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Internet Printing Protocol/1.0: Additional Optional Operations - Set 1

Status of this Memo

This document is a Printer Working Group (PWG) DRAFT. The previous version (980727) was posted to the IPP mailing list for comment on 7/29/98 and reviewed at the August, 19-20, 1998 PWG meeting in Toronto. This version contains the changes agreed to at that meeting, and the IPP telecons on 9/2/98, 9/9/98, and 9/16/98 and need to be reviewed by the participants on the mailing list.

Abstract

This document specifies six OPTIONAL operations for use with the Internet Printing Protocol/1.0 (IPP) [ipp-mod, ipp-pro]. The defined Set 1 operations are 3 Job object operations that end-users may perform on their jobs and operators/administrators may perform on any job:

    Hold-Job
    Release-Job
    Restart-Job
and 3 Printer object operations that operators/administrators may perform on a Printer object:
    Pause-Printer
    Resume-Printer
    Purge-Jobs

31

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49

1   Summary of Set 1 and Operation-Id Assignments

50

51   The Set 1 operations are summarized in the following table:

Operation Name	Operation-Id	Brief description
Hold-Job	0x000C	Holds a pending job so that it cannot be scheduled for processing
Release-Job	0x000D	Allows a previously held job to be scheduled for processing
Restart-Job	0x000E	Restarts a job as the same job on the same Printer object
	0x000F	Reserved for the future.
Pause-Printer	0x0010	Stops the device(s) as soon as possible from processing jobs
Resume-Printer	0x0011	Resumes the device(s) processing jobs
Purge-Jobs	0x0012	Removes all jobs from the Printer regardless of job state

52   All of the operations in Set 1 are OPTIONAL for an IPP object to support. Unless the
53   specification of an OPTIONAL operation requires support of another OPTIONAL operation,
54   conforming implementations may support any combination of these operations.

2   Job Operations

55

56   The job operations in Set 1 are for use by end users on their jobs and by operators and
57   administrators on any jobs. The operation attributes in requests and responses for the job
58   operations are the same as the standard Cancel-Job operation (see [model] 3.3.3). Additional
59   operation attributes are specified that the client MAY supply in a request. In addition, the IPP
60   object MUST return the "job-state" [ipp-mod 4.3.7] attribute and, if supported, the "job-state-
61   reasons" [ipp-mod 4.3.8] attribute in the response as Group 3 Job Attributes in order to indicate
62   the effect of the operation on the job object.

2.1   Hold-Job

63

64   This operation allows a client to hold a pending job in the queue so that it is not eligible for
65   scheduling. If the Hold-Job operation is supported, then the Release-Job operation MUST be
66   supported, and vice-versa.

2.1.1   "job-hold-until" (type3 keyword | name(MAX)) operation attribute

67

68   The client OPTIONALLY supplies this attribute. The IPP object MUST support this operation
69   attribute in a Hold-Job request, if it supports the "job-hold-until" Job template attribute in create
70   operations. See [ipp-mod] section 4.2.2. Otherwise, the IPP object NEED NOT support the

71 "job-hold-until" operation attribute in a Hold-Job request. If supplied and supported, the IPP
72 object copies the attribute to the Job object, replacing the job's previous "job-hold-until"
73 attribute, if present, and makes the job a candidate for scheduling during the supplied named time
74 period.

75 As with all operations, if the client supplies the "job-hold-until" (or any OPTIONAL) Operation
76 attribute that is unknown or unsupported or the value is unsupported, the IPP object MUST
77 accept and perform the operation, ignoring the unknown or unsupported operation attribute and
78 returning the ignored or unsupported attributes and/or values in Group 2 Unsupported Attributes
79 (see [ipp-mod] sections 3.3.3.2 and 16.3.6).

80 If the client (1) supplies a value that specifies a time period that has already started or the 'no-
81 hold' value [ipp-mod 4.2.2] (meaning don't hold the job) and (2) the IPP object supports the "job-
82 hold-until" operation attribute and there are no other reasons to hold the job, the IPP object
83 MUST accept the operation and make the job be a candidate for processing immediately (see
84 [ipp-mod] Section 4.2.2).

85 The following new keyword value is defined for use with the "job-hold-until" Job Template
86 attribute in job create operations and the "job-hold-until" operation attribute in Hold-Job and
87 Restart-Job operations:

88   'indefinite': - the job is held indefinitely, until a client performs a Release-Job or Restart-
89   Job operation

90 If the client does not supply a "job-hold-until" operation attribute in the request, the IPP object
91 MUST populate the job object with a "job-hold-until" attribute with the 'indefinite' value (if IPP
92 object supports the "job-hold-until" attribute) and hold the job indefinitely, until a client performs
93 a Release-Job or Restart-Job operation.

94 The IPP object SHOULD support the "job-hold-until" Job Template attribute for use in job create
95 operations with at least the 'indefinite' value, if it supports the Hold-Job operation. Otherwise, a
96 client cannot create a job and hold it immediately (without picking some supported time period
97 in the future).

98 The IPP object MUST accept or reject the request based on the job's current state, transition the
99 job to the indicated new state, and return the indicated new "job-state" attribute and status code
100 as follows:

Current "job-state"	New "job-state"	IPP object's response status code and action:
'pending'	'pending-held'	'successful-ok' See Note 1
'pending'	'pending'	'successful-ok' See Note 2
'pending-held'	'pending-held'	'successful-ok' See Note 1
'pending-held'	'pending'	'successful-ok' See Note 2

'processing'	'processing'	'client-error-not-possible'
'processing-stopped'	'processing-stopped'	'client-error-not-possible'
'completed'	'completed'	'client-error-not-possible'
'canceled'	'canceled'	'client-error-not-possible'
'aborted'	'aborted'	'client-error-not-possible'

101   Note 1: If the OPTIONAL "job-state-reasons" attribute is supported and if the implementation
102   supports multiple reasons for a job to be in the 'pending-held' state, the IPP object MUST add the
103   'job-hold-until-specified' value to the job's "job-state-reasons" attribute.

104   Note 2: If the IPP object supports the "job-hold-until" operation attribute, but the specified time
105   period has already started (or is the 'no-hold' value) and there are no other reasons to hold the job,
106   the IPP object MUST make the job be a candidate for processing immediately (see [ipp-mod]
107   Section 4.2.2) by putting the job in the 'pending' state.

108   Note: In order to keep the Hold-Job operation simple, such a request is rejected when the job is
109   in the 'processing' or 'processing-stopped' states. If an operation is needed to hold jobs while in
110   these states, it will be added as an additional operation, rather than overloading the Hold-Job
111   operation. Then it is clear to clients by querying the Printer object's "operations-supported" [ipp-
112   mod 4.4.13] and the Job object's "job-state" [ipp-mod 4.3.7] attributes which operations are
113   possible.

114   *Access Rights:* The requesting user must either be the submitter of the job or an operator or
115   administrator of the Printer object (see [ipp-mod] Section 1). Otherwise, the IPP object MUST
116   reject the operation and return: 'client-error-forbidden', 'client-error-not-authenticated', or 'client-
117   error-not-authorized' as appropriate.

118   **2.2   Release-Job**

119   This operation allows a client to release a previously held job so that it is again eligible for
120   scheduling. This operation removes the "job-hold-until" job attribute, if present, from the job
121   object that had been supplied in the create or most recent Hold-Job or Restart-Job operation and
122   remove its effect on the job.

123   If the Hold-Job operation is supported, then the Release-Job operation MUST be supported, and
124   vice-versa.

125   If the OPTIONAL "job-state-reasons" attribute is supported, the IPP object MUST remove the
126   'job-hold-until-specified' value from the job's "job-state-reasons" attribute, if present.

127   The IPP object MUST accept or reject the request based on the job's current state, transition the
128   job to the indicated new state, and return the indicated new "job-state" attribute and status code
129   as follows:

| Current "job-state" | New "job-state" | IPP object's response status code and action: |
| 'pending' | 'pending' | 'successful-ok' No effect on the job. |

'pending-held'	'pending-held'	'successful-ok' See Note 1
'pending-held'	'pending'	'successful-ok'
'processing'	'processing'	'successful-ok' No effect on the job.
'processing-stopped'	'processing-stopped'	'successful-ok' No effect on the job.
'completed'	'completed'	'client-error-not-possible'
'canceled'	'canceled'	'client-error-not-possible'
'aborted'	'aborted'	'client-error-not-possible'

130 Note 1: If there are other reasons to keep the job in the 'pending-held' state, such as 'resources-
131 are-not-ready', the job remains in the 'pending-held' state. Thus the 'pending-held' state is not just
132 for jobs that have the 'job-hold-until' applied to them, but are for any reason to keep the job from
133 being a candidate for scheduling and processing, such as 'resources-are-not-ready'. See the "job-
134 hold-until" attribute ([ipp-mod] Section 4.2.2).

135 *Access Rights:* The requesting user must either be the submitter of the job or an operator or
136 administrator of the Printer object. Otherwise, the IPP object MUST reject the operation and
137 return: 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as
138 appropriate.

139 **2.3   Restart-Job**

140 This operation allows a client to restart a job that is retained in the queue after processing has
141 completed. As an implementation option, a job in the 'processing' and/or 'processing-stopped'
142 states MAY be restarted.

143 The job is moved to the 'pending' job state and restarts at the beginning on the same IPP Printer
144 object with the same attribute values. The Job Description attributes that accumulate job
145 progress, such as "job-impressions-completed", "job-media-sheets-completed", and "job-k-
146 octets-processed", MUST be reset to 0 so that they give an accurate record of the job from its
147 restart point. The job object MUST continue to use the same "job-uri" and "job-id" attribute
148 values.

149 **2.3.1   "job-hold-until" (type3 keyword | name(MAX)) operation attribute**

150 The client OPTIONALLY supplies this attribute. The IPP object MUST support this operation
151 attribute in a Restart-Job request, if it supports the "job-hold-until" Job template attribute in
152 create operations. See [ipp-mod] section 4.2.2. Otherwise, the IPP object NEED NOT support
153 the "job-hold-until" operation attribute in a Restart-Job request. If supplied and supported, the
154 IPP object copies the attribute to the Job object, replacing the job's previous "job-hold-until"
155 attribute, if present, and makes the job a candidate for scheduling during the supplied named time
156 period.

157 See Section 2.1.1 for the common semantics of the "job-hold-until" operation attribute for the
158 Hold-Job operation and Restart-Job operation.

159 Note: In the future an OPTIONAL Modify-Job operation may be specified that allows the client
160 to modify other attributes before releasing the restarted job.

161 The IPP object MUST accept or reject the request based on the job's current state, transition the
162 job (or new job, depending on implementation) to the indicated new state, and return the
163 indicated new "job-state" attribute and status code as follows:

Current "job-state"	New "job-state"	IPP object's response status code and action:
'pending'	'pending'	'client-error-not-possible'.
'pending-held'	'pending-held'	'client-error-not-possible'.
'processing'	'pending'	OPTION 1: 'successful-ok' - job is started over. See Note 1.
'processing'	'processing'	OPTION 2: 'client-error-not-possible'.
'processing-stopped'	'pending'	OPTION 1: 'successful-ok' - job is started over. See Note 1
'processing-stopped'	'processing-stopped'	OPTION 2: 'client-error-not-possible'.
'completed'	'pending'	'successful-ok' - job is started over.
'canceled'	'pending'	'successful-ok' - job is started over.
'aborted'	'pending'	'successful-ok' - job is started over.

164

165 Note 1: For OPTION 1, the IPP object SHOULD indicate to clients that a Restart-Job operation
166 is possible while the job is in the 'processing' and/or 'processing-stopped' states, by populating the
167 job's "job-state-reasons" attribute with the 'job-restartable' value.

168 *Access Rights:* The requesting user must either be the submitter of the job or an operator or
169 administrator of the Printer object. Otherwise, the IPP object MUST reject the operation and
170 return: 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as
171 appropriate.

172 3   The Job History concept and additional "job-state-reasons"

173 This section explains the so-called Printer object's "job-history" that contains the recently
174 completed, canceled, and aborted jobs. This section also specifies the 'job-restartable' value of
175 the "job-state-reasons" Job Description attribute for use with the Restart-Job operations.

176 3.1   The "job history" concept

177 When a job is completed, canceled, or aborted, the IPP Printer object MAY retain the job with its
178 document data in a restartable condition using the Restart-Job operation for an implementation-
179 defined time period which may be zero seconds. If the IPP object supports the "job-state-

180 reasons" attribute and the Restart-Job operation, then it SHOULD indicate that such jobs are
181 restartable by adding the 'job-restartable' value to the job's "job-state-reasons" attribute (see
182 Section 3.2) during that implementation-defined time period.

183 After the implementation-defined restartable time period expires, the Printer object deletes the
184 document data for the job and the job becomes part of the "job history". The Print object MAY
185 also delete any number of the job attributes. Since the job is no longer restartable, the Printer
186 object MUST remove the 'job-restartable' value from the job's "job-state-reasons" attribute, if
187 supported. Clients are able to query jobs in the Printer object's "job history" using Get-Job-
188 Attributes and Get-Jobs operations.

189 Subsequently, the IPP Printer removes jobs from its "job history" in an implementation-defined
190 manner, such as after a fixed time period (which MAY be zero seconds) or when the number of
191 jobs exceeds a fixed number. Thereupon, the job can no longer be queried using the Get-Job-
192 Attributes and Get-Jobs operations and the IPP object returns the 'client-error-not-found' or
193 'client-error-gone' as appropriate.

194 **3.2   Add a new 'job-restartable' value to the "job-state-reasons" attribute**

195 The following new keyword value is specified for use with the "job-state-reasons" Job
196 Description attribute and the Restart-Job operation (see Section 2.3):

197   'job-restartable' - This job is currently able to be restarted using the Restart-Job operation.
198   With which job states this values is used depends on implementation, i.e., OPTION 1 vs.
199   OPTION 2 in the job state transition table in Section 2.3. Whenever the IPP object will
200   reject a Restart-Job operation for the job with the 'client-error-not-possible' error status
201   code because the job is not restartable, the IPP object MUST remove this value from the
202   job's "job-state-reasons" attribute.

203

204   For example, after a job is completed (job state is 'completed', 'aborted', or 'canceled'), the
205   implementation MAY retain the job in a restartable condition for an implementation-
206   defined time period. When that time elapses, an implementation MAY delete the
207   document data, but MAY retain some or all of the job attributes as a "job history" for an
208   additional implementation-defined time period. During this second time period, the
209   implementation removes the 'job-restartable' value from the job's "job-state-reasons"
210   attribute, since the job can no longer be restarted.

211

4   Printer operations

The printer operations in Set 1 are for use by operators and administrators of each Printer object. The following figure is copied from [ipp-mod] with the addition of the following arrow:
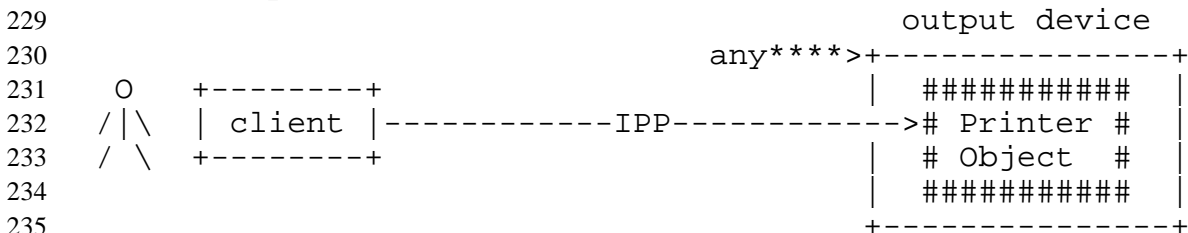
```
      any****>
```

indicating an additional source of job submission using IPP or any other job submission protocol that passes to the device but does NOT pass through the IPP Printer object in question.

```
Legend:

##### indicates a Printer object which is
      either embedded in an output device or is
      hosted in a server.  The Printer object
      might or might not be capable of queuing/spooling.

any   indicates any network protocol or direct
      connect, including IPP

embedded printer:
                                             output device
                                 any****>+---------------+
 O    +--------+                         |  ########## |
/|\   | client |------------IPP------------># Printer # |
/ \   +--------+                         |  # Object  # |
                                         |  ########## |
                                         +---------------+

hosted printer:
                                 any****>+---------------+
 O    +--------+         ##########      |               |
/|\   | client |--IPP--># Printer #-any->| output device |
/ \   +--------+         # Object  #      |               |
                        ##########      +---------------+


                                 any****>+---------------+
fan out:                                 |               |
                                 +-->| output device |
                             any/        |               |
 O    +--------+      ##########   /     +---------------+
/|\   | client |-IPP># Printer #--*
/ \   +--------+      # Object  #   \     +---------------+
                     ########## any\      |               |
                                 +-->| output device |
                                         |               |
                                         +---------------+
```
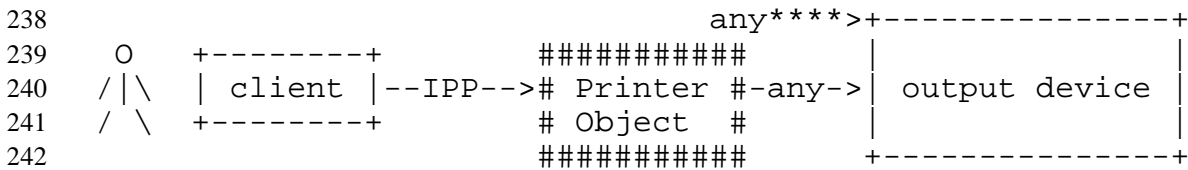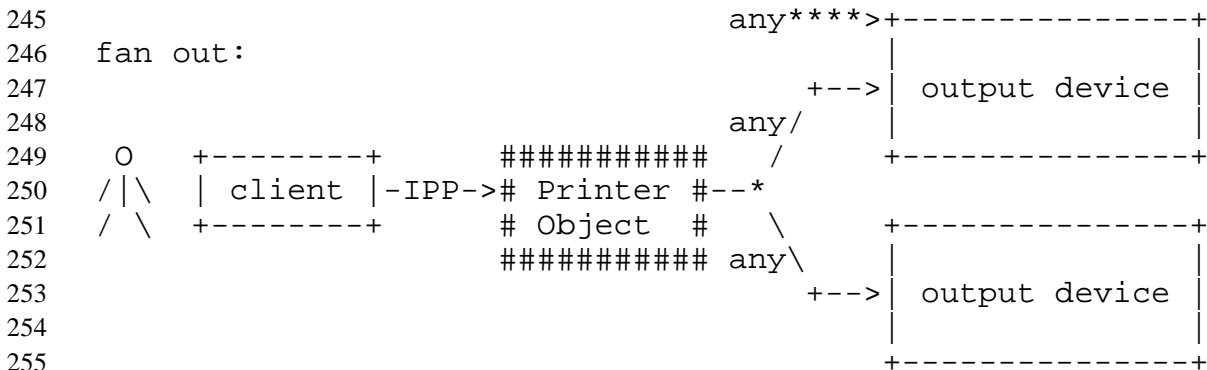
256   The operation attributes for the Printer operation requests are as follows:-

257   Group 1: Operation Attributes

258   Natural Language and Character Set:
259   The "attributes-charset" and "attributes-natural-language" attributes as described in
260   section 3.1.4.1 of [ipp-mod].
261
262   Target:
263   The "printer-uri" (uri) operation attribute which is the target for this operation as
264   described in section 3.1.5 of [ipp-mod].
265
266   Requesting User Name:
267   The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client
268   as described in section 8.3 of [ipp-mod].

269   The operation attributes for the Printer operation responses are as follows:

270   Group 1: Operation Attributes

271   Status Message:
272   In addition to the REQUIRED status code returned in every response, the response
273   OPTIONALLY includes a "status-message" (text) operation attribute as described in
274   section 3.1.6 of [ipp-mod].
275
276   Natural Language and Character Set:
277   The "attributes-charset" and "attributes-natural-language" attributes as described in
278   section 3.1.4.2 of [ipp-mod].
279

280   Group 2: Unsupported Attributes

281   This is a set of Operation attributes supplied by the client (in the request) that are not
282   supported by the Printer object or that conflict with one another (see sections 3.2.1.2 and
283   16).
284

285   Group 3: Printer Object Attributes

286   Printer state information:
287   The Printer object MUST return the "printer-state" [ipp-mod 4.4.10] and, if supported, the
288   "printer-state-reasons" [ipp-mod 4.4.11] attributes in order to indicate the effect of the
289   operation on the Printer object.

290 **4.1   Pause-Printer**

291 This operation allows a client to stop the Printer object from scheduling jobs on all its devices.
292 Depending on implementation, the Pause-Printer operation MAY also stop the Printer from
293 processing the current job or jobs. Any job that is currently being printed is either stopped as
294 soon as the implementation permits or is completed, depending on implementation. The Printer
295 object MUST still accept create operations to create new jobs, but MUST prevent any jobs from
296 entering the 'processing' state.

297 If the Pause-Printer operation is supported, then the Resume-Printer operation MUST be
298 supported, and vice-versa.

299 The IPP Printer stops the current job(s) on its device(s) that were in the 'processing' or
300 'processing-stopped' states as soon as the implementation permits. If the implementation
301 supports the "printer-state-reasons" attribute and the devices will take appreciable time to stop,
302 the IPP Printer adds the 'moving-to-paused' value to the Printer object's "printer-state-reasons"
303 attribute. When the device(s) have all stopped, the IPP Printer transitions the Printer object to the
304 'stopped' state, removes the 'moving-to-paused' value, if present, and adds the 'paused' value to
305 the Printer object's "printer-state-reasons" attribute.

306 When the current job(s) complete that were in the 'processing' state, the IPP Printer transitions
307 them to the 'completed' state. When the current job(s) stop in mid processing that were in the
308 'processing' state, the IPP Printer transitions them to the 'processing-stopped' state and, if the
309 "job-state-reasons" attribute is supported, adds the 'printer-stopped' value to the job's "job-state-
310 reasons" attribute.

311 Note: for any jobs that are 'pending' or 'pending-held', the 'printer-stopped' value of the jobs'
312 "job-state-reasons" attribute also applies. However, the IPP Printer NEED NOT update those
313 job's "job-state-reasons" attributes and only need return the 'printer-stopped' value when those
314 jobs are queried (so-called "lazy evaluation").

315 Whether the Pause-Printer operation affects jobs that were submitted to the device from other
316 sources than the IPP Printer object (see the any***> arrow in the figure above) in the same
317 way that the Pause-Printer operation affects jobs that were submitted to the IPP Printer object
318 using IPP, depends on implementation, i.e., on whether the IPP protocol is being used as a
319 universal management protocol or just to manage IPP jobs, respectively.

320 The IPP Printer MUST accept the request in any state, transition the Printer to the indicated new
321 "printer-state" before returning, and return the indicated "printer-state", "printer-state-reasons",
322 and status code as follows:

Current "printer-state"	New "printer-state" returned	"printer-state-reasons"	IPP Printer's response status code and action:
'idle'	'stopped'	'paused'	'successful-ok'
'processing'	'processing'	'moving-to-	OPTION 1: 'successful-ok';

		paused'	Later, when all output has stopped, the "printer-state" becomes 'stopped', and the 'paused' value replaces the 'moving-to-paused' value in the "printer-state-reasons" attribute
'processing'	'stopped'	'paused'	OPTION 2: 'successful-ok'; all output stopped immediately
'stopped'	'stopped'	'paused'	'successful-ok'

323 *Access Rights:* The requesting user must be an operator or administrator of the Printer object.
324 Otherwise, the IPP Printer MUST reject the operation and return: 'client-error-forbidden', 'client-
325 error-not-authenticated', or 'client-error-not-authorized' as appropriate.

4.1.1   Add a new 'moving-to-paused' value to the "printer-state-reasons" attribute

327 The following new keyword value is specified for use with the "printer-state-reasons" Printer
328 Description attribute:

329   'moving-to-paused': The Printer object's operator or administrator has paused the Printer
330   object using the Pause-Printer operation or other means, but it has not yet stopped
331   producing output. When all the devices stop producing output, the Printer object MUST
332   replace this value with the 'paused' value.

4.2   Resume-Printer

334 This operation allows a client to resume the Printer object scheduling jobs on all its devices. If
335 the Printer object supports the "printer-state-reasons" attribute, it MUST remove the 'paused' and
336 'moving-to-paused' values from the Printer object's "printer-state-reasons" attribute, if present. If
337 there are no other reasons to keep a device paused (such as media-jam), the IPP Printer
338 transitions itself to the 'processing' or 'idle' states, depending on whether there are jobs to be
339 processed or not, respectively, and the device(s) resume processing jobs.

340 If the Pause-Printer operation is supported, then the Resume-Printer operation MUST be
341 supported, and vice-versa.

342 The IPP Printer removes the 'printer-stopped' value from any job's "job-state-reasons" attributes
343 contained in that Printer.

344 The IPP Printer MUST accept the request in any state, transition the Printer object to the
345 indicated new state, and return the indicated "printer-state" and status code as follows:

Current "printer-state"	New "printer-state" returned	IPP Printer's response status code and action:
'idle'	'idle'	'successful-ok'
'processing'	'processing'	'successful-ok'
'stopped'	'processing'	'successful-ok';

		when there are jobs to be processed
'stopped'	'idle'	'successful-ok'; when there are no jobs to be processed.

346 *Access Rights:* The requesting user must be an operator or administrator of the Printer object.
347 Otherwise, the IPP Printer MUST reject the operation and return: 'client-error-forbidden', 'client-
348 error-not-authenticated', or 'client-error-not-authorized' as appropriate.

349 **4.3   Purge-Jobs**

350 This operation allows a client to remove all jobs from an IPP Printer object, regardless of their
351 job states, including jobs in the Printer object's "job-history" (see Section 3.1). After a Purge-
352 Jobs operation has been performed, a Printer object MUST return no jobs in subsequent Get-Job-
353 Attributes and Get-Jobs responses (until new jobs are submitted).

354 Whether the Purge-Jobs (and Get-Jobs) operation affects jobs that were submitted to the device
355 from other sources than the IPP Printer object (see the any***> arrow in the figure in Section
356 4) in the same way that the Purge-Jobs operation affects jobs that were submitted to the IPP
357 Printer object using IPP, depends on implementation, i.e., on whether the IPP protocol is being
358 used as a universal management protocol or just to manage IPP jobs, respectively.

359 Note: if an operator wants to cancel all jobs without clearing out the job history, the operator
360 uses the Cancel-Job operation on each job instead of using the Purge-Job operation.

361 The Printer object MUST accept this operation in any state and transition the Printer object to the
362 'idle' state.

363 *Access Rights:* The requesting user must be an operator or administrator of the Printer object.
364 Otherwise, the IPP object MUST reject the operation and return: client-error-forbidden, client-
365 error-not-authenticated, and client-error-not-authorized as appropriate.

366 **5   Security Considerations**

367 For the job operations in Set 1 (Section 2), the requesting user must either be the submitter of the
368 job or an operator or administrator of the Printer object (see [ipp-mod] Section 1). Otherwise,
369 the IPP object MUST reject the operation and return: 'client-error-forbidden', 'client-error-not-
370 authenticated', or 'client-error-not-authorized' as appropriate. See [ipp-mod] Section 8.3 on the
371 two ways that the client MUST specify the user who is performing each IPP operation.

372 For the printer operations in Set 1 (Section 4), the requesting user must by an operator or
373 administrator of the Printer object (see [ipp-mod] Section 1). The means for authorizing an
374 operator or administrator of the Printer object are not specified in either [ipp-mod] or this
375 document.

6   References

376

377   [ipp-mod]
378   Isaacson, S., deBry, R., Hastings, T., Herriot, R., Powell, P., "Internet Printing
379   Protocol/1.0: Model and Semantics" draft-ietf-ipp-mod-10.txt, June, 1998.

380   [ipp-pro]
381   Herriot, R., Butler, S., Moore, P., Tuner, R., "Internet Printing Protocol/1.0: Encoding
382   and Transport", draft-ietf-ipp-pro-06.txt, June, 1998.

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