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# Internet Printing Protocol/1.1: Requirements for IPP Notifications
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ABSTRACT

This document is one of a set of documents which together describe all aspects of a new Internet Printing
Protocol (IPP). IPP is an application level protocol that can be used for distributed printing on the Internet.
There are multiple parts to IPP, but the primary architectural components are the Model, the Protocol and
an interface to Directory Services. This document provides a statement of the requirements for notifications
as part of an IPP Service. Some ISSUES are indicated in the text.

35    The full set of IPP documents include:
36
37              Design Goals for an Internet Printing Protocol [RFC2567]
38              Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
39              Internet Printing Protocol/1.0: Model and Semantics [RFC2566]
40              Internet Printing Protocol/1.0: Encoding and Transport [RFC2565]
41              Internet Printing Protocol/1.0: Implementer's Guide [ipp-iig]
42              Mapping between LPD and IPP Protocols [RFC2569]
43
44    The 'Design Goals for an Internet Printing Protocol' document takes a broad look at distributed printing
45    functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in
46    a printing protocol for the Internet.  It identifies requirements for three types of users: end users, operators,
47    and administrators.  It calls out a subset of end user requirements that are satisfied in IPP/1.0.  Operator and
48    administrator requirements are out of scope for version 1.0.
49
50    The 'Rationale for the Structure and Model and Protocol for the Internet Printing Protocol' document
51    describes IPP from a high level view, defines a roadmap for the various documents that form the suite of
52    IPP specifications, and gives background and rationale for the IETF working group's major decisions.
53
54    The 'Internet Printing Protocol/1.0: Encoding and Transport' document is a formal mapping of the abstract
55    operations and attributes defined in the model document onto HTTP/1.1.  It defines the encoding rules for a
56    new Internet media type called 'application/ipp'.
57
58    The 'Internet Printing Protocol/1.0: Implementer's Guide' document gives insight and advice to
59    implementers of IPP clients and IPP objects.  It is intended to help them understand IPP/1.0 and some of the
60    considerations that may assist them in the design of their client and/or IPP object implementations.  For
61    example, a typical order of processing requests is given, including error checking.  Motivation for some of
62    the specification decisions is also included.
63
64    The 'Mapping between LPD and IPP Protocols' document gives some advice to implementers of gateways
65    between IPP and LPD (Line Printer Daemon) implementations.
66
67
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# 1    Scope

The scope of this requirements statement is for end users, print administrators and operators.

# 2    Terminology

It is necessary to define a set of terms in order to be able to clearly express the requirements for notification services in an IPP System.

### 2.1 Job Submitting End User

A human end user who submits a print job to an IPP Printer. This person may or may not be within the same security domain as the Printer. This person may or may not be geographically near the printer.

### 2.2 Administrator

A human user who established policy for and configures the print system

### 2.3 Operator

A human user who carries out the policy established by the Administrator and controls the day to day running of the print system.

### 2.4 Job Submitting Application

An application (for example a batch application), acting on behalf of an end user, which submits a print job to an IPP Printer. The application may or may not be within the same security domain as the Printer. This application may or may not be geographically near the printer.

### 2.5 Security Domain

For the purposes of this discussion, the set of network components which can communicate without going through a proxy or firewall. A security domain may be geographically very large, for example - anyplace within IBM.COM.

### 2.6 IPP Client

The software component on the client system which implements the IPP protocol.

### 2.7 Job Recipient

A human who is the ultimate consumer of the print job. In many cases this will be the same person as the Job Submitting End User, but this need not always be the case. For example, if I use IPP to print a document on a printer in a business partner's office, I am the Job Submitting End User, while the person I intend the document for in my business partner's office is the Job Recipient.  Since one of the goals of IPP is to be able to print near the ultimate recipient of the printed output, we would normally expect the Job Recipient to be in the same security domain as, and geographically near the Printer. However, this may not always be the case. For example, I submit a print job across the Internet to a Kinko's print shop. I am both the Submitting end User and the Job Recipient, but I am neither near nor in the same security domain as the Printer.

### 2.8 Job Recipient Proxy

A person acting on behalf of the Job Recipient.  In particular, the Job Recipient Proxy physically picks up the printed document from the Printer, if the Job Recipient cannot perform that function. The Proxy is **by**

130    **definition** geographically near and in the same security domain as the printer. For example, I submit a print
131    job from home to be printed on a printer at work. I'd like my secretary to pick up the print job and put it on
132    my desk. In this case, I am acting as both Job Submitting End User and Job Recipient. My secretary is
133    acting as a Job Recipient Proxy.
134
135    **2.9 Notification Subscriber**
136
137    A client that requests the IPP Printer to send event reports to one or more Notification Recipients. A
138    Notification Subscriber may be a Job Submitting End User or an End User, an Operator, or an
139    Administrator that is not submitting a job.
140
141    **2.10 Notification Source**
142
143    The entity that sends notification events
144
145    **2.11 Notification Recipient**
146
147    Any of: Job Submitting End User, Job Submitting Application, Job Recipient, or Job Recipient Proxy or
148    admin etc folks and their representatives or log file or accounting/audit application or other active or
149    passive entities or President Clinton. Or Monica.
150
151    **2.12 Notification Recipient Agent**
152
153    A program which receives events on behalf of the notification recipient. The agent may take some action on
154    behalf of the recipient, forward the notification to the recipient via some alternative means (for example,
155    page the recipient), or queue the notification for later retrieval by the recipient.
156
157    **2.13 Event**
158
159    A event is some occurrence (either expected or unexpected) within the printing system. Any of the
160    following constitute events that a Job Submitting End User can specify notifications be sent for:
161
162    • Any standard Printer MIB alert (i.e. device alerts) (critical and warning?) (state change notifications)?
163    • Job Received (transition from Unknown to Pending)
164    • Job Started (Transition from Pending to Processing)
165    • Page Complete (Page is stacked)
166    • Collated Copy Complete (last sheet of collated copy is stacked)
167    • Job Complete (transition from Processing or Processing-stopped to Completed)
168    • Job aborted (transition from Pending, Pending-held, Processing, or Processing-stopped to Aborted)
169    • Job canceled (transition from Pending, Pending-held, Processing, or Processing-held to Canceled)
170    • Other job state changes like 'paused', purged?
171    • Device problems on which the job is destine for
172    • Job (interpreter) issues
173
174    **2.14 Event report**
175
176    When an event occurs, an event report is generated that fully describes the event (what the event was, where
177    it occurred, when it occurred, etc.). Event reports are delivered to all the notification recipients that are
178    subscribed to that event, if any. The event report is delivered to the address of the notification recipient
179    using the notification delivery method defined in the subscription. However, an Event Report is sent ONLY
180    if there is a corresponding subscription.
181
182    **2.15 Notification Subscription**
183

184    It should be possible for end users and operators to 'subscribe' for notifications of certain types of events,
185    independent of Job Submission.  An end user or operator may subscribe for

187    • All Job Traps
188    • All Traps (Job and Printer)
189    • None (Reserves a slot in some limited stable of 'notification hosts')
190    ISSUE:  Need to discuss granularity and categorization in the context of anticipated event frequency

192    **2.16 Notification Attributes**

194    IPP Objects (for example, a print job) from which notification are being sent may have attributes associated
195    with them. A user may want to have one or more of these associated attributes returned along with a
196    particular notification. In general, these may include any attribute associated with the object emitting the
197    notification. Examples include:

199            number-of-intervening jobs
200            job-k-octets
201            job-k-octets processed
202            job impressions
203            job-impressions-interpreted
204            job-impressions-completed
205            impressionsCompletedCurrentCopy (job MIB)
206            sheetCompletedCopyNumber (job MIB)
207            sheetsCompletedDocumentNumber (job MIB)
208            Copies-requested
209            Copy-type
210            Output-destination
211            Job-state-reasons
212            Job ID
213            Printer URI
214            Subscription ID (for job independent subscription)

216    **2.17 Notification Delivery Method (**or **Delivery Method** for short**)**

218    Event reports are delivered using a method, such as email, TCP/IP, etc.

220    **2.18 Immediate Notification**

222    Notifications sent to the notification recipient or the notification recipient's agent in such a way that the
223    notification arrives immediately , within the limits of common addressing, routing, network congestion and
224    quality of service.

226    **2.19 Queued Notification**

228    Notifications which are not necessarily sent immediately, but are queued for delivery by some intermediate
229    network application, or for later retrieval. Email with store and forward is an example of queued
230    notification.

232    **2.20 Notification over Reliable Transport**

234    Notifications which are delivered by a reliable, sequenced delivery of packets or character stream, with
235    acknowledgment and retry, such that delivery of the notification is guaranteed within some reasonable time
236    limits. For example, if the notification recipient has logged off and gone home for the day, an immediate
237    notification cannot be guaranteed to be delivered, even when sent over a reliable transport, because there is
238    nothing there to catch it. Guaranteed delivery requires both queued notification and a reliable transport. If

239  delivery of the notification requires process to process communications, each session is managed in a
240  reliable manner, assuring fully ordered, end-to-end delivery.
241
242  **2.21 Notification over Unreliable Transport**
243
244  Notifications are delivered via the fundamental transport address and routing framework, but no
245  acknowledgment or retry is required. Process to process communications, if involved, are unconstrained.
246
247
248  **2.22 Human Consumable Notification**
249
250  Notifications which are intended to be consumed by human end users **only**. They contain no machine
251  readable encoding of the event. Email would be an example of a Human consumable notification.
252  ISSUE:  Do we need both human and machine or is machine sufficient? There is no intent to attempt to
253  standardize human readable strings.
254  Human readable is intended for certain protocols, like e-mail, though email can also convey machine
255  readable MIME types as well using multipart/report.
256  ISSUE:  Is e-mail the only, or most likely, means of conveying the notification through the firewall (which
257  would drive a requirement for mixed text, binary content).
258
259  **2.23 Machine Consumable Notification**
260
261  Notifications which are intended for consumption by a program **only**, such as an IPP Client. Machine
262  Consumable notifications may not contain human readable information. Do we need both human and
263  machine? Machine readable is intended for application to application only.  The Notification Recipient
264  could process the machine readable report into human readable format.
265
266  **2.24 Mixed Notification**
267
268  A mixed notification may contain both human readable and human readable information.
269  ISSUE:  Do we need mixed?
270
271  Mail Services, DNS, Instant Messaging, Distributions lists etc.?
272
273
274  # 3    Requirements
275
276  The following requirements are intended to be met by the IPP Notification specification.
277
278  1.   The specification must indicate which of these requirements are MANDATORY and which are
279       OPTIONAL for a conforming implementation.
280
281  2.   It must be possible to support the IPP Notification interface using third party notification services that
282       exist today or that may be standardized in the future.
283
284  3.   A Job Submitting End User must be able to specify zero or more notification recipients when
285       submitting a print job. But don't expect a submitter to be able to circumvent out of band subscriptions.
286
287  4.   When specifying a notification recipient, a Notification Subscriber must be able to specify one or more
288       notification events for that notification recipient.
289
290  5.   When specifying a notification recipient, the Notification Subscriber must be able to specify either
291       immediate or queued notification for that notification recipient.  This may be explicit, or implied by the
292       method of delivery chosen by the Job Submitting End User.
293

294     6.   When specifying a notification event, a Notification Subscriber must be able to specify that zero or
295           more notification attributes (or attribute categories) be sent along with the notification, when that event
296           occurs.
297
298     7.   Common delivery methods, e.g. email, must be supported.
299
300     8.   There is no requirement for the IPP Printer receiving the print request to validate the identity of an
301           event recipient, nor the ability of the system to deliver an event to that recipient as requested (for
302           example, if the event recipient is not at work today).
303
304     9.   However, an IPP Printer must validate its ability to deliver an event using the specified delivery
305           scheme. If it does not support the specified scheme, or the specified scheme is invalid for some reason,
306           then it should respond to the print request with an error condition.
307
308     10.  There must be a class of IPP event notification schemes or methods which can flow through corporate
309           firewalls. However, an IPP printer need not test to guarantee delivery of the notification through a
310           firewall before accepting a print job.
311
312     11.  A mechanism must be provided for delivering a notification to the submitting client when the delivery
313           of an event notification to a specified Notification Recipient fails. (Optional? Or not necessary?) Fall
314           back means of subscribers determining if notifications have failed. I.e. polling?
315
316     12.  There must be a mechanism for localizing human consumable notifications by the Notification Source.
317
318     13.  There must be a way to specify whether or not event delivery requires acknowledgement back to the
319           Event Source.
320
321     14.  There must be a mechanism to indicate the quality of service for delivery of event reports.  The policy
322           must include stopping the Printer and allowing the Printer to continue, when delivery of the event
323           report is not acknowledged.   ISSUE:  Should that policy be specified by the Notification Subscriber
324           (and authorized by the Printer) or by the administrator in configuring the Printer?
325
326     15.  There must be a mechanism so that job independent subscriptions do not become stale and do not
327           require human intervention to remove stale subscriptions.  However, stale must not be the inability to
328           deliver a notification report, since temporary event delivery problems must be tolerated.
329
330

## 4   Scenarios

331
332
333     1.   I am sitting in my office and submit a print job to the printer down the hall. I am in the same security
334           domain as the printer and of course, geographically near.  I want to know immediately when my print
335           job will be completed (or if there is a problem) because the document I am working on is urgent. I
336           submit the print job with the following attributes:
337
338           −   Notification Recipient - me
339           −   Notification Events - all
340           −   Notification Attributes - job-state-reason
341           −   Notification Type - immediate
342
343     2.   I am working from home and submit a print job to the same printer as in the previous example.
344           However, since I am not at work, I cannot physically get the print file or do anything with it. It can wait
345           until I get to work this afternoon. However, I'd like my secretary to pick up the output and put it on my
346           desk so it doesn't get lost or miss-filed. I'd also like a queued notification sent to my email so that when

I get to work I can tell if there was a problem with the print job. I submit a print job with the following attributes:

- − Notification Recipient - my secretary
- − Notification Events - print complete
- − Notification Type - immediate

- − Notification Recipient - me
- − Notification Events - print complete
- − Notification Attributes - impressions completed
- − Notification Type - queued

3. I am sitting in my office and submit a print job to a client at an engineering firm we work with on a daily basis. The engineering form is in Belgium. I would like my client to know when the print job is complete, so that she can pick it up from the printer in her building.  It is important that she review it right away and get her comments back to me. I submit the print job with the following attributes:

- − Notification Recipient - client at engineering firm
- − Notification Events - print complete
- − Notification Type - immediate
- − Notification Language - French

4. I am in a hotel room and send a print job to a Kinko's store in the town I am working in, in order to get a printed report for the meeting I am attending in the morning.  Since I'm going out to dinner after I get this job submitted, an immediate notification won't do me much good. However, I'd like to check in the morning before I drive to the Kinko's store to see if the file has been printed. An email notification is sufficient for this purpose. I submit the print job with the following attributes:

- − Notification Recipient - me
- − Notification Events - print complete
- − Notification Type - email

5. I am printing a large, complex print file. I want to have some immediate feedback on the progress of the print job as it prints. I submit the print job with the following attributes:

- − Notification Recipient - me
- − Notification Type - immediate
- − Notification Events - all state transitions
- − Notification Attributes - impression completed

6. I am an operator and my duties is to keep the printer running.  I subscribe independently from a job submission so that my subscription outlasts any particular job.  I subscribe with the following attributes:

- − Notification Recipient - me
- − Notification Type - immediate
- − Notification Events - all Printer state transitions
- − Notification Attributes - Printer state, printer state reasons, device powering up, device powering down.

7. I am an accounting or audit application. I subscribe independently from a job submission so that my subscription outlasts any particular job.  My subscription may persists across power cycles.  I subscribe with the following attributes:

400
401        −     Notification Recipient - me
402        −     Notification Type - immediate
403        −     Notification Events - job completion
404        −     Notification Attributes - impression completed, sheets completed, time submitted, time started,
405              time completed, job owner, job size in octets, etc.
406