1 INTERNET-DRAFT   Robert Herriot (editor)
2 <draft-ietf-ipp-notify-get-032.txt>   Xerox Corp.
3 [Target category: standards track]   Carl Kugler
4   IBM, Corp.
5   Harry Lewis
6   IBM, Corp.
7   April 5February 28, 2001

8   Internet Printing Protocol (IPP):
9   **The 'ippget' Delivery Method for Event Notifications**
10
11
12

Status of this Memo:

Abstract

23   The notification extension document [ipp-ntfy] defines operations that a client can perform in order to create
24   *Subscription Objects* in a Printer and carry out other operations on them. A Subscription Object represents a
25   Subscription abstraction. The Subscription Object specifies that when one of the specified *Events* occurs, the
26   Printer sends an asynchronous *Event Notification* to the specified *Notification Recipient* via the specified
27   *Delivery Method* (i.e., protocol).

28   The notification extension document [ipp-ntfy] specifies that each Delivery Method is defined in another
29   document. This document describes an extension to the Internet Printing Protocol/1.0 (IPP) [RFC2566,
30   RFC2565] and IPP/1.1 [RFC2911, RFC2910]. This document is one such document, and it specifies the
31   'ippget' dDelivery mMethod for use with the IPP Event Notification Specification [ipp-ntfy].

32   The 'ippget' Delivery Method is a 'pull and push' Delivery Method. That is, when an Event occurs, the Printer
33   saves the Event Notification for a period of time called the *Event Notification Lease Time*. and expects
34   tThe Notification Recipient to fetches (pulls) the Event Notifications (the pull part)using the Get-Notifications
35   operation. If the Notification Recipient has selected the option to wait for additional Event Notifications, Tthe
36   Printer continues to send return (push) Event Notifications to the Notification Recipient as Get-Notification

37   responses as Events occur (the push part) if the client has selected the option to wait for additional Event
38   Notifications.

39   When a Printer supports this Delivery Method, it holds each Event Notification for an amount of time, called
40   the *Event Notification Lease Time.*

41   When a Notification Recipient wants to receive Event Notifications, it performs an IPP operation called 'Get
42   Notifications', which this document defines. This operation causes the Printer to return all Event Notifications
43   held for the Notification Recipient. If the Notification Recipient has selected the option to wait for additional
44   Event Notifications, the Printer continues sending Event Notifications to the Notification Recipient as additional
45   Events occur.

46   The basic set of IPP documents includes:

47   Design Goals for an Internet Printing Protocol [RFC2567]
48   Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
49   Internet Printing Protocol/1.1: Model and Semantics [RFC2911]
50   Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]
51   Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]
52   Mapping between LPD and IPP Protocols [RFC2569]
53   Internet Printing Protocol/1.0 & 1.1: IPP Event Notification Specification [ipp-ntfy]
54
55   The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing
56   functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in a
57   printing protocol for the Internet. It identifies requirements for three types of users: end users, operators, and
58   administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A few OPTIONAL
59   operator operations have been added to IPP/1.1.

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

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

67   The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract
68   operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding
69   rules for a new Internet MIME media type called "application/ipp". This document also defines the rules for
70   transporting over HTTP a message body whose Content-Type is "application/ipp". This document defines a
71   new scheme named 'ippget' for identifying IPP printers and jobs.

72   The "Internet Printing Protocol/1.1: Implementer's Guide" document gives insight and advice to implementers
73   of IPP clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the considerations

74   that may assist them in the design of their client and/or IPP object implementations. For example, a typical
75   order of processing requests is given, including error checking. Motivation for some of the specification
76   decisions is also included.

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

79   The "Event Notification Specification" document describes an extension to the IPP/1.0, IPP/1.1, and future
80   versions. This extension allows a client to subscribe to printing related Events. Subscriptions are modeled as
81   *Subscription Objects*. The Subscription Object specifies that when one of the specified *Event* occurs, the
82   Printer sends an asynchronous *Event Notification* to the specified *Notification Recipient* via the specified
83   *Delivery Method* (i.e., protocol). A client associates Subscription Objects with a particular Job by
84   performing the Create-Job-Subscriptions operation or by submitting a Job with subscription information. A
85   client associates Subscription Objects with the Printer by performing a Create-Printer-Subscriptions
86   operation. Four other operations are defined for Subscription Objects: Get-Subscriptions-Attributes, Get-
87   Subscriptions, Renew-Subscription, and Cancel Subscription.

88
89   **Table of Contents**

136   **Table of Tables**

1 Introduction

145

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

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

160 The 'ippget' Delivery Method is a 'pull and push' Delivery Method. That is, when an Event occurs, the
161 Printer saves the Event Notification for a period of time called the *Event Notification Lease Time*. and
162 expects tThe Notification Recipient to fetches (pulls) the Event Notifications (the pull part) using the Get-
163 Notifications operation. This operation causes the Printer to return all Event Notifications held for the
164 Notification Recipient. If the Notification Recipient has selected the option to wait for additional Event
165 Notifications, Tthe Printer continues to send return (push) Event Notifications to the Notification Recipient as
166 Get-Notification responses as Events occur (the push part) if the client has selected the option to wait for
167 additional Event Notifications.

168 When a Printer supports this Delivery Method, it holds each Event Notification for an amount of time, called
169 the *Event Notification Lease Time*.

170 When a Notification Recipient wants to receive Event Notifications, it performs an IPP operation called 'Get-
171 Notifications', which this document defines. This operation causes the Printer to return all Event Notifications
172 held for the Notification Recipient. If the Notification Recipient has selected the option to wait for additional
173 Event Notifications, the Printer the Printer continues to send Event Notifications to the Notification Recipient
174 as Events occur.

2 Terminology

175

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

177 Capitalized terms, such as **MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY,**
178 **NEED NOT,** and **OPTIONAL**, have special meaning relating to conformance to this specification. These

179   terms are defined in [RFC2911 section 13.1 on conformance terminology, most of which is taken from RFC
180   2119 [RFC2119].

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

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

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

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

3   Model and Operation

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

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

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

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

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

213 # 4 General Information

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

215   **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

216

5 Get-Notifications operation

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

219 A Printer MUST support this operation.

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

221   1. Whose associated Subscription Object's "notify-recipient-uri" attribute equals the "notify-recipient-
222   uri" Operation attribute AND

223   2. Whose associated Subscription Object's "notify-recipient-uri" attribute has a scheme value of 'ippget'
224   AND

225   3. Whose Event Notification Lease Time has not yet expired AND

226   4. Where the Notification Recipient is the owner of or has read-access rights to the associated
227   Subscription Object.

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

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

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

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

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

5.1   Get-Notifications Request

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

248 Group 1: Operation Attributes

249   Natural Language and Character Set:
250   The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]
251   section 3.1.4.1.
252
253   Target:
254   The "printer-uri" (uri) operation attribute which is the target for this operation as described in
255   [RFC2911] section 3.1.5.
256
257   Requesting User Name:
258   The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
259   described in [RFC2911] section 8.3.
260
261   "notify-recipient-uri" (url):
262   The client MUST supply this attribute. The Printer object MUST support this attribute. The Printer
263   matches the value of this attribute (byte for byte with no case conversion) against the value of the
264   "notify-recipient-uri" in each Subscription Object in the Printer. If there are no matches, the IPP
265   Printer MUST return the 'client-error-not-found' status code. For each matched Subscription
266   Object, the IPP Printer MUST return all unexpired Event Notifications associated with it. The
267   Printer MUST send additional Event Notifications as Events occur if and only if the value of the
268   "notify-no-wait" attribute is 'false' or not supplied by the client (see the next attribute below).
269
270   Note: this attribute allows a subscribing client to pick URLs that are unique, e.g. the client's own
271   URL or a friend's URL, which in both cases is likely the URL of the person's host. An application
272   could make a URL unique for each application.
273
274   "notify-no-wait" (boolean):
275   The client MAY supply this attribute. The Printer object MUST support this attribute. If the value
276   of this attribute is 'false', the Printer MUST send all un-expired Event Notifications (as defined in the
277   previous attribute) and it MUST continue to send responses for as long as the Subscription Objects
278   associated with the specified "notify-recipient-uri" continue to exist. If the value of this attribute is
279   'true', the Printer MUST send all un-expired Event Notifications (as defined in the previous attribute)
280   and the Printer MUST conclude the operation without waiting for any additional Events to occur. If
281   the client doesn't supply this attribute, the Printer MUST behave as if the client had supplied this
282   attribute with the value of 'false'.

5.2   Get-Notifications Response

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

Group 1: Operation Attributes

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

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

   successful-ok: the response contains all Event Notification associated with the specified
      "notify-recipient-uri". If the specified Subscription Objects have no associated Event
      Notification, the response MUST contain zero Event Notifications.
   client-error-not-found: The Printer has no Subscription Object's whose "notify-recipient-uri"
      attribute equals the "notify-recipient-uri" Operation attribute.
   server-error-busy: The Printer is too busy to accept this operation. If the "suggested-ask-
      again-time-interval" operation attribute is present in the Operation Attributes of the
      response, then the Notification Recipient SHOULD wait for the number of seconds
      specified by the "suggested-ask-again-time-interval" attribute before performing this
      operation again. If the "suggested-ask-again-time-interval" Operation Attribute is not
      present, the Notification Recipient should use the normal network back-off algorithms for
      determining when to perform this operation again.
   redirection-other-site: The Printer does not handle this operation and requests the
      Notification Recipient to perform the operation with the uri specified by the "notify-ippget-
      redirect" Operation Attribute in the response.

Natural Language and Character Set:
   The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]
   section 3.1.4.2.

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

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

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

326   "printer-up-time" (integer(0:MAX)):
327   The value of this attribute is the Printer's "printer-up-time" attribute at the time the Printer sends this
328   response. Because each Event Notification also contains the value of this attribute when the event
329   occurred, the value of this attribute lets a Notification Recipient know when each Event Notification
330   occurred relative to the time of this response.

332   "suggested-ask-again-time-interval" (integer(0:MAX)):
333   The value of this attribute is the number of seconds that the Notification Recipient SHOULD wait
334   before trying this operation again when
335   a) the Printer returns the 'server-error-busy' status code OR
336   b) the Printer returns the 'successful-ok' status code and the client supplied the "notify-no-
337   wait" attribute with a value of 'true'.
338   This value is intended to help the client be a good network citizen.

340   "notify-ippget-redirect" (uri):
341   The value of this attribute is uri that the Notification Recipient MUST use for the Get-Notifications
342   operation. This attribute is present in the Operation Attributes if and only if the status code has the
343   value 'redirection-other-site'.

345   Group 2: Unsupported Attributes

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

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

351   Group 3 through N: Event Notification Attributes

352   The Printer responds with one Event Notification Attributes Group per matched Event Notification.
353   The initial matched Event Notifications are all un-expired Event Notification associated with the
354   matched Subscription Objects. If the Notification Recipient has selected the option to wait for
355   additional Event Notifications, the Printer the subsequent Event Notifications in the response are
356   Event Notifications associated with the matched Subscription Objects as the corresponding Event
357   occurs.

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

364 or cause time-outs to occur. The client MUST be prepared to perform the Get-Notifications
365 operation again when time-outs occur.
366
367 Each Event Notification Group MUST start with an 'event-notification-attributes-tag' (see the
368 section "Encodings of Additional Attribute Tags" in [ipp-ntfy]).
369
370 Each attribute is encoded using the IPP rules for encoding attributes [RFC2910] and may be
371 encoded in any order. Note: the Get-Jobs response in [RFC2911] acts as a model for encoding
372 multiple groups of attributes.
373
374 Each Event Notification Group MUST contain all of attributes specified in section 9.1 ("Content of
375 Machine Consumable Event Notifications") of [ipp-ntfy] with exceptions denoted by asterisks in the
376 tables below.
377
378 The tables below are copies of the tables in section 9.1 ("Content of Machine Consumable Event
379 Notifications") of [ipp-ntfy] except that each cell in the "Sends" column is a "MUST".
380
381 For an Event Notification for all Events, the Printer includes the attributes shown in Table 2.

382 **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

383
384 * The Printer MUST send the "printer-current-time" attribute if and only if it supports the "printer-
385 current-time" attribute on the Printer object.
386
387 ** If the associated Subscription Object does not contain a "notify-user-data" attribute, the Printer
388 MUST send an octet-string of length 0.
389

390   *** If the "notify-attributes" attribute is present on the Subscription Object, the Printer MUST send
391   all attributes specified by the "notify-attributes" attribute. Note: if the Printer doesn't support the
392   "notify-attributes" attribute, it is not present on the associated Subscription Object.
393
394   For Event Notifications for Job Events, the Printer includes the additional attributes shown in Table
395   3.

396   **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

397

398   * The Printer MUST send the "job-impressions-completed" attribute in an Event Notification only
399   for the combinations of Events and Subscribed Events shown in Table 4.
400

401   **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'

402
403
404   For Event Notification for Printer Events, the Printer includes the additional attributes shown in Table
405   5.

406   **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

6 Subscription Template Attributes

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

409   6.1   Subscription Template Attribute Conformance

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

413   6.2   Additional Information about Subscription Template Attributes

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

415   6.2.1   notify-recipient-uri (uri)

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

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

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

424   6.3   Subscription Description Attribute Conformance

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

428   7   Additional Printer Description Attributes

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

430   7.1   Printer Description Attribute Conformance

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

434 ## 7.2   New Values for Existing Printer Description Attributes

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

436 ### 7.2.1   notify-schemes-supported (1setOf uriScheme)

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

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

440 ### 7.2.2   operations-supported (1setOf type2 enum)

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

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

Value	Operation Name
0x001C	Get-Notifications

444

445 ## 7.3   begin-to-expire-time-interval (integer(0:MAX))

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

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

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

452 For example, assume the following:

453   1. a client performs a Job Creation operation that creates a Subscription Object associated with this
454   Delivery Method, AND

455   2. an Event associated with the new Job occurs immediately after the Subscription Object is created,
456   AND

457   3. the same client or some other client performs a Get-Notifications operation N seconds after the Job
458   Creation operation.

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

461 # 8   New Status Codes

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

464 ## 8.1   redirection-other-site (0x300)

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

468 # 9   The IPPGET URL Scheme

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

470 ## 9.1   The IPPGET URL Scheme Applicability and Intended Usage

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

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

476 ## 9.2   The IPPGET URL Scheme Associated Port

477 None.

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

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

9.3   The IPPGET URL Scheme Associated MIME Type

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

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

9.4   The IPPGET URL Scheme Character Encoding

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

9.5   The IPPGET URL Scheme Syntax in ABNF

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

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

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

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

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

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

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

```
512        reg_name   = 1*( unreserved | escaped | "$" | "," |
513                        ";" | ":" | "@" | "&" | "=" | "+" )
514        server     = [ [ userinfo "@" ] hostport ]
515        userinfo   = *( unreserved | escaped |
516                        ";" | ":" | "&" | "=" | "+" | "$" | "," )
517        hostport   = host [ ":" port ]
518        abs_path   = "/"  path_segments
```

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

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

9.5.1   IPPGET URL Examples

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

```
525            ippget://abc.com
526            ippget://abc.com/listener
527            ippget://bob@abc.com/listener/1232
```

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

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

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

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

9.5.2   IPPGET URL Comparisons

542   When comparing two 'ippget' URLs to decide if they match or not, an IPP Client or IPP Printer MUST use
543   the same rules as those defined for HTTP URI comparisons in [RFC2616].SHOULD use a case-sensitive
544   octet-by-octet comparison of the entire URLs, with these exceptions:

545   Comparisons of host names MUST be case-insensitive;

546   Comparisons of scheme names MUST be case-insensitive;

547   An empty 'abs_path' is equivalent to an 'abs_path' of "/".

548   Characters other than those in the "reserved" and "unsafe" sets (see [RFC2396] and [RFC2732]) are
549   equivalent to their ""%" HEX HEX" encoding.

550   For example, the following three URIs are equivalent:

551   ippget://abc.com/~smith/listener

552   ippget://ABC.com/%7Esmith/listener

553   ippget://ABC.com:/%7esmith/listener

10 Encoding

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

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

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

558

11 Conformance Requirements

11.1 Conformance for IPP Printers

561   IPP Printers that conform to this specification:

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

563   2.   MUST support the Get-Notifications operation defined in section 5;

564   3.   MUST support the Subscription object attributes as defined in section 6;

565   4.   MUST support the additional values for IPP/1.1 Printer Description attributes defined in section 7.2;

566   5.   MUST support the "begin-to-expire-time-interval" Printer Description attribute defined in section 7.3;

567   6.   MUST support the "redirection-other-site" status code defined 8.1;

568   7.   SHOULD reject received 'ippget' URLs in 'application/ipp' request bodies (e.g., in the "notify-
569   recipient-uri" attribute in a Get-Notifications request) that do not conform to the ABNF for 'ippget'
570   URLs specified in section 9.5 of this document;

571   8.   MUST listen for the IPP Get-Notifications operation requests on IANA-assigned well-known port
572   631, unless explicitly configured by system administrators or site policies;

573   9.   SHOULD NOT listen for IPP Get-Notifications operation requests on any other port, unless explicitly
574   configured by system administrators or site policies.

575   11.2   Conformance for IPP Clients

576   IPP Clients that conform to this specification:

577   1.   MUST create unambiguously unique 'ippget' URLs in all cases;

578   2.   MUST send 'ippget' URLs (e.g., in the "notify-recipient-uri" attribute in a Get-Notifications request)
579   that conform to the ABNF specified in section 9.5 of this document;

580   3.   MUST send IPP Get-Notifications operation requests via the port specified in the associated 'ipp'
581   URL (if present) or otherwise via IANA assigned well-known port 631;

582   4.   MUST convert the associated 'ipp' URLs for use in IPP Get-Notifications operation to their
583   corresponding 'http' URL forms for use in the HTTP layer according to the rules in section 5 "IPP
584   URL Scheme" in [RFC2910].

585   Note: The use of ambiguous 'ippget' URLs is NOT an optional feature for IPP Clients; it is a non-conformant
586   implementation error.

587   12 IANA Considerations

588   IANA is requested to register the 'ippget' URL scheme as defined in section 9 according to the procedures of
589   [RFC2717].

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

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

594 ## 12.1 Operation Registrations

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

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

598 The registry entry will contain the following information:

599 ```
Operations: Ref.   Section:
```
600  ```
Get-Notifications operation                          RFC NNNN     5
```
601

602 ## 12.2 Additional values of existing attributes

603 ### 12.2.1 Additional values for the "notify-schemes-supported" Printer attribute

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

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

607 The registry entry will contain the following information:

608 ```
                                                      Ref.   Section:
```
609  ```
ippget                                               RFC NNNN    7.2.1
```

610 ### 12.2.2 Additional values for the "operations-supported" Printer attribute

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

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

614 The registry entry will contain the following information:

615 ```
                                          Value   Ref.   Section:
```
616  ```
Get-Notifications                         0x001C     RFC NNNN    7.2.2
```

617 ## 12.3 Attribute Registrations

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

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

621   The registry entry will contain the following information:

```
622    Printer Description attributes:                    Ref.      Section:
623    begin-to-expire-time-interval (integer(0:MAX)) RFC NNNN    7.3
```

12.4 Status code Registrations

625   The status codes defined in this document will be published by IANA according to the procedures in RFC
626   2911 [RFC2911] section 6.6 with the following path:

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

628   The registry entry will contain the following information:

```
629    Status codes:                                      Ref.      Section:
630    redirection-other-site (0x300)                     RFC NNNN    8.1
631
```

13 Internationalization Considerations

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

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

14 Security Considerations

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

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

15 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]

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

[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.

[RFC2119]

S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119 , March 1997

[RFC2368]

P. Hoffman, L. Masinter, J. Zawinski. The "mailto" URL Scheme, RFC 2368, July 1998.

[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.

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

681   [RFC2567]
682   Wright, D., "Design Goals for an Internet Printing Protocol", RFC 2567, April 1999.

683   [RFC2568]
684   Zilles, S., "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol", RFC
685   2568, April 1999.

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

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

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

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

697   [RFC2910]
698   Herriot, R., Butler, S., Moore, P., Tuner, R., "Internet Printing Protocol/1.1: Encoding and Transport",
699   RFC 2910, September 2000.

700   [RFC2911]
701   R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.1: Model and
702   Semantics", RFC 2911, September 2000.

703   16 Authors' Addresses

704
705   Robert Herriot
706   Xerox Corp.
707   3400 Hill View Ave, Building 1
708   Palo Alto, CA 94304
709
710   Phone: 650-813-7696
711   Fax: 650-813-6860

712   e-mail: robert.herriot@pahv.xerox.com
713
714   Carl Kugler
715   IBM
716   P.O. Box 1900
717   Boulder, CO 80301-9191
718
719   Phone:
720   Fax:
721   e-mail: kugler@us.ibm.com
722
723   Harry Lewis
724   IBM
725   P.O. Box 1900
726   Boulder, CO 80301-9191
727
728   Phone: 303-924-5337
729   FAX:
730   e-mail: harryl@us.ibm.com
731

732   # 17 Description of Base IPP documents

733

733   The baseic set of IPP documents includes:

734   Design Goals for an Internet Printing Protocol [RFC2567]
735   Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
736   Internet Printing Protocol/1.1: Model and Semantics [RFC2911]
737   Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]
738   Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]
739   Mapping between LPD and IPP Protocols [RFC2569]
740   Internet Printing Protocol/1.0 & 1.1 (IPP): IPP Event Notification Specification [ipp-ntfy]

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

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

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

754   The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract
755   operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding
756   rules for a new Internet MIME media type called "application/ipp". This document also defines the rules for
757   transporting over HTTP a message body whose Content-Type is "application/ipp". This document defines a
758   new the 'ippget' scheme named 'ippget' for identifying IPP printers and jobs.

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

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

766   The "IPP Event Notification Specification" document describes defines an extension to the IPP/1.0
767   [RFC2566, RFC2565], and IPP/1.1 [RFC2911, RFC2910], and future versions. This extension allows a
768   client to subscribe to printing related Events and defines the semantics for delivering asynchronous *Event
769   Notifications* to the specified *Notification Recipient* via a specified *Delivery Method* (i.e., protocols)
770   defined in (separate) Delivery Method documents. Subscriptions are modeled as *Subscription Objects*. The
771   Subscription Object specifies that when one of the specified *Event* occurs, the Printer sends an asynchronous

772   *Event Notification* to the specified *Notification Recipient* via the specified *Delivery Method* (i.e.,
773   protocol). A client associates Subscription Objects with a particular Job by performing the Create-Job-
774   Subscriptions operation or by submitting a Job with subscription information. A client associates Subscription
775   Objects with the Printer by performing a Create-Printer-Subscriptions operation. Four other operations are
776   defined for Subscription Objects: Get-Subscriptions-Attributes, Get-Subscriptions, Renew-Subscription, and
777   Cancel-Subscription.

18 Full Copyright Statement

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

780   This document and translations of it may be copied and furnished to others, and derivative works that
781   comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and
782   distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and
783   this paragraph are included on all such copies and derivative works. However, this document itself may not
784   be modified in any way, such as by removing the copyright notice or references to the Internet Society or
785   other Internet organizations, except as needed for the purpose of developing Internet standards in which case
786   the procedures for copyrights defined in the Internet Standards process must be followed, or as required to
787   translate it into languages other than English.

788   The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its
789   successors or assigns.

790   This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET
791   SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES,
792   EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE
793   OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED
794   WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

795 **Acknowledgement**
796
797   Funding for the RFC Editor function is currently provided by the Internet Society.