1 INTERNET-DRAFT
2 <draft-ietf-ipp-indp-method-01.txt>

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7   May 3, 2000

8   Internet Printing Protocol (IPP):

9   **The INDP Notification Delivery Method**

10

12 Status of this Memo

21 **Abstract**

22 The IPP event notification specification [ipp-ntfy] is an OPTIONAL extension to IPP/1.0, IPP/1.1, and
23 future versions. [ipp-ntfy] requires the definition of one or more delivery methods for dispatching
24 Notifications to Notification Recipients. This document describes the semantics and syntax of the INDP
25 Notification Delivery Method that is itself a request/response protocol. For this delivery method, an IPP
26 Printer sends (pushes) IPP event Notifications to the Notification Recipients using the IPP Notification
27 Delivery Protocol (INDP) defined in [indp]. The Notification Recipient can either be the Ultimate Recipient
28 of the Notification or can be a Notification Service that forwards the Notification to the Ultimate Recipient.

29   The full set of IPP documents includes:

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

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

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

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

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

57

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Expires: Nov 3, 2000

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1   Introduction

79 An IPP Printer that supports the OPTIONAL IPP event notification extension [ipp-ntfy] is called a
80 Notification Source which sends event Notifications to Notification Recipients. As such, a Printer either a)
81 accepts, stores, and uses notification Subscription objects to generate event Notification and implements one
82 or more delivery methods for notifying interested parties, or b) supports a subset of these tasks and farms
83 out the remaining tasks to a Notification Delivery Service. The INDP Notification Delivery Method
84 specified in this document employs a request/response protocol, which is a subset of the IPP Notification
85 Delivery Protocol (INDP), defined in [indp]. A Notification Source may implement the INDP Notification
86 Delivery Method to send (push) event notifications to Notification Recipients using the INDP Send-
87 Notifications operation (see section 4.1) over HTTP.

2   Terminology

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

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

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

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

3   Model and Operation

105 In the IPP Notification Model [ipp-ntfy], a client is able to:

106 1. supply one or more Per-Job Subscriptions in the Job Creation operation

107 2. OPTIONALLY supply Per-Job Subscriptions as subsequent Create-Job-Subscription operations

108 3. Supply one Per-Printer Subscription in the Create-Printer-Subscription operation.

109 The client that creates these Subscription objects becomes the owner of the Subscription object.

110 When creating each Subscription object, the client supplies the "notify-recipient" (uri) attribute. The "notify-
111 recipient" attribute specifies both a single Notification Recipient that is to receive the Notifications when
112 subsequent events occur and the method for notification delivery that the IPP Printer is to use. For the
113 Notification delivery method defined in this document, the notification method is 'indp' and the rest of the
114 URI is the address of the Notification Recipient to which the IPP Printer will send the INDP Send-
115 Notifications operation.

116 The INDP Notification Delivery Method defined in this document also uses a client/server protocol
117 paradigm. The "client" in this HTTP relationship is the Notification Source described in [ipp-ntfy] while the
118 "server" is the Notification Recipient. The Notification Source invokes the Send-Notifications operation
119 supported in INDP to communicate IPP event Notification contents to the Notification Recipient. The
120 Notification Recipient only conveys information to the Notification Source in the form of responses to the
121 operations initiated by the Notification Source.

122 Notification Sources that implement the INDP Notification Delivery Method will need to include an INDP
123 client stack (and hence an HTTP client stack) while notification recipients that implement this delivery
124 method will need to support an INDP server stack (and hence an HTTP server stack). See section 6 for
125 more details.

126 **4   Notification Operations**

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

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

135 **4.1   Send-Notifications Operation**

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

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

141 **4.1.1   Send-Notifications Request**

142 Every operation request contains the following REQUIRED parameters (see [ipp-mod] section 3.1.1):

143   - a "version-number"
144   - an "operation-id"
145   - a "request-id"

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

147   Group 1: Operation Attributes
148   Natural Language and Character Set:
149   The "attributes-charset" and "attributes-natural-language" attributes ads defined in [rfc 2566]
150   section 3.1.4.1.
151
152   Target:
153   The "notification-recipient-uri" (uri) operation attribute which is the target of this operation
154   as described in [ipp-mod] section 3.1.5, i.e., the URI of the 'indp' Notification Recipient.

155   Group 2 to N: Notification Attributes

156   "human-readable-report" (text)
157   The 'indp' Notification Source OPTIONALLY supports this attribute. This attribute is a text string
158   generated by the IPP printer or Notification Delivery Service from the contents of the IPP
159   Notification suitable for human consumption. If the Notification Source supports this attribute, it
160   MUST supply this attribute if the Subscription object contains the "notify-text-format"
161   (mimeMediaType) attribute. The text value of this attribute MUST be localized in the charset
162   identified by the "notify-charset" (charset) attribute and the natural language identified by the notify-
163   natural-language" (naturalLanguage) attribute supplied in the associated Subscription object that
164   generates this event Notification. The format of the text value is specified by the value of the
165   "notify-text-format" (mimeMediaType) supplied in the associated Subscription object.
166
167   "human-readable-report-format" (mime)
168   This attribute MUST be supplied by the Notification Source whenever the "human-readable-report"
169   attribute is present. It indicates the format, e.g., text/plain, text/html, etc. of the "human-readable-
170   report" attribute.
171
172   All of the REQUIRED attributes and any of the OPTIONAL attributes indicated in [ipp-ntfy] for a Push
173   event Notification, including "notify-text-format-type" (mimeMediaType), if the "human-readable-
174   report" (text) attribute is included, so that the Notification Recipient will know the text format of the
175   "human-readable-report" (text) attribute value.

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

179   **4.1.2 Send-Notifications Response**

180   The 'indp' Notification Recipient returns a status code for the entire operation and one for each Notification
181   Report in the request if the operation's status code is other than "successful-ok". If the 'indp' Notification
182   Recipient receives a Notification report that it can't pair up with a Subscription it knows about, it can return

183 a 'client-error-unknown-subscription' error status-code to indicate that events associated with that
184 subscription should no longer be sent to it. Alternatively, the Notification Recipient can return the
185 'successful-ok-but-cancel-subscription' to the Notification Source and cancel a Subscription that is no longer
186 wanted.

187 Every operation response contains the following REQUIRED parameters (see [ipp-mod] section 3.1.1}:

188   -   a "version-number"
189   -   a "status-code"
190   -   the "request-id" that was supplied in the corresponding request
191
192 The status-code can take any of the following standard IPP values (as defined in [ipp-mod]):
193   'successful-ok'
194   'client-error-bad-request'
195   'client-error-not-found'
196   'client-error-request-entity-too-large'
197   'client-error-request-value-too-long'
198   'server-error-version-not-supported'
199   'server-error-temporary-error'
200
201 or one of the following INDP status-code extensions:
202   'successful-ok-partial-notification' (0x0004)
203
204 The 'successful-ok-partial-notification indicates that at least one notification was received and process
205 successfully and that errors were encountered with one or more notifications. If this status code is returned,
206 then Group 2 below MUST be present in the response with one status-code per notification.
207
208 Group 1: Operation Attributes

209   Natural Language and Character Set:
210   The "attributes-charset" and "attributes-natural-language" attributes ads defined in [rfc 2566] section
211   3.1.4.1.
212
213 Group 2 to N: Notification Attributes

214   "notification-report-status-code" (type2 enum)
215   Indicates whether the 'ipp-notify-send' Notification Recipient was able to consume the n-th
216   Notification Report.
217
218   The following standard IPP status codes, defined in [ipp-mod], may be returned:
219
220   'successful-ok'
221   'client-error-not-found'

222 **4.2　Notification Protocol URI Scheme**

223 The INDP Notification Delivery Method uses the 'indp://' URI scheme in the "notify-recipients" attribute in
224 the Subscription object in order to indicate the notification delivery method defined in this document. The
225 remainder of the URI indicates the host and address of the Notification Recipient that is to receive the Send-
226 Notification operation.

227 # 5　Encoding of the Operation Layer

228 The INDP Notification Delivery Method uses the INDP operation layer encoding described in [indp].

229 # 6　Encoding of Transport Layer

230 The INDP Notification Delivery Method uses the INDP transport layer encoding described in [indp].

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

234 # 7　IANA Considerations

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

236 # 8　Internationalization Considerations

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

241 # 9　Security Considerations

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

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

250 **9.1 Security Conformance**

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

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

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

263 # 10 References

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