1   IPP Notification New Model
2   From: Tom Hastings
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5   This document is a new proposal to simplify the IPP Notification Model. It uses Harry Lewis's suggested
6   terminology of Per-Job subscriptions and Per-Printer subscriptions. The Subscription object is defined only
7   for use as Per-Printer subscriptions. Per-Job subscriptions are done entirely with Job attributes and use an
8   exclude event mask (like SNMPv3 trap subscriptions) in order to allow different recipients to get different
9   events. I've also added conformance requirements for operations and attributes, so that we can more
10   properly reason about the model, before updating the specification document.

11   This document also includes the results of the 8/4/99 IPP telecon.

12   There are 17 issues highlighted like this that need to be resolved.

13   This paper uses object modeling techniques to describe the current IPP Notification Specification object
14   model (July 22, 1999):

15   ftp://ftp.pwg.org/pub/pwg/ipp/new_NOT/ipp-notification-990722.pdf

16   and the proposed new object model that introduces the Subscription object as an OPTIONAL object when
17   implementing notification. In other words, notification can be implemented with or without the
18   Subscription object. Review of this object model before writing the complete spec will help speed up the
19   production of the spec and will also help with the understanding of the semantics. I suggest that this
20   modeling be kept in the final spec in some form similar to this paper.

21   This paper also gives an outline of how the final spec might be presented, including being divided into two
22   parts. After describing the additional object attributes for the Job, Printer, and Subscription objects, the
23   order of the spec is suggested to be:

24   1.   the REQUIRED first part (sections 5, 6, and 7) defines the extensions to the Job and Printer object
25   and its operations for Per-Job subscriptions of Job and Printer events and their notification content.

26   2.   the OPTIONAL second part (section 8) defines the Per-Printer subscription mechanism and the
27   Subscription object and its operations and attributes.

28   NOTE - *Throughout*In this model document, the notation [ ] indicates that the sender (client in a
29   request, IPP object in a response, notification sender in a notification) MAY omit the attribute
30   inside the square brackets if there is not data to send. *For simplicity, the* In addition, IPP Printer
31   conformance requirements for operation and attribute support are *not* indicated in this document
32   with the words and codes:

33   REQUIRED (R) to support notification at all
34   CONDITIONALLY REQUIRED (C) - REQUIRED if Per-Printer subscription is supported
35   OPTIONAL (O) - not required for either Per-Job or Per-Printer Subscrpitions.

36   Therefore, the [ ] do NOT mean OPTIONAL support and should not be confused with support
37   requirements.

38

Table of Contents

68

69

1   Current IPP Notification Operations

The current IPP Notification specification (July 22, 1999) consists of the Job object and the Printer object. A Job object contains zero or one Per-Job Subscription which specifies Job and/or Printer events. The Job events apply only to this Job. The Printer events apply no matter which job. A Printer object contains zero or more Per-Printer Subscriptions which specify Job and/or Printer events. The Job and Printer events apply no matter which job.

The following operations are defined for Per-Job Subscriptions and Per-Printer Subscriptions~~for each of the object targets~~:

1.1   Per-Job Subscriptions - previous model~~object~~

Job object related:	salient inputs besides printer-uri:
job creation operations	recipients, [events,] [user-data]
Subscribe-Job	job-id, recipients, [events]
Get-Job-Attributes	job-id, [requested-attributes]
Unsubscribe-Job	job-id, subscription-id

1.2   Per-Printer Subscriptions - previous model~~object~~

Printer object related:	salient inputs beside printer-uri:
Get-Printer-Attributes	[requested-attributes]
Renew-Printer-Subscription	[lease time]
Get-Printer-Subscriptions	[my-subscriptions]

2   New IPP Notification Operations

This new proposed IPP object model add the Subscription object (to the Job and Printer objects), but only for the Per-Printer subscriptions.

The following operations are defined for Per-Job Subscriptions and Per-Printer Subscriptions:

~~1.1~~2.1   Per-Job Subscriptions - new model~~object~~

Job object related:	salient inputs besides printer-uri
job creation operations	recipients, [events,] [user-data,] [exclude-event-mask] ~~[subscription-ids]~~
Get-Job-Attributes	job-id, [requested-attributes]
Replace-Job-Subscription	job-id, [recipients,] [events,] [user-data,] [exclude-event-mask]

85

3

86   ~~1.2~~2.2   *Per-Printer Subscriptions~~object~~ - new model*

Printer object ~~target~~related:	salient inputs beside printer-uri:
Get-Printer-Attributes	[requested-attributes]
~~Get-Printer-Subscriptions~~	~~[my-subscriptions]~~

87   *~~2.3Subscription object - new OPTIONAL package~~*

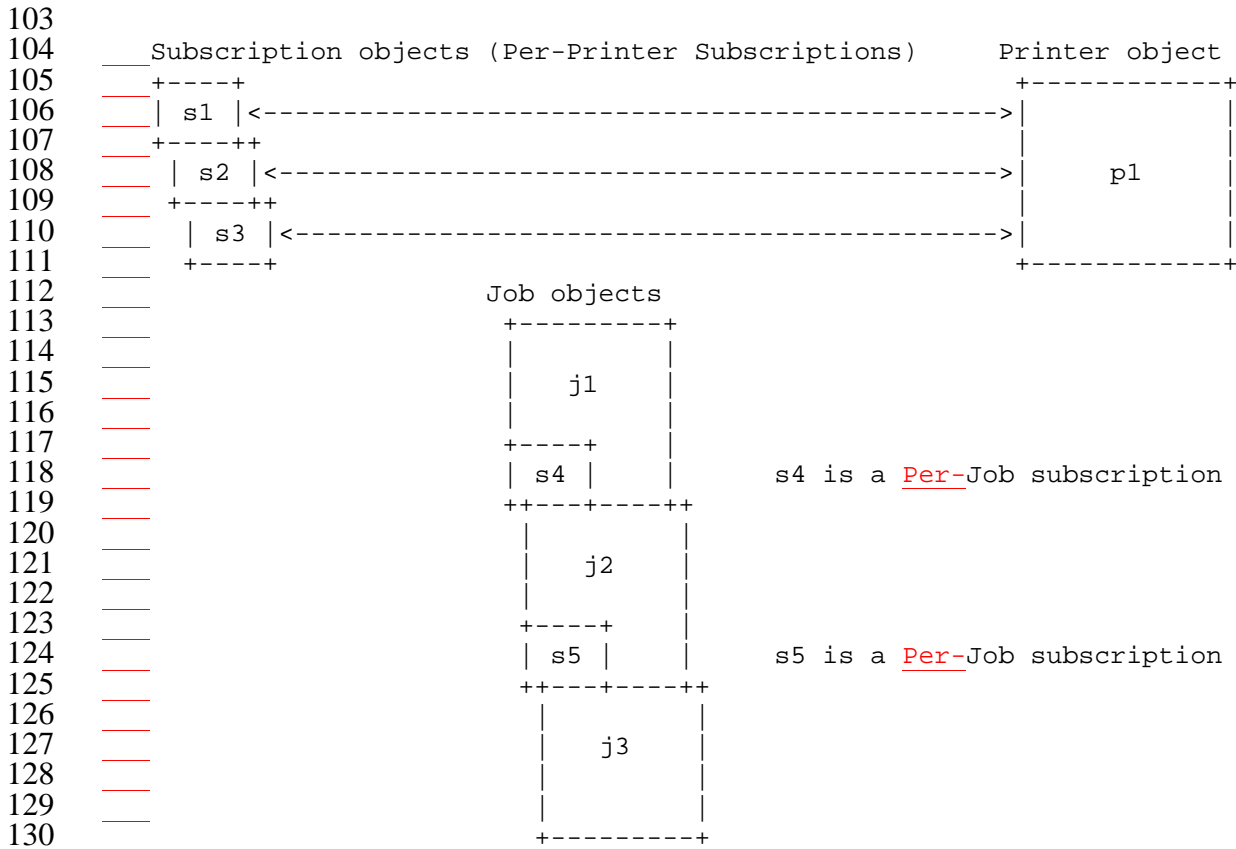| Subscription object related:	salient inputs besides printer-uri:
Create-Printer-Subscription	~~job-id,~~ recipients, [events,] [user-data,] [exclude-event-mask,] [lease-time]
Get-Printer-Subscription-Attributes	subscription-id, [requested-attributes]
Get-Printer-Subscriptions	[my-printer-subscriptions,] [requested-attributes]
Renew-Printer-Subscription	subscription-id, [lease time]
Cancel-Printer-Subscription	subscription-id

88

3   Job, Printer, and Subscription object relationships

90 This section describes the new notification object model that adds a Subscription object which together
91 with the Job and Printer object provide the complete notification semantics. The Subscription object is
92 OPTIONAL. The Subscription object MUST be supported if Per-Printer subscriptions are supported and
93 vice-versa.

94 Per-Job subscriptions do not use the Subscription object. Instead, a Job can have one Per-Job subscription
95 which is represented entirely as Job attributes. ~~Without the Subscription object, the Job Submission~~
96 ~~Subscription semantics are supported with only a single subscription per job and no explicit Subscriptions~~
97 ~~for the Job or Printer object as described in section 4.~~

98 ~~When the Subscription object is supported, it is created and associated with one Printer object, one~~
99 ~~previously created Job object, or neither (so that a subsequent job creation operation can perform the~~
100 ~~association of the Job object with the Subscription object and possibly other previously created~~
101 ~~Subscription objects).~~

102 The object ~~association~~ relationships can be seen pictorially as ~~(object containment not shown)~~:

```
104     Subscription objects (Per-Printer Subscriptions)      Printer object
105     +----+                                              +-----------+
106     | s1 |<--------------------------------------------->|           |
107     +----++                                             |           |
108      | s2 |<-------------------------------------------->|    p1     |
109      +----++                                            |           |
110       | s3 |<------------------------------------------->|           |
111       +----+                                             +-----------+
112                          Job objects
113                          +---------+
114                          |         |
115                          |    j1   |
116                          |         |
117                          +----+    |
118                          | s4 |    |     s4 is a Per-Job subscription
119                          ++---+----++
120                           |        |
121                           |   j2   |
122                           |        |
123                          +----+    |
124                          | s5 |    |     s5 is a Per-Job subscription
125                          ++---+----++
126                           |        |
127                           |   j3   |
128                           |        |
129                           |        |
130                          +---------+
```

131   s1, s2, and s3 are Per-Printer Subscription objects and can identify Printer and/or Job events.

132   ~~s4 is an unassociated per-Job Subscription object and can identify Printer and/or Job events.~~

133   s4~~5, s6,~~ and s5~~7~~ are Per-Job ~~S~~subscriptions (not objects) and can identify Printer and/or Job events.

134 The object relationships can be stated as follows:

1. The Printer object contains zero or more Subscription objects (p1 contains s1-s3 Subscription objects).

2. Each~~A~~ Subscription object (s1, s2, and s3) is contained in one Printer object (p1).

3. Each~~A~~ Subscription object (s1, s2, and s3) ~~is exactly one of~~represents one Per-Printer subscription.~~:~~

     ~~"per-Printer" subscription object - associated with one Printer object (s1-s3)~~

     ~~"per-Job" subscription object - associated with one previously created Job object (s5 and s6 are associated with job j1, s7 is associated with job j2)~~

     ~~"un-associated per-Job" subscription object - not associated with a Job object (s4), but is intended to be before its lease expires~~

5

144　4. Each "per-Printer" Subscription object identifies one or more Job and/or Printer events. Such Job
145　　events are for *all* jobs on the Printer. Such Printer events are for *any* Printer event, no matter which
146　　job is processing.

147　5. The "per-Job" subscription (not an object) identifies one or more Job and/or Printer events. Such
148　　Job events are only for *this* job (different than "per-Printer" Subscriptions). Such Printer events are
149　　for *any* Printer event, no matter which job (same as for "per-Printer" Subscriptions.

150　~~6.A Printer object is associated with zero or more per-Printer Subscription objects (p1 is associated with~~
151　　~~per-Printer s1-s3 objects)~~

152　~~7.~~6. A Job object ~~is associated with~~ contains zero or ~~more~~ one ~~previously created~~ Per-Job
153　　~~S~~subscription~~s~~ (not an object)~~objects~~ (Job j1 ~~is associated with~~contains ~~s5~~ Per-Job subscription s4
154　　~~and s6;~~ Job j2 contains Per-Job subscription s5 ~~is associated with s7~~, Job j3 does not contain a Per-
155　　Job subscription.~~is not associated with any s objects)~~

156　~~8.~~7. A Subscription object cannot be contained in or associated with more than one Printer object

157　~~9.A Subscription object cannot be associated with more than one Job object~~

158　~~10.A Subscription object cannot be associated with both a Printer object and a Job object~~

159　~~11.A Subscription object MUST be associated ONLY with jobs that are contained in its Printer object~~

4 Object attributes defined for Notification ~~attributes defined for each object~~

161 The following notification attributes are defined for each of the Printer, Job, and (new, but OPTIONAL)
162 Subscription objects. The explanations about some of the object attributes are collected here so that they
163 can be referred to from the operations that set them. All Job, Printer, and Subscription object attributes are
164 READ-ONLY, i.e., they MUST NOT be settable with the Set-Job-Attributes or Set-Printer-Attributes
165 operations. Instead, all of them are set as a side effect of another operation or when an event notification is
166 delivered. Attributes and objects not in the current, July 22, spec are labeled as "new":

167 4.1.24.1.1 Job object attributes related to notification

Job object attributes:	Printer support	READ-ONLY, set by:
notify-recipients (1setOf uri)	R	job creation operation
notify-events (1setOf type2 keyword)	R	job creation operation
notify-user-data (octetString(255))	R	job creation operation
notify-exclude-event-masks (1setOf octetString(8))	O	job creation operation

168 new: job-subscription-ids (1setOf integer(0:MAX))   job creation operation and/or
169   subsequent Create-Subscription
170   0 indicates no Subscription objects

171

job-trigger-event (type2 keyword)	Printer support	Printer - event occurring
job-trigger-message (text(255))	R	Printer - event occurring
job-trigger-time (integer(MIN:MAX))	R	Printer - event occurring
job-trigger-date-time (dateTime)	O	Printer - event occurring
previous-job-state (type1 enum)	R	Printer - event occurring
job-state-reasons-added (1setOf type2 keyword)	R	Printer - event occurring
job-state-reasons-deleted (1setOf type2 keyword)	R	Printer - event occurring

172 Attribute Notes:

173 notify-user-data (octetString(255)) - information being sent from the Subscriber to the Notification
174   Recipient(s). This information could identify the real recipient, in case the Notification Recipient is
175   a general recipient tool, such as Tool Talk or an Instant Message Service.
176   ISSUE 1 - is 255 octets too long for "notify-user-data (octetString(255))", since it also has to be sent
177   in the notification content? How about 64 octets?

178 notify-exclude-event-masks (1setOf octetString(8)) - an OPTIONAL per-recipient event mask whose
179   values are parallel to the "notify-recipients" attribute. Each 1 bit indicates that the corresponding
180   recipient is not to receive the 'i'-th event specified in the "notify-events" attribute. The first event in
181   "notify-events" is numbered '1' which corresponds to the first bit (Big Endian network order) of the
182   event mask octetString. If an implementation only supports n events, then the maximum number of
183   octets that an implementation need support for this attribute is not really 8 octets, but is n mod 8.
184   ISSUE 2 - Should "notify-exclude-event-masks (1setOf octetString(8))" be REQUIRED if the
185   number of Notification Recipients supported in a Per-Job (or Per-Printer) Subscription in greater
186   than 1 (as specified in the Printer's "max-notification-recipients-supported" attribute)?

187 job-state-reasons-added (1setOf type2 keyword) and job-state-reasons-deleted (1setOf type2 keyword) -
188   ISSUE 3 - why not just "previous-job-state-reasons" instead of "job-state-reasons-added" and "job-
189   state-reasons-deleted" attributes as Job Description attributes?

190 4.1.14.1.2   Printer object attributes related to notification

Printer object attributes:	Printer support	READ-ONLY, set by:
notify-recipients-schemes-supported (1setOf uriScheme)	R	Administrator/implementation
max-notification-recipients-supported (integer(1:MAX))	R	Administrator/implementation
notify-events-default (1setOf type2 keyword)	R	Administrator/implementation
notify-events-supported (1setOf type2 keyword)	R	Administrator/implementation
max-events-supported (integer(5:MAX))	R	Administrator/implementation
notify-lease-time-supported (rangeOfInteger(0:MAX))	C	Administrator/implementation
notify-lease-time-default (integer(0:MAX))	C	Administrator/implementation
max-number-of-printer-subscriptions-supported (integer(01:MAX))	C	Administrator/implementation

203 Attribute Notes:

204 notify-schemes-supported (1setOf uriScheme) - the schemes that are supported in Per-Job and Per-Printer
205   "notify-recipients" operation attributes.

206 max-notification-recipients-supported (integer(1:MAX)) - the maximum number of Notification Recipients
207   that are supported in a Per-Job Subscription. If Per-Printer subscriptions are supported this same
208   number applies. An implementation MUST support at least 1.

209 max-events-supported (integer(5:MAX)) - the maximum number of events that are supported in a Per-Job
210   Subscription. If Per-Printer subscriptions are supported this same number applies. An
211   implementation MUST support at least 5.

212 notify-lease-time-supported (rangeOfInteger(0:MAX)) - the minimum and maximum lease times
213   supported. When the lease time expires for a Per-Printer Subscription without renewing, the Printer
214   MUST delete the Subscription object. A value of 0 indicates an infinite amount of time, i.e., no
215   lease. No lease MAY require authorization.

216 max-printer-subscriptions-supported (integer(0:MAX)) - the maximum number of Per-Printer subscription
217   supported. 0 means there is no limit.

218   1.1.34.1.3 Subscription object attributes (new and OPTIONAL)

Subscription object attributes:	Printer support	READ-ONLY, set by:
notify-recipients (1setOf uri)	C	client - Create-Printer-Subscription
notify-events (1setOf type2 keyword)	C	client - Create-Printer-Subscription
notify-user-data (octetString(255))	C	client - Create-Printer-Subscription
notify-exclude-event-mask (1setOf octetString(8))	O	client - Create-Printer-Subscription
notify-lease-time (integer(0:MAX))	C	client - Create-Printer-Subscription
associated-printer (boolean)		client - Create-Subscription
associated-job-id (integer(1:MAX))		client - Create-Subscription

219

| notify-lease-time-remaining (integer(0:MAX)) | C | Printer - Create-Printer-Subscription |
| subscriber-user-name (name(MAX)) | C | Printer - Create-Printer-Subscription |

220

most-recent-request-idsequence-number (1setOf integer(0:MAX))	C	Printer - event occurring
delivery-failure-count (integer(0:MAX))	C	Printer - event occurring

221   Attribute Notes:

222   "notify-user-data" (octetString(255)) - same as the "notify-user-data" Job Description attribute.

223   "notify-exclude-event-mask" (1setOf octetString(8)) - same as the "notify-exclude-event-mask" Job
224   Description attribute.

225   The "notify-leaset-time" attribute is - the number of seconds granted for the subscription. It is used to
226   restore the subscription on the Restart-Job and Reprocess-Job operations. A 0 value indicates
227   infinite time.

228   The "notify-lease-time-remaining" attribute is - the number of seconds remaining in the lease. When the
229   Printer counts the value down to 0, the Printer MUST delete the Per-Printer Subscription object. A
230   client is able to extend a lease using the Renew-Printer-Subscription operation (see section 8.4).
231   Internally, the implementation may have a more absolute representation of when the least expires,
232   but this relative value is returned to help the client know how much more time is remaining in the
233   lease. A value of 0 indicates an infinite name, if such a policy is supported as indicated in the
234   "notify-lease-time-supported (integer(0:MAX)) Printer Description attribute.is used for
235   Subscriptions associated with Jobs, since they don't have a lease, but depend on the life time of the
236   documents of the Job.

237   "subscriber-user-name (name(MAX)) - the printable name of the most authenticated user that created the
238   Per-Printer Subscription (analogous to "job-originating-user-name" for Job objects).

239   The "most-recent-request-idsequence-number" (1setOf integer(0:MAX)) attribute maintains - the request-
240   idsequence number that was delivered in the most recent notification for the subscription for the
241   recipient in the corresponding parallel "notify-recipients" (1setOf uri) attribute. The reason to have

242   a separate request-id for each recipient is so that when more than one Notification Recipient is
243   specified in a subscription, each recipient will have its own monotonically increasing set of request-
244   ids, i.e., no gaps, in order to be able to detect a missing notification. If an implementation doesn't
245   support more than one Notification Recipient then this attribute only has one value as well.

246   The "delivery-failure-count" (integer(0:MAX)) - attribute is the number of transport delivery failures in
247   delivering a notification to any of the "notify-recipients" using the transport indicated. Note: for the
248   current delivery methods envisioned (see Notification Requirements [ipp-req], Notification
249   Recipients do not respond to the Notification Source, so this count is not the number of
250   unacknowledged notifications.

5 Events

252 Events are defined to be non-overlapping. So for example, 'job-state-changed' doesn't include creating the
253 job or completing the job. This reduces the need to batch events together, since events tends to happen at
254 different times by definition.

255 Both Job and/or Printer events may be specified for Per-Job or Per-Printer subscriptions:

256   Job events in a Per-Job subscription indicate Job events for *this* job only
257   Job events in a Per-Printer subscription indicates Job events for *all* jobs
258   Printer events in a Per-Job subscription indicate Printer events for *any* job
259   Printer events in a Per-Job subscription indicate Printer events for *any* job
260   ISSUE 4 - Should we disambiguate the 'job-xxx' events and double the number by renaming to 'my-
261   job-xxx' and 'all-job-xxx' events for use in both Per-Job and Per-Printer subscriptions?

5.1 Job events

263   '**none**': REQUIRED - no notifications of any events
264   ISSUE 5 - Add a 'job-announce' event which is sent to the Notification Recipient(s) when the
265   subscription is accepted to prepare/warn them?
266   '**job-created**': REQUIRED - the Printer object has accepted Create-Job, Print-Job, or Print-URI.
267   '**job-completed**': REQUIRED - the job has reached 'completed**,** 'aborted', or 'canceled'.
268   '**job-state-changed**': REQUIRED - any job state or state-reason changed, except when the job is
269   created or when the job moves to 'completed', 'aborted', or 'canceled'.
270   ISSUE 6 - Ok to make 'job-state-changed' REQUIRED?
271   '**job-config-changed**' – "job-message-from-operator" or any of the non-READ-ONLY Job attributes
272   changed, typically through the Set-Job-Attributes operation.
273   '**job-purged**' - Job-Purged operation on a 'non-completed' job.

274

275   '**job-progress**' - sheet or copy completed. See separate [ipp-prog] spec.

5.2 Printer events

277   '**none**' - REQUIRED - no notification of any events
278   ISSUE 6 - Add a 'printer-announce' event which is sent to the Notification Recipient(s) when the
279   subscription is accepted to prepare/warn them?

280 **'printer-restarted'** - device powered up or Restart-Printer operation is performed (see [ipp-adm]).
281 **'printer-shutdown'** - device is being powered down or the Shutdown-Printer operation [ipp-adm]).
282 **'printer-state-changed'** - REQUIRED - "printer-state", "printer-state-reasons", and/or "printer-is-
283   accepting-jobs" attributes changed, except when the Printer starts up or is shutdown.
284 **'printer-media-changed'** – when the media loaded ("media-ready") on a printer has been changed.
285 **'printer-config-changed'** – "printer-message-from-operator" or any non-READ-ONLY Printer
286   attributes changed, except for "media-ready" (which has its own event), whether through the
287   Set-Printer-Attributes operation or by other means and whether initiated by a human or not.
288 **'printer-no-longer-full'** – Printer may still be printing but has acquired more buffer space to accept
289   jobs. This event only occurs when the Printer did not have room to accept jobs previously and
290   rejected a Print-Job, Print-URI, Create-Job, Send-Document, or Send-URI operation from any
291   client (desktop or Server).
292 **'printer-almost-idle'** – Printer needs another Job in order to stay busy. Typically sent to a Server
293   that has subscribed.

6   Notification Content

295 ISSUE 7 - How is the User Friendly notification represented, such as is used with the 'mailto:' notification
296 delivery scheme? What parts gets translated into the Natural Language of the subscriber (presumed to be
297 the same as the recipient), besides the "job-trigger-message" and "printer-trigger-message"? The idea of
298 using multipart/report has problems going through firewalls because of attachments, so maybe we need a
299 single text message that can be read by humans, and still be parsed by programs for some of the (un-
300 translated) keywords attribute names. Perhaps, the trigger-message contains user friendly stuff like job-
301 name, printer-name, and the translated job-state and state-reasons values and the rest of the message is a
302 series of lines of the form:

303   keyword: text

304 where 'keyword' is the un-translated (i.e, U.S. English) attribute keyword name and the text is the
305 representation of the attribute values. Which attributes would be required beside the "job-trigger-message"
306 and "printer-trigger-message"?

307 The notification content is the same for the current and new ~~specs~~models. All attributes indicated are
308 REQUIRED for *all* events, unless inside [ ] or the comment indicates otherwise:

~~7.1~~6.1   ~~Basic~~ Job Event Notification content

310 The following notification content is sent for both Per-Job and Per-Printer Subscriptions when a Job event
311 occurs (see section 5.1 for Job events):

11

312   ISSUE 8 - Most transports only allow 500 to 1000 octets in a packet we have too much stuff.
313   version-number (integer (0:32767))
314   status-code (integer (0:32767)) - with the value: basic-job-event(600)
315   request-id (integer (1:MAX)) - used as notification delivery sequence number for each recipient
316   job-printer-uri (uri)
317   job-id (integer(1:MAX))
318   job-trigger-event (type2 keyword)
319   [job-trigger-message (text(255))]
320   ISSUE 9 - is 255 too long for "job-trigger-message (text(255))", since it also has to be sent in the
321   notification content?
322   ISSUE 10 - How to include user friendly data, like job-name, job-owner, printer-name, date, time,
323   and event name in a Job event notification?
324   ISSUE 11 - Should we REQUIRE the "printer-trigger-message" to contain the user friendly data
325   localized information about this event, namely: like job-name, job-owner, printer-name, date, time,
326   and event name and REQUIRE "printer-trigger-message"?
327   job-trigger-time (integer(1:MAX))
328   [job-trigger-date-time (dateTime)]
329   job-state (type1 enum)
330   previous-job-state (type1 enum)   not for 'job-completed' event
331   job-state-reasons (1setOf type2 keyword)
332   job-state-reasons-added (1setOf type2 keyword)   not for 'job-completed' event
333   job-state-reasons-deleted (1setOf type2 keyword)   not for 'job-completed' event
334   ISSUE 12 - in a Job notification why not just "previous-job-state-reasons" instead of "job-state-
335   reasons-added" and "job-state-reasons-deleted"?
336   [job-impressions-completed (integer(0:MAX))]   only for 'job-completed' event
337   [job-media-sheets-completed (integer(0:MAX))]   only for 'job-completed' event
338   job-collation-type (type2 enum)   only for 'job-progress' event
339   sheet-completed-copy-number (integer(-2:MAX))   only for 'job-progress' event
340   sheet-completed-document-number(integer(-2:MAX)) only for 'job-progress' event
341   impressions-interpreted (integer(-2:MAX))   only for 'job-progress' event
342   impressions-completed-current-copy (integer(-2:MAX)) only for 'job-progress' event
343   [subscription-id (integer(1:MAX))]   MUST if from a Per-Printer
344   subscription

345   1.26.2   Basic Printer Event Notification content:

346 The following notification content is sent for both Per-Job and Per-Printer Subscriptions when a Job event
347 occurs (see section 5.2 for Printer events):

348 ==ISSUE 13 - Most transports only allow 500 to 1000 octets in a packet so we have too much stuff==
349 ==here.==
350   version-number (integer (0:32767))
351   status-code (integer (0:32767)) - with the value: basic-job-event(601)
352   request-id (integer (1:MAX)) - used as notification delivery sequence number for each recipient
353   printer-uri ~~supported~~ (uri)
354   printer-trigger-event (type2 keyword)
355 [printer-trigger-message (text(255))]
356 ==ISSUE 14 - is 255 too long for "printer-trigger-message (text(255))", since it also has to be sent in==
357 ==the notification content?==
358 ==ISSUE 15 - How to include user friendly data, like printer-name, date, time, and event name in a==
359 ==Printer event notification?==
360 ==ISSUE 16 - Should we REQUIRE the "printer-trigger-message" to contain the user friendly data==
361 ==localized information about this event, namely: printer-name, date, time, and event name and==
362 ==REQUIRE "printer-trigger-message"?==
363   printer-trigger-time (integer(1:MAX))
364 [printer-trigger-date-time (dateTime)]
365   printer-state (type1 enum)
366   previous-printer-state (type1 enum)
367   printer-state-reasons (1setOf type2 keyword)
368   printer-state-reasons-added (1setOf type2 keyword)
369   printer-state-reasons-deleted (1setOf type2 keyword)
370 ==ISSUE 17 - in a Printer notification why not just "previous-printer-state-reasons" instead of "printer-==
371 ==state-reasons-added" and "printer-state-reasons-deleted"?==
372 [subscription-id (integer(1:MAX))]   MUST if from a Per-Printer
373 subscription
374 ~~** If the Subscription object is implemented, the "subscription-id" MUST be supplied in the notification~~
375 ~~content.~~

7 REQUIRED Per-Job ~~Submission~~ Subscription mechanism

This section lists the REQUIRED operation requests and response that have some relation to notification,
i.e., that are related to Per-Job subscription.   Section 8 lists the OPTIONAL operation requests and
responses associated with the OPTIONAL Per-Printer subscription and its Subscription object.

1.17.1   Job Creation Operations (Create-Job, Print-Job, Print-URI) and Validate-Job

As in the current notification spec (July 22, 1999), the usual method for a client to associate one subscription with a Job is to specify the subscription when the job is created. For a Per-Job Submission Subscription, the client supplies the following notification operation attributes with any of the job creation operations (Create-Job, Print-Job, Print-URI), plus Validate-Job (which doesn't create a job or subscription):

notify-recipients (1setOf uri)	REQUIRED to support
[notify-events (1setOf type2 keyword)]	REQUIRED to support
[notify-user-data (octetString(255))]	OPTIONAL REQUIRED to support
[notify-exclude-event-mask (octetString(8))]	OPTIONAL to support

1.27.2   Get-Printer-Attributes operation

The Get-Printer-Attributes can be used to request the additional Printer Description attributes that indicate the notification supported. See section 4.1.2.

1.37.3   Get-Job-Attributes operation

The Get-Job-Attributes can be used to request the additional Job Description attributes that relate to notification. See section 4.1.1.

8   OPTIONAL Explicit Per-Printer Subscriptions and the Subscription object

This section describes the new notification object model that adds a Subscription object which together with the Job and Printer object provide the notification semantics. The Subscription object is OPTIONAL. Without the Subscription object, the Job Submission Subscription semantics are supported with only a single subscription per job and no explicit Subscriptions for the Job or Printer object as described in section 4.

8.1Extensions to Job Submission Subscriptions for Subscription object

Even when the Subscription object is supported, the usual method for a client to associate one subscription with a Job is to specify the subscription when the job is created. For a Job Submission Subscription, the client supplies the following notification operation attributes:

notify-recipients (1setOf uri)	REQUIRED to support
[notify-events (1setOf type2 keyword)]	REQUIRED to support
[notify-user-data (octetString(255))]	OPTIONAL to support

If the implementation supports the Subscription operation, then the Printer MUST create a Subscription object, duplicate these notification operation attributes on it, and return subscription id of the Subscription object in the job creation response. Otherwise, the subscription couldn't be canceled for the job. If the implementation does not support the Subscription object, then the notification operation attributes remain only on the Job object.

> ISSUE 18 - Ok to REQUIRE an implementation that supports the Subscription object to create a per-Job Subscription object that is a copy of the Job Submission Subscription?

If the client only supplies a "subscription-ids" attribute and does not supply these explicit "notify-xxx" attributes, the Printer MUST copy these three attributes from the first Subscription object identified in the "subscription-ids" operation attribute. Then all clients will see the subscription attributes of the first subscription on the Job object, thereby simplifying client query of job-related notification subscription information. When the client does not supply any "xxx-notify" operation attributes in the job creation operation, the Printer does not create any new Subscription objects.

> ISSUE 19 - Ok to REQUIRE an implementation that supports the Subscription object to copy the attributes of the job's first per-Job Subscription object to the Job object to make it look like a Job Submission Subscription?

8.2Operation requests and responses related to the Subscription object

This section lists the operation requests and responses thate MUST be supported if the OPTIONAL Per-Printer Subscriptions are supported which REQUIRES that the Subscription object is be supported and vice versa.

8.2.1Job Creation Operations (Create-Job, Print-Job, Print-URI, and Validate-Job)

The following IPP/1.1 extension operation attributes are defined for use with any of the job creation operations, including Validate-Job (which doesn't create a job or subscription):

```
    Request:
        Group 1: Operation Attributes
            ["subscription-ids"  (1setOf integer(1:MAX))]
            ["notify-recipients" (1setOf uri)
            ["notify-events" (1setOf type2 keyword)]
            ["notify-user-data" (octetString(255))]]
    Response:
        Group 1: Operation Attributes
            [subscription-ids (1setOf integer(1:MAX))]
```

Notes: The client MAY supply one or both of:

1.one or more subscription ids for previously created (but unassociated) Subscription objects
2.explicit "notify-xxx" attributes

If the implementation supports the Subscription object and the client supplies "notify-xxx" operation attributes, the Printer MUST create a new Subscription object initialized with these "notify-xxx" operation attributes and return the "subscription-ids" operation attribute with the new subscription-id as the first value.

No lease time is requested or returned, since Subscription objects associated with Jobs have no real lease. Instead the Subscription object is maintained until the job completes and the document data is deleted.

8.2.28.1   Create-Printer-Subscription operation

The Create-Printer-Subscription operation creates a Per-Printer subscription by creating a Per-Printer Subscription object which is added to the Printer object. or an unassociated per-Job Subscription object depending on whether "associated-job-id", "associated-printer"='true', or neither is supplied.

454 Request:

Group 1: Operation Attributes	Printer support
"attributes-charset" (charset)	R
"attributes-natural-language" (naturalLanguage)	R
"printer-uri" (uri)	R
["requesting-user-name" (name(MAX))]	RECOMMENDED
"notify-recipients" (1setOf uri)	R
["notify-events" (1setOf type2 keyword)]	R
["notify-user-data" (octetString(255))]	R
["notify-exclude-event-mask" (1setOf octetString(8))]	O
["notify-lease-time" (integer(0:MAX))]	R
["associated-job-id" (integer(1:MAX)) OR "associated-printer" (boolean)]	

455 Response:

Group 1: Operation Attributes	Printer Support
"status-code" (type2 enum)	R
"attributes-charset" (charset)	R
"attributes-natural-language" (naturalLanguage	R
["status-message" (text(255))]	O
["detailed-status-message" (text(MAX))	O
"subscription-id" (integer(1:MAX))	R
"notify-lease-time" (integer(0:MAX))	R
"notify-lease-time-remaining" (integer(0:MAX))	R
Group 2: Unsupported Attributes	R

456 Notes: A "notify-lease-time" and "notify-lease-time-remaining" of 0 means infinite, i.e., the Per-Printer
457 Subscription has no lease. Supplying a 0 value MAY require authentication in order to be used when
458 supported at all. for use with Subscriptions associated with Job objects, since the life of the subscription is
459 the same as for the documents in the job.

460 The client MUST supply either "associated-job-id" or "associated-printer" or neither one, but MUST NOT
461 specify both, since a Subscription object can be associated with at most one (Job or Printer) object.

462 The Printer object MUST return the "notify-lease-time" actually granted which may be less than the
463 requester requested if it was greater than the MAX supported or more than the requester requested if it was
464 less than the MIN supported, as indicated in the Printer's "lease-time-supported" (rangeOfInteger(0:MAX))
465 attribute.

466 The Printer object MUST return the "notify-lease-time-remaining" which is the number of seconds
467 remaining in the lease.

468 ### *8.2.3*8.2 Get-*Printer*-Subscription-Attributes *operation*

469 The Get-Printer-Subscription-Attributes returns the requested attributes of the identified Per-Printer
470 Subscription object (per-Printer subscription objects or un-associated subscription objects) depending on
471 whether or not the "job-id' operation attribute is suppliedcan be used to request the Subscription object
472 attributes. See section 4.1.3.

473 Request:

Group 1: Operation Attributes	Printer support
"attributes-charset"	R
"attributes-natural-language"	R
"printer-uri" (uri)	R
["job-id" (integer(1:MAX))]	
["requesting-user-name" (name(MAX))]	RECOMMENDED
"subscription-id" (integer(1:MAX))	R
["requested-attributes" (1setOf type2 keyword)]	R

474 Response:

Group 1: Operation Attributes	Printer support
"status-code" (type2 enum)	R
["status-message" (text(255))]	O
["detailed-status-message (text(MAX))]	O
"attributes-charset"	R
"attributes-natural-language"	R
Group 2: Unsupported Attributes	R
Group 3: <the requested Subscription object attributes>	R

475

476 This operation is similar to the Get-Printer-Attributes operation. If the client omits the "requested-
477 attributes" operation attribute, the Printer MUST respond as if the client had supplied the 'all' value, i.e.,
478 return all of the attributes supported for the Subscription object.

479 Notes: A client MUST supply the "job-id" operation attribute, if the Subscription object is associated with
480 a Job. If the "job-id" operation attribute is omitted, the "subscription-id" is assumed to apply to a
481 Subscription object associated with the Printer object or not associated yet with either the Printer object or a
482 Job object.

483 ## 8.2.48.3   Get-Printer-Subscriptions operation

484 The Get-Printer-Subscriptions operations returns Per-Printer subscription objects, i.e., ones associated with
485 the Printer Subscription objects or ones that have not been associated with either a Printer or Job object.
486 However, if the client supplies a "job-id" operation attribute, per-Job Subscription objects that are
487 associated with a Job object are not returned for the identified Job, instead of per-Printer Subscription
488 objects. since there could be a large number of them associated with a large number of jobs and the Job
489 Subscription can be easily queried using the Get-Job-Attributes or Get-Jobs operations to request the
490 "subscription-ids" attribute and then performing Get-Subscriptions operations.

491 ISSUE 1: Agreed that we don't want this operation to return the Subscription objects associated with Jobs,
492 correct?

493 `Request:`

Group 1: Operation Attributes	Printer support
"attributes-charset"	R
"attributes-natural-language"	R
"printer-uri" (uri)	R
["job-id" (integer(1:MAX))] — to get per-Job, instead of per-Printer	
["requesting-user-name" (name(MAX))]	RECOMMENDED
["limit" (integer(1:MAX))]	R
["requested-attributes" (1setOf type2 keyword)]	R
["my-subscriptions" (boolean)]	R

494 `Response:`

Group 1: Operation Attributes	Printer support
"status-code" (type2 enum)	R
"attributes-charset"	R
"attributes-natural-language"	R
["status-message" (text)]	O
["detailed-status-message" (text(MAX))]	O
["subscription-ids" (1setOf integer(1:MAX))]	
Group 2: Unsupported Attributes	R
Group 3 to N:<the requested Subscription Attributes for each Subscription object in a separate group>	R

495

496 Notes: This operation is similar to the Get-Jobs operation. If the client wants any attributes returned,
497 including the "subscription-id", it must include the attribute keyword name in the "requested-attributes"
498 operation attribute. If the "requested-attributes operation attribute is omitted, the Printer MUST respond as
499 if the client supplied the value: 'subscription-id'. ISSUE 3: We don't really need a parallel Get-Job-
500 Subscriptions operation, since a client can use either Get-Job-Attributes or Get-Jobs to request the Job's
501 "subscription-ids" attribute and then do a Get-Subscription-Attributes for each, ok?

502 ***8.2.5*8.4   Renew-Printer-Subscription operation**

503 `Request:`

Group 1: Operation Attributes	Printer support
"attributes-charset"	R
"attributes-natural-language"	R
"printer-uri" (uri)	R
"requesting-user-name" (name(MAX))	RECOMMENDED
"subscription-id" (integer(1:MAX))	R
"notify-lease-time" (integer(0:MAX))	R

504 `Response:`

Group 1: Operation Attributes	Printer support
"status-code" (type2 enum)	R
"attributes-charset"	R
"attributes-natural-language"	R
["status-message" (text(255))]	O
["detailed-status-message" (text(MAX))]	O
"notify-lease-time" (integer(0:MAX))	R
"notify-lease-time-remaining" (integer(0:MAX))	R
Group 2: Unsupported Attributes	R

505 Notes: The Printer object MUST return the "notify-lease-time" actually granted which may be less than the
506 requester requested if it was greater than the MAX supported or more than the requester requested if it was
507 less than the MIN supported, as indicated in the Printer's "lease-time-supported" (rangeOfInteger(0:MAX))
508 attribute.

509 The Printer object MUST return the "notify-lease-time-remaining" which is the number of seconds
510 remaining in the lease.

511 Note: There is no need to renew a Per-Job Subscription, since it is effectively the time that the Job has
512 documents.

513 ### ~~8.2.6~~8.5   Cancel-~~Printer-~~Subscription operation

514 Request:

Group 1: Operation Attributes	Printer support
"attributes-charset"	R
"attributes-natural-language"	R
"printer-uri" (uri)	R
~~["job-id" (integer(1:MAX))]~~	
["requesting-user-name" (name(MAX))]	RECOMMENDED
"subscription-id" (integer(1:MAX))	R

515 Response:

Group 1: Operation Attributes	Printer support
"status-code" (type2 enum)	R
"attributes-charset"	R
"attributes-natural-language"	R
["status-message" (text(255))]	O
["detailed-status-message" (text(MAX))]	O
Group 2: Unsupported Attributes	R

516 ~~Notes: A client MUST supply the "job-id" operation attribute, if the Subscription object is associated with~~
517 ~~a Job. If the "job-id" operation attribute is omitted, the "subscription-id" is assumed to apply to a~~
518 ~~Subscription object associated with the Printer object or not associated yet with either the Printer object or a~~
519 ~~Job object.~~

520 ### ~~8.2Subscription object lease time~~

521 ~~A Subscription object that is associated with a Printer object or is not associated with any object has a lease~~
522 ~~time. When the lease time expires, the Printer object MUST delete the Subscription object. A subscriber is~~
523 ~~expected to renew such Subscriptions before the lease expires. A Subscription object that is associated~~
524 ~~with a Job object has no lease; instead the Printer object deletes Subscription object when it deletes~~
525 ~~document data for the job. Thus if the job is in one of the Retained states ('completed', 'canceled', or~~
526 ~~'aborted') and a client issues the Restart-Job or Reprocess-Job operation, the Printer initializes the~~
527 ~~associated Subscription objects with new lease times.~~

528 ~~A Subscription object that is associated with a Job does not have a lease. Instead the life of the job is used~~
529 ~~instead. When the Job completes (or is aborted or canceled), the documents may be retained for a period of~~
530 ~~time so that a client can use the Restart-Job or Reprocess-Job operation to perform the job again. In these~~
531 ~~cases, the subscription(s) associated with the Job are automatically renewed. When the Printer object~~
532 ~~deletes the Documents for a completed (aborted or canceled) Job, then it MUST also delete any~~
533 ~~Subscription objects associated with the Job.~~

534 ### ~~8.3Sequencing of Subscription object association with the Printer or a Job object~~

535 ~~Subscription object may be created before Job objects and vice versa. All associations between~~
536 ~~Subscription objects and a Printer or a Job object occurs when the second object instance is created by~~
537 ~~specifying the first object instance that is to form the association. Therefore, one and only one of the~~
538 ~~following rules for the timing and sequencing of associating objects applies to each association:~~

539   1. A Subscription object is associated with its Printer object when the Subscription object is created

540   2. A Subscription object is associated with a previously created Job object when the Subscription object
541   is created

542   3. A Subscription object is created without any association and a subsequent Job object creation
543   associates the Job object with (one or more previously created, but unassociated) Subscription
544   object(s)

545   ### *8.4 Not implementing the Subscription object*

546   As an implementer option, only Job Submission Subscription need be supported. In this case, the
547   Subscription object and the Create-Subscription, Cancel-Subscription, Renew-Subscription, and Get-
548   Printer-Subscriptions operations are not implemented. Thus no Explicit subscriptions are provided.
549   However, a Job Submission Subscription can still specify Job events and/or Printer events, just as when the
550   Subscription object and the other operations are implemented.

551   # 9 References

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