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9 **Internet Printing Protocol (IPP):**
10 **Job and Printer Set Operations**

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21 Abstract

22 This document specifies 3 additional OPTIONAL operations for use with the Internet Printing Protocol/1.0
23 (IPP) [RFC2565, RFC2566], IPP/1.1 [RFC2911, RFC2910], and future versions. The end user, operator,
24 and administrator Set-Job-Attributes and Set-Printer-Attributes operations are used to modify IPP Job
25 objects and Printer objects, respectively. The third administrator Get-Printer-Supported-Values operation
26 returns values that the IPP Printer will accept for setting its "xxx-supported" attributes.

27 Three out-of-band values are defined for use with these operations: 'delete-attribute', 'admin-define', and 'not-
28 settable', along with a 'client-error-attributes-not-settable' status code.

29 Two operation attributes: "printer-message-from-operator" (text) and "job-message-from-operator" (text) are
30 defined to set the corresponding IPP/1.1 Printer and Job Description attributes with the same names.

31 Nine Printer Description attributes are defined:

32 printer-settable-attributes-supported (1setOf type2 keyword)

33 job-settable-attributes-supported (1setOf type2 keyword)

34 document-format-varying-attributes (1setOf type2 keyword)

35 printer-message-time (integer(MIN:MAX))

36 printer-message-date-time (dateTime)

37 printer-xri-supported (1setOf collection)
38 xri-uri-scheme-supported (1setOf uriScheme)
39 xri-authentication-supported (1setOf type2 keyword)
40 xri-security-supported (1setOf type2 keyword)
41

41 The full set of IPP documents includes:

42 Design Goals for an Internet Printing Protocol [RFC2567]

43 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]

44 Internet Printing Protocol/1.1: Model and Semantics [RFC2911]

45 Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]

46 Internet Printing Protocol/1.1: Implementer's Guide [IPP-IIG]

47 Mapping between LPD and IPP Protocols [RFC2569]

48

49 The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing
50 functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in a
51 printing protocol for the Internet. It identifies requirements for three types of users: end users, operators, and
52 administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A few OPTIONAL
53 operator operations have been added to IPP/1.1.

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

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

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

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

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140 **1 Introduction**

141 The Internet Printing Protocol (IPP) is an application level protocol that can be used for distributed printing
142 using Internet tools and technologies. IPP version 1.1 [RFC2911, RFC2910] focuses on end user
143 functionality with a few administrative operations included. This document defines additional OPTIONAL end
144 user, operator, and administrator Set-Job-Attributes and Set-Printer-Attributes operations used to modify IPP
145 Job objects and Printer objects, respectively. It also defines a third administrator Get-Printer-Supported-
146 Values operation that returns values that the IPP Printer will accept for setting its "xxx-supported" attributes.
147 The Get-Printer-Supported-Values operation MUST be supported, if the implementation supports setting any
148 "xxx-supported" Printer attributes using the Set-Printer-Attributes operation.

149 Three out-of-band values are defined for use with these three operations: 'delete-attribute' for deleting Job
150 attributes with the Set-Job-Attributes request, 'not-settable' for use in either the Set-Job-Attributes or Set-
151 Printer-Attributes responses, and 'admin-define' for use in the Get-Printer-Supported-Values response.

152 Two operation attributes: "printer-message-from-operator" (text) and "job-message-from-operator" (text) are
153 defined to set the corresponding IPP/1.1 Printer and Job Description attributes with the same names. These
154 operation attributes may be used with any operation that affect the Printer or Job object for which an
155 operation might want to indicate a message. For the Set-Job-Attributes and Set-Printer-Attributes
156 operations, the client MUST explicitly set them, rather than using these operation attributes.

157 A Printer implementation can make the value of some attributes dependent on the document-format, e.g.
158 "resolution-supported".

159 This document is an extension to IPP/1.0 [RFC2565, RFC2566] and IPP/1.1 [RFC2911, RFC2910], and
160 future versions.

161 **2 Terminology**

162 This section defines terminology used throughout this document.

163 **2.1 Conformance Terminology**

164 Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED
165 NOT, and OPTIONAL, have special meaning relating to conformance. These terms are defined in
166 [RFC2911] section 12.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

167 The following specialization of these terms apply to this document:

168 REQUIRED: if an implementation supports the extensions described in this document, it MUST support a
169 REQUIRED feature.

170 OPTIONAL: if an implementation supports the extensions described in this document, it MAY support an
171 OPTIONAL feature.

172 2.2 Other terminology

173 This document uses terms such as Job object (or Job), IPP Printer object (or Printer), "operation", "request",
174 response", "attributes", "keywords", and "support". These terms have special meaning and are defined in the
175 model terminology [RFC2911] section 12.2. The following additional terms are introduced in this document:

176 READ-ONLY: used in an attribute definition document to indicate that the attribute MUST NOT be settable
177 using an IPP protocol Set operation. In other words, the attribute is not settable by definition.
178 not-settable: an implementation does not support setting an attribute (whether or not the attribute's definition is
179 READ-ONLY).

180 3 Requirements and Use Cases

181 The following requirements and usage are intended to be met by the specification in this document.

- 182 1. The end-user and the operator need a way to modify a Job that is in the 'pending' or 'pending-held' state.

183 Usage: The end-user discovers that he/she forgot to include a print instruction, such as "finishings" =
184 'staple' after submitting a job. Rather than canceling the job and resubmitting it to the same IPP Printer, the
185 end-user is able to modify the job on the IPP Printer.

186 The operator needs to modify a job because it is requesting a particular kind of media for which there is no
187 more, but the policy is to print the job on a comparable medium.

- 188 2. The system administrator needs a way to re-configure or change the policy of the IPP Printer remotely.

189 Usage: The system administrator is adding additional named media to the supported media list (setting
190 'name' values to the "media-supported" Printer attribute).

191 The system administrator is reducing the capability of the IPP Printer by removing one of the operations
192 from the supported operations list, such as Cancel-Job, because the policy is to run the IPP Printer like a
193 public facsimile machine. After having removed Cancel-Job from the list of supported operations, an
194 administrative client needs to be able to display to an administrator that the implementation is capable of
195 being reconfigured to support Cancel-Job once again.

196 The system administrator is remotely configuring the IPP Printer after installing it, and so is replacing the
197 Printer Description attributes that have the out-of-band 'no-value' value (see [RFC2911] section 4.1) with
198 the proper values.

199 The operator is changing the media loaded in the input tray and so is replacing the "media-ready" Job
200 Template Printer attribute value with the proper values

201 4 Definition of the Set operations

202 The Set-Printer-Attributes operation (as are all Printer operations) are directed at Printer objects. A client
 203 MUST always supply the "printer-uri" operation attribute in order to identify the correct target of the
 204 operation. These descriptions assume all of the common semantics of IPP/1.1 Model and Semantics
 205 document [RFC2911] section 3.1.

206 The Set-Job-Attributes operation (as are all Job operations) are directed at Job objects. A client MUST
 207 always supply some means of identifying the Job object in order to identify the correct target of the operation.
 208 That job identification MAY either be a single Job URI or a combination of a Printer URI with a Job ID as
 209 defined in [RFC2911]. The IPP object implementation MUST support both forms of identification for every
 210 job. If possible, a client SHOULD use the Printer URI with a Job ID rather than a Job URI, since the 32-bit
 211 "job-id" is more readily translated to and from other print protocols that MAY be serving as gateways into or
 212 out of the IPP implementation.

213 The Set Printer operations are summarized in Table 1:

214 **Table 1 - Operation-Id assignments**

Operation Name	Operation-Id	Brief description
Set-Printer-Attributes	0x0013	Sets attribute values of the target Printer object
Set-Job-Attributes	0x0014	Sets attribute values of the target Job object
Get-Printer-Supported-Values	0x0015	Gets values that are valid for setting "xxx-supported" attributes using the Set-Printer-Attributes operation

215 4.1 Set-Printer-Attributes Operation

216 This OPTIONAL operation allows a client to set the values of the attributes of a Printer object. In the
 217 request, the client supplies the set of Printer keyword attribute names and values that are to be set. In the
 218 response, the Printer object returns success or rejects the entire request with indications of which attribute or
 219 attributes could not be set.

220 The Printer object validates the client-supplied attributes in the Set-Printer-Attributes request. For an attribute
 221 to validate it MUST meet all of the following rules:

- 222 1. The number of attributes supplied by the client MUST NOT exceed the maximum number that the Printer
 223 supports in a Set-Printer-Attributes request. A Printer MUST accept at least one attribute, but SHOULD
 224 accept a reasonable number in a single Set-Printer-Attributes request.

225 Note: There is no way for the client to determine the maximum number of attributes that the Printer
 226 supports in a Set-Printer-Attributes request, except to try a reasonable number.

- 227 2. The Printer MUST support the attribute.

- 228 3. The attribute MUST NOT be READ-ONLY, i.e., the definition of the attribute MUST NOT indicate that
229 the attribute is READ-ONLY (see Appendix A for an indication of which IPP/1.1 attributes are READ-
230 ONLY).
- 231 4. The attribute MUST be settable in this implementation.
- 232 5. The Printer MUST support the value according to the rules defined in Appendix A, i.e., each value of each
233 supplied "xxx" attribute MUST be validated against a value of a corresponding "xxx-supported" Printer
234 attribute. One of those rules permits an administrator to set arbitrary 'name' values to those "xxx-
235 supported" Printer attributes that include the 'name' attribute syntax if the implementation supports the
236 'admin-define' out-of-band value for that "xxx-supported" attribute (see section 15 and 8.3).
- 237 6. The attribute's values MUST NOT conflict with the values of other Printer attributes, including ones being
238 set in this same operation.

239 If any of the supplied attributes does not validate, the Printer object MUST reject the entire operation; the
240 Printer object MUST NOT partially set some of the supplied attributes. In other words, after the operation,
241 all the supplied attributes MUST be set or none of them MUST be set, thus making the Set-Printer-Attributes
242 an atomic operation.

243 The Printer MUST accept this operation when its READ-ONLY "printer-state" attribute (see RFC2911)
244 section 4.4.11) is 'idle' or 'stopped', and SHOULD accept it when the value is 'processing'. The Printer
245 MUST accept this operation for any of the values of the Printer object's READ-ONLY "printer-state-
246 reasons" and "printer-is-accepting-jobs" attributes, unless explicitly defined otherwise in the definition of these
247 attributes' values.

248 This operation MUST NOT change the value of attributes not specified in the operation unless the definition of
249 the attribute explicitly specifies such side-effects. For example, this document explicitly specifies that when this
250 operation sets "printer-message-from-operator", the Printer also MUST set the READ-ONLY "printer-
251 message-time" and READ-ONLY "printer-message-date-time" attributes to the time of the operation as a side
252 effect. In particular, if this operation changes an "xxx-default" attribute, the new value MUST be in the "xxx-
253 supported" attribute or the request MUST contain a new value for "xxx-supported" which contains the new
254 value for the "xxx-default". Otherwise, the Printer MUST reject the operation. In general, Printer attribute
255 definitions that are settable will not define side-effects on other attributes that are settable, only side effects on
256 READ-ONLY attributes, if any.

257 **4.1.1 Settable and READ-ONLY Printer Description attributes**

258 If the Printer supports the Set-Printer-Attributes operation, then it SHOULD support setting of:

- 259 all Job Template Default ("xxx-default") attributes
260 all Job Template Supported ("xxx-supported") attributes
261 all Job Template Ready ("xxx-ready") attributes

262 that the implementation supports (see [RFC2911] section 4.2 and extensions).

263 Some Printer Description attributes (see [RFC2911] section 4.4) MUST NOT be settable, i.e., they are
264 defined to be READ-ONLY. An attribute marked as "READ-ONLY" in the Printer Description attribute
265 table in Appendix A is such an attribute. The Printer attributes that are not marked as "READ-ONLY" MAY
266 be settable using the Set-Printer-Attributes operation, depending on implementation.

267 Note: From now on, all extensions that define new object attributes will indicate whether or not the attributes
268 are READ-ONLY, by including the "READ-ONLY" adjective in their descriptions and/or explicitly stating
269 whether they MAY be settable.

270 The current values of each "xxx-supported" Printer attribute MUST reflect the current policy for support of the
271 corresponding "xxx" attribute. If an "xxx-supported" Printer attribute is settable in an implementation, then its
272 value(s) MUST affect the behavior of the implementation. If an "xxx-supported" Printer attribute is defined to
273 be READ-ONLY or is not-settable in an implementation, then its values MUST NOT be settable using the
274 Set-Printer-Attributes operation. Consider the following example:

275 For example, if the "operations-supported" Printer Description attribute (see [RFC2911] section 4.4.15) is
276 settable in a particular implementation, then changing its value with a Set-Printer-Attributes operation
277 MUST affect the operations that the implementation accepts or rejects. Such an implementation will need
278 to be able to reject values for operations that it contains no code support for (see section 4.3). If the
279 "operations-supported" Printer Description attribute is not settable in a particular implementation, then that
280 implementation MUST reject an attempt to set it with a Set-Printer-Attributes operation, return the 'client-
281 error-attributes-not-settable' status code (see section 7.1), and return the "operations-supported" attribute
282 with the out-of-band 'not-settable' value in the Unsupported Attributes Group.

283 As another example, consider an implementation in which the "media-default" and "media-supported" are
284 settable. If a client supplies a Set-Printer-Attributes request that contains the "media-default" attribute with
285 a value that is not a member of the Printer's "media-supported" attribute, the Printer MUST reject the
286 request and return the "client-error-conflicting-attributes" status code with the "media-default" and "media-
287 supported" attributes and their values (see [RFC2911] section 3.1.7).

288 As a third example, if a client supplies a Set-Printer-Attributes request that contains both the "media-
289 default" and the "media-supported" attributes, but includes a value in the "media-default" that is not a
290 member of the supplied "media-supported" attribute, the Printer MUST reject the request and return the
291 "client-error-conflicting-attributes" status code with the "media-default" and "media-supported" attributes
292 and their values (see [RFC2911] section 3.1.7).

293 *Access Rights:* The authenticated user (see [RFC2911] section 8.3) performing this operation must be an
294 operator or administrator of the Printer object (see [RFC2911] Sections 1 and 8.5). Most Printer attributes
295 will require administrator access rights to set, such as "xxx-supported", while some will require operator
296 access rights only, such as "media-ready" and "printer-message-from-operator". Which attributes require
297 which access rights depends on implementation and MAY depend on site policy.

298 4.1.2 Set-Printer-Attributes Request

299 The following sets of attributes are part of the Set-Printer-Attributes Request:

300 Group 1: Operation Attributes

301 Natural Language and Character Set:

302 The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]
303 section 3.1.4.1.

304 Target:

305 The "printer-uri" (uri) operation attribute which is the target for this operation as described in
306 [RFC2911] section 3.1.5.

307 Requesting User Name:

308 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
309 described in [RFC2911] section 8.3.

310 "document-format" (mimeMediaType):

311 The client OPTIONALLY supplies this attribute. The Printer object MUST support this attribute.
312 This attribute is useful for a client to select the document-format to which the attribute modification
313 should be applied. A Printer implementation MAY allow some attributes to have different values for
314 each document format that it supports. See [RFC2911] section 3.2.5.1 "Get-Printer-Attributes
315 Request".

316 If the client includes this attribute, the Printer MUST change the supplied attributes for the document
317 format specified by this attribute. If a supplied attribute is a member of the "document-format-
318 varying-attributes" (i.e., the attribute varies by document format, see section 6.3), the Printer MUST
319 change the supplied attribute for the document format specified by this attribute, but not for other
320 document formats. If a supplied attribute isn't a member of the "document-format-varying-attributes"
321 (i.e. it doesn't vary by document format), the Printer MUST change the supplied attribute for all
322 document formats.

323 If the client omits this attribute, the Printer MUST change the supplied attributes for all document
324 formats whether or not they vary by document-format.

325 If the client supplies a value for the "document-format" Operation attribute that is either
326 'application/octet-stream' or not supported by the Printer, i.e., is not among the values of the Printer
327 object's "document-format-supported" attribute, the Printer object MUST reject the operation and
328 return the 'client-error-document-format-not-supported' status code. Note: the document-format
329 'application/octet-stream' is the union of several document-formats (see [RFC2911] section 3.2.5.1,
330 Get-Printer-Attributes) and is not a true document-format.

337

338 Group 2: Printer Attributes

339 The client MUST supply a set of Printer attributes with one or more values (including explicitly
340 allowed out-of-band values) as defined in [RFC2911] section 4.2 Job Template Attributes ("xxx-
341 default", "xxx-supported", and "xxx-ready" attributes), section 4.4 Printer Description Attributes, and
342 any attribute extensions supported by the Printer. The value(s) of each Printer attribute supplied in
343 Group 2 replaces the value(s) of the corresponding Printer attribute on the target Printer object. For
344 attributes that can have multiple values (1setOf), all values supplied by the client replace all values of
345 the corresponding Printer object attribute. If a Printer object attribute had not been configured yet
346 and so had the 'no-value' out-of-band value (see [RFC2911] section 4.1), the supplied value(s)
347 replace the 'no-value' value.
348

349 **4.1.3 Set-Printer-Attributes Response**

350 The Printer object returns the following sets of attributes as part of the Get-Printer-Attributes Response:

351 Group 1: Operation Attributes

352 Status Message:

353 In addition to the REQUIRED status code returned in every response, the response OPTIONALLY
354 includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation
355 attribute as described in [RFC2911] sections 13 and 3.1.6.
356

357 Natural Language and Character Set:

358 The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]
359 section 3.1.4.2.
360

361 Group 2: Unsupported Attributes

362 See [RFC2911] section 3.1.7 for details on returning Unsupported Attributes.
363

364 If some of the attributes in the operation fail to validate, the Printer MUST reject the operation,
365 MUST NOT change any Printer attributes, and MUST return the indicated status code below. In
366 this group, the Printer MUST also return all attributes that fail to validate. The following are the
367 reasons that an attribute fails to validate and the value returned for the attribute, along with the
368 indicated status code and order of detection:

- 369 1. The number of attributes supplied by the client exceeds the maximum number that the Printer
370 supports in a Set-Printer-Attributes request: return the 'client-error-request-entity-too-large'
371 (see [RFC2911] section 13.1.4.9).
- 372 2. The Printer doesn't support the attribute: return the attribute with the "out-of-band" value
373 'unsupported' (see [RFC2911] section 3.1.7 and [RFC2910]) and the 'client-error-attributes-
374 or-values-not-supported' (see [RFC2911] section 13.1.4.12).

- 375 3. The attribute is either READ-ONLY (in its definition) or is not-settable in this implementation:
376 return the attribute with the "out-of-band" value 'not-settable' (see section 8.1) and the 'client-
377 error-attributes-not-settable' status code (see section 7.1).
- 378 4. The Printer doesn't support the value: if the attribute in the operation has a single value return it.
379 If the attribute in the operation is multi-valued, return only those values in a 1setOf that are not
380 supported. Return the 'client-error-attributes-or-values-not-supported' status code (see
381 [RFC2911] section 13.1.4.12).
- 382 5. The values of some of the supplied attributes conflict with one another and/or other Printer
383 attribute values not being set: if the conflicting attribute in the operation has a single value return
384 the attribute and the value. If the attribute in the operation is multi-valued, return only the
385 attribute and those values in a 1setOf that are conflicting with other attributes. Return the 'client-
386 error-conflicting-attributes' status code (see [RFC2911] section 13.1.4.15).

387 4.2 Set-Job-Attributes Operation

388 This OPTIONAL operation allows a client to set the values of the attributes of a Job object. In the request,
389 the client supplies the set of Job keyword attribute names and values that are to be set. In the response, the
390 IPP object returns success or rejects the entire request with indications of which attribute or attributes could
391 not be set.

392 This operation is almost identical to the Set-Printer-Attributes operation and follows the same rules for
393 validation (see section 4.1). The only differences are that the Set-Job-Attributes operation is directed at a Job
394 object rather than a Printer object, there is no "document-format" operation attribute used when setting a Job
395 object, the operation can add an attribute to the (Job) object, the 'delete-attributes' out-of-band value is
396 permitted to remove an attribute, and the validation is the same as the Job Creation operations (Print-Job,
397 Print-URI, and Create-Job), i.e., depends on the "xxx-supported" Printer Description attributes (see
398 [RFC2911] section 3.1). Using the Set-Printer-Attributes operation, the administrator can set arbitrary
399 'name' values to those "xxx-supported" Printer attributes that include the 'name' attribute syntax if the
400 implementation supports the 'admin-define' out-of-band value for that "xxx-supported" attribute (see section
401 15 and 8.3). However, the Set-Job-Attributes cannot be used to add unsupported names to the Job object.

402 If a client supplies a job attribute in a Set-Job-Attributes request that the Printer supports, and the job was
403 originally submitted without supplying that attribute, the Printer adds the attribute to the Job object.

404 If the client supplies a job attribute with the "out-of-band" value 'delete-attribute' (see section 8.2), then the
405 Printer MUST remove the attribute and all of its values from the Job object, if present. The semantic effect of
406 the client supplying the 'delete-attribute' value in a Set-Job-Attributes operation MUST be the same as if the
407 attribute had not been supplied with the Job object in the Job Creation operation, i.e., the Printer applies its
408 default attribute or behavior with lower precedence than the PDL (see the beginning of [RFC2911] section 4.2
409 and [RFC2911] 3.2.1.1). Any subsequent query of the Job object using Get-Job-Attributes or Get-Jobs
410 MUST NOT return any attribute that has been deleted using the 'delete-attribute' out-of-band value.

411 However, a client can re-establish such a deleted Job attribute with any supported value(s) using a subsequent
412 Set-Job-Attributes operation.

413 If the client supplies an attribute in a Set-Job-Attributes request with the 'delete-attribute' value and that
414 attribute is not present on the Job object, the Printer ignores that supplied attribute in the request, does not
415 return the attribute in the Unsupported Attributes group, and returns the 'successful-ok' status code, if there
416 are no other problems with the request.

417 The validation of the Set-Job-Attributes request is performed by the Printer as if the job had been submitted
418 originally with the new attribute values (and the deleted attributes removed) and with "ipp-attribute-fidelity" set
419 to 'true', i.e., all modified attributes Job attributes and values MUST be supported in combination with the Job
420 attributes not modified. If such a Job Creation operation would have been accepted, then the Set-Job-
421 Attributes MUST be accepted. If such a Job Creation operation would have been rejected, then the Set-Job-
422 Attributes MUST be rejected and the Job MUST be unchanged. In addition, if any of the supplied attributes
423 are not supported, are not settable, or the values are not supported, the Printer object MUST reject the entire
424 operation; the Printer object MUST NOT partially set some of the supplied attributes. In other words, after
425 the operation, all the supplied attributes MUST be set or none of them MUST be set, thus making the Set-
426 Job-Attributes an atomic operation.

427 The IPP object MUST accept or reject this operations when the Job's READ-ONLY "job-state" attribute has
428 the values shown in Table 2. The job's current state MUST affect whether the IPP object accepts or rejects
429 the request. For example, in the case where the operation creates a request for unavailable resources, the Job
430 transitions to a new state. Table 2 shows the allowed behaviors in each job state and the transitions.

431 **Table 2 - Job State Transition Table for the Set-Job-Attributes operation**

Current "job-state"	New "job-state"	IPP object's response status code and action:
'pending'	'pending'	'successful-ok'
'pending'	'pending-held'	'successful-ok' - needed resources are not ready
'pending-held'	'pending-held'	'successful-ok'
'pending-held'	'pending'	'successful-ok' - needed resources are ready
'processing'	'processing'	'successful-ok' or 'client-error-not-possible' depending on implementation, including the attributes being set, whether the job has started marking media, etc.
'processing-stopped'	'processing-stopped'	'successful-ok' or 'client-error-not-possible' depending on implementation, including the attributes being set, whether the job has started marking media, etc.
'completed'	'completed'	'client-error-not-possible'
'canceled'	'canceled'	'client-error-not-possible'
'aborted'	'aborted'	'client-error-not-possible'

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433 This operation MUST NOT change the value of attributes not specified in the operation unless the definition of
434 the attribute explicitly specifies such side-effects. In general, Job attribute definitions that are settable will not
435 define side-effects on other attributes that are settable, only side effects on READ-ONLY attributes, if any.

436 **4.2.1 Settable and READ-ONLY Job Description attributes**

437 If the Printer supports the "job-message-from-operator" Job Description attribute (see [RFC2911] section
438 4.3.16) and the client explicitly supplies a new value for the "job-message-from-operator" in the Set-Job-
439 Attributes request, then the Printer MUST set the "job-message-from-operator" Job attribute to this new
440 value.

441 If the Printer supports the Set-Job-Attributes operation, then it SHOULD support setting of:

442 all Job Template job ("xxx") attributes

443 that the implementation supports (see [RFC2911] section 4.2 and extensions).

444 Some Job Description attributes (see [RFC2911] section 4.3) MUST NOT be settable, i.e., they are defined
445 to be READ-ONLY. An attribute marked as "READ-ONLY" in the Job Description attribute table in
446 Appendix A is such an attribute. The Job attributes not marked as "READ-ONLY" MAY be settable using
447 the Set-Job-Attributes operation, depending on implementation.

448 Note: From now on, all extensions that define new object attributes will indicate whether or not the attributes
449 are READ-ONLY, by including the "READ-ONLY" adjective in their descriptions and/or explicitly stating
450 whether they MAY be settable.

451 *Access Rights:* The authenticated user (see [RFC2911] section 8.3) performing this operation must either be
452 the job owner (as determined in the Job Creation operation) or an operator or administrator of the Printer
453 object (see [RFC2911] Sections 1 and 8.5).

454 **4.2.2 Set-Job-Attributes Request**

455 The following sets of attributes are part of the Set-Job-Attributes Request:

456 Group 1: Operation Attributes

457 Natural Language and Character Set:

458 The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]
459 section 3.1.4.1.

460 Target:

461 Either (1) the "printer-uri" (uri) plus "job-id" (integer(1:MAX)) or (2) the "job-uri" (uri) operation
462 attribute(s) which define the target for this operation as described in [RFC2911] section 3.1.5.
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Requesting User Name:

The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as described in [RFC2911] section 8.3.

Group 2: Job Attributes

The client MUST supply a set of Job attributes with one or more values (including explicitly allowed out-of-band values) as defined in [RFC2911] section 4.2 Job Template Attributes ("xxx" attributes), section 4.3 Job Description Attributes, and any attribute extensions supported by the Printer. The value(s) of each Job attribute supplied in Group 2 replaces the value(s) of the corresponding Job attribute on the target Job object. For attributes that can have multiple values (1setOf), all values supplied by the client replace all values of the corresponding Job object attribute.

If the client supplies an "xxx" attribute with the 'delete-attribute' out-of-band value (see section 8.2), the Printer MUST remove the "xxx" attribute from the Job object, if present.

4.2.3 Set-Job-Attributes Response

The IPP object returns the following sets of attributes as part of the Set-Job-Attributes Response:

Group 1: Operation Attributes

Status Message:

In addition to the REQUIRED status code returned in every response, the response OPTIONALLY includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation attribute as described in [RFC2911] sections 13 and 3.1.6.

Natural Language and Character Set:

The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911] section 3.1.4.2.

Group 2: Unsupported Attributes

See [RFC2911] section 3.1.7 for details on returning Unsupported Attributes.

If some of the attributes in the operation fail to validate, the Printer MUST reject the operation, MUST NOT change any Job attributes, and MUST return the indicated status code below. In this group, the Printer MUST also return all attributes that fail to validate. The following are the reasons that an attribute fails to validate and the value returned for the attribute, along with the indicated status code and order of detection:

1. The number of attributes supplied by the client exceeds the maximum number that the Printer supports in a Set-Printer-Attributes request: return the 'client-error-request-entity-too-large' (see [RFC2911] section 13.1.4.9).

- 503 2. The Printer doesn't support the attribute: return the attribute with the 'unsupported' out-of-band
504 attribute value (see [RFC2911] section 3.1.7 and [RFC2910]) and the 'client-error-attributes-
505 or-values-not-supported' (see [RFC2911] section 13.1.4.12).
- 506 3. The attribute is READ-ONLY (in its definition) or is not-settable in this implementation: return
507 the attribute with the 'not-settable' out-of-band attribute value (see section 8.1) and the 'client-
508 error-attributes-not-settable' status code (see section 7.1).
- 509 4. The Printer doesn't support the value: if the attribute in the operation has a single value return it.
510 If the attribute in the operation is multi-valued, return only those values in a 1setOf that are not
511 supported. Return the 'client-error-attributes-or-values-not-supported' status code (see
512 [RFC2911] section 13.1.4.12).
- 513 5. The values of some of the supplied attributes conflict with one another and/or other Job attribute
514 values not being set: if the conflicting attribute in the operation has a single value return the
515 attribute and the value. If the attribute in the operation is multi-valued, return only the attribute
516 and those values in a 1setOf that are conflicting with other attributes. Return the 'client-error-
517 conflicting-attributes' status code (see [RFC2911] section 13.1.4.15).

518 **4.3 Get-Printer-Supported-Values Operation**

519 This OPTIONAL operation allows a client to request the values that the Printer allows in the Set-Printer-
520 Attributes operation for "xxx-supported" attributes. If the Printer supports the Set-Printer-Attributes
521 operation AND some of its "xxx-supported" Printer attributes are settable, then the Printer MUST also
522 support this operation.

523 The Printer MUST return in the Get-Printer-Supported-Values response those, and only those, "xxx-
524 supported" Printer attributes that it supports setting with the Set-Printer-Attributes operation. Furthermore, if
525 a client requests the value of an attribute that is not settable or is not supported (as in the Get-Printer-
526 Attributes response), the Unsupported Attributes Group of the response NEED NOT contain the "requested-
527 attributes" operation attribute with any such requested (attribute keyword) values.

528 This operation has identical request/response attributes to the Get-Printer-Attributes operation in IPP/1.1
529 [RFC2911]. The operation also behaves identically to the Get-Printer-Attributes operation in IPP/1.1
530 [RFC2911] with the following exceptions:

- 531 1. The Get-Printer-Supported-Values operation supports only "xxx-supported" attributes.
- 532 2. The Get-Printer-Attributes operation returns the few "xxx-supported" attributes that are defined to be
533 single valued, such as "page-ranges-supported" (boolean) or "pdl-override-supported" (type2 keyword),
534 as single values, while Get-Printer-Supported-Values returns the possible values that can be set as a
535 1setOf of the same attribute syntax type (See Appendix B: Attributes returned from Get-Printer-
536 Supported-Values).

- 537 3. The Get-Printer-Attributes operation returns the current values of requested attributes while the Get-
538 Printer-Supported-Values operation returns the values that are inherently supported by the implementation
539 code, i.e., the values that an administrative client can set in a Set-Printer-Attributes request.
- 540 4. The Get-Printer-Attributes operation returns the current values of requested "xxx-supported" attributes
541 that the Printer is configured to accept in Job Creation operations, including additional values defined by
542 the administrator, while the Get-Printer-Supported-Values operation returns only the values of "xxx-
543 supported" attributes that are inherently supported by the implementation and does not return any
544 additional values defined by the administrator where the implementation supports the 'admin-define' out-
545 of-band value.
- 546 5. The Get-Printer-Attributes never returns the 'admin-define' out-of-band attribute value, while the Get-
547 Printer-Supported-Attributes operation does, if the implementation allows the administrator to define name
548 values by setting that "xxx-supported" attribute with any 'name' value(s).
- 549 6. The Get-Printer-Attributes operation only requires end-user access rights, while the Get-Printer-
550 Supported-Values requires administrator access rights.

551 *Access Rights:* The authenticated user (see [RFC2911] section 8.3) performing this operation must be an
552 administrator of the Printer object (see [RFC2911] Sections 1 and 8.5).

553 4.3.1 Definition of the usage of the 'admin-define' out-of-band attribute value

554 If the Set-Printer-Attributes operation allows the System Administrator to define arbitrary 'name' values for an
555 "xxx-supported" attribute, then the Get-Printer-Supported-Values operation MUST return the 'admin-define'
556 out-of-band attribute value (see section 8.3) as one of the values of the "xxx-supported" attribute. In other
557 words, the 'admin-define' out-of-band attribute value indicates that the Printer implementation supports clients
558 setting arbitrary 'name' attribute syntax values for that "xxx-supported" attribute using the Set-Printer-
559 Attributes operation as long as the attribute is defined with the 'name' attribute syntax.

560 For example, if the Get-Printer-Supported-Values operation returns several keywords as the value of the
561 "media-supported" attribute, then the Set-Printer-Attributes operation MUST accept any of these keywords
562 as values for the "media-supported" attribute. If the Get-Printer-Supported-Values operation returns an
563 'admin-define' out-of-band attribute value as one of the values of the "media-supported" attribute, then the
564 Set-Printer-Attributes operation MUST accept any value whose attribute syntax is 'name' as a value for the
565 "media-supported" attribute (provided that the user is properly authenticated to use the Set-Printer-Attributes
566 operation, e.g., has administrative access rights).

567 The Get-Printer-Supported-Values MAY return the 'admin-define' out-of-band attribute value for any
568 IPP/1.1 or extension Job Template attribute if the implementation supports allowing the System Administrator
569 to add values to the "xxx-supported" attribute using the Set-Printer-Attributes operation. In this case, the
570 Printer MUST accept any 'name' value of the correct attribute syntax in a Set-Printer-Attributes operation that
571 is setting that attribute. For "xxx-supported" attributes that are defined with a choice of attribute syntaxes,
572 such as 'keyword | name', it is the 'name' attribute syntax that the System Administrator can use to add new

573 values, not the 'keyword' attribute syntax. For IPP/1.1 this requirement includes the following Job Template
574 attributes:

575 media-supported
576 job-hold-until-supported
577 job-sheets-supported

578 Implementations that support additional Job Template attributes that include the 'name' attribute syntax, MAY
579 use the 'admin-define' out-of-band value with them.

580 If the 'admin-define' out-of-band attribute value is not one of the values of an "xxx-supported" attribute
581 returned in a Get-Printer-Supported-Values response, then the Printer MUST NOT allow the Set-Printer-
582 Attributes operation for that attribute to contain a value that is not one of the explicit 'keyword' or 'name'
583 values returned in a Get-Printer-Supported-Values response.

584 See Appendix B: Attributes returned from Get-Printer-Supported-Values for a full list of values returned by
585 this operation.

586 **5 New Operation attributes**

587 This section defines new operation attributes for use with the IPP/1.1 operations indicated. As new
588 operations are defined they will also indicate explicitly whether these operation attributes are defined for use
589 with them.

590 **5.1 printer-message-from-operator (text(127))**

591 The Printer SHOULD support this Operation attribute in following operations if it supports the corresponding
592 "printer-message-from-operator" Printer Description attribute.

593 Pause-Printer
594 Resume-Printer
595 Purge-Jobs

596 The client OPTIONALLY supplies this attribute in the above operations. The value of this attribute is a
597 message from the operator about the Printer object on which the operator is performing the operation. If this
598 operation attribute is supported, the Printer copies the value to its "printer-message-from-operator" Printer
599 Description attribute (see [RFC2911] section 4.4.25) even if this Operation attribute is a zero-length text
600 value or consists solely of white space.

601 If the Printer supports this operation attribute, it MUST support both a zero-length text value and the 'no-
602 value' out-of-band value (see [RFC2911] section 4.1) to indicate that the operator has sent no message. In
603 this case, the Printer sets the value of the "printer-message-from-operator" to the zero-length value or 'no-

604 value' out-of-band value, respectively. If the client queries the "printer-message-from-operator" Printer
605 attribute, the Printer returns the attribute with the zero-length value or the 'no-value' value, respectively.

606 In addition, the Printer automatically copies:

- 607 1. the value of its "printer-up-time" attribute (see [RFC2911] section 4.4.29) to its "printer-message-time"
608 attribute,
- 609 2. the value of its "printer-current-time" (dateTime) attribute (see [RFC2911] section 4.4.30) to its "printer-
610 message-date-time" attribute, if supported.

611 If the client omits this operation attribute, the Printer does not change the value of its "printer-message-from-
612 operator", "printer-message-time" and "printer-message-date-time" Printer Description attributes.

613 The "printer-message-from-operator" operation attribute MUST NOT be supported as an operation attribute
614 for the Set-Printer-Attributes operation. If the operator wants to set the Printer's "printer-message-from-
615 operator" Printer Description attribute when issuing the Set-Printer-Attributes operation, the client supplies the
616 "printer-message-from-operator" explicitly with its new value as one of the Printer Description attributes in
617 Group 2 in the request. The Printer also updates its "printer-message-time" and "printer-message-date-time"
618 Printer Description attributes. If the client does not explicitly supply the "printer-message-from-operator" with
619 its new value in the Set-Printer-Attributes request, the Printer leaves the value of the Printer's "printer-
620 message-from-operator" Printer Description attribute unchanged.

621 **5.2 job-message-from-operator (text(127))**

622 The Printer SHOULD support this Operation attribute in following operations if it supports the corresponding
623 "job-message-from-operator" Job Description attribute.

624 Cancel-Job
625 Hold-Job
626 Release-Job
627 Restart-Job

628 The client OPTIONALLY supplies this attribute in the above operations. The value of this attribute is a
629 message from the operator about the Job object on which the operator has just performed an operation. If
630 supported, the Printer copies the value to the Job's "job-message-from-operator" Job Description attribute
631 (see [RFC2911] section 4.3.16) (even if this Operation attribute is a zero-length text value or consists solely
632 of white space).

633 If the Printer supports this operation attribute, it MUST support both a zero-length text value and the 'no-
634 value' out-of-band value (see [RFC2911] section 4.1) to indicate that the operator has sent no message. In
635 this case, the Printer sets the value of the "job-message-from-operator" to the zero-length value or 'no-value'
636 out-of-band value, respectively. If the client queries the "job-message-from-operator" Job attribute, the IPP
637 object returns the attribute with the zero-length value or the 'no-value' value, respectively.

638 If the client omits this attribute, the Printer does not change the value of its "job-message-from-operator" Job
639 Description attribute.

640 Note: There are no corresponding "job-message-time" and "job-message-date-time" Job Description
641 attributes, since the usual lifetime of a job is limited.

642 The "job-message-from-operator" operation attribute **MUST NOT** be supported as an operation attribute for
643 the Set-Job-Attributes operation. If the operator wants to set the Job's "job-message-from-operator" Job
644 Description attribute when issuing the Set-Job-Attributes operation, the client **MUST** supply the "job-
645 message-from-operator" with its new value as one of the Job Description attributes in Group 2 in the request.
646 Otherwise, the Printer leaves the value of the Job's "job-message-from-operator" Job Description attribute
647 unchanged by not explicitly setting the attribute. If the client does not explicitly supply the "job-message-
648 from-operator" with its new value in the Set-Job-Attributes request, the Printer leaves the value of the Job's
649 "job-message-from-operator" Job Description attribute unchanged.

650 **6 New Printer Description Attributes**

651 The following new Printer Description attributes are needed to support the new operations defined in this
652 document.

653 **6.1 printer-settable-attributes-supported (1setOf type2 keyword)**

654 This **REQUIRED READ-ONLY** Printer attribute identifies the Printer object attributes that are settable in this
655 implementation, i.e., that are settable using the Set-Printer-Attributes operations (see section 4.1). This
656 attribute **MUST** be supported if the Set-Printer-Attributes operations is supported. The Printer **MUST** reject
657 attempts to set any Printer attributes that are not one of the values of this attribute, returning the 'client-error-
658 attributes-not-settable' status code (see section 7.1). The value of this attribute **MAY** depend on the value of
659 the "document-format" operation attribute supplied in the Get-Printer-Attributes operation (see [RFC2911]
660 section 3.2.5.1).

661 Standard keyword values are:

662 'none': There are no settable Printer attributes.

663 'xxx': Where 'xxx' is any of the keyword attribute names allowed by section 4.1.1

664 **6.2 job-settable-attributes-supported (1setOf type2 keyword)**

665 This **REQUIRED READ-ONLY** Printer attribute identifies the Job object attributes that are settable in this
666 implementation, i.e., that are settable using the Set-Job-Attributes operation (see section 4.2). This attribute
667 **MUST** be supported if the Set-Job-Attributes operations is supported. The Printer **MUST** reject attempts to
668 set any Job attributes that are not one of the values of this attribute, returning the 'client-error-attributes-not-
669 settable' status code (see section 7.1).

670 Standard keyword values are:

671 'none': There are no settable Job attributes.

672 'xxx': Where 'xxx' is any of the keyword attribute names allowed by section 4.2.1.

673 **6.3 document-format-varying-attributes (1setOf type2 keyword)**

674 This OPTIONAL READ-ONLY Printer Description attribute contains a set of attribute name keywords.
675 This attribute SHOULD be supported by a Printer object, if the Printer object has Printer attributes whose
676 value vary depending on document format (see [RFC2911] Get-Printer-Attributes operation). This attribute
677 specifies which attribute values can vary by document-format. If an attribute's name "xxx" is a member of this
678 attribute and the value of attribute "xxx" is changed with the Set-Printer-Attributes operation that included the
679 "document-format" operation attribute, then the Printer MUST change the value for the specified document
680 format and no other document formats (see section 4.1.2). If an attribute's name "xxx" is not a member of this
681 attribute and the value of attribute "xxx" is changed with the Set-Printer-Attributes operation, then the attribute
682 is changed for all document formats (whether or not the client supplied the "document-format" operation
683 attribute).

684 **6.4 printer-message-time (integer(MIN:MAX))**

685 This OPTIONAL READ-ONLY Printer Description attribute contains the time that the Printer's "printer-
686 message-from-operator" was changed by the operator using any operation where the client supplied the
687 "printer-message-from-operator" operation attribute (see section 5.1) or was explicitly set using the Set-
688 Printer-Attributes operation (see section 4.1). This attribute allows the users to know when the "printer-
689 message-from-operator" attribute was last set.

690 The Printer sets the value of this attribute by copying the value of the Printer's "printer-up-time" attribute (see
691 [RFC2911] section 4.3.14). If the Printer resets its "printer-up-time" attribute to 1 on power-up, then it
692 MUST change the value of the "printer-message-time" to 0 or a negative number as specified in [RFC2911]
693 section 4.3.14.

694 Note: This attribute helps users better understand the context for the "printer-message-from-operator"
695 message.

696 **6.5 printer-message-date-time (dateTime)**

697 This OPTIONAL READ-ONLY Printer Description attribute contains the date and time that the Printer's
698 "printer-message-from-operator" was changed by the operator using any operation where the client supplied
699 the "printer-message-from-operator" operation attribute (see section 5.1) or was explicitly set using the Set-
700 Printer-Attributes operation (see section 4.1). This attribute allows the users to know when the "printer-
701 message-from-operator" attribute was last set.

702 This attribute **MUST** be supported if the Printer supports both the "printer-message-time" and the "printer-
703 current-time" (dateTime) attributes (see [RFC2911] section 4.4.30).

704 Note: This attribute helps users better understand the context for the "printer-message-from-operator"
705 message.

706 **6.6 printer-xri-supported (1setOf collection)**

707 This OPTIONAL Printer Description attribute is a multi-valued attribute where each value has the 'collection'
708 attribute syntax (see [ipp-coll]) containing member attributes with the same semantics as the following IPP/1.1
709 READ-ONLY Printer Description attributes, except for cardinality:

710 printer-uri-supported (1setOf uri) - see [RFC2911] section 4.4.1
711 uri-authentication-supported (1setOf type2 keyword) - see [RFC2911] section 4.4.2
712 uri-security-supported (1setOf type2 keyword) - see [RFC2911] section 4.4.3

713 When setting the "printer-xri-supported" attribute with a Set-Printer-Attributes request, the Printer **MUST** also
714 set these three IPP/1.1 READ-ONLY Printer Description attributes as a defined side effect. Thus, this
715 collection attribute provides the means to set these three IPP/1.1 READ-ONLY attributes atomically so that
716 they are never left in a partially inconsistent state.

717 An IPP Printer **MUST NOT** provide any other way using IPP to set these three IPP/1.1 READ-ONLY
718 Printer Description attributes, since they are READ-ONLY and **MUST** have consistent values at all times.
719 Note: The "xri-printer-supported" (1setOf collection) attribute can be put into a directory schema that
720 requires a single text string value, such as SLP or LDPA, by using suitable delimiting characters to separate
721 member attributes of the collection and/or terminating collection values. See [svrloc-printer] and [ldap-
722 printer].

723 The member attributes of the "printer-xri-supported" (1setOf collection) are given in Table 3.

724 **Table 3 - Member attributes of "printer-xri-supported" (1setOf collection)**

Member attribute	client MUST supply	Printer MUST support
xri-uri (uri)	yes	yes
xri-authentication (1setOf type2 keyword)	yes	yes
xri-security (1setOf type2 keyword)	yes	yes

725 Each collection value **MUST** contain a single unique value for the "xri-uri" member attribute. However, the
726 other two member attributes are multi-valued, so that a single URI can support more than one authentication
727 scheme and/or more than one security scheme. Other than the uniqueness and the cardinality requirements,
728 the semantics of these three member attributes is given in [RFC2911] sections 4.4.1, 4.4.2, and 4.4.3,
729 respectively.

730 A client can query the current values using the Get-Printer-Attributes operation by supplying either:

- 731 1. the three IPP/1.1 attribute names: "printer-uri-supported", "uri-authentication-supported", "uri-security-
732 supported" and getting back the parallel values OR
- 733 2. the single attribute name: "printer-xri-supported" and getting back the 1setOf collection which contains the
734 same information semantically, but in a different form.

735 A client can query what member attribute values can be set by supplying the three attribute names: "xri-uri-
736 scheme-supported", "xri-authentication-supported", and "xri-security-supported" in a Get-Printer-Supported-
737 Values request and getting back the uriScheme and type2 keyword values that can be set. Since the "printer-
738 xri-supported", "uri-authentication-supported", and "uri-security-supported" attributes are READ-ONLY,
739 they are not queriable with the Get-Printer-Supported-Values operation (see section 4.3). See Table 15.

740 When performing a Set-Printer-Attributes operation, if there are multiple values for the "xri-authentication"
741 and/or "xri-security" member attributes, the Printer MUST set the corresponding three READ-ONLY
742 attributes with all possible combinations of values. For example, setting the "printer-xri-supported" with the
743 following two collection values where the first URI has both 'basic' and 'digest' authentication:

```
744
745 "printer-xri-supported =
746     { "xri-uri" = ipp://abc.com/p1
747       "xri-authentication" = basic, digest
748       "xri-security" = tls
749     },
750     { "xri-uri" = http://abc.com/pq
751       "xri-authentication" = none
752       "xri-security" = none
753     }
754
```

755 would cause the Printer to set the three corresponding IPP/1.1 READ-ONLY attributes, each with three
756 parallel values as follows:

```
757
758 "printer-uri-supported" = { ipp://abc.com/p1, ipp://abc.com/p1,
759                             http://abc.com/pq }
760 "uri-authentication-supported" = { basic, digest, none }
761 "uri-security-supported" = { tls, tls, none }
762
```

763 Because there were two authentication values for the ipp://abc.com/p1 URL, that URL value is repeated.
764 Had the ipp URL had 2 authentication values and 3 security values, then there would have been 7 (2*3 + 1)
765 parallel values for each of the three attributes, 6 with the same ipp URI and 1 with the http URI.

766 6.7 xri-uri-scheme-supported (1setOf uriScheme)

767 This OPTIONAL READ-ONLY Printer Description attribute identifies the URI schemes that the
768 implementation supports for use in the "printer-uri-supported" (1setOf uri) Printer Description attribute (see

769 [RFC2911] section 4.4.1) and the "xri-uri" member attribute of the "xri-printer-supported" (1setOf collection)
770 Printer Description attribute (see section 6.6).

771 A Printer MUST support this attribute if it supports setting the "printer-xri-supported" (1setOf collection) with
772 the Set-Printer-Attributes operation.

773 **6.8 xri-authentication-supported (1setOf type2 keyword)**

774 This OPTIONAL READ-ONLY Printer Description attribute identifies the Client Authentication mechanisms
775 that the implementation supports for use in the "uri-authentication-supported" (1setOf type2 keyword) Printer
776 Description attribute (see [RFC2911] section 4.4.2) and the "xri-authentication" member attribute of the "xri-
777 printer-supported" (1setOf collection) Printer Description attribute (see section 6.6).

778 A Printer MUST support this attribute if it supports setting the "printer-xri-supported" (1setOf collection) with
779 the Set-Printer-Attributes operation.

780 **6.9 xri-security-supported (1setOf type2 keyword)**

781 This OPTIONAL READ-ONLY Printer Description attribute identifies the URI schemes that the
782 implementation supports for use in the "uri-security-supported" (1setOf type2 keyword) Printer Description
783 attribute (see [RFC2911] section 4.4.3) and the "xri-security" member attribute of the "xri-printer-supported"
784 (1setOf collection) Printer Description attribute (see section 6.6).

785 A Printer MUST support this attribute if it supports setting the "printer-xri-supported" (1setOf collection) with
786 the Set-Printer-Attributes operation.

787 **7 Additional status codes**

788 This section defines new status codes used by the operations defined in this document.

789 **7.1 'client-error-attributes-not-settable' (0x0413)**

790 The Set-Printer-Attributes or Set-Job-Attributes operation failed because one or more of the specified
791 attributes cannot be set either because the attribute is defined to be READ-ONLY or the attribute is not
792 settable in this implementation (see sections 4.1.3 and 4.2.3), the Printer MUST return this error code and the
793 attribute keyword name(s) and the 'not-settable' out-of-band value (see section 8.1) in the Unsupported
794 Attributes Group (see [RFC2911] section 3.1.7) for all of the attributes that could not be set. When the Printer
795 returns this status, it MUST NOT change any of the attributes supplied in the operation.

796 **8 Additional out-of-band values**

797 This section defines additional out-of-band values. As with all out-of-band values, a client or a Printer **MUST**
798 **NOT** use an out-of-band value unless the definition of the attribute in an operation request and/or response
799 explicitly allows such usage. See the beginning of [RFC2911] section 4.1.

800 **8.1 'not-settable' out-of-band value**

801 The 'not-settable' out-of-band attribute value is returned by the IPP Printer in the Unsupported Attributes
802 group of a response to indicate that the attribute supplied by the client in the request is **READ-ONLY** by
803 definition or is not settable in this implementation.

804 The 'not-settable' out-of-band attribute value is defined for use with the Set-Job-Attributes and Set-Printer-
805 Attributes response only. If a future additional "set" operation allows the 'not-settable' out-of-band value, its
806 definition document **MUST** indicate such use explicitly, including with which attributes.

807 An IPP object **MUST** support the 'not-settable' out-of-band value in a Set-Job-Attributes or Set-Printer-
808 Attributes request if it supports those operations. A client **MUST NOT** supply the 'not-settable' out-of-band
809 value in any request. An IPP object **MUST NOT** support the 'not-settable' out-of-band value in other
810 operations, unless the operations' definition document explicitly defines such usage. If a Printer receives this
811 out-of-band value in any operation request, the Printer **MUST** either (1) reject the entire request and return
812 the 'client-error-bad-request' status code or (2) ignore the attribute and return it with the 'unsupported' out-of-
813 band value.

814 See sections 4.1.3 and 4.2.3 in this document for an example definition of the usage of the 'not-settable' out-
815 of-band value in the Set-Printer-Attributes and Set-Job-Attributes responses.

816 **8.1.1 Encoding of the 'not-settable' out-of-band attribute value**

817 The encoding of the 'not-settable' out-of-band value is 0x15 (see [RFC2910]). The value-length **MUST** be 0
818 and the value empty.

819 **8.2 'delete-attribute' out-of-band value**

820 The 'delete-attribute' out-of-band attribute value is supplied by the client in a request to indicate that the
821 Printer is to remove the supplied attribute and all of its values from the target object, if present.

822 The 'delete-attribute' out-of-band attribute value is defined for use with the Set-Job-Attributes request only. If
823 a future additional "set" operation allows the 'delete-attribute' out-of-band value, its definition document
824 **MUST** indicate such use explicitly, including with which attributes.

825 An IPP Printer MUST support the 'delete-attribute' out-of-band value if it supports the Set-Job-Attributes
826 operation. A client MUST NOT supply and an IPP object MUST NOT support the 'delete-attribute' out-of-
827 band value in other operations, unless the operations' definition document explicitly defines such usage. For
828 example, the 'delete-attribute' out-of-band value MUST NOT be used in the Set-Printer-Attributes operation,
829 where the absence of an attribute from an IPP object indicates that the attribute is not supported. If a Printer
830 receives this out-of-band value in other operation requests, the Printer MUST either (1) reject the entire
831 request and return the 'client-error-bad-request' status code or (2) ignore the attribute and return it with the
832 'unsupported' out-of-band value.

833 See section 4.2 in this document for the definition of the usage of the 'delete-attribute' out-of-band value in the
834 Set-Job-Attributes request.

835 **8.2.1 Encoding of the 'delete-attribute' out-of-band value**

836 The encoding of the 'delete-attribute' out-of-band value is 0x16 (see [RFC2910]). The value-length MUST
837 be 0 and the value empty.

838 **8.3 'admin-define' out-of-band attribute value**

839 Section 4.3 defines the Get-Printer-Supported-Values response to contain the values of an "xxx-supported"
840 attribute that are supported by the implementation before any additional value are defined by the administrator.
841 The 'admin-define' out-of-band attribute value is returned as an additional value of an "xxx-supported"
842 attribute in a Get-Printer-Supported-Values response to indicate that the implementation supports allowing an
843 administrator to define additional arbitrary 'name' values for that "xxx-supported" attribute.

844 For example, if the "media-supported" (1setOf (type3 keyword | name)) attribute contains this value, then the
845 Printer MUST permit an administrator to add new media names to the Printer's "media-supported" attribute.
846 In order for an administrator to add new values to a Printer's "xxx-supported" attribute, the client supplies the
847 existing and new values in a Set-Printer-Attributes request for that attribute. The client MUST supply any
848 such administratively defined values in the Set-Printer-Attributes request using the 'name' attribute syntax.

849 The 'admin-define' out-of-band attribute value is defined for use with the Get-Printer-Supported-Values
850 response only. A Printer MUST NOT return the 'admin-define' out-of-band value in a Get-Printer-Attributes
851 response, since such a response indicates what an end-user client can supply in a Job Creation operation. If a
852 future additional "get" operation allows the 'admin-define' out-of-band value, its definition document MUST
853 indicate such use explicitly, including with which attributes.

854 An IPP Printer MUST support the 'admin-define' out-of-band value, if it supports a client setting arbitrary
855 'name' values of an "xxx-supported" Printer attribute using the Set-Printer-Attributes operation. A client
856 MUST NOT supply the 'admin-define' out-of-band value in any request. An IPP object MUST NOT
857 support the 'admin-define' out-of-band value in other operations, unless the operations' definition document
858 explicitly defines such usage. If a Printer receives this out-of-band value in any operation request, the Printer

859 MUST either (1) reject the entire request and return the 'client-error-bad-request' status code or (2) ignore
860 the attribute and return it with the 'unsupported' out-of-band value.

861 This document defines that the 'admin-define' out-of-band value MUST be used only with "xxx-supported"
862 attributes that are defined to include the 'name' attribute syntax. This out-of-band value is not intended to be
863 used with "xxx-supported" attributes of other attribute syntaxes, such as 'uri', even though the administrator
864 defines arbitrary values for such attributes. If other documents extend the use of the 'admin-define' out-of-
865 band value to other attribute syntaxes, such a document MUST define such use explicitly, including with which
866 attributes.

867 See section 4.3 in this document for an example definition of the usage of the 'admin-define' out-of-band
868 attribute value in any "xxx-supported" attribute returned in a Get-Printer-Supported-Values response that is
869 defined to include the 'name' attribute syntax.

870 **8.3.1 Encoding of the 'admin-define' out-of-band attribute value**

871 The encoding of the 'admin-define' out-of-band attribute value is 0x17 (see [RFC2910]). The value-length
872 MUST be 0 and the value empty.

873 **9 Conformance Requirements**

874 This section specifies the conformance requirements for clients and IPP objects.

875 Both the Set-Job-Attributes and the Set-Printer-Attributes operations defined in the document are
876 OPTIONAL for an IPP object to support. Either one MAY be supported without the other or both MAY be
877 supported. However, if the Set-Printer-Attributes operation is supported, then the Get-Printer-Supported-
878 Values operation MUST be supported if any "xxx-supported" attributes are settable. Otherwise, the Get-
879 Printer-Supported-Values operation is OPTIONAL for an IPP Printer to support.

880 If the Set-Printer-Attributes operation is supported, then the Printer MUST support the following additional
881 items:

- 882 1. the Get-Printer-Supported-Values operation (see section 5), if any "xxx-supported" attributes are
883 settable.
- 884 2. the "printer-settable-attributes-supported" Printer Description attribute (see section 6.1)
- 885 3. the 'not-settable' out-of-band value in responses (see section 8.1)
- 886 4. the 'client-error-not-settable' status code (see section 7.1)
- 887 5. If "printer-message-from-operator" Printer Description attribute is supported (see [RFC2911] section
888 4.4.25), then it MUST be settable.

- 889 6. the Get-Printer-Supported-Values operation (see section 4.3), if any "xxx-supported" attributes are
890 settable.
- 891 7. If a client can set a value with the 'name' attribute syntax for one or more "xxx-supported" attributes,
892 then the 'admin-define' out-of-band attribute value (see section 8.3) MUST be supported in the Get-
893 Printer-Supported-Values response for each such settable attribute (see section 4.3)

894 If the Set-Job-Attributes operation is supported, then the Printer MUST support the following additional
895 items:

- 896 1. the "job-settable-attributes-supported " Printer Description attribute (see section 6.2)
- 897 2. the 'not-settable' out-of-band value in responses (see section 8.1)
- 898 3. the 'delete-attribute' out-of-band value in requests (see section 8.2)
- 899 4. the 'client-error-not-settable' status code (see section 7.1)
- 900 5. If the "job-message-from-operator" Printer Description attribute is supported (see [RFC2911]
901 4.3.16), then it MUST be settable.

902 It is OPTIONAL for the Printer object to support the "printer-message-time" (integer) and "printer-message-
903 date-time" (dateTime) Printer Description attributes. If both the "printer-message-time" (integer) and the
904 "printer-current-time" (dateTime) (see [RFC2911] section 4.4.30) attributes are supported, then the "printer-
905 message-date-time" (dateTime) Printer Description attribute MUST be supported.

906 As with all out-of-band values, a client or a Printer MUST NOT use an out-of-band value unless the definition
907 document for the attribute in an operation request and/or response explicitly allows such usage.

908 **10 IANA Considerations**

909 This section contains the exact information for IANA to add to the IPP Registries according to the procedures
910 defined in RFC 2911 [RFC2911] section 6.

911

912 *Note to RFC Editors: Replace RFC NNNN below with the RFC number for this document, so that it*
913 *accurately reflects the content of the information for the IANA Registry.*

914 **10.1 Operation Registrations**

915 The operations defined in this document will be published by IANA according to the procedures in RFC 2911
916 [RFC2911] section 6.4 with the following path:

917

918 ftp.isi.edu/iana/assignments/ipp/operations/
919

920 The registry entry will contain the following information:

921
 922 Operations: Ref.
 923 Section:
 924 Set-Printer-Attributes RFC NNNN
 925 4.1
 926 Set-Job-Attributes RFC NNNN
 927 4.2
 928 Get-Printer-Supported-Values RFC NNNN
 929 4.3
 930

931 10.2 Attribute Registrations

932 The attributes defined in this document will be published by IANA according to the procedures in RFC 2911
 933 [RFC2911] section 6.2 with the following path:

934
 935 <ftp.isi.edu/iana/assignments/ipp/attributes/>
 936

937 The registry entry will contain the following information:

938
 939 Operation attributes: Ref.
 940 Section:
 941 printer-message-from-operator (text(127)) RFC NNNN
 942 5.1
 943 job-message-from-operator (text(127)) RFC NNNN
 944 5.2
 945
 946 Printer Description attributes: Ref.
 947 Section:
 948 printer-settable-attributes-supported (1setOf type2 keyword) RFC NNNN
 949
 950 6.1
 951 job-settable-attributes-supported (1setOf type2 keyword) RFC NNNN
 952
 953 6.2
 954 document-format-varying-attributes (1setOf type2 keyword) RFC NNNN
 955
 956 6.3
 957 printer-message-time (integer(MIN:MAX)) RFC NNNN
 958 6.4
 959 printer-message-date-time (dateTime) RFC NNNN
 960 6.5
 961 printer-xri-supported (1setOf collection) RFC NNNN
 962 6.6
 963 xri-uri-scheme-supported (1setOf uriScheme) RFC NNNN
 964 6.7

965 xri-authentication-supported (1setOf type2 keyword)
966 6.8
967 xri-security-supported (1setOf type2 keyword) RFC NNNN
968 6.9
969

970 10.3 Status code Registrations

971 The status codes defined in this document will be published by IANA according to the procedures in RFC
972 2911 [RFC2911] section 6.6 with the following path:

973
974 ftp.isi.edu/iana/assignments/ipp/status-codes/
975

976 The registry entry will contain the following information:

977 Status codes: Ref.
978 Section:
979 'client-error-attributes-not-settable' (0x0413) RFC NNNN
980 7.1
981
982

983 10.4 Out-of-band Attribute Value Registrations

984 The out-of-band attribute values defined in this document will be published by IANA according to the
985 procedures in RFC 2911 [RFC2911] section 6.7 with the following path:

986
987 ftp.isi.edu/iana/assignments/ipp/out-of-band-attribute-value-tags/
988

989 The registry entry will contain the following information:

990
991 Out-of-band Attribute Values: Ref.
992 Section:
993 'not-settable' out-of-band value RFC NNNN
994 8.1
995 'delete-attribute' out-of-band value RFC NNNN
996 8.2
997 'admin-define' out-of-band attribute value RFC NNNN
998 8.3

999 11 Internationalization Considerations

000 This document has the same localization considerations as the [RFC2911].

001 **12 Security Considerations**

002 The IPP Model and Semantics document [RFC2911 section 8] discusses high level security requirements
003 (Client Authentication, Server Authentication and Operation Privacy). Client Authentication is the mechanism
004 by which the client proves its identity to the server in a secure manner. Server Authentication is the mechanism
005 by which the server proves its identity to the client in a secure manner. Operation Privacy is defined as a
006 mechanism for protecting operations from eavesdropping.

007 In addition, the introduction of the Set-Printer-Attributes and Set-Job-Attributes operations creates another
008 security threat, since the client is able to modify the Printer and Job attributes stored in the Printer. Such
009 modifications could lead to denial of service.

010 A malicious user could alter the policy established by the system administrator and stored in the Printer
011 attributes. Such alteration could either grant access to more resources or deny access to resources that the
012 system administrator has established. For example, the malicious user could remove all of the document-
013 format values from the "document-format-supported" Printer attribute so that the Printer would refuse to
014 accept all jobs.

015 The general remedy for such malicious user actions against Printer attributes is to have strong Client
016 Authentication coupled with Printer access control to limit the users who have System Administrator or
017 Operator privileges.

018 A malicious user could modify the Job Template attributes of another user's Job, such as the "copies" attribute.
019 For example, setting the number of copies to a large number.

020 The general remedy for such malicious user actions against another user's job is to have strong Client
021 Authentication coupled with Printer access control to limit the users who have System Administrator or
022 Operator privileges who can modify any job and, in addition, store the Client Authentication with each Job so
023 that only the job owner End User can modify his/her own job.

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- 086

086 **15 Appendix A: Allowed Values for Set-Printer-Attributes and Set-Job-** 087 **Attributes requests**

088 This appendix is a normative part of this document and contains a table of all IPP/1.1 attributes. Each row
089 contains:

- 090 – an attribute and
- 091
- 092 – the values allowed in the Set-Printer-Attributes or Set-Job-Attributes request for the attribute. The
093 entry in each cell is the name (first few words) of each item below 1, 2, 3, 4a-g, and 5.

094 The allowed values include the following cases:

- 095 1. READ-ONLY: the Set-Printer-Attributes or Set-Job-Attributes operation MUST NOT change this
096 attribute and MUST reject the entire operation (see section 7.1).
- 097 2. Any of "xxx-supported": the Set-Printer-Attributes or Set-Job-Attributes operation accepts values that
098 are allowed according to the IPP/1.1 rules for validating the value(s) of an "xxx" Printer or Job attribute
099 against the value(s) of the corresponding "xxx-supported" Printer attribute. Table 4 summarizes those
100 validation rules depending on each attribute syntax and value of an "xxx" attribute supplied in the request
101 and that of the corresponding "xxx-supported" Printer attribute. The "xxx-supported" attribute syntax type
102 and value(s) are obtained from a Get-Printer-Supported-Values response (see the tables in this
103 Appendix).

104 **Table 4 - Validation rules for 'Any of "xxx-supported" '**

Type of "xxx" value to be set	Type of "xxx-supported" value	Validates if:
integer	rangeOfInteger	each value is in one of the "xxx-supported" ranges
uri	uriScheme	each uri scheme matches one of the "xxx-supported" schemes
any	boolean	if the boolean "xxx-supported" is 'true'
any	same type	each value matches an "xxx-supported" value of the same type

105
106 For additional non-normative explanatory information see section 3.1.2.3 of the "Internet Printing
107 Protocol/1.1: Implementer's Guide" [ipp-iig]).

- 108 3. From Get-Printer-Supported-Values: the Set-Printer-Attributes operation accepts values that are allowed
109 according to the IPP/1.1 rules for validating the value(s) of an "xxx" Printer attribute against the value(s) of
110 the corresponding "xxx-supported" Printer attribute. Table 5 summarizes those validation rules depending
111 on each attribute syntax and value of an "xxx" attribute supplied in the request and that of the corresponding
112 "xxx-supported" Printer attribute. The "xxx-supported" attribute syntax type and attribute value(s) are
113 obtained from a Get-Printer-Supported-Values response (see Appendix B: Attributes returned from Get-
114 Printer-Supported-Values below).

115

Table 5 - Validation rules for 'From Get-Printer-Supported-Values'

Type of "xxx" value to be set	Type of "xxx-supported" value	Validates if:
integer	rangeOfInteger	each 'integer' value is in one of the "xxx-supported" ranges
uri	uriScheme	the uri scheme of each value matches one of the "xxx-supported" schemes
any	boolean	if the boolean "xxx-supported" is 'true'
name	'admin-define' out-of-band value	any 'name' value matches
any	same type	each value matches an "xxx-supported" value of the same type

116

117 For additional non-normative explanatory information see section 3.1.2.3 of the "Internet Printing
118 Protocol/1.1: Implementer's Guide" [ipp-iig]).

- 119 4. Any value of the proper attribute syntax: the Set-Printer-Attributes or Set-Job-Attributes operation
120 accepts any value of the specified attribute syntax. The attribute syntaxes supported are enumerated
121 below.
- 122 a. Any text(127)
 - 123 b. Any name(127)
 - 124 c. Any uri
 - 125 d. Any boolean
 - 126 e. Any positive integer
 - 127 f. Any dateTime
 - 128 g. 1setOf any uri
- 129 5. Combination of 'Any of "xxx-supported"' or 'Any name'.

130 If a Printer implementation doesn't want to allow setting values indicated in this Appendix as "any xxx", it can
131 make the value be not-settable.

132

Table 6 - Values allowed for Job Template Attributes in the Set-Job-Attributes Operation

Job Template Attributes	Values allowed for Set
job-priority (integer(1:100))	Any of "xxx-supported"
job-hold-until (type3 keyword name (MAX))	Any of "xxx-supported"
job-sheets (type3 keyword name(MAX))	Any of "xxx-supported"
multiple-document-handling (type2 keyword)	Any of "xxx-supported"
copies (integer(1:MAX))	Any of "xxx-supported"
finishings (1setOf type2 enum)	Any of "xxx-supported"
page-ranges (1setOf rangeOfInteger (1:MAX))	Any of "xxx-supported"
sides (type2 keyword)	Any of "xxx-supported"
number-up (integer(1:MAX))	Any of "xxx-supported"
orientation-requested (type2 enum)	Any of "xxx-supported"
media (type3 keyword name(MAX))	Any of "xxx-supported"
printer-resolution (resolution)	Any of "xxx-supported"
print-quality (type2 enum)	Any of "xxx-supported"

133

134

Table 7 - Values allowed for Job Description Attributes in the Set-Job-Attributes Operation

Job Description Attributes	Values allowed for Set
job-uri (uri)	READ-ONLY
job-id (integer(1:MAX))	READ-ONLY
job-printer-uri (uri)	READ-ONLY
job-more-info (uri)	READ-ONLY
job-name (name(MAX))	Any name(MAX)
job-originating-user-name (name(MAX))	READ-ONLY
job-state (type1 enum)	READ-ONLY
job-state-reasons (1setOf type2 keyword)	READ-ONLY
job-state-message (text(MAX))	READ-ONLY
job-detailed-status-messages (1setOf text(MAX))	READ-ONLY
job-document-access-errors (1setOf text(MAX))	READ-ONLY
number-of-documents (integer(0:MAX))	READ-ONLY
output-device-assigned (name(127))	READ-ONLY
time-at-creation (integer(MIN:MAX))	READ-ONLY
time-at-processing (integer(MIN:MAX))	READ-ONLY
time-at-completed (integer(MIN:MAX))	READ-ONLY
job-printer-up-time (integer(1:MAX))	READ-ONLY
date-time-at-creation (dateTime)	READ-ONLY
date-time-at-processing (dateTime)	READ-ONLY
date-time-at-completed (dateTime)	READ-ONLY
number-of-intervening-jobs (integer(0:MAX))	READ-ONLY
job-message-from-operator (text(127))	Any text(127)
job-k-octets (integer(0:MAX))	READ-ONLY
job-impressions (integer(0:MAX))	READ-ONLY
job-media-sheets (integer(0:MAX))	READ-ONLY
job-k-octets-processed (integer(0:MAX))	READ-ONLY
job-impressions-completed (integer(0:MAX))	READ-ONLY
job-media-sheets-completed (integer(0:MAX))	READ-ONLY
attributes-charset (charset)	READ-ONLY
attributes-natural-language (naturalLanguage)	READ-ONLY

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Table 8 - Values allowed for Printer Job Template Attributes in the Set-Printer-Attributes Operation

Printer Job Template Attributes	Values allowed for Set
job-priority-default (integer(1:100))	Any of "xxx-supported"
job-hold-until-default (type3 keyword name (MAX))	Any of "xxx-supported"
job-sheets-default (type3 keyword name(MAX))	Any of "xxx-supported"
multiple-document-handling-default (type2 keyword)	Any of "xxx-supported"
copies-default (integer(1:MAX))	Any of "xxx-supported"
finishings-default (1setOf type2 enum)	Any of "xxx-supported"
sides-default (type2 keyword)	Any of "xxx-supported"
number-up-default (integer(1:MAX))	Any of "xxx-supported"
orientation-requested-default (type2 enum)	Any of "xxx-supported"
media-default (type3 keyword name(MAX))	Any of "xxx-supported"
printer-resolution-default (resolution)	Any of "xxx-supported"
print-quality-default (type2 enum)	Any of "xxx-supported"
job-priority-supported (integer(1:100))	From Get-Printer-Supported-Values
job-hold-until-supported (1setOf(type3 keyword name (MAX)))	From Get-Printer-Supported-Values
job-sheets-supported (1setOf(type3 keyword name(MAX)))	From Get-Printer-Supported-Values
multiple-document-handling-supported (1setOf type2 keyword)	From Get-Printer-Supported-Values
copies-supported (rangeOfInteger(1:MAX))	From Get-Printer-Supported-Values
finishings-supported (1setOf type2 enum)	From Get-Printer-Supported-Values
page-ranges-supported (boolean)	From Get-Printer-Supported-Values
sides-supported (1setOf type2 keyword)	From Get-Printer-Supported-Values
number-up-supported (1setOf (integer(1:MAX) rangeOfInteger(1:MAX)))	From Get-Printer-Supported-Values
orientation-requested-supported (1setOf type2 enum)	From Get-Printer-Supported-Values
media-supported (1setOf (type3 keyword name(MAX)))	From Get-Printer-Supported-Values
printer-resolution-supported (1setOf resolution)	From Get-Printer-Supported-Values
print-quality-supported (1setOf type2 enum)	From Get-Printer-Supported-Values
media-ready (type3 keyword name(MAX))	From Get-Printer-Supported-Values

138

Table 9 - Values allowed for Printer Description Attributes in the Set-Printer-Attributes Operation

Printer Description Attributes	Values allowed for Set
printer-uri-supported (1setOf uri)	READ-ONLY
uri-authentication-supported (1setOf type2 keyword)	READ-ONLY
uri-security-supported (1setOf type2 keyword)	READ-ONLY
printer-xri-supported (1setOf collection) member attributes:	
xri-uri (uri)	any uriScheme of "xri-uri-scheme-supported" from Get-Printer-Attributes
xri-authentication (1setOf type2 keyword)	any keyword of "xri-authentication-supported" from Get-Printer-Attributes
xri-security (1setOf type2 keyword)	any keyword of "xri-security-supported" from Get-Printer-Attributes
xri-uri-scheme-supported (1setOf uriScheme)	READ-ONLY
xri-authentication-supported (1setOf type2 keyword)	READ-ONLY
xri-security-supported (1setOf type2 keyword)	READ-ONLY
printer-name (name(127))	Any name(127)
printer-location (text(127))	Any text(127)
printer-info (text(127))	Any text(127)
printer-more-info (uri)	Any uri
printer-driver-installer (uri)	Any uri
printer-make-and-model (text(127))	Any text(127)
printer-more-info-manufacturer (uri)	Any uri
printer-state (type1 enum)	READ-ONLY
printer-state-reasons (1setOf type2 keyword)	READ-ONLY
printer-state-message (text(MAX))	READ-ONLY
ipp-versions-supported (1setOf type2 keyword)	From Get-Printer-Supported-Values
operations-supported (1setOf type2 enum)	From Get-Printer-Supported-Values
multiple-document-jobs-supported (boolean)	From Get-Printer-Supported-Values
charset-configured (charset)	Any of "xxx-supported", use "charset-supported"
charset-supported (1setOf charset)	From Get-Printer-Supported-Values
natural-language-configured (naturalLanguage)	Any of "xxx-supported", use "generated-natural-language-supported"
generated-natural-language-supported (1setOf naturalLanguage)	From Get-Printer-Supported-Values
document-format-default (mimeMediaType)	Any of "xxx-supported"
document-format-supported (1setOf mimeMediaType)	From Get-Printer-Supported-Values
printer-is-accepting-jobs (boolean)	READ-ONLY
queued-job-count (integer(0:MAX))	READ-ONLY
printer-message-from-operator (text(127))	Any text(127)

Printer Description Attributes	Values allowed for Set
color-supported (boolean)	From Get-Printer-Supported-Values
reference-uri-schemes-supported (1setOf uriScheme)	From Get-Printer-Supported-Values
pdl-override-supported (type2 keyword)	From Get-Printer-Supported-Values
printer-up-time (integer(1:MAX))	READ-ONLY
printer-current-time (dateTime)	Any dateTime **
multiple-operation-time-out (integer(1:MAX))	any positive integer
compression-supported (1setOf type3 keyword)	From Get-Printer-Supported-Values
job-k-octets-supported (rangeOfInteger(0:MAX))	From Get-Printer-Supported-Values
job-impressions-supported (rangeOfInteger(0:MAX))	From Get-Printer-Supported-Values
job-media-sheets-supported (rangeOfInteger(0:MAX))	From Get-Printer-Supported-Values
pages-per-minute (integer(0:MAX))	READ-ONLY
pages-per-minute-color (integer(0:MAX))	READ-ONLY
printer-settable-attributes-supported (1setOf type2 keyword)	From Get-Printer-Supported-Values
job-settable-attributes-supported (1setOf type2 keyword)	From Get-Printer-Supported-Values
document-format-varying-attributes (1setOf type2 keyword)	READ-ONLY
printer-message-time (integer(MIN:MAX))	READ-ONLY
printer-message-date-time(dateTime)	READ-ONLY

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** - The "printer-current-time" (dateTime) attribute is settable in order to allow an administrator to correct an incorrect dateTime or time zone.

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16 Appendix B: Attributes returned from Get-Printer-Supported-Values

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This Appendix is a normative part of this document and lists all the attributes that are possible for an implementation to return in a Get-Printer-Supported-Values response, i.e., all the "xxx-supported" attributes that can be supplied in a Set-Printer-Attributes request. READ-ONLY attributes MUST NOT be returned in a Get-Printer-Supported-Values response and are indicated in the tables as "READ-ONLY - MUST NOT be returned."

149

150

For the following attributes, the value allowed by the Set-Printer-Attributes operation MUST be a single integer value in the range specified by the value returned by the Get-Printer-Supported-Values operation.

151

Table 10 - Printer Job Template Attributes returned from Get-Printer-Supported-Values

Printer Job Template Attributes	Values Returned
job-priority-supported (integer(1:100))	rangeOfInteger(1:100)

152

153 For the following attributes, the value allowed by the Set-Printer-Attributes operation MUST be a single
 154 rangeOfInteger value whose bounds do not exceed those of the range specified by the value returned by the
 155 Get-Printer-Supported-Values operation.

156

Table 11 - Printer Job Template Attributes returned from Get-Printer-Supported-Values

Printer Job Template Attributes	Values Returned
copies-supported (rangeOfInteger(1:MAX))	rangeOfInteger(1:MAX)

157

158 The following table has the same criteria as the last, but is for Printer Description attributes.

159

Table 12 - Printer Description Attributes returned from Get-Printer-Supported-Values

Printer Description Attributes	Values allowed for Set
job-k-octets-supported (rangeOfInteger(0:MAX))	rangeOfInteger(0:MAX)
job-impressions-supported (rangeOfInteger(0:MAX))	rangeOfInteger(0:MAX)
job-media-sheets-supported (rangeOfInteger(0:MAX))	rangeOfInteger(0:MAX)

160

161 For the following attributes, the value allowed by the Set-Printer-Attributes operation MUST be one or more
 162 integers and rangeOfInteger values, such that the integer values described by these integers and
 163 rangeOfInteger is the same as or a subset of the integers described by the integers and rangeOf Integer of
 164 value returned by the Get-Printer-Supported-Values operation.

165

Table 13 - Printer Job Template Attributes returned from Get-Printer-Supported-Values

Printer Job Template Attributes	Values Returned
number-up-supported (1setOf (integer(1:MAX) rangeOfInteger(1:MAX)))	1setOf (integer(1:MAX) rangeOfInteger(1:MAX))

166

167 For the following attributes, the value allowed by the Set-Printer-Attributes operation MUST be one or more
 168 values, where each such value matches a value returned by the Get-Printer-Supported-Values operation. A
 169 keyword, enum, boolean, charset, naturalLanguage, uriScheme, mimeType or resolution value matches
 170 if it is equal. For Job Template attributes with the attribute syntax 'type3 keyword | name', any 'name' attribute
 171 syntax value matches the 'admin-define' out-of-band value, if the implementation allows the administrator to set
 172 any name values for the attribute.

173

Table 14 - Printer Job Template Attributes returned from Get-Printer-Supported-Values

Printer Job Template Attributes	Values Returned
job-hold-until-supported (1setOf(type3 keyword name(MAX)))	1setOf (type3 keyword 'admin-define')
job-sheets-supported (1setOf(type3 keyword name(MAX)))	1setOf (type3 keyword 'admin-define')
multiple-document-handling-supported (1setOf type2 keyword)	1setOf type2 keyword
finishings-supported (1setOf type2 enum)	1setOf type2 enum
page-ranges-supported (boolean)	1setOf boolean **
sides-supported (1setOf type2 keyword)	1setOf type2 keyword
orientation-requested-supported (1setOf type2 enum)	1setOf type2 enum
media-supported (1setOf (type3 keyword name(MAX)))	1setOf (type3 keyword 'admin-define')
printer-resolution-supported (1setOf resolution)	1setOf resolution
print-quality-supported (1setOf type2 enum)	1setOf type2 enum

174

** Note: the Get-Printer-Supported-Values returns a '1setOf boolean' so that all possible values are indicated, while Get-Printer-Attributes returns only a single 'boolean' value.

175

176

The following table has the same criteria as the last, but is for Printer Description attributes.

177

Table 15 - Printer Description Attributes returned from Get-Printer-Supported-Values

Printer Description Attributes	Values allowed for Set
printer-uri-supported (1setOf uri)	READ-ONLY - MUST NOT be returned
uri-authentication-supported (1setOf type2 keyword)	READ-ONLY - MUST NOT be returned
uri-security-supported (1setOf type2 keyword)	READ-ONLY - MUST NOT be returned
xri-printer-supported (1setOf collection)	MUST NOT be returned; see next three attributes returned with Get-Printer-Attributes:
xri-uri-scheme-supported (1setOf uriScheme)	READ-ONLY - MUST NOT be returned
xri-authentication-supported (1setOf type2 keyword)	READ-ONLY - MUST NOT be returned
xri-security-supported (1setOf type2 keyword)	READ-ONLY - MUST NOT be returned
ipp-versions-supported (1setOf type2 keyword)	1setOf type2 keyword
operations-supported (1setOf type2 enum)	1setOf type2 keyword
multiple-document-jobs-supported (boolean)	1setOf boolean **
charset-supported (1setOf charset)	1setOf charset
generated-natural-language-supported (1setOf naturalLanguage)	1setOf naturalLanguage
document-format-supported (1setOf mimeType)	1setOf mimeType
color-supported (boolean)	1setOf boolean **
reference-uri-schemes-supported (1setOf uriScheme)	1setOf uriScheme
pdl-override-supported (type2 keyword)	1setOf type2 keyword **
compression-supported (1setOf type3 keyword)	1setOf type3 keyword
printer-settable-attributes-supported (1setOf type2 keyword)	1setOf type2 keyword
job-settable-attributes-supported (1setOf type2 keyword)	1setOf type2 keyword

178

** Note: the Get-Printer-Supported-Values returns a '1setOf X' so that all possible values are indicated, while Get-Printer-Attributes returns only a single 'X' value.

179

180

17 Appendix C: Full Copyright Statement

182

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183

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