Hugo Parra
Novell, Inc.
Tom Hastings
Xerox Corp.
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Internet Printing Protocol/1.1: **The INDP Event Notification Delivery Method**

Status of this Memo

Abstract

The IPP event notification specification [ipp-ntfy] is an OPTIONAL extension to IPP/1.0 and IPP/1.1. [ipp-ntfy] requires the definition of one or more delivery methods for dispatching event notification reports to Notification Recipients. This document describes the semantics and syntax of the 'indp' event notification delivery method that is itself a request/response protocol. For this delivery method, an IPP Printer sends (pushes) IPP event Notifications to the Notification Recipients using the IPP Notification Delivery Protocol (INDP) defined in [indp].

27   The full set of IPP documents includes:

28   Design Goals for an Internet Printing Protocol [RFC2567]
29   Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
30   Internet Printing Protocol/1.1: Model and Semantics (this document)
31   Internet Printing Protocol/1.1: Encoding and Transport [ipp-pro]
32   Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]
33   Mapping between LPD and IPP Protocols [RFC2569]
34
35   The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing
36   functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in
37   a printing protocol for the Internet. It identifies requirements for three types of users: end users, operators,
38   and administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A few
39   OPTIONAL operator operations have been added to IPP/1.1.

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

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

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

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

55

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1   Introduction

77 IPP Printers that support the OPTIONAL IPP event notification extension [ipp-ntfy] either a) accept, store,
78 and use notification Subscriptions to generate notification reports and implement one or more delivery
79 methods for notifying interested parties, or b) support a subset of these tasks and farm out the remaining
80 tasks to a Notification Delivery Service. Based on INDP, the 'indp' event notification delivery method
81 specified in this document employs a request/response protocol. Its primary intended use is for IPP Printers
82 and Notification Delivery Services to send (push) event notifications to Notification Recipients using the
83 INDP Send-Notifications operation over HTTP.

2   Terminology

85 This document uses terms such as "attributes", "keywords", and "support". These terms have special
86 meaning and are defined in the model terminology [ipp-mod] section 12.2.

87 Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED
88 NOT, and OPTIONAL, have special meaning relating to conformance. These terms are defined in [ipp-
89 mod] section 12.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

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

91   REQUIRED: if an implementation supports the extensions described in this document, it MUST support
92   a REQUIRED feature.
93   OPTIONAL: if an implementation supports the extensions described in this document, it MAY support
94   an OPTIONAL feature.
95   Event Notification (Notification for short) - See [ip-ntfy]
96   Notification Source - See [ipp-ntfy]
97   Notification Recipient - See [ipp-ntfy]
98   Subscription object - See [ipp-ntfy]
99   Ultimate Notification Recipient - See [ipp-ntfy]

3   Model and Operation

101 In the IPP Notification Model [ipp-ntfy], one or more Per-Job Subscriptions can be supplied in the Job
102 Creation operation or OPTIONALLY as subsequent Create-Job-Subscription operations; one Per-Printer
103 Subscription can be supplied in the Create-Printer operation. The client that creates these Subscription
104 objects becomes the owner of the Subscription object.

105 When creating each Subscription object, the client supplies the "notify-recipient" (uri) attribute. The "notify-
106 recipient" attribute specifies both a single Notification Recipient that is to receive the Notifications when
107 subsequent events occur and the method for notification delivery that the IPP Printer is to use. For the
108 Notification delivery method defined in this document, the notification method is 'indp' and the rest of the

109 URI is the address of the Notification Recipient to which the IPP Printer will send the INDP Send-
110 Notifications operation.

111 The 'indp' event notification delivery method defined in this document also employs a client/server protocol.
112 The "client" in this HTTP relationship is the Notification Source described in [ipp-ntfy] while the "server" is
113 the Notification Recipient. The Notification Source invokes the Send-Notifications operation supported
114 INDP to communicate IPP event Notification contents to the Notification Recipient. The Notification
115 Recipient only conveys information to the Notification Source in the form of responses to the operations
116 initiated by the Notification Source.

117 Notification Sources that implement the 'indp' event notification delivery method will need to include an
118 INDP client stack (and hence an HTTP client stack) while notification recipients that implement this delivery
119 method will need to support an INDP server stack (and hence an HTTP server stack). See section 6 for
120 more details.

121 **4   Notification Operations**

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

124 INDP makes extensive use of the operations model defined by IPP [rfc2566]. This includes, the use of a
125 URI as the identifier for the target of each operation, the inclusion of a version number, operation-id, and
126 request-id in each request, and the definition of attribute groups. The Send-Notifications operation uses the
127 Operation Attributes group, but currently has no need for the Unsupported Attributes, Printer Object
128 Attributes, and Job-Object Attributes groups. However, it uses a new attribute group, the Notification
129 Attributes group (see [indp]).

130 **4.1   Send-Notifications Operation**

131 This REQUIRED operation allows a Notification Source to send one or more Notifications to a Notification
132 Recipient using HTTP. The operation has been tailored to accommodate the current definition of IPP
133 Notification [ipp-ntfy].

134 Both Machine-Consumable and Human-Consumable notifications may be sent to a Notification Recipient
135 through this operation.

136 **4.1.1 Send-Notifications Request**

137 The following groups of attributes are part of the Send-Notifications Request:

138 Group 1: Operation Attributes
139 　　　Natural Language and Character Set:
140 　　　　The "attributes-charset" and "attributes-natural-language" attributes ads defined in [rfc 2566]
141 　　　　section 3.1.4.1.

142
143   Target:
144   The URI of the 'indp' Notification Recipient.

145 Group 2 to N: Notification Attributes

146   "human-readable-report" (text)
147   The 'indp' Notification Source OPTIONALLY supports this attribute. This attribute is a text string
148   generated by the IPP printer or Notification Delivery Service from the contents of the IPP
149   Notification suitable for human consumption. If the Notification Source supports this attribute, it
150   MUST supply this attribute if the Subscription object contains the "notify-text-format"
151   (mimeMediaType) attribute. The text value of this attribute MUST be localized in the charset
152   identified by the "notify-charset" (charset) attribute and the natural language identified by the notify-
153   natural-language" (naturalLanguage) attribute supplied in the associated Subscription object that
154   generates this event Notification. The format of the text value is specified by the value of the
155   "notify-text-format" (mimeMediaType) supplied in the associated Subscription object.

156
157   "human-readable-report-format" (mime)
158   This attribute MUST be supplied by the Notification Source whenever the "human-readable-report"
159   attribute is present. It indicates the format, e.g., text/plain, text/html, etc. of the "human-readable-
160   report" attribute.

161
162   All of the REQUIRED attributes and any of the OPTIONAL attributes indicated in [ipp-ntfy] for a Push
163   event Notification, including "notify-text-format-type" (mimeMediaType), if the "human-readable-
164   report" (text) attribute is included, so that the Notification Recipient will know the text format of the
165   "human-readable-report" (text) attribute value.

166   These attributes communicate the same information as the notification attributes by the same name
167   described in sections 7.4, 7.5, and 7.6 of [ipp-ntfy]. The rules that govern when each individual attribute
168   MUST or MAY be included in this operation precisely mirror those specified in [ipp-ntfy].

169 **4.1.2 Send-Notifications Response**

170 The 'indp' Notification Recipient returns a status code for the entire operation and one for each Notification
171 Report in the request if the operation's status code is other than "success-ok". If the 'ipp-notify-send'
172 notification listener receives a Notification report that it can't pair up with a subscription it knows about, it
173 can return an error status-code to indicate that events associated with that subscription should no longer be
174 sent to it.

175 Group 1: Operation Attributes

176   Natural Language and Character Set:
177   The "attributes-charset" and "attributes-natural-language" attributes ads defined in [rfc 2566] section
178   3.1.4.1.
179 Group 2 to N: Notification Attributes

180   "notification-report-status-code" (type2 enum)
181   Indicates whether the 'ipp-notify-send' Notification Recipient was able to consume the n-th
182   Notification Report.

183   **4.2   Notification Protocol URI Scheme**

184   The 'indp' event notification delivery method uses the 'indp://' URI scheme in the "notify-recipients" attribute
185   in the Subscription object in order to indicate the event notification delivery method defined in this
186   document. The remainder of the URI indicates the host and address of the Notification Recipient that is to
187   receive the Send-Notification operation.

188   # 5   Encoding of the Operation Layer

189   The 'indp' event notification delivery method uses the INDP operation layer encoding described in [indp].

190   # 6   Encoding of Transport Layer

191   The 'indp' event notification delivery method uses the INDP transport layer encoding described in [indp].

192   It is REQUIRED that an 'indp' Notification Recipient implementation support HTTP over the IANA
193   assigned Well Known Port XXX (the INDP default port), though a notification recipient implementation
194   MAY support HTTP over some other port as well.

195   # 7   IANA Considerations

196   The 'indp://' URL scheme and the IDNP default fort will be registered with IANA.

197   # 8   Internationalization Considerations

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

202   # 9   Security Considerations

203   The IPP Model and Semantics document [ipp-mod] discusses high level security requirements (Client
204   Authentication, Server Authentication and Operation Privacy). Client Authentication is the mechanism by
205   which the client proves its identity to the server in a secure manner. Server Authentication is the mechanism
206   by which the server proves its identity to the client in a secure manner. Operation Privacy is defined as a
207   mechanism for protecting operations from eavesdropping.

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

211   **9.1   Security Conformance**

212   Notification Sources (client) MAY support Digest Authentication [rfc2617]. If Digest Authentication is
213   supported, then MD5 and MD5-sess MUST be supported, but the Message Integrity feature NEED NOT be
214   supported.

215   Notification Recipient (server) MAY support Digest Authentication [rfc2617]. If Digest Authentication is
216   supported, then MD5 and MD5-sess MUST be supported, but the Message Integrity feature NEED NOT be
217   supported.

218   Notification Recipients MAY support TLS for client authentication, server authentication and operation
219   privacy. If a notification recipient supports TLS, it MUST support the
220   TLS_DHE_DSS_WITH_3DES_EDE_CBC_SHA cipher suite as mandated by RFC 2246 [rfc2246]. All
221   other cipher suites are OPTIONAL. Notification recipients MAY support Basic Authentication (described in
222   HTTP/1.1 [rfc2616]) for client authentication if the channel is secure. TLS with the above mandated cipher
223   suite can provide such a secure channel.

224   # 10 References

225
226   [indp]
227   Parra, H., T. Hastings, "Internet Printing Protocol 1.1/1.0: IPP Notification Delivery Protocol",
228   <draft-ietf-indp-00.txt>, February 29, 2000.

229   [ipp-mod]
230   R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and
231   Semantics", <draft-ietf-ipp-model-v11-04.txt>, June, 1999.

232   [ipp-ntfy]
233   Isaacson, S., Martin, J., deBry, R., Hastings, T., Shepherd, M., Bergman, R., "Internet Printing
234   Protocol/1.1: IPP Event Notification Specification", <draft-ietf-ipp-not-spec-02.txt>, February 2,
235   2000.

236   [ipp-pro]
237   Herriot, R., Butler, S., Moore, P., Tuner, R., "Internet Printing Protocol/1.1: Encoding and
238   Transport", draft-ietf-ipp-protocol-v11-03.txt, June, 1999.

239   [rfc2026]
240   S. Bradner, "The Internet Standards Process -- Revision 3", RFC 2026, October 1996.

241 [rfc2616]
242   R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee, "Hypertext
243   Transfer Protocol - HTTP/1.1", RFC 2616, June 1999.

244 [rfc2617]
245   J. Franks, P. Hallam-Baker, J. Hostetler, S. Lawrence, P. Leach, A. Luotonen, L. Stewart, "HTTP
246   Authentication: Basic and Digest Access Authentication", RFC 2617, June 1999.

11 Author's Addresses

248   Hugo Parra
249   Novell, Inc.
250   1800 South Novell Place
251   Provo, UT   84606
252
253   Phone: 801-861-3307
254   Fax: 801-861-2517
255   e-mail: hparra@novell.com
256
257   Tom Hastings
258   Xerox Corporation
259   737 Hawaii St. ESAE 231
260   El Segundo, CA   90245
261
262   Phone: 310-333-6413
263   Fax: 310-333-5514
264   e-mail: hastings@cp10.es.xerox.com
265

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