD reject received 'ippget' URLs in 'application/ipp' request bodies (e.g., in the "notify-  
493 recipient-uri" attribute in a Get-Notifications request) that do not conform to the ABNF for 'ippget'  
494 URLs specified in section 9.5 of this document;
- 495 8. MUST listen for the IPP Get-Notifications operation requests on IANA-assigned well-known port  
496 631, unless explicitly configured by system administrators or site policies;
- 497 9. SHOULD NOT listen for IPP Get-Notifications operation requests on any other port, unless explicitly  
498 configured by system administrators or site policies.

### 499 11.2 Conformance for IPP Clients

500 IPP Clients that conform to this specification:

- 501 1. MUST create unambiguously unique 'ippget' URLs in all cases;
- 502 2. MUST send 'ippget' URLs (e.g., in the "notify-recipient-uri" attribute in a Get-Notifications request)
- 503 that conform to the ABNF specified in section 9.5 of this document;
- 504 3. MUST send IPP Get-Notifications operation requests via the port specified in the associated 'ipp'
- 505 URL (if present) or otherwise via IANA assigned well-known port 631;
- 506 4. MUST convert the associated 'ipp' URLs for use in IPP Get-Notifications operation to their
- 507 corresponding 'http' URL forms for use in the HTTP layer according to the rules in section 5 "IPP
- 508 URL Scheme" in [RFC2910].
- 509 Note: The use of ambiguous 'ippget' URLs is NOT an optional feature for IPP Clients; it is a non-conformant
- 510 implementation error.

## 511 12 IANA Considerations

512 IANA is requested to register the 'ippget' URL scheme as defined in section 9 according to the procedures of

513 [RFC2717].

514 The rest of this section contains the exact information for additional IPP entities for IANA to add to the IPP

515 Registries according to the procedures defined in RFC 2911 [RFC2911] section 6.

516 *Note to RFC Editors: Replace RFC NNNN below with the RFC number for this document, so that*

517 *it accurately reflects the content of the information for the IANA Registry.*

### 518 12.1 Operation Registrations

519 The operations defined in this document will be published by IANA according to the procedures in RFC 2911

520 [RFC2911] section 6.4 with the following path:

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

522 The registry entry will contain the following information:

523 Operations:	Ref.	Section:
524 Get-Notifications operation	RFC NNNN	5
525		

## 526 12.2 Additional values of existing attributes

### 527 12.2.1 Additional values for the "notify-schemes-supported" Printer attribute

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

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

531 The registry entry will contain the following information:

532		Ref.	Section:
533	ippget	<a href="#">RFC NNNN</a>	7.2.1

### 534 12.2.2 Additional values for the "operations-supported" Printer attribute

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

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

538 The registry entry will contain the following information:

539		Value	Ref.	Section:
540	Get-Notifications	<a href="#">0x001C</a>	<a href="#">RFC NNNN</a>	7.2.2

## 541 12.3 Attribute Registrations

542 The attributes defined in this document will be published by IANA according to the procedures in RFC 2911  
543 [RFC2911] section 6.2 with the following path:

544 ftp.isi.edu/iana/assignments/ipp/attributes/

545 The registry entry will contain the following information:

546	Printer Description attributes:	Ref.	Section:
547	begin-to-expire-time-interval (integer(0:MAX))	<a href="#">RFC NNNN</a>	7.3

## 548 12.4 Status code Registrations

549 The status codes defined in this document will be published by IANA according to the procedures in RFC  
550 2911 [RFC2911] section 6.6 with the following path:

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

552 The registry entry will contain the following information:

553	Status codes:	Ref.	Section:
554	redirection-other-site (0x300)	RFC NNNN	8.1
555			

## 556 13 Internationalization Considerations

557 The IPP Printer MUST localize the "notify-text" attribute as specified in section 14 of [ipp-ntfy].

558 In addition, when the client receives the Get-Notifications response, it is expected to localize the attributes that  
559 have the 'keyword' attribute syntax according to the charset and natural language requested in the Get-  
560 Notifications request.

## 561 14 Security Considerations

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

567 Unlike other Event Notification delivery methods in which the IPP Printer initiates the Event Notification, with  
568 the method defined in this document, the Notification Recipient is the client who s the Get-Notifications  
569 operation. Therefore, there is no chance of "spam" notifications with this method. Furthermore, such a client  
570 can close down the HTTP channel at any time, and so can avoid future unwanted Event Notifications at any  
571 time.

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656 **17 Description of Base IPP documents**

657



657 The base set of IPP documents includes:

658 Design Goals for an Internet Printing Protocol [RFC2567]

659 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]

660 Internet Printing Protocol/1.1: Model and Semantics [RFC2911]

661 Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]

662 Internet Printing Protocol/1.1: Implementer’s Guide [ipp-iiig]

663 Mapping between LPD and IPP Protocols [RFC2569]

664 Internet Printing Protocol (IPP): IPP Event Notification Specification [ipp-ntfy]

665

666 The “Design Goals for an Internet Printing Protocol” document takes a broad look at distributed printing  
667 functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in a  
668 printing protocol for the Internet. It identifies requirements for three types of users: end users, operators, and  
669 administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A few OPTIONAL  
670 operator operations have been added to IPP/1.1.

671 The “Rationale for the Structure and Model and Protocol for the Internet Printing Protocol” document  
672 describes IPP from a high level view, defines a roadmap for the various documents that form the suite of IPP  
673 specification documents, and gives background and rationale for the IETF working group’s major decisions.

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

678 The “Internet Printing Protocol/1.1: Encoding and Transport” document is a formal mapping of the abstract  
679 operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding  
680 rules for a new Internet MIME media type called “application/ipp”. This document also defines the rules for  
681 transporting over HTTP a message body whose Content-Type is “application/ipp”. This document defines the  
682 ‘ippget’ scheme for identifying IPP printers and jobs.

683 The “Internet Printing Protocol/1.1: Implementer’s Guide” document gives insight and advice to implementers  
684 of IPP clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the considerations  
685 that may assist them in the design of their client and/or IPP object implementations. For example, a typical  
686 order of processing requests is given, including error checking. Motivation for some of the specification  
687 decisions is also included.

688 The “Mapping between LPD and IPP Protocols” document gives some advice to implementers of gateways  
689 between IPP and LPD (Line Printer Daemon) implementations.

690 The “IPP Event Notification Specification” document defines an extension to IPP/1.0 [RFC2566, RFC2565]  
691 and IPP/1.1 [RFC2911, RFC2910]. This extension allows a client to subscribe to printing related Events and  
692 defines the semantics for delivering asynchronous *Event Notifications* to the specified *Notification Recipient*  
693 via a specified *Delivery Method* (i.e., protocols) defined in (separate) Delivery Method documents.

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