

1 INTERNET-DRAFT
2 <draft-ietf-ipp-job-printer-set-ops-02.txt>

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March 23, 2000

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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 Protocol/1.0
24 (IPP) [RFC2565, RFC2566], IPP/1.1 [ipp-mod, ipp-pro], and future versions. The end user, operator, and
25 administrator Set-Job-Attributes and Set-Printer-Attributes operations are used to modify IPP Job objects
26 and Printer objects, respectively. The third administrator Get-Printer-Supported-Values operation returns
27 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', and
29 '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" (text)
31 are defined to set the corresponding IPP/1.1 Printer and Job Description attributes with the same names.

32 Nine Printer Description attributes are defined:

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

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

42 The full set of IPP documents includes:

- 43 Design Goals for an Internet Printing Protocol [RFC2567]
- 44 Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
- 45 Internet Printing Protocol/1.1: Model and Semantics (this document)
- 46 Internet Printing Protocol/1.1: Encoding and Transport [IPP-PRO]
- 47 Internet Printing Protocol/1.1: Implementer's Guide [IPP-IIG]
- 48 Mapping between LPD and IPP Protocols [RFC2569]

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

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

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

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

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

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146 **1 Introduction**

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

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

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

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

165 This document is an extension to IPP/1.0 [RFC2565, RFC2566] and IPP/1.1 [ipp-mod, ipp-pro], and future
166 versions.

167 **2 Terminology**

168 This section defines terminology used throughout this document.

169 **2.1 Conformance Terminology**

170 Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED
171 NOT, and OPTIONAL, have special meaning relating to conformance. These terms are defined in [ipp-
172 mod] section 12.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

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

174 **REQUIRED:** if an implementation supports the extensions described in this document, it MUST
175 support a REQUIRED feature.

176 **OPTIONAL:** if an implementation supports the extensions described in this document, it MAY support
177 an OPTIONAL feature.

178 2.2 Other terminology

179 This document uses terms such as Job object (or Job), IPP Printer object (or Printer), "operation", "request",
180 response", "attributes", "keywords", and "support". These terms have special meaning and are defined in
181 the model terminology [ipp-mod] section 12.2. The following additional terms are introduced in this
182 document:

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

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

188 3 Requirements and Use Cases

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

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

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

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

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

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

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

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

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

209 4 Definition of the Set operations

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

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

221 The Set Printer operations are summarized in Table 1:

222 **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

223 4.1 Set-Printer-Attributes Operation

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

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

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

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

- 235 2. The Printer MUST support the attribute.

- 236 3. The attribute MUST NOT be READ-ONLY, i.e., the definition of the attribute MUST NOT indicate
237 that the attribute is READ-ONLY (see Appendix A for an indication of which IPP/1.1 attributes are
238 READ-ONLY).
- 239 4. The attribute MUST be settable in this implementation.
- 240 5. The Printer MUST support the value according to the rules defined in Appendix A, i.e., each value
241 of each supplied "xxx" attribute MUST be validated against a value of a corresponding "xxx-
242 supported" Printer attribute. One of those rules permits an administrator to set arbitrary 'name'
243 values to those "xxx-supported" Printer attributes that include the 'name' attribute syntax if the
244 implementation supports the 'admin-define' out-of-band value for that "xxx-supported" attribute (see
245 section 0 and 8.3).
- 246 6. The attribute's values MUST NOT conflict with the values of other Printer attributes, including ones
247 being set in this same operation.

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

252 The Printer MUST accept this operation when its READ-ONLY "printer-state" attribute (see ipp-mod]
253 section 4.4.11) is 'idle' or 'stopped', and SHOULD accept it when the value is 'processing'. The Printer
254 MUST accept this operation for any of the values of the Printer object's READ-ONLY "printer-state-
255 reasons" and "printer-is-accepting-jobs" attributes, unless explicitly defined otherwise in the definition of
256 these attributes' values.

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

266 4.1.1 Settable and READ-ONLY Printer Description attributes

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

- 268 all Job Template Default ("xxx-default") attributes
- 269 all Job Template Supported ("xxx-supported") attributes
- 270 all Job Template Ready ("xxx-ready") attributes

271 that the implementation supports (see [ipp-mod] section 4.2 and extensions).

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

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

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

284 For example, if the "operations-supported" Printer Description attribute (see [ipp-mod] section
285 4.4.15) is settable in a particular implementation, then changing its value with a Set-Printer-
286 Attributes operation MUST affect the operations that the implementation accepts or rejects. Such
287 an implementation will need to be able to reject values for operations that it contains no code
288 support for (see section 4.3). If the "operations-supported" Printer Description attribute is not
289 settable in a particular implementation, then that implementation MUST reject an attempt to set it
290 with a Set-Printer-Attributes operation, return the 'client-error-attributes-not-settable' status code
291 (see section 7.1), and return the "operations-supported" attribute with the out-of-band 'not-settable'
292 value in the Unsupported Attributes Group.

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

298 As a third example, if a client supplies a Set-Printer-Attributes request that contains both the
299 "media-default" and the "media-supported" attributes, but includes a value in the "media-default"
300 that is not a member of the supplied "media-supported" attribute, the Printer MUST reject the
301 request and return the "client-error-conflicting-attributes" status code with the "media-default" and
302 "media-supported" attributes and their values (see [ipp-mod] section 3.1.7).

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

308 **4.1.2 Set-Printer-Attributes Request**

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

310 Group 1: Operation Attributes

311 Natural Language and Character Set:

312 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
313 section 3.1.4.1.

314

315 Target:

316 The "printer-uri" (uri) operation attribute which is the target for this operation as described in [ipp-
317 mod] section 3.1.5.

318

319 Requesting User Name:

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

322

323 "document-format" (mimeMediaType):

324 The client OPTIONALLY supplies this attribute. The Printer object MUST support this attribute.
325 This attribute is useful for a client to select the document-format to which the attribute modification
326 should be applied. A Printer implementation MAY allow some attributes to have different values
327 for each document format that it supports. See [ipp-mod] section 3.2.5.1 "Get-Printer-Attributes
328 Request".

329

330 If the client includes this attribute, the Printer MUST change the supplied attributes for the
331 document format specified by this attribute. If a supplied attribute is a member of the "document-
332 format-varying-attributes" (i.e., the attribute varies by document format, see section 6.3), the Printer
333 MUST change the supplied attribute for the document format specified by this attribute, but not for
334 other document formats. If a supplied attribute isn't a member of the "document-format-varying-
335 attributes" (i.e. it doesn't vary by document format), the Printer MUST change the supplied attribute
336 for all document formats.

337

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

340

341 If the client supplies a value for the "document-format" Operation attribute that is either
342 'application/octet-stream' or not supported by the Printer, i.e., is not among the values of the Printer
343 object's "document-format-supported" attribute, the Printer object MUST reject the operation and
344 return the 'client-error-document-format-not-supported' status code. Note: the document-format
345 'application/octet-stream' is the union of several document-formats (see [ipp-mod] section 3.2.5.1,
346 Get-Printer-Attributes) and is not a true document-format.

347

348 Group 2: Printer Attributes

349 The client MUST supply a set of Printer attributes with one or more values (including explicitly
350 allowed out-of-band values) as defined in [ipp-mod] section 4.2 Job Template Attributes ("xxx-
351 default", "xxx-supported", and "xxx-ready" attributes), section 4.4 Printer Description Attributes,
352 and any attribute extensions supported by the Printer. The value(s) of each Printer attribute supplied
353 in Group 2 replaces the value(s) of the corresponding Printer attribute on the target Printer object.

354 For attributes that can have multiple values (1setOf), all values supplied by the client replace all
355 values of the corresponding Printer object attribute. If a Printer object attribute had not been
356 configured yet and so had the 'no-value' out-of-band value (see [ipp-mod] section 4.1), the supplied
357 value(s) replace the 'no-value' value.
358

359 **4.1.3 Set-Printer-Attributes Response**

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

361 Group 1: Operation Attributes

362 Status Message:

363 In addition to the REQUIRED status code returned in every response, the response OPTIONALLY
364 includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation
365 attribute as described in [ipp-mod] sections 13 and 3.1.6.
366

367 Natural Language and Character Set:

368 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
369 section 3.1.4.2.
370

371 Group 2: Unsupported Attributes

372 See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.
373

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

- 379 1. The number of attributes supplied by the client exceeds the maximum number that the
380 Printer supports in a Set-Printer-Attributes request: return the 'client-error-request-entity-
381 too-large' (see [ipp-mod] section 13.1.4.9).
- 382 2. The Printer doesn't support the attribute: return the attribute with the "out-of-band" value
383 'unsupported' (see [ipp-mod] section 3.1.7 and [ipp-pro]) and the 'client-error-attributes-or-
384 values-not-supported' (see [ipp-mod] section 13.1.4.12).
- 385 3. The attribute is either READ-ONLY (in its definition) or is not-settable in this
386 implementation: return the attribute with the "out-of-band" value 'not-settable' (see section
387 8.1) and the 'client-error-attributes-not-settable' status code (see section 7.1).
- 388 4. The Printer doesn't support the value: if the attribute in the operation has a single value
389 return it. If the attribute in the operation is multi-valued, return only those values in a 1setOf
390 that are not supported. Return the 'client-error-attributes-or-values-not-supported' status
391 code (see [ipp-mod] section 13.1.4.12).

392 5. The values of some of the supplied attributes conflict with one another and/or other Printer
393 attribute values not being set: if the conflicting attribute in the operation has a single value
394 return the attribute and the value. If the attribute in the operation is multi-valued, return only
395 the attribute and those values in a lsetOf that are conflicting with other attributes. Return
396 the 'client-error-conflicting-attributes' status code (see [ipp-mod] section 13.1.4.15).

397 **4.2 Set-Job-Attributes Operation**

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

402 This operation is almost identical to the Set-Printer-Attributes operation and follows the same rules for
403 validation (see section 4.1). The only differences are that the Set-Job-Attributes operation is directed at a
404 Job object rather than a Printer object, there is no "document-format" operation attribute used when setting
405 a Job object, the operation can add an attribute to the (Job) object, the 'delete-attributes' out-of-band value is
406 permitted to remove an attribute, and the validation is the same as the Job Creation operations (Print-Job,
407 Print-URI, and Create-Job), i.e., depends on the "xxx-supported" Printer Description attributes (see [ipp-
408 mod] section 3.1). Using the Set-Printer-Attributes operation, the administrator can set arbitrary 'name'
409 values to those "xxx-supported" Printer attributes that include the 'name' attribute syntax if the
410 implementation supports the 'admin-define' out-of-band value for that "xxx-supported" attribute (see section
411 0 and 8.3). However, the Set-Job-Attributes cannot be used to add unsupported names to the Job object.

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

414 If the client supplies a job attribute with the "out-of-band" value 'delete-attribute' (see section 8.2), then the
415 Printer MUST remove the attribute and all of its values from the Job object, if present. The semantic effect
416 of the client supplying the 'delete-attribute' value in a Set-Job-Attributes operation MUST be the same as if
417 the attribute had not been supplied with the Job object in the Job Creation operation, i.e., the Printer applies
418 its default attribute or behavior with lower precedence than the PDL (see the beginning of [ipp-mod] section
419 4.2 and [ipp-mod] 3.2.1.1). Any subsequent query of the Job object using Get-Job-Attributes or Get-Jobs
420 MUST NOT return any attribute that has been deleted using the 'delete-attribute' out-of-band value.
421 However, a client can re-establish such a deleted Job attribute with any supported value(s) using a
422 subsequent Set-Job-Attributes operation.

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

427 The validation of the Set-Job-Attributes request is performed by the Printer as if the job had been submitted
428 originally with the new attribute values (and the deleted attributes removed) and with "ipp-attribute-fidelity"
429 set to 'true', i.e., all modified attributes Job attributes and values MUST be supported in combination with

430 the Job attributes not modified. If such a Job Creation operation would have been accepted, then the Set-
 431 Job-Attributes MUST be accepted. If such a Job Creation operation would have been rejected, then the Set-
 432 Job-Attributes MUST be rejected and the Job MUST be unchanged. In addition, if any of the supplied
 433 attributes are not supported, are not settable, or the values are not supported, the Printer object MUST reject
 434 the entire operation; the Printer object MUST NOT partially set some of the supplied attributes. In other
 435 words, after the operation, all the supplied attributes MUST be set or none of them MUST be set, thus
 436 making the Set-Job-Attributes an atomic operation.

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

441 **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'

442

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

447 **4.2.1 Settable and READ-ONLY Job Description attributes**

448 If the Printer supports the "job-message-from-operator" Job Description attribute (see [ipp-mod] section
 449 4.3.16) and the client explicitly supplies a new value for the "job-message-from-operator" in the Set-Job-
 450 Attributes request, then the Printer MUST set the "job-message-from-operator" Job attribute to this new
 451 value.

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

453 all Job Template job ("xxx") attributes
454 that the implementation supports (see [ipp-mod] section 4.2 and extensions).

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

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

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

465 **4.2.2 Set-Job-Attributes Request**

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

467 Group 1: Operation Attributes

468 Natural Language and Character Set:

469 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
470 section 3.1.4.1.

471 Target:

472 Either (1) the "printer-uri" (uri) plus "job-id" (integer(1:MAX)) or (2) the "job-uri" (uri) operation
473 attribute(s) which define the target for this operation as described in [ipp-mod] section 3.1.5.

474 Requesting User Name:

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

477 Group 2: Job Attributes

481 The client MUST supply a set of Job attributes with one or more values (including explicitly
482 allowed out-of-band values) as defined in [ipp-mod] section 4.2 Job Template Attributes ("xxx"
483 attributes), section 4.3 Job Description Attributes, and any attribute extensions supported by the
484 Printer. The value(s) of each Job attribute supplied in Group 2 replaces the value(s) of the
485 corresponding Job attribute on the target Job object. For attributes that can have multiple values
486 (1setOf), all values supplied by the client replace all values of the corresponding Job object
487 attribute.

488
489 If the client supplies an "xxx" attribute with the 'delete-attribute' out-of-band value (see section 8.2),
490 the Printer MUST remove the "xxx" attribute from the Job object, if present.

491

492 **4.2.3 Set-Job-Attributes Response**

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

494 Group 1: Operation Attributes

495 Status Message:

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

499

500 Natural Language and Character Set:

501 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
502 section 3.1.4.2.

503

504 Group 2: Unsupported Attributes

505 See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.

506

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

- 512 1. The number of attributes supplied by the client exceeds the maximum number that the
513 Printer supports in a Set-Printer-Attributes request: return the 'client-error-request-entity-
514 too-large' (see [ipp-mod] section 13.1.4.9).
- 515 2. The Printer doesn't support the attribute: return the attribute with the 'unsupported' out-of-
516 band attribute value (see [ipp-mod] section 3.1.7 and [ipp-pro]) and the 'client-error-
517 attributes-or-values-not-supported' (see [ipp-mod] section 13.1.4.12).
- 518 3. The attribute is READ-ONLY (in its definition) or is not-settable in this implementation:
519 return the attribute with the 'not-settable' out-of-band attribute value (see section 8.1) and the
520 'client-error-attributes-not-settable' status code (see section 7.1).
- 521 4. The Printer doesn't support the value: if the attribute in the operation has a single value
522 return it. If the attribute in the operation is multi-valued, return only those values in a 1setOf
523 that are not supported. Return the 'client-error-attributes-or-values-not-supported' status
524 code (see [ipp-mod] section 13.1.4.12).
- 525 5. The values of some of the supplied attributes conflict with one another and/or other Job
526 attribute values not being set: if the conflicting attribute in the operation has a single value
527 return the attribute and the value. If the attribute in the operation is multi-valued, return only

528 the attribute and those values in a 1setOf that are conflicting with other attributes. Return
529 the 'client-error-conflicting-attributes' status code (see [ipp-mod] section 13.1.4.15).

530 **4.3 Get-Printer-Supported-Values Operation**

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

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

540 This operation has identical request/response attributes to the Get-Printer-Attributes operation in IPP/1.1
541 [ipp-mod]. The operation also behaves identically to the Get-Printer-Attributes operation in IPP/1.1 [ipp-
542 mod] with the following exceptions:

- 543 1. The Get-Printer-Supported-Values operation supports only "xxx-supported" attributes.
- 544 2. The Get-Printer-Attributes operation returns the few "xxx-supported" attributes that are defined to
545 be single valued, such as "page-ranges-supported" (boolean) or "pdl-override-supported" (type2
546 keyword), as single values, while Get-Printer-Supported-Values returns the possible values that can
547 be set as a 1setOf of the same attribute syntax type (See Appendix B: Attributes returned from Get-
548 Printer-Supported-Values).
- 549 3. The Get-Printer-Attributes operation returns the current values of requested attributes while the Get-
550 Printer-Supported-Values operation returns the values that are inherently supported by the
551 implementation code, i.e., the values that an administrative client can set in a Set-Printer-Attributes
552 request.
- 553 4. The Get-Printer-Attributes operation returns the current values of requested "xxx-supported"
554 attributes that the Printer is configured to accept in Job Creation operations, including additional
555 values defined by the administrator, while the Get-Printer-Supported-Values operation returns only
556 the values of "xxx-supported" attributes that are inherently supported by the implementation and
557 does not return any additional values defined by the administrator where the implementation
558 supports the 'admin-define' out-of-band value.
- 559 5. The Get-Printer-Attributes never returns the 'admin-define' out-of-band attribute value, while the
560 Get-Printer-Supported-Attributes operation does, if the implementation allows the administrator to
561 define name values by setting that "xxx-supported" attribute with any 'name' value(s).

562 6. The Get-Printer-Attributes operation only requires end-user access rights, while the Get-Printer-
563 Supported-Values requires administrator access rights.

564 *Access Rights:* The authenticated user (see [ipp-mod] section 8.3) performing this operation must be an
565 administrator of the Printer object (see [ipp-mod] Sections 1 and 8.5).

566 **4.3.1 Definition of the usage of the 'admin-define' out-of-band attribute value**

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

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

580 The Get-Printer-Supported-Values MAY return the 'admin-define' out-of-band attribute value for any
581 IPP/1.1 or extension Job Template attribute if the implementation supports allowing the System
582 Administrator to add values to the "xxx-supported" attribute using the Set-Printer-Attributes operation. In
583 this case, the Printer MUST accept any 'name' value of the correct attribute syntax in a Set-Printer-
584 Attributes operation that is setting that attribute. For "xxx-supported" attributes that are defined with a
585 choice of attribute syntaxes, such as 'keyword | name', it is the 'name' attribute syntax that the System
586 Administrator can use to add new values, not the 'keyword' attribute syntax. For IPP/1.1 this requirement
587 includes the following Job Template attributes:

588 media-supported
589 job-hold-until-supported
590 job-sheets-supported

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

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

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

599 5 New Operation attributes

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

603 5.1 "printer-message-from-operator" (text(127))

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

606 Pause-Printer
607 Resume-Printer
608 Purge-Jobs

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

614 If the Printer supports this operation attribute, it MUST support both a zero-length text value and the 'no-
615 value' out-of-band value (see [ipp-mod] section 4.1) to indicate that the operator has sent no message. In
616 this case, the Printer sets the value of the "printer-message-from-operator" to the zero-length value or 'no-
617 value' out-of-band value, respectively. If the client queries the "printer-message-from-operator" Printer
618 attribute, the Printer returns the attribute with the zero-length value or the 'no-value' value, respectively.

619 In addition, the Printer automatically copies:

- 620 1. the value of its "printer-up-time" attribute (see [ipp-mod] section 4.4.29) to its "printer-message-
621 time" attribute,
- 622 2. the value of its printer-current-time" (dateTime) attribute (see [ipp-mod] section 4.4.30) to its
623 "printer-message-date-time" attribute, if supported.

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

626 The "printer-message-from-operator" operation attribute MUST NOT be supported as an operation attribute
627 for the Set-Printer-Attributes operation. If the operator wants to set the Printer's "printer-message-from-
628 operator" Printer Description attribute when issuing the Set-Printer-Attributes operation, the client supplies
629 the "printer-message-from-operator" explicitly with its new value as one of the Printer Description
630 attributes in Group 2 in the request. The Printer also updates its "printer-message-time" and "printer-
631 message-date-time" Printer Description attributes. If the client does not explicitly supply the "printer-

632 message-from-operator" with its new value in the Set-Printer-Attributes request, the Printer leaves the value
633 of the Printer's "printer-message-from-operator" Printer Description attribute unchanged.

634 **5.2 "job-message-from-operator" (text(127))**

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

637 Cancel-Job
638 Hold-Job
639 Release-Job
640 Restart-Job

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

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

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

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

655 The "job-message-from-operator" operation attribute MUST NOT be supported as an operation attribute for
656 the Set-Job-Attributes operation. If the operator wants to set the Job's "job-message-from-operator" Job
657 Description attribute when issuing the Set-Job-Attributes operation, the client MUST supply the "job-
658 message-from-operator" with its new value as one of the Job Description attributes in Group 2 in the
659 request. Otherwise, the Printer leaves the value of the Job's "job-message-from-operator" Job Description
660 attribute unchanged by not explicitly setting the attribute. If the client does not explicitly supply the "job-
661 message-from-operator" with its new value in the Set-Job-Attributes request, the Printer leaves the value of
662 the Job's "job-message-from-operator" Job Description attribute unchanged.

663 **6 New Printer Description Attributes**

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

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

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

Standard keyword values are:

'none': There are no settable Printer attributes.

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

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

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

Standard keyword values are:

'none': There are no settable Job attributes.

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

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

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

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

This OPTIONAL READ-ONLY Printer Description attribute contains the time that the Printer's "printer-message-from-operator" was changed by the operator using any operation where the client supplied the

700 "printer-message-from-operator" operation attribute (see section 5.1) or was explicitly set using the Set-
701 Printer-Attributes operation (see section 4.1). This attribute allows the users to know when the "printer-
702 message-from-operator" attribute was last set.

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

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

709 **6.5 printer-message-date-time (dateTime)**

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

715 This attribute MUST be supported if the Printer supports both the "printer-message-time" and the "printer-
716 current-time" (dateTime) attributes (see [ipp-mod] section 4.4.30).

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

719 **6.6 printer-xri-supported (1setOf collection)**

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

723 printer-uri-supported (1setOf uri) - see [ipp-mod] section 4.4.1

724 uri-authentication-supported (1setOf type2 keyword) - see [ipp-mod] section 4.4.2

725 uri-security-supported (1setOf type2 keyword) - see [ipp-mod] section 4.4.3

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

730 An IPP Printer MUST NOT provide any other way using IPP to set these three IPP/1.1 READ-ONLY
731 Printer Description attributes, since they are READ-ONLY and MUST have consistent values at all times.
732 Note: The "xri-printer-supported" (1setOf collection) attribute can be put into a directory schema that
733 requires a single text string value, such as SLP or LDAPA, by using suitable delimiting characters to separate

734 member attributes of the collection and/or terminating collection values. See [svrloc-printer] and [ldap-
735 printer].

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

737 **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

738 Each collection value MUST contain a single unique value for the "xri-uri" member attribute. However,
739 the other two member attributes are multi-valued, so that a single URI can support more than one
740 authentication scheme and/or more than one security scheme. Other than the uniqueness and the cardinality
741 requirements, the semantics of these three member attributes is given in [ipp-mod] sections 4.4.1, 4.4.2, and
742 4.4.3, respectively.

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

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

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

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

```
758
759 "printer-xri-supported =
760   { "xri-uri" = ipp://abc.com/pl
761     "xri-authentication" = basic, digest
762     "xri-security" = tls
763   },
```



```
764     {  "xri-uri" = http://abc.com/pg
765         "xri-authentication" = none
766         "xri-security" = none
767     }
768
```

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

```
771     "printer-uri-supported" = { ipp://abc.com/p1, ipp://abc.com/p1,
772                               http://abc.com/pg }
773     "uri-authentication-supported" = { basic, digest, none }
774     "uri-security-supported" = { tls, tls, none }
775
776
```

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

780 **6.7 xri-uri-scheme-supported (1setOf uriScheme)**

781 This OPTIONAL READ-ONLY Printer Description attribute identifies the URI schemes that the
782 implementation supports for use in the "printer-uri-supported" (1setOf uri) Printer Description attribute (see
783 [ipp-mod] section 4.4.1) and the "xri-uri" member attribute of the "xri-printer-supported" (1setOf
784 collection) Printer Description attribute (see section 6.6).

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

787 **6.8 xri-authentication-supported (1setOf type2 keyword)**

788 This OPTIONAL READ-ONLY Printer Description attribute identifies the Client Authentication
789 mechanisms that the implementation supports for use in the "printer-authentication-supported" (1setOf
790 type2 keyword) Printer Description attribute (see [ipp-mod] section 4.4.2) and the "xri-authentication"
791 member attribute of the "xri-printer-supported" (1setOf collection) Printer Description attribute (see section
792 6.6).

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

795 **6.9 xri-security-supported (1setOf type2 keyword)**

796 This OPTIONAL READ-ONLY Printer Description attribute identifies the URI schemes that the
797 implementation supports for use in the "printer-security-supported" (1setOf type2 keyword) Printer

798 Description attribute (see [ipp-mod] section 4.4.3) and the "xri-security" member attribute of the "xri-
799 printer-supported" (1setOf collection) Printer Description attribute (see section 6.6).

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

802 **7 Additional status codes**

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

804 **7.1 'client-error-attributes-not-settable' (0x0413)**

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

811 **8 Additional out-of-band values**

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

815 **8.1 'not-settable' out-of-band value**

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

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

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

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

831 **8.1.1 Encoding of the 'not-settable' out-of-band attribute value**

832 The encoding of the 'not-settable' out-of-band value is 0x15 (see [ipp-pro]). The value-length MUST be 0
833 and the value empty.

834 **8.2 'delete-attribute' out-of-band value**

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

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

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

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

850 **8.2.1 Encoding of the 'delete-attribute' out-of-band value**

851 The encoding of the 'delete-attribute' out-of-band value is 0x16 (see [ipp-pro]). The value-length MUST be
852 0 and the value empty.

853 **8.3 'admin-define' out-of-band attribute value**

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

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

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

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

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

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

887 **8.3.1 Encoding of the 'admin-define' out-of-band attribute value**

888 The encoding of the 'admin-define' out-of-band attribute value is 0x17 (see [ipp-pro]). The value-length
889 MUST be 0 and the value empty.

890 **9 Conformance Requirements**

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

892 Both the Set-Job-Attributes and the Set-Printer-Attributes operations defined in the document are
893 OPTIONAL for an IPP object to support. Either one MAY be supported without the other or both MAY be
894 supported. However, if the Set-Printer-Attributes operation is supported, then the Get-Printer-Supported-

895 Values operation **MUST** be supported if any "xxx-supported" attributes are settable. Otherwise, the Get-
896 Printer-Supported-Values operation is **OPTIONAL** for an IPP Printer to support.

897 If the Set-Printer-Attributes operation is supported, then the Printer **MUST** support the following additional
898 items:

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

912 If the Set-Job-Attributes operation is supported, then the Printer **MUST** support the following additional
913 items:

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

920 It is **OPTIONAL** for the Printer object to support the "printer-message-time" (integer) and "printer-
921 message-date-time" (dateTime) Printer Description attributes. If both the "printer-message-time" (integer)
922 and the "printer-current-time" (dateTime) (see [ipp-mod] section 4.4.30) attributes are supported, then the
923 "printer-message-date-time" (dateTime) Printer Description attribute **MUST** be supported.

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

926 **10 IANA Considerations**

927 Since this document is intended to be a standards track document, there is no need to also register the
928 operations, attributes, status codes, and out-of-band values defined here-in with IANA according to the
929 procedures in RFC 2566 [rfc2566] section 6. However, other registration proposals may site the out-of-
930 band attribute values or the status codes defined in this document.

931 **11 Internationalization Considerations**

932 This document has the same localization considerations as the [ipp-mod].

933 **12 Security Considerations**

934 The IPP Model and Semantics document [ipp-mod section 8] discusses high level security requirements
935 (Client Authentication, Server Authentication and Operation Privacy). Client Authentication is the
936 mechanism by which the client proves its identity to the server in a secure manner. Server Authentication is
937 the mechanism by which the server proves its identity to the client in a secure manner. Operation Privacy is
938 defined as a mechanism for protecting operations from eavesdropping.

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

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

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

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

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

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993 **14 References**

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1018 **15 Change History**

1019 This section summarizes the changes. Each sub-section is in reverse chronological order. Adding or
1020 removing ISSUES that don't change the document are not listed here.

1021 **15.1 Changes to the March 21, 2000 version to make the March 23, 2000 version**

1022 The following changes have been made to the March 21, 2000 version to make the March 23, 2000 version
1023 as a result of the IPP WG telecons and mailing list discussion:

- 1024 1. Changed the name of the 'custom' out-of-band value to 'admin-define'.
- 1025 2. Tightened up the spec for 'admin-define' so that it cannot be used returned in a Get-Printer-Attributes
1026 response to allow users to submit arbitrary values in a Job Creation operation. If that functionality is
1027 needed, it will have to be done with another out of band value.

- 1028 3. Clarified that the 'admin-define' out-of-band value is only intended to be used with "xxx-supported"
1029 attributes in a Get-Printer-Supported-Values response that are defined to include the 'name' attribute
1030 syntax. If other documents extend this usage, they MUST define for which attributes and operations.
- 1031 4. Added the definitions of the xri-uri-scheme-supported (1setOf uriScheme), xri-authentication-supported
1032 (1setOf type2 keyword), and xri-security-supported (1setOf type2 keyword) READ-ONLY Printer
1033 attributes that were only referred to. Also made them returnable only in Get-Printer-Attributes, not Get-
1034 Printer-Supported-Values, since they are READ-ONLY and the administrator cannot change them.
- 1035 5. Clarified that the few "xxx-supported" attributes that are single valued, are made 1setOf X in the Get-
1036 Printer-Supported-Values so that the implementation can indicate what possible values can be set.
- 1037 6. Required the client to have administrator access rights in order to use the Get-Printer-Supported-Values
1038 operation, since its purpose is for administrators to use before doing a Set-Printer-Attributes operation.
- 1039 7. Clarified that if an implementation supports setting arbitrary names in a Set-Printer-Attributes request,
1040 then it MUST support the 'admin-define' out-of-band value in the Get-Printer-Supported-Values
1041 response.
- 1042 8. Copied the validation rules from the Implementer's Guide into Appendix A, since the IIG is not a
1043 standards track document. Still refer to the IIG for additional non-normative explanation.

1044 **15.2 Changes to the March 8, 2000 version to make the March 21, 2000 version**

1045 The following changes have been made to the March 8, 2000 version to make the March 21, 2000 version
1046 as a result of the IPP WG telecons and mailing list discussion:

- 1047 9. Changed the name of the 'any-value' out-of-band value to 'custom'. Removed the idea of encoding the
1048 attribute syntax that the 'custom' out-of-band value goes with. Required the value length to be zero.
1049 Instead, the spec for the attribute or attribute syntax defines whether or not the 'custom' out-of-band
1050 value can be used.
- 1051 10. Clarified that the 'custom' out-of-band value can be used in combination with other values of an "xxx-
1052 supported" Printer attribute.
- 1053 11. Clarified that an implementation is not prevented from supporting some 'name' attribute values for
1054 "xxx-supported" out-of-the-box, if desired. But these values would be returned in a Get-Printer-
1055 Supported-Values response, such like keywords are.

1056 **15.3 Changes to the March 1, 2000 version to make the March 8, 2000 version**

1057 The following changes have been made to the March 1, 2000 version to make the March 8, 2000 version as
1058 a result of the IPP WG telecons and mailing list discussion:

- 1059 1. Added the "printer-xri-supported" (1setOf collection) attribute so that the three parallel IPP/1.1 "printer-
1060 uri-supported", "uri-authentication-supported", and "uri-security-supported" attributes could be set as

1061 one atomic attribute. Consequently, changed the three parallel attributes to be READ-ONLY and
1062 removed the requirement that three attributes MUST be set in a single request if the three parallel
1063 IPP/1.1 "printer-uri-supported", "uri-authentication-supported", and "uri-security-supported" were
1064 settable.

1065 2. Clarified Get-Printer-Supported-Values so that if an implementation does not support setting a settable
1066 attribute, it MUST NOT return the attribute in the Printer Attribute group and it NEED NOT return the
1067 attribute in the Unsupported Attributes group, same as in a Get-Printer-Attributes response for
1068 unsupported attributes. Same clarification when unsupported attributes are requested.

1069 3. Fixed "printer-message-date-time" (dateTime) attribute to be OPTIONAL.

1070 4. Added note as to why the "printer-current-time" Printer Description attribute is settable (to fix an
1071 incorrect time or time zone).

1072 5. Added "xri-authentication-supported" (1setOf type2 keyword) and "xri-security-supported" (1setOf
1073 type2 keyword) attributes to the table of attributes that can be queried with Get-Printer-Supported-
1074 Values. Added a note that these two attributes are NOT queriable with Get-Printer-Attributes, since the
1075 client queries either (1) the three "printer-uri-supported" (1setOf uri), "uri-authentication-supported"
1076 (1setOf type2 keyword), "uri-security-supported" (1setOf type2 keyword) attributes, or (2) the single
1077 "printer-xri-supported" (1setOf collection) attribute.

1078 **15.4 Changes to the January 30, 2000 version to make the March 1, 2000 version**

1079 The following changes to the January 30, 2000 version to make the March 1, 2000 version as a result of the
1080 IPP WG telecons and mailing list discussion:

1081 1. Clarified that this extension may be used with any IPP version, including 1.0, 1.1, and future versions.

1082 2. Added "READ-ONLY" and "not-settable" terms to the terminology section. READ-ONLY is by
1083 definition, and "not-settable" is by implementation.

1084 3. Assigned the "operation-id" values 0x0013, 0x0014, and 0x0015, respectively, for the Set-Printer-
1085 Attributes, Set-Job-Attributes, and Get-Printer-Supported-Values operations.

1086 4. Clarified that the Set-Printer-Attributes operation while a Printer SHOULD accept a reasonable number
1087 of attribute, the Printer need only support setting one attribute in a request, unless it supports setting the
1088 three "parallel" attributes, ("printer-uri-supported", "uri-authentication-supported", and "uri-security-
1089 supported" (see [ipp-mod] sections 4.4.1 through 4.4.3), in which case it MUST support setting at least
1090 three attributes in a single request.

1091 5. Clarified that for the Set-Printer-Attributes operation the Printer MUST validate all of the supplied
1092 attributes in combination with each other, as well as with all of the existing attribute of the Printer
1093 object Set-Printer-Attributes.

- 1094 6. Changed the requirements for accepting the Set-Printer-Attributes operation when the Printer is in the
1095 'stopped' state from MUST to SHOULD, since some implementations may not be able to accept
1096 requests when stopped.
- 1097 7. Clarified that setting certain Printer attributes with Set-Printer-Attributes MAY require more access
1098 rights than other attributes, i.e., System Administrator rights to set policy and only Operator rights to set
1099 the configuration attributes to reflect the current hardware setup.
- 1100 8. Clarified the order of error checking and what is returned in each case in the Set-Printer-Attributes
1101 response.
- 1102 9. Changed the 'default' out-of-band value to 'delete-attribute' out-of-band value so that the effect is to
1103 actually remove the Job attribute entirely in the Set-Job-Attribute operation.
- 1104 10. Clarified that removing a Job attribute that is not present is not an error.
- 1105 11. Clarified the validation of the Set-Job-Attributes request and what is returned for each error.
- 1106 12. Changed the 'any-name' out-of-band attribute value to a more general 'any-value' out-of-band attribute
1107 value which in combination with an attribute syntax represents any value of that attribute syntax. The
1108 'any-value' value can be used with the 'name' attribute syntax in a Get-Printer-Supported-Values
1109 response to indicate whether or not a Set-Printer-Attributes will accept any name to be set for particular
1110 "xxx-supported" (1setOf name | ...) Printer attributes.
- 1111 13. Clarified that "printer-message-from-operator" and "job-message-from-operator" both REQUIRE that
1112 the Printer accept zero-length messages and the 'no-value' out-of-band value is synonymous with
1113 removing any value from these Printer attributes.
- 1114 14. Clarified that the Get-Printer-Supported-Values is REQUIRED only if the Set-Printer-Attributes
1115 operation will accept setting some "xxx-supported" Printer attributes.
- 1116 15. Changed the IANA Considerations to indicate that the operations, attributes, status codes, and out-of-
1117 band-values won't be registered and published by IANA, since this document is intended to be standards
1118 track.
- 1119 16. Added security considerations for denial of service and sabotage because of the Set operations.

1120 **15.5 Changes to the January 20, 2000 version to make the January 30, 2000 version**

1121 The following changes to the January 20, 2000 version to make the January 30, 2000 version as a result of
1122 the IPP WG telecons and mailing list discussion:

- 1123 1. Deleted the "document-format-varying-scope" operation attribute from the Set-Printer-Attributes
1124 operation and made whether or not the "document-format" operation was present determine whether
1125 one or all document formats are affected, respectively.

- 1126 2. Renamed the Get-Reset-Printer-Attributes operation to Get-Printer-Supported-Values, so that it only
1127 returns "xxx-supported" values. Relegate obtaining reset values to another operation to be paired with
1128 the Reset-Printer operation in the Set2 [ipp-set2] document.
- 1129 3. Added "-supported" to the names of the "printer-settable-attributes" and "job-settable-attributes" Printer
1130 Description attributes, so that they could be returned in Get-Printer-Supported-Values and could be set
1131 by Set-Printer-Attributes.
- 1132 4. Deleted "authentication-methods-supported" (1setOf type2 keyword) and "security-methods-supported"
1133 (1setOf type2 keyword) and clarified that "uri-authentication-supported" (1setOf type2 keyword) and
1134 "uri-security-supported" (1setOf type2 keyword) can return multiple keywords of the same value in a
1135 Get-Printer-Supported-Values operation.

1136 **15.6 Changes to the January 4, 2000 version to make the January 20, 2000 version**

1137 The following changes to the January 4, 2000 version to make the January 4, 2000 version as a result of the
1138 IPP WG telecons and mailing list discussion:

- 1139 1. Replaced the "factory-settings" operation attribute proposed to be added to the Get-Printer-Attributes
1140 operation with the Get-Reset-Printer-Attributes operation which returns the reset values and the possible
1141 "xxx-supported" values.
- 1142 2. Added the out-of-band 'any-name' value to be used with "xxx-supported" attributes with attribute syntax
1143 'type3 keyword | name' to indicate that any name will be accepted in a Job Creation operation for
1144 configurations that support such a concept.
- 1145 3. Added authentication-methods-supported (1setOf type2 keyword) and security-methods-supported
1146 (1setOf type2 keyword) Printer Description attributes so that clients can discover the possible values for
1147 use in Set-Printer-Attributes to set "uri-authentication-supported" and "uri-security-supported"
1148 attributes, since the Reset-Printer operation doesn't change them.
- 1149 4. Added validation rules that the Printer MUST use to validate a Set-Printer-Attributes request.
- 1150 5. Clarified that the Set-Printer-Attributes operation MUST NOT have any side effects on other attributes,
1151 unless explicitly specified in this document.
- 1152 6. Moved the specification of the attributes that MUST be READ-ONLY to Appendix A.
- 1153 7. Added the "document-format-varying-attributes" (1setOf type2 keyword)
- 1154 8. Added the REQUIRED "document-format-varying-scope" operation attribute to Set-Printer-Attributes
1155 in order to control whether one or all document formats are affected for those attributes that vary by
1156 document format.
- 1157 9. Clarified that the Printer returns the 'client-error-attributes-not-settable' status code in a Set-Printer-
1158 Attributes response whether the attribute is READ-ONLY, the attribute is not supported, or the value is
1159 not supported.

- 1160 10. Added the out-of-band 'default' value for use with Set-Job-Attributes and Job Creation operations.
- 1161 11. Deleted the "printer-message-operation" Printer Description attribute.
- 1162 12. Made the "Get-Reset-Printer-Attributes" operation, along with the "authentication-methods-supported"
1163 and the "security-methods-supported" Printer Description attributes REQUIRED, if the Set-Printer-
1164 Attributes operation is supported.
- 1165 13. Made the 'not-settable' out-of-band value and the 'client-error-not-settable' status code REQUIRED, if
1166 the Set-Printer-Attributes operation is supported.
- 1167 14. Made the 'default' out-of-band value REQUIRED, if the Set-Job-Attributes operation is supported.
- 1168 15. Removed the requirement that "xxx-supported" Printer Description attributes that contain only one
1169 value be read-only.

1170 **15.7 Changes to the December 8, 1999 version to make the January 4, 2000 version**

1171 The following changes to the December 8, 1999 version to make the January 4, 2000 version as a result of
1172 the IPP WG telecons and mailing list discussion:

- 1173 1. Removed the Set operations and related items from the Set2 specification [ipp-set2] to create this Set
1174 specification.
- 1175 2. Added that an attribute that can only be set to one fixed value SHOULD NOT be included in the
1176 "printer-settable-attributes" or "job-settable-attributes" attributes.
- 1177 3. Indicated that the encoding of the 'not-settable' out-of-band value is TBD.
- 1178 4. Added that Set-Job-Attributes operation adds an attribute to the Job object if it wasn't already there
- 1179 5. Added the conformance section to make it easy to understand the conformance requirements.

1180 **16 Appendix A: Allowed Values for Set-Printer-Attributes and Set-Job-Attributes requests**

1181 This appendix is a normative part of this document and contains a table of all IPP/1.1 attributes. Each row
1182 contains:

- 1183 – an attribute and
- 1184
- 1185 – the values allowed in the Set-Printer-Attributes or Set-Job-Attributes request for the attribute.
1186 The entry in each cell is the name (first few words) of each item below 1, 2, 3, 4a-g, and 5.

1187 The allowed values include the following cases:

- 1188 1. READ-ONLY: the Set-Printer-Attributes or Set-Job-Attributes operation MUST NOT change this
1189 attribute and MUST reject the entire operation (see section 7.1).
- 1190 2. Any of "xxx-supported": the Set-Printer-Attributes or Set-Job-Attributes operation accepts values
1191 that are allowed according to the IPP/1.1 rules for validating the value(s) of an "xxx" Printer or Job
1192 attribute against the value(s) of the corresponding "xxx-supported" Printer attribute. Table 4
1193 summarizes those validation rules depending on each attribute syntax and value of an "xxx"
1194 attribute supplied in the request and that of the corresponding "xxx-supported" Printer attribute.
1195 The "xxx-supported" attribute syntax type and value(s) are obtained from a Get-Printer-Supported-
1196 Values response (see the tables in this Appendix).

1197

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

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

1198

1199 For additional non-normative explanatory information see section 3.1.2.3 of the "Internet Printing
1200 Protocol/1.1: Implementer's Guide" [ipp-iig]).

- 1201 3. From Get-Printer-Supported-Values: the Set-Printer-Attributes operation accepts values that are
1202 allowed according to the IPP/1.1 rules for validating the value(s) of an "xxx" Printer attribute
1203 against the value(s) of the corresponding "xxx-supported" Printer attribute. Table 5 summarizes
1204 those validation rules depending on each attribute syntax and value of an "xxx" attribute supplied in
1205 the request and that of the corresponding "xxx-supported" Printer attribute. The "xxx-supported"
1206 attribute syntax type and attribute value(s) are obtained from a Get-Printer-Supported-Values
1207 response (see Appendix B: Attributes returned from Get-Printer-Supported-Values below).

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

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

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

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

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

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

Job Template Attributes	Values allowed for Set
job-priority (integer(1:100))	Any of "xxx-supported"
job-hold-until (type3 keyword name (MAX))	Any of "xxx-supported"
job-sheets (type3 keyword name(MAX))	Any of "xxx-supported"
multiple-document-handling (type2 keyword)	Any of "xxx-supported"
copies (integer(1:MAX))	Any of "xxx-supported"
finishings (1setOf type2 enum)	Any of "xxx-supported"
page-ranges (1setOf rangeOfInteger (1:MAX))	Any of "xxx-supported"

Job Template Attributes	Values allowed for Set
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"

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

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

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

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

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

Printer Description Attributes	Values allowed for Set
printer-uri-supported (1setOf uri)	READ-ONLY
uri-authentication-supported (1setOf type2 keyword)	READ-ONLY
uri-security-supported (1setOf type2 keyword)	READ-ONLY
printer-xri-supported (1setOf collection) member attributes:	
xri-uri (uri)	any uriScheme of "xri-uri-scheme-supported" from Get-Printer-Attributes
xri-authentication (1setOf type2 keyword)	any keyword of "xri-authentication-

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

Printer Description Attributes	Values allowed for Set
job-media-sheets-supported (rangeOfInteger(0:MAX))	From Get-Printer-Supported-Values
pages-per-minute (integer(0:MAX))	READ-ONLY
pages-per-minute-color (integer(0:MAX))	READ-ONLY
printer-settable-attributes-supported (1setOf type2 keyword)	From Get-Printer-Supported-Values
job-settable-attributes-supported (1setOf type2 keyword)	From Get-Printer-Supported-Values
document-format-varying-attributes (1setOf type2 keyword)	READ-ONLY
printer-message-time (integer(MIN:MAX))	READ-ONLY
printer-message-date-time(dateTime)	READ-ONLY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1266 ** Note: the Get-Printer-Supported-Values returns a '1setOf boolean' so that all possible values are
1267 indicated, while Get-Printer-Attributes returns only a single 'boolean' value.

1268 The following table has the same criteria as the last, but is for Printer Description attributes.

1269 **Table 15 - Printer Description Attributes returned from Get-Printer-Supported-Values**

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

1270 ** Note: the Get-Printer-Supported-Values returns a '1setOf X' so that all possible values are indicated,
1271 while Get-Printer-Attributes returns only a single 'X' value.

1272

1273 **18 Appendix C: Full Copyright Statement**

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