

1 Internet Printing Protocol WG
2 INTERNET-DRAFT
3 <draft-ietf-ipp-job-printer-set-ops-04.txt>
4 Updates: RFC 2910 and 2911
5 [Target Category: standards track]
6 Expires: January 17, 2002
7
8

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July 17, 2001

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

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22 Abstract

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

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

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

33 Nine Printer Description attributes are defined:

34 printer-settable-attributes-supported (1setOf type2 keyword)
35 job-settable-attributes-supported (1setOf type2 keyword)
36 document-format-varying-attributes (1setOf type2 keyword)
37 printer-message-time (integer(MIN:MAX))
38 printer-message-date-time (dateTime)

39 printer-xri-supported (1setOf collection)
40 xri-uri-scheme-supported (1setOf uriScheme)
41 xri-authentication-supported (1setOf type2 keyword)
42 xri-security-supported (1setOf type2 keyword)
43
44

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Table of Contents

45	1 Introduction	6
46	2 Terminology.....	6
47	2.1 Conformance Terminology	6
48	2.2 Other terminology	7
49	3 Requirements and Use Cases	7
50	4 Definition of the Set operations	8
51	4.1 Set-Printer-Attributes Operation.....	8
52	4.1.1 Settable and READ-ONLY Printer Description attributes	9
53	4.1.2 Set-Printer-Attributes Request.....	11
54	4.1.3 Set-Printer-Attributes Response.....	12
55	4.2 Set-Job-Attributes Operation.....	13
56	4.2.1 Settable and READ-ONLY Job Description attributes	15
57	4.2.2 Set-Job-Attributes Request	15
58	4.2.3 Set-Job-Attributes Response.....	16
59	4.3 Get-Printer-Supported-Values Operation.....	17
60	4.3.1 Definition of the usage of the 'admin-define' out-of-band attribute value.....	18
61	5 New Operation attributes	19
62	5.1 printer-message-from-operator (text(127))	19
63	5.2 job-message-from-operator (text(127)).....	20
64	6 New Printer Description Attributes.....	21
65	6.1 printer-settable-attributes-supported (1setOf type2 keyword)	21
66	6.2 job-settable-attributes-supported (1setOf type2 keyword).....	21
67	6.3 document-format-varying-attributes (1setOf type2 keyword).....	22
68	6.4 printer-message-time (integer(MIN:MAX))	22
69	6.5 printer-message-date-time (dateTime).....	22
70	6.6 printer-xri-supported (1setOf collection).....	23
71	6.7 xri-uri-scheme-supported (1setOf uriScheme).....	24
72	6.8 xri-authentication-supported (1setOf type2 keyword)	25
73	6.9 xri-security-supported (1setOf type2 keyword).....	25
74	7 Additional status codes.....	25
75	7.1 client-error-attributes-not-settable (0x0413)	25
76	8 Additional out-of-band values.....	26
77	8.1 'not-settable' out-of-band value	26
78	8.1.1 Encoding of the 'not-settable' out-of-band attribute value.....	26
79	8.2 'delete-attribute' out-of-band value.....	26
80	8.2.1 Encoding of the 'delete-attribute' out-of-band value	27

81	8.3 'admin-define' out-of-band attribute value	27
82	8.3.1 Encoding of the 'admin-define' out-of-band attribute value	28
83	9 New Values for Existing Printer Description Attributes	28
84	9.1 operations-supported (1setOf type2 enum)	28
85	10 Conformance Requirements.....	28
86	11 IANA Considerations	30
87	11.1 Operation Registrations	30
88	11.2 Additional Enum Attribute Value Registrations for the "operations-supported" Printer Attribute.....	30
89	11.3 Attribute Registrations.....	30
90	11.4 Status code Registrations.....	31
91	11.5 Out-of-band Attribute Value Registrations.....	31
92	12 Internationalization Considerations	32
93	13 Security Considerations	32
94	14 Author's Addresses.....	32
95	15 References.....	34
96	16 Appendix A: Allowed Values for Set-Printer-Attributes and Set-Job-Attributes requests	35
97	17 Appendix B: Attributes returned from Get-Printer-Supported-Values	41
98	18 Appendix C: Description of the Base IPP Documents.....	44
99	19 Appendix D: Full Copyright Statement	45

Table of Tables

102	Table 1 - Operation-Id assignments	8
103	Table 2 - Job State Transition Table for the Set-Job-Attributes operation	14
104	Table 3 - Member attributes of "printer-xri-supported" (1setOf collection)	23
105	Table 4 - Operation-id assignments.....	28
106	Table 5 - Validation rules for 'Any of "xxx-supported" '	35
107	Table 6 - Validation rules for 'From Get-Printer-Supported-Values'	36
108	Table 7 - Values allowed for Job Template Attributes in the Set-Job-Attributes Operation.....	37
109	Table 8 - Values allowed for Job Description Attributes in the Set-Job-Attributes Operation	38
110	Table 9 - Values allowed for Printer Job Template Attributes in the Set-Printer-Attributes Operation.....	39
111	Table 10 - Values allowed for Printer Description Attributes in the Set-Printer-Attributes Operation	40
112	Table 11 - Printer Job Template Attributes returned from Get-Printer-Supported-Values.....	42
113	Table 12 - Printer Job Template Attributes returned from Get-Printer-Supported-Values.....	42
114	Table 13 - Printer Description Attributes returned from Get-Printer-Supported-Values.....	42
115	Table 14 - Printer Job Template Attributes returned from Get-Printer-Supported-Values.....	42

116 Table 15 - Printer Job Template Attributes returned from Get-Printer-Supported-Values..... 43
117 Table 16 - Printer Description Attributes returned from Get-Printer-Supported-Values..... 44
118
119
120

120 **1 Introduction**

121 This document is an OPTIONAL extension to IPP/1.0 [RFC2565, RFC2566] and IPP/1.1 [RFC2911,
122 RFC2910]. For a description of the base IPP documents see section 18.

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

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

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

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

143 **2 Terminology**

144 This section defines terminology used throughout this document.

145 **2.1 Conformance Terminology**

146 Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY,
147 NEED NOT, and OPTIONAL, have special meaning relating to conformance as defined in RFC 2119
148 [RFC2119] and [RFC2911] section 12.1. If an implementation supports the extension defined in this
149 document, then these terms apply; otherwise, they do not. These terms define conformance to *this*
150 *document only*; they do not affect conformance to other documents, unless explicitly stated otherwise.

151 2.2 Other terminology

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

156 READ-ONLY: used in an attribute definition document to indicate that the attribute MUST NOT be
157 settable using an IPP protocol Set operation. In other words, the attribute is not settable by
158 definition.

159 not-settable: an implementation does not support setting an attribute (whether or not the attribute's
160 definition is READ-ONLY).

161 3 Requirements and Use Cases

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

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

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

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

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

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

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

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

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

184 4 Definition of the Set operations

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

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

196 The Set Printer operations are summarized in Table 1:

197 **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

198 4.1 Set-Printer-Attributes Operation

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

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

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

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

- 210 2. The Printer **MUST** support the attribute.

- 211 3. The attribute MUST NOT be READ-ONLY, i.e., the definition of the attribute MUST NOT
212 indicate that the attribute is READ-ONLY (see Appendix A for an indication of which IPP/1.1
213 attributes are READ-ONLY).
- 214 4. The attribute MUST be settable in this implementation.
- 215 5. The Printer MUST support the value according to the rules defined in Appendix A, i.e., each value
216 of each supplied "xxx" attribute MUST be validated against a value of a corresponding "xxx-
217 supported" Printer attribute. One of those rules permits an administrator to set arbitrary 'name'
218 values to those "xxx-supported" Printer attributes that include the 'name' attribute syntax if the
219 implementation supports the 'admin-define' out-of-band value for that "xxx-supported" attribute
220 (see section 16 and 8.3).
- 221 6. The attribute's values MUST NOT conflict with the values of other Printer attributes, including
222 ones being set in this same operation.

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

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

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

241 **4.1.1 Settable and READ-ONLY Printer Description attributes**

242 If the Printer supports the Set-Printer-Attributes operation, then it SHOULD support setting of:
243 all Job Template Default ("xxx-default") attributes
244 all Job Template Supported ("xxx-supported") attributes
245 all Job Template Ready ("xxx-ready") attributes
246 that the implementation supports (see [RFC2911] section 4.2 and extensions).

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

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

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

260 For example, if the "operations-supported" Printer Description attribute (see [RFC2911] section
261 4.4.15) is settable in a particular implementation, then changing its value with a Set-Printer-
262 Attributes operation MUST affect the operations that the implementation accepts or rejects. Such an
263 implementation will need to be able to reject values for operations that it contains no code support
264 for (see section 4.3). If the "operations-supported" Printer Description attribute is not settable in a
265 particular implementation, then that implementation MUST reject an attempt to set it with a Set-
266 Printer-Attributes operation, return the 'client-error-attributes-not-settable' status code (see section
267 7.1), and return the "operations-supported" attribute with the out-of-band 'not-settable' value in the
268 Unsupported Attributes Group.

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

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

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

284 **4.1.2 Set-Printer-Attributes Request**

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

286 Group 1: Operation Attributes

287 Natural Language and Character Set:

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

290 Target:

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

293 Requesting User Name:

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

296 "document-format" (mimeType):

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

302 If the client includes this attribute, the Printer MUST change the supplied attributes for the
303 document format specified by this attribute. If a supplied attribute is a member of the
304 "document-format-varying-attributes" (i.e., the attribute varies by document format, see
305 section 6.3), the Printer MUST change the supplied attribute for the document format specified
306 by this attribute, but not for other document formats. If a supplied attribute isn't a member of
307 the "document-format-varying-attributes" (i.e. it doesn't vary by document format), the Printer
308 MUST change the supplied attribute for all document formats.

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

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

317 Group 2: Printer Attributes

325 The client MUST supply a set of Printer attributes with one or more values (including
326 explicitly allowed out-of-band values) as defined in [RFC2911] section 4.2 Job Template
327 Attributes ("xxx-default", "xxx-supported", and "xxx-ready" attributes), section 4.4 Printer
328 Description Attributes, and any attribute extensions supported by the Printer. The value(s) of
329 each Printer attribute supplied in Group 2 replaces the value(s) of the corresponding Printer
330 attribute on the target Printer object. For attributes that can have multiple values (1setOf), all
331 values supplied by the client replace all values of the corresponding Printer object attribute. If
332 a Printer object attribute had not been configured yet and so had the 'no-value' out-of-band
333 value (see [RFC2911] section 4.1), the supplied value(s) replace the 'no-value' value.
334

335 **4.1.3 Set-Printer-Attributes Response**

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

338 Group 1: Operation Attributes

339 Status Message:

340 In addition to the REQUIRED status code returned in every response, the response
341 OPTIONALLY includes a "status-message" (text(255)) and/or a "detailed-status-message"
342 (text(MAX)) operation attribute as described in [RFC2911] sections 13 and 3.1.6.
343

344 Natural Language and Character Set:

345 The "attributes-charset" and "attributes-natural-language" attributes as described in [RFC2911]
346 section 3.1.4.2.
347

348 Group 2: Unsupported Attributes

349 See [RFC2911] section 3.1.7 for details on returning Unsupported Attributes.
350

351 If some of the attributes in the operation fail to validate, the Printer MUST reject the
352 operation, MUST NOT change any Printer attributes, and MUST return the indicated status
353 code below. In this group, the Printer MUST also return all attributes that fail to validate.
354 The following are the reasons that an attribute fails to validate and the value returned for the
355 attribute, along with the indicated status code and order of detection:
356

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

- 363 3. The attribute is either READ-ONLY (in its definition) or is not-settable in this
364 implementation: return the attribute with the "out-of-band" value 'not-settable' (see section
365 8.1) and the 'client-error-attributes-not-settable' status code (see section 7.1).
- 366 4. The Printer doesn't support the value: if the attribute in the operation has a single value
367 return it. If the attribute in the operation is multi-valued, return only those values in a
368 1setOf that are not supported. Return the 'client-error-attributes-or-values-not-supported'
369 status code (see [RFC2911] section 13.1.4.12).
- 370 5. The values of some of the supplied attributes conflict with one another and/or other Printer
371 attribute values not being set: if the conflicting attribute in the operation has a single value
372 return the attribute and the value. If the attribute in the operation is multi-valued, return
373 only the attribute and those values in a 1setOf that are conflicting with other attributes.
374 Return the 'client-error-conflicting-attributes' status code (see [RFC2911] section
375 13.1.4.15).

376 4.2 Set-Job-Attributes Operation

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

381 This operation is almost identical to the Set-Printer-Attributes operation and follows the same rules for
382 validation (see section 4.1). The only differences are that the Set-Job-Attributes operation is directed at
383 a Job object rather than a Printer object, there is no "document-format" operation attribute used when
384 setting a Job object, the operation can add an attribute to the (Job) object, the 'delete-attributes' out-of-
385 band value is permitted to remove an attribute, and the validation is the same as the Job Creation
386 operations (Print-Job, Print-URI, and Create-Job), i.e., depends on the "xxx-supported" Printer
387 Description attributes (see [RFC2911] section 3.1). Using the Set-Printer-Attributes operation, the
388 administrator can set arbitrary 'name' values to those "xxx-supported" Printer attributes that include the
389 'name' attribute syntax if the implementation supports the 'admin-define' out-of-band value for that "xxx-
390 supported" attribute (see section 16 and 8.3). However, the Set-Job-Attributes cannot be used to add
391 unsupported names to the Job object.

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

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

401 using the 'delete-attribute' out-of-band value. However, a client can re-establish such a deleted Job
 402 attribute with any supported value(s) using a subsequent Set-Job-Attributes operation.

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

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

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

422 **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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424 This operation MUST NOT change the value of attributes not specified in the operation unless the
425 definition of the attribute explicitly specifies such side-effects. In general, Job attribute definitions that
426 are settable will not define side-effects on other attributes that are settable, only side effects on READ-
427 ONLY attributes, if any.

428 **4.2.1 Settable and READ-ONLY Job Description attributes**

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

433 If the Printer supports the Set-Job-Attributes operation, then it SHOULD support setting of:
434 all Job Template job ("xxx") attributes
435 that the implementation supports (see [RFC2911] section 4.2 and extensions).

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

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

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

446 **4.2.2 Set-Job-Attributes Request**

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

448 Group 1: Operation Attributes

449 Natural Language and Character Set:

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

452 Target:

453 Either (1) the "printer-uri" (uri) plus "job-id" (integer(1:MAX)) or (2) the "job-uri" (uri)
454 operation attribute(s) which define the target for this operation as described in [RFC2911]
455 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).

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

514 **4.3 Get-Printer-Supported-Values Operation**

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

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

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

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

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

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

551 **4.3.1 Definition of the usage of the 'admin-define' out-of-band attribute value**

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

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

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

572 Administrator can use to add new values, not the 'keyword' attribute syntax. For IPP/1.1 this
573 requirement includes the following Job Template attributes:

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

577

578 Implementations that support additional Job Template attributes that include the 'name' attribute syntax,
579 MAY 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-
582 Printer-Attributes operation for that attribute to contain a value that is not one of the explicit 'keyword'
583 or 'name' 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
585 returned by 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
589 use 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
592 corresponding "printer-message-from-operator" Printer Description attribute.

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

596

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

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

606 from-operator" Printer attribute, the Printer returns the attribute with the zero-length value or the 'no-
607 value' value, respectively.

608 In addition, the Printer automatically copies:

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

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

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

624 **5.2 job-message-from-operator (text(127))**

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

627 Cancel-Job
628 Hold-Job
629 Release-Job
630 Restart-Job

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

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

641 operator" Job attribute, the IPP object returns the attribute with the zero-length value or the 'no-value'
642 value, respectively.

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

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

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

656 **6 New Printer Description Attributes**

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

659 **6.1 printer-settable-attributes-supported (1setOf type2 keyword)**

660 This **REQUIRED READ-ONLY** Printer attribute identifies the Printer object attributes that are settable
661 in this implementation, i.e., that are settable using the Set-Printer-Attributes operations (see section
662 4.1). This attribute **MUST** be supported if the Set-Printer-Attributes operations is supported. The
663 Printer **MUST** reject attempts to set any Printer attributes that are not one of the values of this attribute,
664 returning the 'client-error-attributes-not-settable' status code (see section 7.1). The value of this
665 attribute **MAY** depend on the value of the "document-format" operation attribute supplied in the Get-
666 Printer-Attributes operation (see [RFC2911] section 3.2.5.1).

667 Standard keyword values are:

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

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

670 **6.2 job-settable-attributes-supported (1setOf type2 keyword)**

671 This **REQUIRED READ-ONLY** Printer attribute identifies the Job object attributes that are settable in
672 this implementation, i.e., that are settable using the Set-Job-Attributes operation (see section 4.2). This
673 attribute **MUST** be supported if the Set-Job-Attributes operations is supported. The Printer **MUST**

674 reject attempts to set any Job attributes that are not one of the values of this attribute, returning the
675 'client-error-attributes-not-settable' status code (see section 7.1).

676 Standard keyword values are:

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

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

679 **6.3 document-format-varying-attributes (1setOf type2 keyword)**

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

690 **6.4 printer-message-time (integer(MIN:MAX))**

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

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

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

702 **6.5 printer-message-date-time (dateTime)**

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

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

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

712 **6.6 printer-xri-supported (1setOf collection)**

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

- 716 printer-uri-supported (1setOf uri) - see [RFC2911] section 4.4.1
- 717 uri-authentication-supported (1setOf type2 keyword) - see [RFC2911] section 4.4.2
- 718 uri-security-supported (1setOf type2 keyword) - see [RFC2911] section 4.4.3

719
720 When setting the "printer-xri-supported" attribute with a Set-Printer-Attributes request, the Printer
721 MUST also set these three IPP/1.1 READ-ONLY Printer Description attributes as a defined side effect.
722 Thus, this collection attribute provides the means to set these three IPP/1.1 READ-ONLY attributes
723 atomically so that they are never left in a partially inconsistent state.

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

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

731 **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

732 Each collection value MUST contain a single unique value for the "xri-uri" member attribute. However,
733 the other two member attributes are multi-valued, so that a single URI can support more than one
734 authentication scheme and/or more than one security scheme. Other than the uniqueness and the
735 cardinality requirements, the semantics of these three member attributes is given in [RFC2911] sections
736 4.4.1, 4.4.2, and 4.4.3, respectively.
737

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

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

743 A client can query what member attribute values can be set by supplying the three attribute names: "xri-
744 uri-scheme-supported", "xri-authentication-supported", and "xri-security-supported" in a Get-Printer-
745 Supported-Values request and getting back the uriScheme and type2 keyword values that can be set.
746 Since the "printer-xri-supported", "uri-authentication-supported", and "uri-security-supported"
747 attributes are READ-ONLY, they are not queriable with the Get-Printer-Supported-Values operation
748 (see section 4.3). See Table 16.

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

```
754 "printer-xri-supported" =
755     { "xri-uri" = ipp://abc.com/p1
756       "xri-authentication" = basic, digest
757       "xri-security" = tls
758     },
759     { "xri-uri" = http://abc.com/pq
760       "xri-authentication" = none
761       "xri-security" = none
762     }
763
```

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

```
766 "printer-uri-supported" = { ipp://abc.com/p1, ipp://abc.com/p1,
767                             http://abc.com/pq }
768 "uri-authentication-supported" = { basic, digest, none }
769 "uri-security-supported" = { tls, tls, none }
770
```

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

775 6.7 xri-uri-scheme-supported (1setOf uriScheme)

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

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

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

782 **6.8 xri-authentication-supported (1setOf type2 keyword)**

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

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

790 **6.9 xri-security-supported (1setOf type2 keyword)**

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

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

797 **7 Additional status codes**

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

799 **7.1 client-error-attributes-not-settable (0x0413)**

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

807 **8 Additional out-of-band values**

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

811 **8.1 'not-settable' out-of-band value**

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

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

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

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

827 **8.1.1 Encoding of the 'not-settable' out-of-band attribute value**

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

830 **8.2 'delete-attribute' out-of-band value**

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

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

836 An IPP Printer MUST support the 'delete-attribute' out-of-band value if it supports the Set-Job-
837 Attributes operation. A client MUST NOT supply and an IPP object MUST NOT support the 'delete-
838 attribute' out-of-band value in other operations, unless the operations' definition document explicitly
839 defines such usage. For example, the 'delete-attribute' out-of-band value MUST NOT be used in the

840 Set-Printer-Attributes operation, where the absence of an attribute from an IPP object indicates that the
841 attribute is not supported. If a Printer receives this out-of-band value in other operation requests, the
842 Printer MUST either (1) reject the entire request and return the 'client-error-bad-request' status code or
843 (2) ignore the attribute and return it with the 'unsupported' out-of-band value.

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

846 **8.2.1 Encoding of the 'delete-attribute' out-of-band value**

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

849 **8.3 'admin-define' out-of-band attribute value**

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

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

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

867 An IPP Printer MUST support the 'admin-define' out-of-band value, if it supports a client setting
868 arbitrary 'name' values of an "xxx-supported" Printer attribute using the Set-Printer-Attributes
869 operation. A client MUST NOT supply the 'admin-define' out-of-band value in any request. An IPP
870 object MUST NOT support the 'admin-define' out-of-band value in other operations, unless the
871 operations' definition document explicitly defines such usage. If a Printer receives this out-of-band
872 value in any operation request, the Printer MUST either (1) reject the entire request and return the
873 'client-error-bad-request' status code or (2) ignore the attribute and return it with the 'unsupported' out-
874 of-band value.

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

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

884 **8.3.1 Encoding of the 'admin-define' out-of-band attribute value**

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

887 **9 New Values for Existing Printer Description Attributes**

888 This section contains those attributes for which additional values are added.

889 **9.1 operations-supported (1setOf type2 enum)**

890 The following "operation-id" values are added in order to support the new operations defined in this
 891 document:

892 **Table 4 – Operation-id assignments**

Value	Operation Name
0x0013	Set-Printer-Attributes
0x0014	Set-Job-Attributes
0x0015	Get-Printer-Supported-Values

893 **10 Conformance Requirements**

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

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

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

- 902 1. the Get-Printer-Supported-Values operation (see section 5), if any "xxx-supported" attributes
903 are settable.
- 904 2. the "printer-settable-attributes-supported" Printer Description attribute (see section 6.1)
- 905 3. the 'not-settable' out-of-band value in responses (see section 8.1)
- 906 4. the 'client-error-not-settable' status code (see section 7.1)
- 907 5. If "printer-message-from-operator" Printer Description attribute is supported (see [RFC2911]
908 section 4.4.25), then it MUST be settable.
- 909 6. the Get-Printer-Supported-Values operation (see section 4.3), if any "xxx-supported" attributes
910 are settable.
- 911 7. If a client can set a value with the 'name' attribute syntax for one or more "xxx-supported"
912 attributes, then the 'admin-define' out-of-band attribute value (see section 8.3) MUST be
913 supported in the Get-Printer-Supported-Values response for each such settable attribute (see
914 section 4.3)

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

- 917 1. the "job-settable-attributes-supported" Printer Description attribute (see section 6.2)
- 918 2. the 'not-settable' out-of-band value in responses (see section 8.1)
- 919 3. the 'delete-attribute' out-of-band value in requests (see section 8.2)
- 920 4. the 'client-error-not-settable' status code (see section 7.1)
- 921 5. If the "job-message-from-operator" Printer Description attribute is supported (see [RFC2911]
922 4.3.16), then it MUST be settable.

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

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

931 11 IANA Considerations

932 This section contains registration information for IANA to add to the various IPP Registries according
 933 to the procedures defined in RFC 2911 [RFC2911] section 6.

934
 935 *Note to RFC Editors: Replace RFC NNNN below with the RFC number for this document, so that it*
 936 *accurately reflects the content of the information for the IANA Registry.*

937 11.1 Operation Registrations

938 The following table lists all of the operations defined in this document. These are to be registered
 939 according to the procedures defined in RFC 2911 [RFC2911] section 6.4.

940	Operations:	Ref.	Section:
941	Set-Printer-Attributes	RFC NNNN	4.1
942	Set-Job-Attributes	RFC NNNN	4.2
943	Get-Printer-Supported-Values	RFC NNNN	4.3
944			

945
 946 The resulting operation registrations will be published in the
 947 <ftp://ftp.iana.org/in-notes/iana/assignments/ipp/operations/>
 948 area.

949 11.2 Additional Enum Attribute Value Registrations for the “operations-supported” Printer 950 Attribute

951 The following table lists all the new enum attribute values defined in this document as additional type2
 952 enum values for use with the “operations-supported” Printer Description attribute. These are to be
 953 registered according to the procedures defined in RFC 2911 [RFC 2911] section 6.1.

954	Enum Attribute Values:	Value	Ref.	Section:
955	Set-Printer-Attributes	0x0013	RFC NNNN	4
956	Set-Job-Attributes	0x0014	RFC NNNN	4
957	Get-Printer-Supported-Values	0x0015	RFC NNNN	4
958				

959
 960 The resulting enum attribute value registrations will be published in the
 961 <ftp://ftp.iana.org/in-notes/iana/assignments/ipp/attribute-values/operations-supported/>
 962 area.

963 11.3 Attribute Registrations

964 The following table lists all of the attributes defined in this document. These are to be registered
 965 according to the procedures in RFC 2911 [RFC2911] section 6.2.

966	Operation attributes:	Ref.	Section:
967	printer-message-from-operator (text(127))	RFC NNNN	5.1
968	job-message-from-operator (text(127))	RFC NNNN	5.2
969			

970

	Ref.	Section:
971 Printer Description attributes:		
972 printer-settable-attributes-supported (1setOf type2 keyword)		
973	RFC NNNN	6.1
974 job-settable-attributes-supported (1setOf type2 keyword)		
975	RFC NNNN	6.2
976 document-format-varying-attributes (1setOf type2 keyword)		
977	RFC NNNN	6.3
978 printer-message-time (integer(MIN:MAX))	RFC NNNN	6.4
979 printer-message-date-time (dateTime)	RFC NNNN	6.5
980 printer-xri-supported (1setOf collection)	RFC NNNN	6.6
981 xri-uri-scheme-supported (1setOf uriScheme)	RFC NNNN	6.7
982 xri-authentication-supported (1setOf type2 keyword)		6.8
983 xri-security-supported (1setOf type2 keyword)	RFC NNNN	6.9

984
 985 The resulting attribute registrations will be published in the
 986 <ftp://ftp.iana.org/in-notes/iana/assignments/ipp/attributes/>
 987 area.
 988

989 11.4 Status code Registrations

990 The following table lists the status code defined in this document. This is to be registered according to
 991 the procedures in RFC 2911 [RFC2911] section 6.6.

	Ref.	Section:
992 Status codes:		
993 client-error-attributes-not-settable (0x0413)	RFC NNNN	7.1

994
 995
 996 The resulting status code registration will be published in the
 997 <ftp://ftp.iana.org/in-notes/iana/assignments/ipp/status-codes/>
 998 area.
 999

000 11.5 Out-of-band Attribute Value Registrations

001 The following table lists all of the out-of-band attribute values defined in this document. These are to
 002 be registered according to the procedures in RFC 2911 [RFC2911] section 6.7.

	Ref.	Section:
003 Out-of-band Attribute Values:		
004 'not-settable' out-of-band value	RFC NNNN	8.1
005 'delete-attribute' out-of-band value	RFC NNNN	8.2
006 'admin-define' out-of-band attribute value	RFC NNNN	8.3

007
 008
 009 The resulting out-of-band attribute value registrations will be published in the
 010 <ftp.iana.org/in-notes/iana/assignments/ipp/out-of-band-attribute-value-tags/>
 011 area.

012 **12 Internationalization Considerations**

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

014 **13 Security Considerations**

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

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

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

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

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

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

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074 IPP Web Page: <http://www.pwg.org/ipp/>

075 IPP Mailing List: ipp@pwg.org

076

077 To subscribe to the ipp mailing list, send the following email:

078 1) send it to majordomo@pwg.org

079 2) leave the subject line blank

080 3) put the following two lines in the message body:

081 subscribe ipp

082 end

083

084 Implementers of this specification document are encouraged to join the IPP Mailing List in order to
085 participate in any discussions of clarification issues and review of registration proposals for additional
086 attributes and values. In order to reduce spam the mailing list rejects mail from non-subscribers, so you
087 must subscribe to the mailing list in order to send a question or comment to the mailing list.

088

15 References

089

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113

114

114 **16 Appendix A: Allowed Values for Set-Printer-Attributes and Set-Job-** 115 **Attributes requests**

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

- 118 – an attribute and
- 119
- 120 – the values allowed in the Set-Printer-Attributes or Set-Job-Attributes request for the attribute.
 121 The entry in each cell is the name (first few words) of each item below 1, 2, 3, 4a-g, and 5.
- 122

123 The allowed values include the following cases:

- 124 1. READ-ONLY: the Set-Printer-Attributes or Set-Job-Attributes operation MUST NOT change this
 125 attribute and MUST reject the entire operation (see section 7.1).
- 126 2. Any of "xxx-supported": the Set-Printer-Attributes or Set-Job-Attributes operation accepts values
 127 that are allowed according to the IPP/1.1 rules for validating the value(s) of an "xxx" Printer or Job
 128 attribute against the value(s) of the corresponding "xxx-supported" Printer attribute. Table 5
 129 summarizes those validation rules depending on each attribute syntax and value of an "xxx"
 130 attribute supplied in the request and that of the corresponding "xxx-supported" Printer attribute.
 131 The "xxx-supported" attribute syntax type and value(s) are obtained from a Get-Printer-Supported-
 132 Values response (see the tables in this Appendix).

133 **Table 5 - 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

134

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

- 137 3. From Get-Printer-Supported-Values: the Set-Printer-Attributes operation accepts values that are
 138 allowed according to the IPP/1.1 rules for validating the value(s) of an "xxx" Printer attribute
 139 against the value(s) of the corresponding "xxx-supported" Printer attribute. Table 6 summarizes
 140 those validation rules depending on each attribute syntax and value of an "xxx" attribute supplied in
 141 the request and that of the corresponding "xxx-supported" Printer attribute. The "xxx-supported"

142 attribute syntax type and attribute value(s) are obtained from a Get-Printer-Supported-Values
 143 response (see Appendix B: Attributes returned from Get-Printer-Supported-Values below).

144 **Table 6 - 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

145
 146 For additional non-normative explanatory information see section 3.1.2.3 of the "Internet Printing
 147 Protocol/1.1: Implementer's Guide" [ipp-iig]).

- 148 4. Any value of the proper attribute syntax: the Set-Printer-Attributes or Set-Job-Attributes operation
 149 accepts any value of the specified attribute syntax. The attribute syntaxes supported are
 150 enumerated below.
- 151 a. Any text(127)
 - 152 b. Any name(127)
 - 153 c. Any uri
 - 154 d. Any boolean
 - 155 e. Any positive integer
 - 156 f. Any dateTime
 - 157 g. 1setOf any uri
- 158
 159 5. Combination of 'Any of "xxx-supported"' or 'Any name'.

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

162

Table 7 - 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"

163

Table 8 - 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

166
167**Table 9 - 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

168
169
170**Table 10 - 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"

Printer Description Attributes	Values allowed for Set
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)
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

171

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173

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

174

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

175

176

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"

177 attributes that can be supplied in a Set-Printer-Attributes request. READ-ONLY attributes MUST
 178 NOT be returned in a Get-Printer-Supported-Values response and are indicated in the tables as "READ-
 179 ONLY - MUST NOT be returned."

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

183 **Table 11 - 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)

184
 185 For the following attributes, the value allowed by the Set-Printer-Attributes operation MUST be a
 186 single rangeOfInteger value whose bounds do not exceed those of the range specified by the value
 187 returned by the Get-Printer-Supported-Values operation.

188 **Table 12 - Printer Job Template Attributes returned from Get-Printer-Supported-Values**

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

189
 190 The following table has the same criteria as the last, but is for Printer Description attributes.

191 **Table 13 - 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)

192
 193 For the following attributes, the value allowed by the Set-Printer-Attributes operation MUST be one or
 194 more integers and rangeOfInteger values, such that the integer values described by these integers and
 195 rangeOfInteger is the same as or a subset of the integers described by the integers and rangeOf Integer
 196 of value returned by the Get-Printer-Supported-Values operation.

197 **Table 14 - 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))

198

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

205 **Table 15 - 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

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

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

209

Table 16 - 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

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

212 18 Appendix C: Description of the Base IPP Documents

213 The base set of IPP documents includes:

- 214 Design Goals for an Internet Printing Protocol [RFC2567]
- 215 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
- 216 Internet Printing Protocol/1.1: Model and Semantics [RFC2911]
- 217 Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]
- 218 Internet Printing Protocol/1.1: Implementer's Guide [IPP-IIG]

219 Mapping between LPD and IPP Protocols [RFC2569]

220

221 The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed
222 printing functionality, and it enumerates real-life scenarios that help to clarify the features that need to
223 be included in a printing protocol for the Internet. It identifies requirements for three types of users:
224 end users, operators, and administrators. It calls out a subset of end user requirements that are satisfied
225 in IPP/1.0 [RFC2566, RFC2565]. A few OPTIONAL operator operations have been added to IPP/1.1
226 [RFC2911, RFC2910].

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

231 The "Internet Printing Protocol/1.1: Model and Semantics" document describes a simplified model with
232 abstract objects, their attributes, and their operations. The model introduces a Printer and a Job. The
233 Job supports multiple documents per Job. The model document also addresses how security,
234 internationalization, and directory issues are addressed.

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

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

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

247 **19 Appendix D: Full Copyright Statement**

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265 **Acknowledgement**

266 Funding for the RFC Editor function is currently provided by the Internet Society.