

1 **Subj: Notifications for the IPP print protocol**

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6 ***There are several issues indicated in the document that we should cover at the***
7 ***upcoming meeting, as well as review the proposal. See color highlighting.***

8 **1 Introduction**

9 IPP is considering the definition and use of notifications for two main purposes. First,
10 when used to achieve printing over a wide area network, or the Internet, the end-user
11 experience is similar to today's FAX paradigm, so we want to provide notification that
12 the job has completed successfully (or not). This notification may traverse the Internet as
13 an e-mail message or end up on someone's pager. Second, and more widely, when used
14 as a standard LAN print submission protocol (i.e., LPR replacement), the end-user will
15 have the desire and opportunity for a much more dynamic interaction with the printer and
16 the print job. Here, notification should consist of a local area network messaging scheme
17 that addresses unsolicited events related to the printer, the job's position in the server or
18 printer queue, start of processing, printing progress and job completion, including forms
19 of cancellation. This paper proposes MANDATORY IPP attributes to be used for both
20 purposes, and OPTIONAL attributes and values that are appropriate only for one or the
21 other.

22 The notification events and content are also intended to apply to the PWG Job
23 Monitoring MIB (JMP). See sections 3.1.1.2 and 6.

24 **1.1 Summary of the proposal**

25 This paper proposes the following:

- 26 1. One OPTIONAL "job-notify" Operation attribute for use with the Print-Job, Print-
27 URI, and Create-Job operation. The "job-notify" Operation attribute has an attribute
28 syntax of '1setOf collection' so that the client can request different events for different
29 notification recipients for the same job. Each collection value consists of the
30 following member attributes with the indicated support if the "job-notify" Operation
31 attribute is supported at all:

Member attribute name	syntax	in request	support
-----	----	-----	-----
"job-notify-event-groups"	1setOf type2 keyword	MAY	mandatory
"job-notify-recipients"	1setOf uri	SHOULD	mandatory
"job-notify-charset"	charset	MAY	mandatory
"job-notify-natural-language"	naturalLanguage	MAY	optional
"job-notify-additional-attributes"	1setOf keyword	MAY	optional

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40 2. One "job-notify" Job Description attribute which is populated with the supplied
41 Operation attribute or the Printer's default.
42 3. Five corresponding "xxx-default" and five "xxx-supported" Printer attributes.

43 **2 Registration for notification**

44 **2.1 End-user and server-to-device registration as part of job submission**

45 Registration for notifications should be accomplished via IPP for end-user and server-to-
46 device notifications related to the jobs being submitted. This proposal includes specifics
47 for these types of registrations. Here the registration information is submitted with the
48 job and an implementation may store the information with the job. When the IPP Printer
49 removes the job from the system, the registration is automatically removed with such an
50 implementation. If the IPP Printer object implementation uses a notification server, then
51 the IPP object will have to un-register with that notification server when the job
52 completes.

53 **2.2 Registration by third parties for device and/or job monitoring**

54 Registration should also be possible by 3rd party accounting or job monitoring
55 applications, independent of job submissions. This proposal does NOT include specifics
56 for this type of registration. A similar Printer "printer-notify" attribute could be defined
57 along the lines of the "job-notify" Job attribute and be set by means outside the scope of
58 IPP/1.0 (perhaps by a future extension, such as a Set-Printer-Attributes operation?).

59 **3 New Operation attributes for the create operations**

60 While e-mail notifications may be freeform and flexible, for applications to make use of
61 the server-to-device protocol notifications there needs to be a defined (extendable) set of
62 notification methods. The following IPP Job and Printer attributes are proposed to meet
63 the requirements for notification and querying of supported capabilities, including human
64 readable and program processable forms. The events are taken from Ron's and Harry's
65 previously published lists, as well as the original set in the IPP Model from last October.
66 The create operation attributes are intended to meet the requirements in the requirements
67 document (draft-ietf-ipp-not-01.txt, .pdf).

68 **3.1 job-notify (1setOf collection)**

69 The client **OPTIONALLY** supplies this Operation attribute as a *collection* attribute as
 70 part of the Print-Job, Print-URI, and Create-Job operations. The Printer object
 71 **OPTIONALLY** supports this Operation attribute as part of the Print-Job, Print-URI, and
 72 Create-Job operations. If the Printer object supports this attribute for any of these create
 73 operations, it **MUST** support it for all of these create operations that it supports.

74 The value of this attribute is one or more collection values. Each collection value **MAY**
 75 consist of a "job-notify-event-groups", a "job-notify-recipients", a "job-notify-charset", a
 76 "job-notify-natural-languages", and a "job-notify-additional-attributes" *member* attributes
 77 with the following syntax:

78 Member attribute name	syntax	in request	support
79 -----	-----	-----	-----
80 "job-notify-event-groups"	1setOf type2 keyword	MAY	mandatory
81 "job-notify-recipients"	1setOf uri	SHOULD	mandatory
82 "job-notify-charset"	charset	MAY	mandatory
83 "job-notify-natural-language"	naturalLanguage	MAY	optional
84 "job-notify-additional-attributes"	1setOf keyword	MAY	optional

85 If the IPP object supports the "job-notify" Operation attribute, the "job-notify-event-
 86 groups", "job-notify-recipients", and "job-notify-charset" member attributes are
 87 **MANDATORY** for the IPP object to support and the other member attributes are
 88 **OPTIONAL** for support.

89 If the client does not supply the "job-notify" Operation attribute, the Printer object **MAY**
 90 populate the corresponding Job object attribute using the Notification Default Printer
 91 attributes (see section 5.1).

92 For this attribute (like the "job-k-octets", "job-impressions", and "job-media-sheets"
 93 Operation attributes), if the client supplies the attribute, but the Printer object does not
 94 support the "job-notify" Operation attribute or some of its member attributes, the Printer
 95 object ignores the client-supplied "job-notify" value or the member attributes,
 96 respectively.

97 If the client supplies the "job-notify" Operation attribute and the Printer object supports
 98 the "job-notify" Operation attribute, the collection value(s) of the attribute are used to
 99 populate the job object's "job-notify" Job Description attribute (see section 4) according
 100 to the following conditions:

101 If the client supplies the "job-notify" Operation attribute and the Printer supports
 102 the attribute, and the values of the member attributes are within the range of the
 103 corresponding Printer object's "xxx-supported" attributes (see section 5.2), the
 104 Printer object **SHALL** use the collection value(s) to populate the job object's "job-
 105 notify" Job Description attribute.

106 If the client supplies the "job-notify" Operation attribute and the Printer supports
 107 the attribute, but some of the member attributes are not supported, the Printer
 108 object **SHALL** copy such member attributes to the Unsupported Attributes
 109 response group with the out-of-band value of 'not-supported', copy the remaining

110 (supported) member attributes to the job object's "job-notify" Job Description
111 attribute, accept the request, and return the 'successful-ok-ignored-or-substituted-
112 attributes' status code.

113 If the client supplies the "job-notify" Operation attribute and the Printer supports
114 the attribute, but some of the member attribute values are outside the range of the
115 corresponding Printer object's "xxx-supported" attributes (see section 5.2), the
116 Printer object SHALL copy such member attributes and their values to the
117 Unsupported Attributes response group, substitute or ignore the supplied values,
118 copy the remaining (supported) member attribute values to the job object's "job-
119 notify" Job Description attribute, accept the request, and return the 'successful-ok-
120 ignored-or-substituted-attributes' status code.

121 "The following attributes are defined for use in one or more collection values of the "job-
122 notify" Operation attribute:

123 **3.1.1 job-notify-event-groups (1setOf type2 keyword)**

124 The client OPTIONALLY supplies this attribute as a member of the "job-notify"
125 Operation attribute. The Printer object SHALL support this attribute if it supports the
126 "job-notify" Operation attribute. This attribute specifies one or more event groups for
127 which the end user desires some sort of notification to be sent to one or more notification
128 recipients that the client supplies in the same "job-notify" collection value in the create
129 request for this job.

130 Each event is assigned a keyword value (see section 3.1.1.2). Each of the events is
131 assigned to one of the standard event groups. Each standard group is also assigned a
132 keyword (see section 3.1.1.1), in order to simplify (1) client registration for the events
133 supplied by the client and (2) event filtering by the notification mechanism.

134 Implementers MAY add additional events to a group. Therefore, notification recipients
135 SHOULD check the event that is sent in the notification content (see section 6) to make
136 sure that it is an event that is wanted.

137 **3.1.1.1 Job Notification Groups**

138 This section defines the event groups that a client may register for in the create operation.
139 These event group keywords (not the actual event keywords themselves) are passed as
140 attribute values in the "job-notify-event-groups" Operation attribute in the create request.

141 Standard event group values are:

142 'none': the Printer SHALL not notify on any notification events for this job. This
143 value is useful to prevent notifications when the Printer object has default
144 notification attributes configured.

145 'all': the Printer SHALL notify when any of the supported notification events occur
146 for this job.

147 'delivery': the Printer SHALL notify on any of the following events which, in
148 general, pertain to the progress of delivering the job to the Printer:

149 'job-received', 'job-started-processing', 'print-deadline-exceeded'

150 `progress`: the Printer SHALL notify on any of the following events which, in
151 general, pertain to the progress of pending or actually interpreting, marking,
152 finishing or otherwise processing the job by the Printer object:
153 `job-held`, `job-released`, `sheet-completed`, `collated-copy-completed`
154 `problems`: the Printer SHALL notify on any of the following events which, in
155 general, pertain to problems with the job or the Printer. The notification recipient
156 is able to check the "job-state" attribute in the notification content to determine
157 whether this job caused the problem :
158 `problems`
159 `completion`: the Printer SHALL notify on any of the following events which, in
160 general, pertain to ways that a job can end:
161 `job-completed`, `job-aborted`, `job-canceled`
162 `management`: the Printer SHALL notify on any of the following events which, in
163 general, pertain to the logistics of print job management and accounting:
164 `job-entry-expired`

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166 In a create request, if the client supplies `none` along with any other combination of
167 values, it is the same as if only that other set of values had been supplied (i.e., the `none`
168 value has no affect). If the client supplies `all` along with any other combination of
169 values, it is the same as if only `all` had been supplied (i.e., the `all` value subsumes all
170 other values).

171 Note: the group `progress` is intended for those who wish to receive more frequent,
172 "real-time" progress notifications on a page and copy boundary basis. This is why `job-
173 started-printing` is in the `delivery` group, rather than the `progress` group, for example.
174 An application which was interested in less granular milestones of print job progress
175 would likely register for `delivery`, `completion` and `problems` (only).

176 **3.1.1.2 Job Notification Events**

177 This section defines the notification events. Each event is a member of an event group.
178 When an event occurs, the event keyword, not the event group, is included in the
179 notification content (see section 6).

180 The standard event values are:

181 `job-received`: the Printer SHALL notify when it accepts this job (i.e., when the job is
182 created entering the `pending` or `pending-held` (JMP `pendingHeld` states) (JMP:
183 issued by the agent when the agent creates a row in the MIB for that job).

184 `job-started-processing`: the Printer SHALL notify when the Printer starts processing
185 this Job (i.e., when the job leaves the `pending` state and enters the `processing`
186 state).

187 `sheet-completed`: the Printer SHALL notify when each sheet in this job is completed
188 (i.e., stacked in the output bin).

189 `collated-copy-completed`: the Printer SHALL notify when each document copy in
190 this job is completed (i.e., last sheet of a collated copy is stacked in an output bin)

191 'job-held': The Printer SHALL notify when this job enters the 'pending-held' (JMP
192 pendingHeld) state (using some protocol operation not defined in IPP/1.0, but
193 perhaps in another protocol or added as an extension), or the system or device
194 holds the job because of some requirement that cannot be met and other jobs
195 could be processed, if there are any.
196 'job-released': the Printer SHALL notify when this job leaves the 'pending-held' (JMP
197 pendingHeld) state entering the 'pending' or 'processing' states due to the user,
198 operator, or system releasing the held job (using some protocol operation not
199 defined in IPP/1.0, but perhaps in another protocol or added as an extension).
200 'problems': the Printer SHALL notify when this job encounters a problem (i.e., when
201 the job leaves the 'processing' state and enters the 'processing-stopped' state) OR
202 when this job is affected by a Printer problem caused by another job (i.e., when
203 the Printer enters the 'stopped' state while this job is in any of the 'pending' or
204 'pending-held' states, even though the job remains in the 'pending' or 'pending-
205 held' job state). The job attributes sent in the notification content (see section 6)
206 SHALL be for the job that was processing when the problem occurred, not the job
207 for which the registration was submitted. Thus a number of jobs may have
208 registered for this event, and their specified notification recipients will all get the
209 same notification content.

210 ***ISSUE 1: Ok to have combined these two events into one***
211 ***event (and one event group) for simplicity and specified that***
212 ***the notification content is the same for all notification***
213 ***recipients receiving this event?***

214 'job-completed': the Printer SHALL notify when this job completes processing (with
215 or without errors or warnings) and enters the 'completed' state.
216 'job-aborted': the Printer SHALL notify when this job was aborted by the system
217 while in the 'processing' or 'processing-stopped' state, due to some encountered
218 problem that cannot be remedied by human intervention.
219 'job-canceled': the Printer SHALL notify when this job was canceled by the user or
220 operator using the Cancel-Job operation while the job was in any state .
221 'job-deadline-to-start-exceeded': the Printer SHALL notify when this job has not
222 started process before the job's "job-deadline-to-start" time arrived.

223 ***ISSUE 2: Should we register a "job-deadline-to-start" Job***
224 ***Template attribute for use with IPP/1.0?***

225 'job-entry-expired': - the Printer SHALL notify when the Printer (or SNMP agent)
226 removes the job from the system so that the job is no longer available via the Get-
227 Jobs or Get-Job-Attributes operations after being in the 'completed', 'aborted', or
228 'canceled' states for a time period that depends on implementation and site policy
229 (JMP: when agent removes the MIB row).

230

231 **3.1.2 job-notify-recipients (1setOf uri)**

232 The client **OPTIONALLY** supplies this attribute as a member of the "job-notify"
233 Operation attribute. The Printer object **SHALL** support this attribute if it supports the
234 "job-notify" Operation attribute. This attribute describes both where (the address) and
235 how (the mechanism for delivery) events are to be delivered. The Printer object **SHALL**
236 use this attribute as the set of addresses and methods for sending notifications when one
237 of the events occurs that the client supplied in the "job-notify-event-groups" member
238 attribute in the same "job-notify" collection value "in the create request for this job. The
239 Printer object **MAY** achieve the notification using some (unspecified) notification service
240 that supports the requested mechanism of notifying the notification recipients.

241 Standard uriScheme values are:

242 'mailto': a text message via email to the specified email address

243 'http': an HTML formatted message via an HTTP POST method to the specified URI

244 'ftp': a text message via an FTP 'append' command to the specified remote file.

245 'page': a pager phone number to call as specified by the /phone-number parameter in
246 the URL.

247 'tcp-ip-sockets': a notification via a TCP/IP socket that is opened by the Printer object
248 on the IP address specified in the URI (using IP address dot notation) using the
249 port on that host specified using the /port=nnn keyword. For example:

250 tcp-ip-socket:13.240.120.138/port=6000

251 would cause the Printer object to open the TCP/IP port 6000 at IP address

252 13.240.120.138. 'snmpv1': a notification as an SNMPv1 trap to the host specified
253 as the address in the URI.

254 Note: by specifying different port numbers for each registration on different
255 Printers, a notification recipient can differentiate between events from different
256 Printers, even when the "job-notify-additional-attributes" attribute is not
257 supported.

258 'snmpv2': a notification as an SNMPv2 inform to the host specified as the address in
259 the URI.

260 'snmpv3': a notification as an SNMPv3 inform to the host specified as the address in
261 the URI.

262 'sense': a notification as a SENSE UDP data gram that is opened by the Printer object
263 on the IP address specified in the URI (using IP address dot notation) using the
264 port on that host specified using the /port=nnn keyword. See the tcp-ip-socket
265 example.

266

267 If the Printer object supports the "job-notify" Operation attribute, it **MUST** support the
268 'mailto' scheme for "job-notify-recipients".

270 **3.1.3 job-notify-charset (charset)**

271 The client **OPTIONALLY** supplies this attribute as a member of the "job-notify"
272 Operation attribute. The Printer object **SHALL** support this attribute if it supports the
273 "job-notify" Operation attribute. This attribute specifies the charset for the IPP object to
274 use in the human readable part of the notification content that is sent to the notification
275 recipients that the client supplied in this same collection value. If the attribute is not
276 supplied, the charset supplied in the "attributes-charset" Operation attribute **SHALL** be
277 used, if the charset value is supported by the Printer, else the Printer object shall use the
278 Printer's "charset-configured" value.

279 **3.1.4 job-notify-natural-language (naturalLanguage)**

280 The client **OPTIONALLY** supplies this attribute as a member of the "job-notify"
281 Operation attribute. The Printer object **OPTIONALLY** supports this attribute if it
282 supports the "job-notify" Operation attribute. This attribute specifies the natural language
283 for the IPP object to use in the human readable part of the notification content is sent to
284 the notification recipients that the client supplied in this same collection value. If this
285 attribute is not supplied or the value is not supported by the Printer object, the natural
286 language supplied in the "attributes-natural-language" operation attribute **SHALL** be
287 used, if the natural language value is supported by the Printer, else the Printer object
288 **SHALL** use the Printer's "natural-language-configured" value.

289 **3.1.5 job-notify-additional-attributes (1setOf keyword)**

290 The client **OPTIONALLY** supplies this attribute as a member of the "job-notify"
291 Operation attribute. The Printer object **OPTIONALLY** supports this attribute if it
292 supports the "job-notify" Operation attribute. This attribute specifies the additional
293 attributes that the requester wishes to be included in the notification content, in addition
294 to the fixed set that depends on the event as shown in the table in section 6. If this
295 attribute is not supported or not supplied by the client, the Printer object **SHALL** supply
296 the fixed set of attributes indicated in section 6 depending on the event being requested.

297

298 4 Notification Job attributes

299 4.1 "job-notify" (1setOf collection)

300 This attribute specifies one or more collections of events, notification-recipients, and
301 other member attributes that the client supplied in the "job-notify" Operation attribute of
302 the create request and/or the Printer object defaulted. The Printer object SHALL support
303 this Job attribute if it supports the "job-notify" Operation attribute. See the description of
304 the "job-notify" Operation attribute for the complete specification of the semantics of this
305 Job Description attribute.

306 5 Notification Printer attributes

307 If the Printer object supports the "job-notify" Operation attribute for the Print-Job, Print-
308 URI, and Create-Job operations, then the Printer object SHALL support the following
309 default and supported Printer object attributes that correspond to the "job-notify" member
310 attributes supported.

311 Note: These Printer attributes are specified as separate Printer object attributes, rather
312 than as member attributes of a Printer object's collection attribute, since any combination
313 of values may be used for any of the attributes.

314	Operation and	Printer: Default Value	Printer: Supported
315	Job Attribute	Attribute	Values Attribute
316	job-notify-event-	job-notify-event-	job-notify-event-
317	groups	groups-default	groups-supported
318	(1setOf type2	1setOf type2 keyword	(1setOf type2 keyword
319	keyword)		
320			
321			
322			
323	job-notify-	job-notify-	job-notify-
324	recipients	recipients-default	recipients-supported
325	(1setOf uri)	(uriScheme)	(1setOf uriScheme)
326			
327	job-notify-charset	job-notify-charset-	job-notify-charset-
328	recipients	default	supported
329	(1setOf charset)	(charset)	(1setOf charset)
330			
331	job-notify-	job-notify-natural-	job-notify-natural-
332	natural-language	default	language-supported
333	(naturalLanguage)	(naturalLanguage)	(1setOf
334			naturalLanguage)
335			
336	job-notify-	job-notify-	job-notify-
337	additional-	additional-	additional-
338	attributes	attributes-default	attributes-supported
339	(1setOf keyword)	(1setOf keyword)	(1setOf keywords)
340			

341

342 **5.1 Notification Default Printer attributes**

343 The value of the Printer object's "job-notify-recipients-default" attribute is a 'uriScheme'.
344 If the Printer object supports this attribute, the Printer object adds additional characters to
345 form the 'uri' value for the job's "job-notify-recipients" member attribute of the "job-
346 notify" Job attribute.

347 The client MAY omit the "job-notify-recipients" member attribute, if the Printer object
348 supports "job-notify-recipients-default". However, if the Printer object does NOT
349 support the "job-notify-recipients-default" Printer attribute, the client MUST supply the
350 "job-notify-recipients" member attribute. That is why the table specifies that the client
351 SHOULD supply the "job-notify-recipients-default" in order to interoperate with any
352 Printer object.

353 **5.2 Notification Supported Printer attributes**

354 The value of the Printer object's "job-notify-recipients-supported" attribute is a
355 'uriScheme'. The Printer object SHALL use the values 'of this attribute to validates the
356 scheme supplied by the client in the "job-notify-recipients" member attribute. These
357 Printer attributes specify the supported values for the corresponding member attributes of
358 the "job-notify" Operation collection attribute.

359 For example, if a Printer object supports:

- 360 1) 'mailto:' method for the 'job-completed', 'job-canceled', and 'job-aborted' events
361 using English, French, U.S. English, and German and supporting additional
362 attributes: "job-uri", "job-name", "job-originating-user-name", "number-of-
363 documents", "job-state", "sides", "finishing"
- 364 2) 'sense' and 'tcp/ip-socket' methods for the 'job-received', 'job-started', 'job-
365 completed', 'job-aborted', 'job-canceled' events in English only

366 a system administrator could configure the following Printer attributes":

367 "job-notify-addresses" = 'mailto', 'sense', 'tcp-ip-sockets'

368 "job-notify-event-groups" = 'delivery', 'completed'

369 "job-notify-natural-language" = 'en', 'fr', 'en-us', 'de'

370 "job-notify-additional-attributes" = 'job-uri', 'job-name',
371 'job-originating-user-name', 'number-of-documents',
372 'job-state', 'sides', 'finishing'

373 Note: the fact that not all events are supported for the mailto scheme, or that not all
374 languages are supported for the 'sense' and 'tcp-ip-sockets' methods is not represented,
375 since the collection mechanism is not used to represent the supported attributes. If the
376 client supplies a combination that is not supported, the Printer object SHALL make
377 suitable substitutions and return the attributes that are ignored or substituted in the create
378 operation response.

379 **6 Notification Content definitions**

380 Just as applications need a defined (extendable) set of notifications, they also need a fixed
381 structure and reliable notification content. The notification content depends on the event.
382 For all events, except the 'problems' event, the job to which the event occurred is the
383 same as the job for which the registration was specified in the create job operation. For
384 the 'problems' event, that attributes that are included in the notification content are for the
385 job that caused the event, not the jobs that registered for the event. Thus when a queue of
386 jobs all register for the 'problem' event, their specified notification-recipients all receive
387 the same notification content (for the job that caused the problem event on the Printer).

388 An IPP Printer object MAY also implement the "job-notify-additional-attributes"
389 Operation member attribute in order to allow a client to request additional attributes over
390 and above the fixed set shown in Table 1. Note: a client may wish to request the
391 "printer-uri" attributes in order for the recipient to receive the URI of the printer, in case
392 the recipient needs to obtain additional job and printer attributes using the Get-Job-
393 Attributes and Get-Printer-Attributes operation.

394 Some delivery methods, such as SNMP, do not support the requester requesting
395 additional attributes; the notification recipient will have to explicitly use a Get-Job-
396 Attributes or Get-Printer-Attributes operation to get additional attributes about the job or
397 device.

398 Some delivery methods encode the notification content as a multi-part/alternative MIME
399 type in order to represent both (1) the human readable alternative and (2) a program
400 processable alternative using 'application/ipp' with the Get-Job-Attributes response
401 encoding of the attributes listed in Table 1.

402 IPP does not have some of the job progress attributes that the PWG Job Monitoring has.
403 These are indicated with "-" in the IPP attribute column.

404 ***ISSUE 3: Do we need/want to add these missing attributes to IPP as***
405 ***Printer object attributes?***

406

407

Table 1 - Mandatory attributes sent in notification content depending on the event

IPP attribute (content)	JMP attribute (content)	Event			
		job-received	job-started-processing, print-deadline-exceeded, job-held, job-released	problems	sheet-completed, collated-copy-completed, job-completed, job-aborted, job-canceled, job-entry-expired
job-uri	jmJobSubmissionID	Yes	Yes	Yes	-
job-id	jmJobIndex	Yes	Yes	Yes	Yes
number-of-intervening-jobs	jmNumberOfInterveningJobs	Yes	Yes	Yes	-
job-k-octets	jmJobKOctetsPerCopyRequested	-	Yes	Yes	Yes
job-k-octets-processed	jmJobKOctetsProcessed	-	-	Yes	Yes
job-impressions	jmJobImpressionsPerCopyRequested	-	Yes*	Yes*	Yes*
-	impressionsInterpreted	-	-	Yes	Yes
job-impressions-completed	jmJobImpressionsCompleted	-	-	Yes	Yes
copies	jobCopiesRequested	-	-	Yes	Yes
-	impressionsCompletedCurrentCopy	-	-	Yes	Yes
-	sheetCompletedCopyNumber	-	-	Yes	Yes
-	sheetCompletedDocumentNumber	-	-	Yes	Yes
-	jobCollationType	-	-	Yes	Yes
-	outputBin	-	-	-	Yes**
job-state	jmJobState	-	-	Yes	-
job-state-reasons	jmJobStateReasons1	Yes	Yes		Yes

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'-' indicates that the attribute SHALL NOT be included in the notification content.

* The IPP Printer object will treat jmJobImpressionsPerCopyRequested in the following manner. If explicitly *passed in on submission*, this will be the value used. If there is no

412 value passed in on submission, then the *implicit value, derived from the final number of*
413 *impressions* interpreted for the first copy will be used.

414
415 ** outputBin may be multi-valued

416

417 Note: the 'delivery' group has different patterns of attributes sent in the notification
418 content, so that the IPP Printer object would have to register with the SNMP agent using
419 several different SNMP trap OIDs because the VarBind lists must be different.

420 NOTE: The following objects and attributes have not been included in the fixed set of
421 attributes that SHALL be returned for the indicated reasons (they MAY be requested in
422 implementations that support the "ipp-notify-additional-attributes" attribute):

- 423 1) "job-state" (JMP jmJobState) - the event indicates the job's new state.
- 424 2) "job-owner" (JMP jobOwner) - the notification recipient should know who the
425 owner is. Also the owner is a string, so it can be long. The total size of the
426 content must fit in the maximum size of a PDU for any transport, which is
427 about 500 octets or so (for IPX).
- 428 3) For an IPP device, the jmJobSubmissionID is "job-uri", at least the last 47
429 octets of it.

430 7 Encoding

431 The new 'collection' attribute syntax will use the 0x34 tag value that has been reserved for
432 the 'dictionary' attribute syntax **the IPP/1.0: Protocol Specification.**

433 **ISSUE 4 - Should we change the name that is reserved in the IPP/1.0:**
434 **Protocol Specification from 'dictionary' to 'collection' before the RFC is**
435 **published?**