



The Printer Working Group

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IPP Document Object v1.1 (DOCOBJECT)

Status: Approved

Abstract: This specification defines the IPP Document object and its associated attributes, values, group, and operations.

This is a PWG Candidate Standard. For a definition of a "PWG Candidate Standard", see:

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<https://ftp.pwg.org/pub/pwg/candidates/cs-ippdocobject11-20190521-5100.5.docx>

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<https://www.pwg.org>

Contact information:

The Printer Working Group
c/o The IEEE Industry Standards and Technology Organization
445 Hoes Lane
Piscataway, NJ 08854
USA

Table of Contents

1. Introduction	7
2. Terminology	7
2.1 Conformance Terminology	7
2.2 Printing Terminology.....	7
2.3 Protocol Role Terminology	8
2.4 Other Terminology.....	8
2.5 Acronyms and Organizations	9
3. Requirements.....	9
3.1 Rationale	9
3.2 Use Cases.....	9
3.2.1 Specify Per-Document Print Intent.....	9
3.2.2 See a List of Documents in a Job	10
3.2.3 Cancel a Single Document	10
3.3 Exceptions.....	10
3.4 Out of Scope	10
3.5 Design Requirements	10
4. Model	11
4.1 Document Object.....	11
4.2 Operations.....	11
4.3 Job and Document Template Attributes	12
5. New Operations	13
5.1 Document Operations.....	13
5.1.1 Cancel-Document	13
5.1.2 Get-Document-Attributes	15
5.1.3 Set-Document-Attributes.....	18
5.2 Job Operations	21
5.2.1 Get-Documents.....	21
6. New Attributes.....	24
6.1 Document Description Attributes	24
6.1.1 document-name (name(MAX))	24
6.2 Document Status Attributes.....	24
6.2.1 document-charset (charset)	26
6.2.2 document-format-detected (mimeMediaType)	26
6.2.3 document-message (text(MAX))	26
6.2.4 document-number (integer(1:MAX))	26
6.2.5 last-document (boolean)	26
6.3 Document Template Attributes	26
6.4 Operation Attributes.....	27
6.4.1 document-charset (charset)	27
6.4.2 document-number (integer(1:MAX))	27
6.5 Printer Description Attributes.....	28
6.5.1 document-creation-attributes-supported (1 setOf type2 keyword)	28
7. New Attribute Group Tags.....	28
7.1 document-attributes-tag.....	28
8. Additional Semantics for Existing Operations	29

- 8.1 Cancel-Job: "document-state" and "document-state-reasons"29
- 8.2 Hold-Job and Release-Job: "document-state-reasons"29
- 8.3 Print-Job, Print-URI: Document Object and Attributes.....29
 - 8.3.1 Print-Job/Print-URI Response.....31
- 8.4 Send-Document: Document Object and Attributes32
 - 8.4.1 Send-Document Request.....33
 - 8.4.2 Send-Document Response.....33
- 8.5 Send-URI: Document Object and Attributes34
 - 8.5.1 Send-URI Request.....35
 - 8.5.2 Send-URI Response35
- 9. Additional Values for Existing Attributes.....36
 - 9.1 operations-supported (1setOf type2 enum)36
 - 9.2 requested-attributes (1setOf type2 keyword).....36
- 10. Obsolete Operations and Attributes37
 - 10.1 Obsolete Delete-Document Operation.....37
 - 10.2 Obsolete Document Status Attributes.....37
- 11. Conformance Requirements37
 - 11.1 Printer Conformance Requirements37
 - 11.2 Client Conformance Requirements38
- 12. Internationalization Considerations38
- 13. Security Considerations39
- 14. IANA Considerations.....39
 - 14.1 Attribute Registrations39
 - 14.2 Attribute Value Registrations41
 - 14.3 Type2 enum Registrations.....41
 - 14.4 Operation Registrations.....42
 - 14.5 Attribute Group Registrations42
- 15. Overview of Changes.....43
 - 15.1 IPP Document Object v1.143
- 16. References.....44
 - 16.1 Normative References.....44
 - 16.2 Informative References45
- 17. Author's Address.....47
- 18. Change History **Error! Bookmark not defined.**
 - 18.1 September 19, 2018 **Error! Bookmark not defined.**

List of Tables

- Table 1 - IPP Operations 12
- Table 2 - Document State Transitions for Cancel-Document..... 14
- Table 3 - Allowed Document States for the Set-Document-Attributes operation..... 18
- Table 4 - Document Status Attributes24
- Table 5 - Document Template Attributes26
- Table 6 - Operation Attributes Copied to Document Objects30
- Table 7 - Returned Document Status Attributes.....31
- Table 8 – Operation-id Values36

Table 9 - Obsolete Document Status Attributes37

List of Figures

Figure 1 - Document Object Life Cycle 11

1 **1. Introduction**

2 This specification extends the Internet Printing Protocol/1.1 [STD92] by defining the IPP
3 Document object and its associated attributes, values, group, and operations. The IPP Job
4 object is extended to contain zero or more addressable Document objects representing the
5 Documents submitted for and operated on by the Job.

6 This specification obsoletes portions of the previous version of this specification
7 [PWG5100.5-2003]. A list of changes can be found in section 15.

8 **2. Terminology**

9 **2.1 Conformance Terminology**

10 Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD,
11 SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as
12 defined in Key words for use in RFCs to Indicate Requirement Levels [BCP14]. The term
13 CONDITIONALLY REQUIRED is additionally defined for a conformance requirement that
14 applies when a specified condition is true.

15 The term DEPRECATED is used for previously defined and approved protocol elements that
16 SHOULD NOT be used or implemented. The term OBSOLETE is used for previously defined
17 and approved protocol elements that MUST NOT be used or implemented.

18 **2.2 Printing Terminology**

19 Normative definitions and semantics of printing terms are imported from the Internet Printing
20 Protocol/1.1 [STD92].

21 *Document*: An object created and managed by a Printer that contains description,
22 processing, and status information. A Document object may have attached data and is
23 bound to a single Job.

24 *Job*: An object created and managed by a Printer that contains description, processing, and
25 status information. The Job also contains zero or more Document objects.

26 *Logical Device*: a print server, software service, or gateway that processes jobs and either
27 forwards or stores the processed job or uses one or more Physical Devices to render output.

28 *Output Device*: a single Logical or Physical Device

29 *Physical Device*: a hardware implementation of an endpoint device, e.g., a marking engine,
30 a fax modem, etc.

31 **2.3 Protocol Role Terminology**

32 This specification also defines the following protocol roles to specify unambiguous
33 conformance requirements:

34 *Client*: Initiator of outgoing connections and sender of outgoing operation requests
35 (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

36 *Printer*: Listener for incoming connections and receiver of incoming operation requests
37 (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one or more
38 Physical Devices or a Logical Device.

39 **2.4 Other Terminology**

40 *Attribute Precedence*: The rules which dictate which attribute value takes precedence when
41 the same attribute is supplied at different points in the workflow with different values, such
42 as at both the Job Level and the Document Level.

43 *Document Creation Operation*: Operations that create Document objects including Print-Job,
44 Print-URI, Send-Document, and Send-URI as defined in the IPP/1.1 Model and Semantics
45 [STD92].

46 *Document Level*: Operation and Document Template attributes supplied in the Send-
47 Document and Send-URI operations are referred to as being supplied at the Document
48 Level. Attributes supplied in the Print-Job and Print-URI operations are considered as being
49 supplied at the Job Level only, *not* also at the Document Level, even though Print-Job and
50 Print-URI also create Document objects.

51 *Document Template*: An attribute that the Client supplies in a Send-Document or Send-URI
52 request in the Document attributes group, e.g., “media”.

53 *Honor*: A Printer is said to honor an attribute supplied by the Client if the Printer supports
54 the attribute and supplied value and conforms to the defined semantics.

55 *Job Creation Operation*: Operations that create Job objects including Create-Job, Print-Job,
56 and Print-URI as defined in the IPP/1.1 Model and Semantics [STD92].

57 *Job Level*: Operation and Job Template attributes supplied in Print-Job, Print-URI, and
58 Create-Job requests are referred to as being supplied at the Job Level.

59 **2.5 Acronyms and Organizations**

60 *IANA*: Internet Assigned Numbers Authority, <http://www.iana.org/>

61 *IETF*: Internet Engineering Task Force, <http://www.ietf.org/>

62 *ISO*: International Organization for Standardization, <http://www.iso.org/>

63 *PWG*: Printer Working Group, <http://www.pwg.org/>

64 **3. Requirements**

65 **3.1 Rationale**

66 The Internet Printing Protocol/1.1 [STD92] defines the IPP Model and Semantics, including
67 abstract objects for a Printer that processes Jobs and the Jobs themselves which process
68 Documents. Given the need to directly address Documents in a Job, the IPP Document
69 Object v1.1 should:

- 70 1. Define an abstract IPP Document object and its attributes;
- 71 2. Define new IPP operations for the IPP Document object; and
- 72 3. Extend existing IPP operations as needed to support the IPP Document object.

73 Rationale for the changes from the previous versions of this specification can be found in
74 section 15.

75 **3.2 Use Cases**

76 **3.2.1 Specify Per-Document Print Intent**

77 Jane is printing a multi-volume report and would like the output printed together. She uses
78 an application on her computer to select each volume in the report and a shipping envelope.
79 She then initiates a print action, specifying the media and finishing processes for each
80 volume and the media for the shipping envelope. The printer processes all of the documents
81 as a single job, placing the hardcopy output in a mailbox together.

82 **3.2.2 See a List of Documents in a Job**

83 John has submitted a multi-document job to a printer but cannot remember if he included all
84 of the documents needed. He uses an application on his mobile device to query the list of
85 documents in the print job and display them on the screen.

86 **3.2.3 Cancel a Single Document**

87 Bob has submitted a multi-document job to a printer but realizes there was a typographical
88 error in one of the documents that has not yet printed. He uses an application on his
89 computer to view the list of jobs on the printer, views the list of documents in the job he
90 submitted, and initiates a cancel action for the document containing the error.

91 **3.3 Exceptions**

92 There are no exceptions defined for this specification.

93 **3.4 Out of Scope**

94 The following are considered out of scope for this specification:

- 95 1. Definition of copy or page level semantics; and
- 96 2. Definition of per-page or per-copy overrides.

97 **3.5 Design Requirements**

98 The design requirements for this specification are:

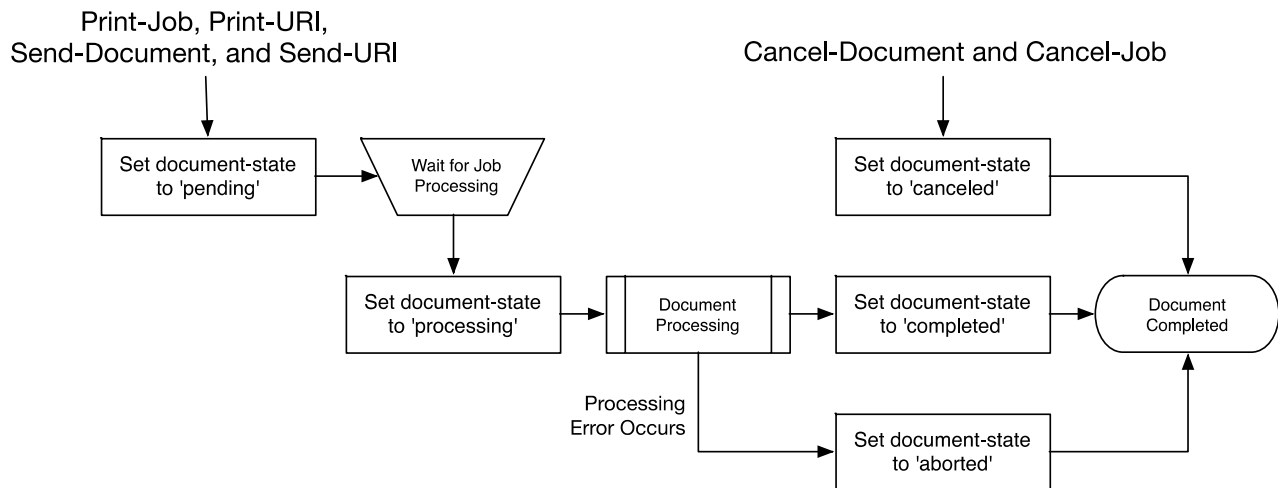
- 99 1. Define an abstract IPP Document object and its semantics;
- 100 2. Define an attribute group tag for attributes of an IPP Document object;
- 101 3. Define attributes and values to describe an IPP Document object;
- 102 4. Define operations for querying and manipulating IPP Document objects;
- 103 5. Extend existing operations to explicitly create IPP Document objects;
- 104 6. Define security requirements necessary to support IPP Document objects; and
- 105 7. Define sections to register all objects, attribute groups, attributes, values, and
- 106 operations with IANA.
- 107

108 **4. Model**

109 The Internet Printing Protocol/1.1 [STD92] defines an object model containing a Printer that
 110 processes Jobs and a Job that processes Documents. This specification extends the Model
 111 with an addressable Document object with its own attributes and state. Printers MAY support
 112 multiple Documents per Job.

113 **4.1 Document Object**

114 The Document object represents a single Document in a Job that contains Document-
 115 specific Description, Status, and Template attributes. Document Description attributes
 116 provide information about the Document, Document Status attributes provide state
 117 information for the Document, and Document Template attributes override the
 118 corresponding Job Template attributes for the Document. A Document object also contains
 119 the Document data and/or a URI that references the Document data. Figure 1 shows the life
 120 cycle of the Document object.



121

122

Figure 1 - Document Object Life Cycle

123 **4.2 Operations**

124 The Print-Job and Print-URI operations [STD92] create a Job object containing a single
 125 Document object while the Create-Job operation [STD92] creates a Job object with no
 126 Document objects. The Send-Document and Send-URI operations [STD92] add Document
 127 objects to the specified Job object. Printers conforming to this specification MUST support
 128 the Create-Job and Send-Document operations.

129 This specification extends the Send-Document and Send-URI operations to accept
 130 Document Template attributes in the Document Attributes group. The Document Template

131 attributes are applied to the Document object being created, overriding any corresponding
 132 Job Template attributes supplied at the Job Level which allows the Client to vary the
 133 Document Template attributes between Document objects in a single Job.

134 This specification also defines one new Job operation and four new Document operations.
 135 Table 1 lists the operations and their conformance requirements.

136 **Table 1 - IPP Operations**

Operation	Target	Conformance	Reference
Cancel-Document	Document	MUST	Section 5.1.1
Create-Job	Printer	MUST	STD 92
Get-Document-Attributes	Document	MUST	Section 5.1.2
Get-Documents	Job	MUST	Section 5.2.1
Print-Job	Printer	MUST	STD 92, Section 8.3
Print-URI	Printer	MAY	STD 92, Section 8.3
Send-Document	Job	MUST	STD 92, Section 8.4
Send-URI	Job	MAY	STD 92, Section 8.5
Set-Document-Attributes	Document	MAY	Section 5.1.3

137 **4.3 Job and Document Template Attributes**

138 Clients OPTIONALLY supply Job Template attributes in Create-Job, Print-Job, and Print-
 139 URI requests, and OPTIONALLY supply Document Template attributes in Print-Job, Print-
 140 URI, Send-Document, and Send-URI requests. Job Template attributes apply to the Job as
 141 a whole. Document Template attributes apply only to the corresponding Document object.

142 Printers MUST support the following Attribute Precedence from highest to lowest when
 143 processing a Document:

- 144 1. Document Level - The Document Template attributes supplied in the Document
 145 Creation request or a subsequent Set-Document-Attributes request;
- 146 2. Job Level - The Job Template attributes supplied in the Job Creation request or
 147 a subsequent Set-Job-Attributes request; and
- 148 3. Printer Default - The Printer Default attributes as supplied by the manufacturer
 149 or configured by the operator or administrator using a Set-Printer-Attributes
 150 request.

151 Note: Depending on the value of the "pdl-override-supported" Printer Description attribute
 152 [STD92], device commands embedded in the Document data could override attributes
 153 specified at any of the previous levels.

154 **5. New Operations**

155 This section defines the new IPP operations for this specification.

156 Note: The Internet Printing Protocol/1.1 [STD92] deprecates the "job-uri" operation attribute
157 for specifying the target Job and recommends that Clients send the "printer-uri" and "job-id"
158 operation attributes instead.

159 **5.1 Document Operations**

160 **5.1.1 Cancel-Document**

161 This REQUIRED Document operation allows a Client to cancel a specified Document in a
162 specified Print Job any time from the time the Document is created up to, but not including,
163 the time that the Document is completed, canceled, or aborted. Since a Document might
164 already be printing by the time a Cancel-Document request is received, some media sheet
165 pages might be printed before the Document processing is actually terminated.

166 The Cancel-Document operation does not remove the Document from the Job and Printer,
167 but only sets the specified Document's "document-state" Document Status attribute to
168 'canceled' and the Document's "document-state-reasons" Document Status attribute with
169 'canceled-by-user' or 'canceled-by-operator'. If the Job object is printed again using
170 operations such as Resubmit-Job [PWG5100.11], any canceled Documents are also printed
171 again. Thus Cancel-Document has the same semantics as Cancel-Job [STD92] which only
172 cancels the processing of the Job and doesn't delete the Job object itself.

173 The Printer MUST accept or reject the request based on the Document's current state and
174 transition the Document to the indicated new state as shown in Table 2.

175 Access Rights: Only the Job Owner or an Operator or Administrator of the Printer can
176 perform this operation. Otherwise, the Printer MUST reject the operation and return 'client-
177 error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as
178 appropriate.

179

180 **Table 2 - Document State Transitions for Cancel-Document**

Current "document-state"	New "document-state"	Printer's response status code and action:
'pending'	'canceled'	'successful-ok'
'processing'	'canceled'	'successful-ok'
'processing'	'processing'	'successful-ok' (note 1)
'processing'	'processing'	'client-error-not-possible' (note 2)
'completed'	'completed'	'client-error-not-possible'
'canceled'	'canceled'	'client-error-not-possible'
'aborted'	'aborted'	'client-error-not-possible'

181 Note 1: If the implementation requires some measurable time to cancel the
 182 Document in the 'processing' state, the Printer MUST add the 'processing-to-stop-
 183 point' value to the Document's "document-state-reasons" attribute and then
 184 transition the Document to the 'canceled' state when the processing ceases.

185 Note 2: If the Document object already has the 'processing-to-stop-point' value in its
 186 "document-state-reasons" attribute, then the Printer MUST reject the Cancel-
 187 Document request.

188 **5.1.1.1 Cancel-Document Request**

189 The following groups of attributes are part of the Cancel-Document request:

190 Group 1: Operation Attributes

191 Natural Language and Character Set:

192 The "attributes-charset" and "attributes-natural-language" attributes as
 193 described in [STD92].

194 Target:

195 Either a) the "printer-uri" (uri) and "job-id" (integer(1:MAX)) or b) the "job-uri"
 196 (uri) operation attribute(s) [STD92] which define the target Job object for this
 197 operation, followed by the "document-number" (integer(1:MAX)) operation
 198 attribute which defines the target Document object for this operation. If the
 199 Client omits the "document-number" operation attribute, the Printer MUST
 200 reject the request and return the 'client-error-bad-request' status code.

201 Requesting User Name:

202 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by
 203 the Client as described in [STD92].

204 "document-message" (text(MAX)):

205 The Client MAY supply this attribute. If supported by the Printer, the Printer
206 MUST also support the corresponding "document-message" (text(MAX))
207 Document Status attribute (see section 6.2.3) and copy the value to the
208 Document's "document-message" attribute.

209 5.1.1.2 Cancel-Document Response

210 The following groups of attributes are part of the Cancel-Document response:

211 Group 1: Operation Attributes

212 Status Message:

213 In addition to the REQUIRED status code returned in every response, the
214 response OPTIONALLY includes a "status-message" (text(255)) and/or a
215 "detailed-status-messages" (text(MAX)) Operation attribute as described in
216 [STD92].

217 Natural Language and Character Set:

218 The "attributes-charset" and "attributes-natural-language" attributes as
219 described in [STD92].

220 Group 2: Unsupported Attributes

221 See [STD92] for details on returning Unsupported Attributes.

222 5.1.2 Get-Document-Attributes

223 This REQUIRED Document operation allows a Client to request the values of selected
224 attributes of a Document object. The Printer MUST only return attributes that were submitted
225 by a Client or generated by the Printer.

226 The Client requests attributes using the "requested-attributes (keyword)" operation attribute
227 [STD92] which lists the attribute names and groups of interest. For Document objects the
228 possible names of attribute groups are:

229 'document-template': The subset of Document Template that the implementation
230 supports for Document objects.

231 'document-description': The subset of Document Description and Document Status
232 attributes that the implementation supports for Document objects.

233 'all': All attributes that the implementation supports for Document objects.

234 Since a Client MAY request specific attributes or named groups, there is a potential that
235 there is some overlap. For example, if a Client requests 'document-name' and 'document-
236 description', the Client is actually requesting the "document-name" attribute once by naming
237 it explicitly and once by inclusion in the 'document-description' group. In such cases, the
238 Printer returns the attribute only once in the response even if it is requested multiple times.
239 The Client SHOULD NOT request the same attribute in multiple ways.

240 Printers MUST support all group names and MUST return all supported attributes belonging
241 to the group.

242 Access Rights: Only the Job Owner or an Operator or Administrator of the Printer can
243 perform this operation. Otherwise, the Printer MUST reject the operation and return 'client-
244 error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as
245 appropriate.

246 5.1.2.1 Get-Document-Attributes Request

247 The following groups of attributes are part of the Get-Document-Attributes request:

248 Group 1: Operation Attributes

249 Natural Language and Character Set:

250 The "attributes-charset" and "attributes-natural-language" attributes as
251 described in [STD92].

252 Target:

253 Either a) the "printer-uri" (uri) and "job-id" (integer(1:MAX)) or b) the "job-uri"
254 (uri) operation attribute(s) [STD92] which define the target Job object for this
255 operation, followed by the "document-number" (integer(1:MAX)) operation
256 which defines the target Document object for this operation. If the Client
257 omits the "document-number" operation attribute, the Printer MUST reject the
258 request and return the 'client-error-bad-request' status code.

259 Requesting User Name:

260 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by
261 the Client as described in [STD92].

262 "requested-attributes" (1setOf keyword):

263 The Client OPTIONALLY supplies and the Printer MUST support this
264 attribute, which is a list of Document attribute names and/or attribute group
265 names that are returned to the Client for each Document object. If the Client
266 does not supply this attribute, the Printer MUST respond as if the Client had
267 supplied this attribute with the single value 'all'.

268 5.1.2.2 Get-Document-Attributes Response

269 The following groups of attributes are part of the Get-Document-Attributes response:

270 Group 1: Operation Attributes

271 Status Message:

272 In addition to the REQUIRED status code returned in every response, the
273 response OPTIONALLY includes a "status-message" (text(255)) and/or a
274 "detailed-status-messages" (text(MAX)) Operation attribute as described in
275 [STD92].

276 Natural Language and Character Set:

277 The "attributes-charset" and "attributes-natural-language" attributes as
278 described in [STD92]. The "attributes-natural-language" MAY be the natural
279 language of the Document object rather than the one in the Get-Document-
280 Attributes request.

281 Group 2: Unsupported Attributes

282 See [STD92] for details on returning Unsupported Attributes.

283 The response MAY contain the "requested-attributes" operation attribute with
284 any supplied values (attribute keywords) that were requested by the Client
285 but are not supported by the Printer. If the Printer does return unsupported
286 attributes referenced in the "requested-attributes" operation attribute and that
287 attribute included group names such as 'all', the unsupported attributes
288 MUST NOT include attributes described in the standard but not supported by
289 the implementation.

290 Group 3: Document Attributes

291 The Printer responds with the Document Description, Document Status, and
292 Document Template attributes for each returned Document object as
293 requested by the "requested-attributes" operation attribute supplied by the
294 Client in the request. The Printer ignores (does not respond with) any
295 requested attribute or value which is not supported or which is restricted by
296 the security policy in force, including whether the requesting user is the Job
297 owner. However, the Printer MUST respond with the 'unknown' out of band
298 value [STD92] for any supported attribute (including all REQUIRED
299 attributes) for which the Printer does not know the value, unless it would
300 violate the security policy.

301 **5.1.3 Set-Document-Attributes**

302 This OPTIONAL Document operation allows a Client to set the values of the attributes of a
 303 Document object after the Document object is submitted to the Printer. In the request, the
 304 Client supplies the set of Document attributes and values that are to be set. In the response,
 305 the Printer returns success or rejects the entire request with indications of which attribute or
 306 attributes could not be set.

307 This operation is similar to the Set-Job-Attributes operation [RFC3380] and follows the same
 308 rules for validation. As with the Set-Job-Attributes operation, the Set-Document-Attributes
 309 operation can add a new attribute, replace the value of an existing attribute, or remove an
 310 attribute using 'delete-attribute' out-of-band value.

311 If the Client supplies an attribute in a Set-Document-Attributes request with the 'delete-
 312 attribute' out-of-band value and that attribute is not present on the Document object, the
 313 Printer ignores the attribute and does not return the attribute in the Unsupported Attributes
 314 group. The Printer also returns the 'successful-ok' status code if there are no other problems
 315 with the request.

316 The Printer MUST accept or reject this operation when the Document's "document-state"
 317 attribute has the values shown in Table 3 but MUST NOT change the state of the Document
 318 object since the Document is a passive object and the Document state is a subset of the Job
 319 State. For example, in the case where the operation creates a request for unavailable
 320 resources, the Job (but not the Document) transitions to a new state.

321 **Table 3 - Allowed Document States for the Set-Document-Attributes operation**

“document-state”	Printer’s response status code and “action”
'pending'	'successful-ok'
'pending'	'successful-ok' - needed resources are not ready (the Job MAY change state)
'processing'	'successful-ok' or 'client-error-not-possible' depending on implementation, including the attributes being set, whether the document has started marking media, etc.
'completed'	'client-error-not-possible'
'canceled'	'client-error-not-possible'
'aborted'	'client-error-not-possible'

322 This operation MUST NOT change the value of attributes not specified in the operation
 323 unless the definition of the attribute explicitly specifies such side effects. In general,
 324 Document attributes that are settable do not define side effects on other attributes that are
 325 settable, only side effects on READ-ONLY attributes, if any.

326 If the Printer supports the Set-Document-Attributes operation, then it SHOULD support
 327 setting of all Document Description and Document Template attributes that the

328 implementation supports. Document Status attributes are READ-ONLY and cannot be set
329 directly using this operation.

330 Note: There is no way for the Client to set all of a Job's Document objects to the same
331 attribute values in a single operation. Either a) the Client sets the corresponding attribute in
332 each Document object in the Job with separate Set-Document-Attributes requests, or b) the
333 Client sets the corresponding attribute at the Job Level using the Set-Job-Attributes
334 operation. Setting the corresponding attribute at the Job Level (or supplying that attribute
335 initially in the Job Creation operation) causes each Document object to inherit the Job Level
336 attribute value, if the Document object doesn't have a corresponding explicit attribute
337 supplied at the Document Level. In other words, supplying an attribute at the Job Level will
338 affect all the Job's Document objects that don't have that attribute also explicitly supplied at
339 the Document Level.

340 Access Rights: Only the Job Owner or an Operator or Administrator of the Printer can
341 perform this operation. Otherwise, the Printer MUST reject the operation and return 'client-
342 error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as
343 appropriate.

344 **5.1.3.1 Set-Document-Attributes Request**

345 The following groups of attributes are part of the Set-Document-Attributes request:

346 Group 1: Operation Attributes

347 Natural Language and Character Set:

348 The "attributes-charset" and "attributes-natural-language" attributes as
349 described in [STD92].

350 Target:

351 Either a) the "printer-uri" (uri) and "job-id" (integer(1:MAX)) or b) the "job-uri"
352 (uri) operation attribute(s) [STD92] which define the target Job object for this
353 operation, followed by the "document-number" (integer(1:MAX)) operation
354 which defines the target Document object for this operation. If the Client
355 omits the "document-number" operation attribute, the Printer MUST reject the
356 request and return the 'client-error-bad-request' status code.

357 Requesting User Name:

358 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by
359 the Client as described in [STD92].

360 Group 2: Document Attributes

361 The Client supplies one or more Document Description or Document
362 Template attributes. If supported, the Printer MUST either add the attribute (if
363 it does not already exist in the Document object), replace all values for the
364 attribute (if it already exists in the Document object), or remove the attribute
365 (if the 'delete-attribute' out-of-band value is supplied by the Client).

366 5.1.3.2 Set-Document-Attributes Response

367 The Printer returns the following groups of attributes as part of the Set-Document-Attributes
368 response:

369 Group 1: Operation Attributes

370 Status Message:

371 In addition to the REQUIRED status code returned in every response, the
372 response OPTIONALLY includes a "status-message" (text(255)) and/or a
373 "detailed-status-messages" (text(MAX)) Operation attribute as described in
374 [STD92].

375 Natural Language and Character Set:

376 The "attributes-charset" and "attributes-natural-language" attributes as
377 described in [STD92].

378 Group 2: Unsupported Attributes

379 See [STD92] for details on returning Unsupported Attributes.

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

386 1. The number of attributes supplied by the client exceeds the maximum
387 number that the Printer supports in a Set-Document-Attributes
388 request: return the 'client-error-request-entity-too-large' status code
389 [STD92].

390 2. The Printer doesn't support the attribute: return the attribute with the
391 'unsupported' out-of-band attribute value and the 'client-error-
392 attributes-or-values-not-supported' status code [STD92].

393 3. The attribute is READ-ONLY (in its definition) or is not-settable in this
394 implementation: return the attribute with the 'not-settable' out-of-band

- 395 attribute value and the 'client-error-attributes-not-settable' status code
396 [RFC3380].
- 397 4. The Printer doesn't support the value: if the attribute in the operation
398 has a single value, return it. If the attribute in the operation is multi-
399 valued, return only those values in a 1setOf that are not supported.
400 Return the 'client-error-attributes-or-values-not-supported' status code
401 [STD92].
- 402 5. The values of some of the supplied attributes conflict with one another
403 and/or other Document attribute values not being set: if the conflicting
404 attribute in the operation has a single value, return the attribute and
405 the value. If the attribute in the operation is multi-valued, return only
406 the attribute and those values in a 1setOf that are conflicting with
407 other attributes. Return the 'client-error-conflicting-attributes' status
408 code [STD92].

409 5.2 Job Operations

410 5.2.1 Get-Documents

411 This REQUIRED Job operation allows a Client to retrieve the list of Document objects
412 belonging to the target Job object. The Client MAY also supply a list of Document attribute
413 names and/or attribute group names. A group of Document object attributes will be returned
414 for each Document object in the Job.

415 This operation is similar to the Get-Document-Attributes operation (see section 5.1.2),
416 except that this operation returns attributes from all Document objects contained in the Job
417 object instead of from a single selected Document object in the Job object. As with the Get-
418 Document-Attributes operation, the Printer MUST only return attributes that were submitted
419 by a Client or generated by the Printer.

420 This operation is also similar to the Get-Jobs operation [STD92] except that there are no
421 equivalents to the "which-jobs" and "my-jobs" operation attributes.

422 It is not an error for the Printer to return 0 Documents. If the response returns 0 Documents
423 because there are no Documents in the Job, then the status code for 0 Documents MUST
424 be 'successful-ok'.

425 Access Rights: Only the Job Owner or an Operator or Administrator of the Printer can
426 perform this operation. Otherwise, the Printer MUST reject the operation and return 'client-
427 error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as
428 appropriate.

429 5.2.1.1 Get-Documents Request

430 The following groups of attributes are part of the Get-Documents request:

431 Group 1: Operation Attributes

432 Natural Language and Character Set:

433 The "attributes-charset" and "attributes-natural-language" attributes [STD92]

434 Target:

435 Either a) the "printer-uri" (uri) and "job-id" (integer(1:MAX)) or b) the "job-uri"
436 (uri) operation attribute(s) [STD92] which define the target Job object for this
437 operation.

438 Requesting User Name:

439 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by
440 the Client as described in [STD92].

441 "limit" (integer(1:MAX)):

442 The client OPTIONALLY supplies and the Printer MUST support this
443 operation attribute, which determines the maximum number of Documents
444 that a Client will receive from the Printer. The limit is a "stateless limit" in that
445 if the value supplied by the Client is 'N', then only the first 'N' Documents are
446 returned in the Get-Documents Response. There is no mechanism to allow
447 for the next 'M' Documents after the first 'N' Documents. If the Client does not
448 supply the "limit" attribute, the Printer responds with all Documents in the
449 Job.

450 "requested-attributes" (1setOf keyword):

451 The client OPTIONALLY supplies and the Printer MUST support this
452 attribute, which is a list of Document attribute names and/or attribute group
453 names that are returned to the Client for each Document object. The allowed
454 attribute group names are the same as those defined in the Get-Documents-
455 Attributes operation in section 5.1.2. If the Client does not supply this
456 attribute, the Printer MUST respond as if the Client had supplied this attribute
457 with the single value 'document-number'.

458 5.2.1.2 Get-Documents Response

459 The following groups of attributes are part of the Get-Documents request:

460 Group 1: Operation Attributes

461 Status Message:

462 In addition to the REQUIRED status code returned in every response, the
463 response OPTIONALLY includes a "status-message" (text(255)) and/or a
464 "detailed-status-messages" (text(MAX)) operation attribute as described in
465 [STD92].

466 Natural Language and Character Set:

467 The "attributes-charset" and "attributes-natural-language" attributes as
468 described in [STD92].

469 Group 2: Unsupported Attributes

470 See [STD92] for details on returning Unsupported Attributes.

471 The response MAY contain the "requested-attributes" operation attribute with
472 any supplied values (attribute keywords) that were requested by the Client
473 but are not supported by the Printer. If the Printer does return unsupported
474 attributes referenced in the "requested-attributes" operation attribute and that
475 attribute included group names such as 'all', the unsupported attributes
476 MUST NOT include attributes described in the standard but not supported by
477 the implementation.

478 Groups 3 to N: Document Attributes

479 The Printer responds with the Document Description, Document Status, and
480 Document Template attributes for each returned Document object as
481 requested by the "requested-attributes" operation attribute supplied by the
482 Client in the request. The Printer ignores (does not respond with) any
483 requested attribute or value which is not supported or which is restricted by
484 the security policy in force, including whether the requesting user is the Job
485 owner. However, the Printer MUST respond with the 'unknown' out of band
486 value [STD92] for any supported attribute (including all REQUIRED
487 attributes) for which the Printer does not know the value, unless it would
488 violate the security policy.

489 The Printer MUST return the groups in order of increasing "document-
490 number" value.

491 **6. New Attributes**492 **6.1 Document Description Attributes**493 **6.1.1 document-name (name(MAX))**

494 This REQUIRED Document Description attribute specifies the name of the document and is
 495 copied from the "document-name" operation attribute [STD92] supplied by the Client in the
 496 Document Creation request.

497 **6.2 Document Status Attributes**

498 Table 4 lists the Document Status attributes defined by this specification. Printers that
 499 support a given operation or Job Status attribute MUST support the corresponding
 500 Document Status attribute.

501

Table 4 - Document Status Attributes

Document Attribute	Operation/Job Attribute	Reference
attributes-charset (charset)	attributes-charset	[STD92]
attributes-natural-language (naturalLanguage)	attributes-natural-language	[STD92]
current-page-order (type2 keyword)	current-page-order	[PWG5100.3]
date-time-at-completed (dateTime)	date-time-at-completed	[STD92]
date-time-at-creation (dateTime)	date-time-at-creation	[STD92]
date-time-at-processing (dateTime)	date-time-at-processing	[STD92]
detailed-status-messages (1setOf text(MAX))	job-detailed-status- messages	[STD92]
document-access-errors (1setOf text(MAX))	job-document-access-errors	[STD92]
document-charset (charset)	document-charset	Sections 6.2.1 and 6.4.1
document-format (mimeType)	document-format	[STD92]
document-format-detected (mimeType)	<none>	Section 6.2.2
document-job-id (integer(1:MAX))	job-id	[STD92]

Document Attribute	Operation/Job Attribute	Reference
document-job-uri (uri)	job-uri	[STD92]
document-message (text(MAX))	<none>	Section 6.2.3
document-natural-language (naturalLanguage)	document-natural-language	[STD92]
document-number (integer(1:MAX))	<none>	Section 6.2.4
document-printer-uri (uri)	job-printer-uri	[STD92]
document-state (type1 enum)	job-state (note 1)	[STD92]
document-state-message (text(MAX))	job-state-message	[STD92]
document-state-reasons (1setOf type2 keyword)	job-state-reasons	[STD92]
document-uri (uri)	document-uri (note 2)	[STD92]
impressions (integer(0:MAX))	job-impressions	[STD92]
impressions-completed (integer(0:MAX))	job-impressions-completed	[STD92]
k-octets (integer(0:MAX))	job-k-octets	[STD92]
k-octets-processed (integer(0:MAX))	job-k-octets-processed	[STD92]
last-document (boolean)	<none>	Section 6.2.5
media-sheets (integer(0:MAX))	job-media-sheets	[STD92]
media-sheets-completed (integer(0:MAX))	job-media-sheets- completed	[STD92]
more-info (uri)	job-more-uri	[STD92]
output-device-assigned (name(MAX))	output-device-assigned	[STD92]
printer-up-time (integer(1:MAX))	job-printer-up-time	[STD92]
time-at-completed (integer(MIN:MAX))	time-at-completed	[STD92]
time-at-creation (integer(MIN:MAX))	time-at-creation	[STD92]
time-at-processing (integer(MIN:MAX))	time-at-processing	[STD92]

502 Note 1: The "document-state" attribute supports all of the "job-state" values *except*
503 '4' (pending-held).

504 Note 2: The "document-uri" attribute identifies the source location of the Document
505 data and is not an identifier for the Document object. The simple identifier of the
506 Document is the "document-number" Document Status attribute.

507 6.2.1 document-charset (charset)

508 This RECOMMENDED Document Status attribute specifies the charset used in the
509 Document data. The Printer sets this attribute from the corresponding operation attribute
510 supplied by the Client in the Document Creation request. Printers that support the
511 "document-charset" operation attribute MUST support this attribute.

512 6.2.2 document-format-detected (mimeMediaType)

513 This Document Status attribute is generated by the Printer to indicate the format of the
514 Document object content as detected by the Printer.

515 6.2.3 document-message (text(MAX))

516 This Document Status attribute contains a message from either a) the User to the Operator
517 about the Document or b) from the Operator, Administrator, or "intelligent" process to
518 indicate to the End User the reasons for modification or other management action taken on
519 the Document. The Printer populates this attribute from the "document-message" operation
520 attribute value supplied by the Client in any of the Document Creation requests or in a
521 Cancel-Document request.

522 6.2.4 document-number (integer(1:MAX))

523 This REQUIRED Document Status attribute is the ordinal number of the Document within
524 the Job, and determines its order of being printed in a multi-Document Job. The Printer
525 MUST generate the values monotonically increasing from 1 for each Job.

526 6.2.5 last-document (boolean)

527 This REQUIRED Document Status attribute indicates whether this Document is the last
528 Document in the Job [STD92]. The Printer sets this attribute from the corresponding
529 operation attribute supplied by the Client in the Document Creation request, when the Client
530 sends a Close-Job request [PWG5100.11], or when the "multiple-operation-time-out" time
531 interval has passed.

532 6.3 Document Template Attributes

533 This specification defines Document Template attributes for every Job Template attribute
534 that does not apply to the whole Job. Table 5 lists the new attributes.

535 **Table 5 - Document Template Attributes**

Attribute	Reference
copies (integer(1:MAX))	[STD92]
cover-back (collection)	[PWG5100.3]
cover-front (collection)	[PWG5100.3]
finishings (1setOf type2 enum)	[STD92]
finishings-col (1setOf collection)	[PWG5100.1]
force-front-side (1setOf integer(1:MAX))	[PWG5100.3]
imposition-template (type2 keyword name(MAX))	[PWG5100.3]
media (type2 keyword name(MAX))	[STD92]
media-col (collection)	[PWG5100.3]
media-input-tray-check (type2 keyword name(MAX))	[PWG5100.3]
number-up (integer(1:MAX))	[STD92]
orientation-requested (type2 enum)	[STD92]
output-bin (type2 keyword name(MAX))	[PWG5100.2]
page-delivery (type2 keyword)	[PWG5100.3]
page-order-received (type2 keyword)	[PWG5100.3]
page-ranges (1setOf rangeOfInteger(1:MAX))	[STD92]
presentation-direction-number-up (type2 keyword)	[PWG5100.3]
print-quality (type2 enum)	[STD92]
printer-resolution (resolution)	[STD92]
sides (type2 keyword)	[STD92]
x-image-position (type2 keyword)	[PWG5100.3]
x-image-shift (integer(MIN:MAX))	[PWG5100.3]
x-side1-image-shift (integer(MIN:MAX))	[PWG5100.3]
x-side2-image-shift (integer(MIN:MAX))	[PWG5100.3]
y-image-position (type2 keyword)	[PWG5100.3]
y-image-shift (integer(MIN:MAX))	[PWG5100.3]
y-side1-image-shift (integer(MIN:MAX))	[PWG5100.3]
y-side2-image-shift (integer(MIN:MAX))	[PWG5100.3]

536 6.4 Operation Attributes

537 6.4.1 document-charset (charset)

538 This RECOMMENDED operation attribute specifies the character set used by the Document
539 data.

540 6.4.2 document-number (integer(1:MAX))

541 This REQUIRED operation attribute specifies the ordinal number of the Document within the
542 Job.

543 **6.5 Printer Description Attributes**

544 **6.5.1 document-creation-attributes-supported (1setOf keyword)**

545 This REQUIRED attribute lists the keyword names of the Document Template and operation
546 attributes that the Printer will accept in the Send-Document and Send-URI Document
547 Creation operations. Implementations that support the Send-URI operation MUST include
548 the 'document-uri' keyword in "document-creation-attributes-supported". Implementations
549 that do not support Send-URI MUST NOT include the 'document-uri' keyword in "document-
550 creation-attributes-supported".

551 Note: The "document-uri" attribute is specific to the Send-URI operation. Inclusion of the
552 'document-uri' keyword in "document-creation-attributes-supported" does not imply that the
553 "document-uri" attribute is valid for the Send-Document operation.

554 **7. New Attribute Group Tags**

555 **7.1 document-attributes-tag**

556 The document-attributes-tag (0x09) attribute group tag is used to delimit Document object
557 attributes in IPP messages.

558

559 **8. Additional Semantics for Existing Operations**

560 **8.1 Cancel-Job: "document-state" and "document-state-reasons"**

561 This REQUIRED operation sets the “document-state” Document Status attribute to
562 ‘canceled’ and the “document-state-reasons” Document Status attribute with ‘canceled-by-
563 user’ or ‘canceled-by-operator’ for *all* Document objects in the identified Job that have not
564 yet reached a terminating state (‘completed’, ‘canceled’, or ‘aborted’).

565 **8.2 Hold-Job and Release-Job: "document-state-reasons"**

566 These OPTIONAL operations affect the state of the target Job. The values of the
567 Documents’ “document-state-reasons” Document Status attributes MUST NOT be affected
568 by these operations.

569 **8.3 Print-Job, Print-URI: Document Object and Attributes**

570 This specification extends the REQUIRED Print-Job and OPTIONAL Print-URI operations
571 [STD92] to explicitly create a Document object and copy the request operation attributes
572 listed in Table 6 to the corresponding Document attributes. Printers MUST NOT copy Job
573 Template attributes to the created Document object.
574 Printers can also return the attributes listed in

575 Table 7 in the Document attributes group after the Job attributes group.

576 **Table 6 - Operation Attributes Copied to Document Objects**

Operation Attribute	Document Attribute	Reference
attributes-charset	attributes-charset	[STD92]
attributes-natural-language	attributes-natural-language	[STD92]
document-charset	document-charset	Sections 6.2.1 and 6.4.1
document-format	document-format	[STD92]
	document-format-detected	Section 6.2.2
document-message	document-message	Section 6.2.3
document-name	document-name	[STD92]
document-natural-language	document-natural-language	[STD92]
document-uri	document-uri	[STD92]
job-impressions	impressions	[STD92], Section 6.2
job-k-octets	k-octets	[STD92], Section 6.2
job-media-sheets	media-sheets	[STD92], Section 6.2

577

578

Table 7 - Returned Document Status Attributes

Document Status Attribute	Print-xxx Conformance	Send-xxx Conformance	Reference
document-number	OPTIONAL	REQUIRED	Section 6.2.4
document-state	OPTIONAL	REQUIRED	Section 6.2
document-state-message	OPTIONAL	OPTIONAL	Section 6.2
document-state-reasons	OPTIONAL	REQUIRED	Section 6.2

579 **8.3.1 Print-Job/Print-URI Response**

580 The following sets of attributes are part of the Print-Job and Print-URI responses:

581 Group 1: Operation Attributes

582 As specified in [STD92].

583 Group 2: Unsupported Attributes

584 As specified in [STD92].

585 Group 3: Job Object Attributes

586 As specified in [STD92].

587 Group 4: Document Object Attributes (new)

588 "document-number" (integer(1:MAX)):

589 The Printer MAY return the number of this Document object that was
590 assigned by the Printer starting with 1 for each Job.

591 "document-state" (type1 enum):

592 The Printer MAY return the state of this Document object.

593 "document-state-reasons" (1setOf type2 keyword):

594 The Printer MAY return the associated state reasons for this Document.

595 "document-state-message" (text(MAX)):

596 The Printer MAY return the localized description of the "document-state" and
597 "document-state-reasons" values for this Document.

598 **8.4 Send-Document: Document Object and Attributes**

599 This specification extends the REQUIRED Send-Document operation [STD92] to explicitly
600 create a Document object and copy the operation attributes listed in Table 6 to the
601 corresponding Document attributes.

602 The Send-Document request is also extended to support an additional Document Template
603 attribute group after the operation attribute group. Document Template attributes are copied
604 to the Document object after validation as described in section 4.3. Printers MUST NOT
605 copy Document Template attributes to the Job object.

606 Finally, Printers also return the attributes listed in

607 Table 7 in the Document attributes group after the Job attributes group.

608 **8.4.1 Send-Document Request**

609 The following attribute sets are part of the Send-Document request:

610 Group 1: Operation Attributes

611 As specified in [STD92].

612 Group 2: Document Template Attributes (new)

613 The Client OPTIONALLY supplies and the Printer MUST support a set of
614 Document Template attributes. If the Client is not supplying any Document
615 Template attributes in the request, the Client SHOULD omit Group 2 rather
616 than sending an empty group. However, a Printer MUST be able to accept
617 an empty group.

618 Group 3: Document Data

619 As specified in [STD92].

620 **8.4.2 Send-Document Response**

621 The following sets of attributes are part of the Send-Document response:

622 Group 1: Operation Attributes

623 As specified in [STD92].

624 Group 2: Unsupported Attributes

625 As specified in [STD92].

626 Group 3: Job Object Attributes

627 As specified in [STD92].

628 Group 4: Document Object Attributes (new)

629 "document-number" (integer(1:MAX)):

630 The Printer MUST return the number of this Document object that was
631 assigned by the Printer starting with 1 for each Job.

632 "document-state" (type1 enum):

- 633 The Printer MUST return the state of this Document object.
- 634 "document-state-reasons" (1 setOf type2 keyword):
- 635 The Printer MUST return the associated state reasons for this Document.
- 636 "document-state-message" (text(MAX)):
- 637 The Printer MAY return the localized description of the "document-state" and
638 "document-state-reasons" values for this Document.

639 **8.5 Send-URI: Document Object and Attributes**

- 640 This specification extends the OPTIONAL Send-URI operation [STD92] to explicitly create
641 a Document object and copy the operation attributes listed in Table 6 to the corresponding
642 Document attributes.
- 643 The Send-URI request is also extended to support an additional Document Template
644 attribute group after the operation attribute group. Document Template attributes are copied
645 to the Document object after validation as described in section 4.3. Printers MUST NOT
646 copy Document Template attributes to the Job object.
647 Finally, Printers also return the attributes listed in

648 Table 7 in the Document attributes group after the Job attributes group.

649 **8.5.1 Send-URI Request**

650 The following attribute sets are part of the Send-URI request:

651 Group 1: Operation Attributes

652 As specified in [STD92].

653 Group 2: Document Template Attributes (new)

654 The Client OPTIONALLY supplies and the Printer MUST support a set of
655 Document Template attributes. If the Client is not supplying any Document
656 Template attributes in the request, the Client SHOULD omit Group 2 rather
657 than sending an empty group. However, a Printer MUST be able to accept
658 an empty group.

659 **8.5.2 Send-URI Response**

660 The following sets of attributes are part of the Send-URI response:

661 Group 1: Operation Attributes

662 As specified in [STD92].

663 Group 2: Unsupported Attributes

664 As specified in [STD92].

665 Group 3: Job Object Attributes

666 As specified in [STD92].

667 Group 4: Document Object Attributes (new)

668 "document-number" (integer(1:MAX)):

669 The Printer MUST return the number of this Document object that was
670 assigned by the Printer starting with 1 for each Job.

671 "document-state" (type1 enum):

672 The Printer MUST return the state of this Document object.

673 "document-state-reasons" (1setOf type2 keyword):

674 The Printer MUST return the associated state reasons for this Document.

675 "document-state-message" (text(MAX)):

676 The Printer MAY return the localized description of the "document-state" and
677 "document-state-reasons" values for this Document.

678 9. Additional Values for Existing Attributes

679 9.1 operations-supported (1setOf type2 enum)

680 Table 8 lists the "operation-id" values for the new operations defined in this specification.

681 **Table 8 – Operation-id Values**

Value	Operation Name	Reference
0x0033	Cancel-Document	Section 5.1.1
0x0034	Get-Document-Attributes	Section 5.1.2
0x0035	Get-Documents	Section 5.2.1
0x0036	Delete-Document (obsolete)	Section 10.1
0x0037	Set-Document-Attributes	Section 5.1.3

682 9.2 requested-attributes (1setOf type2 keyword)

683 This specification defines the following additional values for the "requested-attributes"
684 operation attribute [STD92]:

685 'document-description': All Document Description and Document Status attributes.

686 'document-template': All Document Template and Printer "xxx-supported" attributes.
687

688 10. Obsolete Operations and Attributes

689 10.1 Obsolete Delete-Document Operation

690 The OBSOLETE Delete-Document operation removes the specified Document object and
 691 its data immediately from the specified Job. This operation is OBSOLETE because it
 692 destroys accounting information about the target Document and MUST NOT be supported
 693 by new implementations of this specification.

694 10.2 Obsolete Document Status Attributes

695 Table 9 lists the OBSOLETE Document Status attributes that were defined in the previous
 696 version of this specification [PWG5100.5-2003].

697 Note: This specification does not change the status of the original operation or Job Status
 698 attributes that have the same names.

699 **Table 9 - Obsolete Document Status Attributes**

Attribute	Origin
compression (type2 keyword)	[STD92]
document-digital-signature (type2 keyword)	[PWG5100.7-2003]
document-format-version (text(127))	[PWG5100.7-2003]
document-format-version-detected (text(127))	[PWG5100.7-2003]
impressions-completed-current-copy (integer(0:MAX))	[RFC3381-OBSOLETE]
sheet-completed-copy-number (integer(0:MAX))	[RFC3381-OBSOLETE]

700 11. Conformance Requirements

701 11.1 Printer Conformance Requirements

702 In order for a Printer to claim conformance to this specification, a Printer MUST support:

- 703 1. The required operations defined in section 5;
- 704 2. The required attributes and values defined in section 6;
- 705 3. The new attribute group tag defined in section 7;
- 706 4. The additional semantics defined in section 8;
- 707 5. The additional values defined in section 9;
- 708 6. The internationalization considerations defined in section 12; and
- 709 7. The security considerations defined in section 13.

710 11.2 Client Conformance Requirements

711 In order for a Client to claim conformance to this specification, a Client MUST support:

- 712 1. The required operations defined in section 5;
- 713 2. The required attributes and values defined in section 6;
- 714 3. The new attribute group tag defined in section 7;
- 715 4. The additional values defined in section 9;
- 716 5. The internationalization considerations defined in section 12; and
- 717 6. The security considerations defined in section 13.

718 12. Internationalization Considerations

719 For interoperability and basic support for multiple languages, conforming implementations
720 MUST support:

- 721 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
722 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 723 2. The Unicode Format for Network Interchange [RFC5198] which requires
724 transmission of well-formed UTF-8 strings and recommends transmission of
725 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

726 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
727 characters and combining marks) followed by Canonical Composition (into canonical
728 composed characters wherever Unicode has assigned them).

729 WARNING – Performing normalization on UTF-8 strings received from Clients and
730 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client
731 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
732 'hidden').

733 Implementations of this specification SHOULD conform to the following standards on
734 processing of human-readable Unicode text strings, see:

735 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

736 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

737 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

738 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

739 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

740 Unicode Collation Algorithm [UTS10] – sorting

741 Unicode Locale Data Markup Language [UTS35] – locale databases

742 Implementations of this specification are advised to also review the following informational
743 documents on processing of human-readable Unicode text strings:

744 Unicode Character Encoding Model [UTR17] – multi-layer character model

745 Unicode Character Property Model [UTR23] – character properties

746 Unicode Conformance Model [UTR33] – Unicode conformance basis

747 **13. Security Considerations**

748 The IPP extensions defined in this specification require the same security considerations as
749 defined in the Internet Printing Protocol/1.1 [STD92].

750 Implementations of this specification SHOULD conform to the following standard on
751 processing of human-readable Unicode text strings, see:

752 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

753 Implementations of this specification are advised to also review the following informational
754 document on processing of human-readable Unicode text strings:

755 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

756 **14. IANA Considerations**

757 **14.1 Attribute Registrations**

758 The attributes defined in this specification will be published by IANA according to the
759 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

760 <http://www.iana.org/assignments/ipp-registrations>

761 The registry entries will contain the following information:

762	Document Description attributes:	Reference
763	-----	-----
764	document-name (name(MAX))	[PWG5100.5]
765		
766	Document Status attributes:	Reference
767	-----	-----
768	attributes-charset (charset)	[PWG5100.5]
769	attributes-natural-language (naturalLanguage)	[PWG5100.5]

770	compression(obsolete) (type2 keyword)	[PWG5100.5]
771	date-time-at-completed (dateTime)	[PWG5100.5]
772	date-time-at-created (dateTime)	[PWG5100.5]
773	date-time-at-processing (dateTime)	[PWG5100.5]
774	detailed-status-messages (1setOf text(MAX))	[PWG5100.5]
775	document-access-errors (1setOf text(MAX))	[PWG5100.5]
776	document-charset (charset)	[PWG5100.5]
777	document-digital-signature(obsolete) (type2 keyword)	[PWG5100.5]
778	document-format (mimeMediaType)	[PWG5100.5]
779	document-format-detected (mimeMediaType)	[PWG5100.5]
780	document-format-version(obsolete) (text(127))	[PWG5100.5]
781	document-format-version-detected(obsolete) (text(127))	[PWG5100.5]
782	document-job-id (integer(1:MAX))	[PWG5100.5]
783	document-job-uri (uri)	[PWG5100.5]
784	document-message (text(MAX))	[PWG5100.5]
785	document-natural-language (naturalLanguage)	[PWG5100.5]
786	document-number (integer(1:MAX))	[PWG5100.5]
787	document-printer-uri (uri)	[PWG5100.5]
788	document-state (type1 enum)	[PWG5100.5]
789	document-state-message (text(MAX))	[PWG5100.5]
790	document-state-reasons (1setOf type2 keyword)	[PWG5100.5]
791	document-uri (uri)	[PWG5100.5]
792	impressions (integer(0:MAX))	[PWG5100.5]
793	impressions-completed (integer(0:MAX))	[PWG5100.5]
794	impressions-completed-current-copy(obsolete) (integer(0:MAX))	[PWG5100.5]
795		[PWG5100.5]
796	k-octets (integer(0:MAX))	[PWG5100.5]
797	k-octets-processed (integer(0:MAX))	[PWG5100.5]
798	last-document (boolean)	[PWG5100.5]
799	media-sheets (integer(0:MAX))	[PWG5100.5]
800	media-sheets-completed (integer(0:MAX))	[PWG5100.5]
801	more-info (uri)	[PWG5100.5]
802	output-device-assigned (name(MAX))	[PWG5100.5]
803	printer-up-time (integer(1:MAX))	[PWG5100.5]
804	sheet-completed-copy-number(obsolete) (integer(0:MAX))	[PWG5100.5]
805	time-at-completed (integer(MIN:MAX))	[PWG5100.5]
806	time-at-creation (integer(MIN:MAX))	[PWG5100.5]
807	time-at-processing (integer(MIN:MAX))	[PWG5100.5]
808		
809	Document Template attributes:	Reference
810	-----	-----
811	copies (integer(1:MAX))	[PWG5100.5]
812	cover-back (collection)	[PWG5100.5]
813	<Member attributes are the same as the "cover-back" Job Template	
814	attribute>	[PWG5100.5]
815	cover-front (collection)	[PWG5100.5]
816	<Member attributes are the same as the "cover-front" Job Template	
817	attribute>	[PWG5100.5]
818	finishings (1setOf type2 enum)	[PWG5100.5]
819	finishings-col (1setOf collection)	[PWG5100.5]
820	<Member attributes are the same as the "finishings-col" Job Template	
821	attribute>	[PWG5100.5]
822	force-front-side (1setOf integer(1:MAX))	[PWG5100.5]
823	imposition-template (type2 keyword name(MAX))	[PWG5100.5]
824	media (type2 keyword name(MAX))	[PWG5100.5]
825	media-col (collection)	[PWG5100.5]

826	<Member attributes are the same as the "media-col" Job Template	
827	attribute>	[PWG5100.5]
828	media-input-tray-check (type2 keyword name(MAX))	[PWG5100.5]
829	number-up (integer(1:MAX))	[PWG5100.5]
830	orientation-requested (type2 enum)	[PWG5100.5]
831	output-bin (type2 keyword name(MAX))	[PWG5100.5]
832	page-delivery (type2 keyword)	[PWG5100.5]
833	page-ranges (1setOf rangeOfInteger(1:MAX))	[PWG5100.5]
834	presentation-direction-number-up (type2 keyword)	[PWG5100.5]
835	print-quality (type2 enum)	[PWG5100.5]
836	printer-resolution (resolution)	[PWG5100.5]
837	sides (type2 keyword)	[PWG5100.5]
838	x-image-position (type2 keyword)	[PWG5100.5]
839	x-image-shift (integer(MIN:MAX))	[PWG5100.5]
840	x-side1-image-shift (integer(MIN:MAX))	[PWG5100.5]
841	x-side2-image-shift (integer(MIN:MAX))	[PWG5100.5]
842	y-image-position (type2 keyword)	[PWG5100.5]
843	y-image-shift (integer(MIN:MAX))	[PWG5100.5]
844	y-side1-image-shift (integer(MIN:MAX))	[PWG5100.5]
845	y-side2-image-shift (integer(MIN:MAX))	[PWG5100.5]
846		
847	Operation attributes:	Reference
848	-----	-----
849	document-charset (charset)	[PWG5100.5]
850	document-number (integer(1:MAX))	[PWG5100.5]
851		
852	Printer Description attributes:	Reference
853	-----	-----
854	document-creation-attributes-supported (1setOf keyword)	[PWG5100.5]

855 14.2 Type2 keyword Registrations

856 The keyword values defined in this specification will be published by IANA according to the
 857 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

858 <http://www.iana.org/assignments/ipp-registrations>

859 The registry entries will contain the following information:

860	Attributes (attribute syntax)	
861	Keyword Attribute Value	Reference
862	-----	-----
863	requested-attributes (1setOf type2 keyword)	[STD92]
864	document-description	[PWG5100.5]
865	document-template	[PWG5100.5]

866 14.3 Type2 enum Registrations

867 The enum values defined in this specification will be published by IANA according to the
 868 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

869 <http://www.iana.org/assignments/ipp-registrations>

870 The registry entries will contain the following information:

871	Attributes (attribute syntax)		
872	Enum Value	Enum Symbolic Name	Reference
873	-----	-----	-----
874	operations-supported (1setOf type2 enum)		[STD92]
875	0x0033	Cancel-Document	[PWG5100.5]
876	0x0034	Get-Document-Attributes	{PWG5100.5}
877	0x0035	Get-Documents	[PWG5100.5]
878	0x0036	Delete-Document (obsolete)	[PWG5100.5]
879	0x0037	Set-Document-Attributes	[PWG5100.5]
880			

881 14.4 Operation Registrations

882 The operations defined in this specification will be published by IANA according to the
 883 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

884 <http://www.iana.org/assignments/ipp-registrations>

885 The registry entries will contain the following information:

886	Operation Name	Reference
887	-----	-----
888	Cancel-Document	[PWG5100.5]
889	Cancel-Job (extension)	[PWG5100.5]
890	Delete-Document (obsolete)	[PWG5100.5]
891	Get-Document-Attributes	[PWG5100.5]
892	Get-Documents	[PWG5100.5]
893	Hold-Job (extension)	[PWG5100.5]
894	Print-Job (extension)	[PWG5100.5]
895	Print-URI (extension)	[PWG5100.5]
896	Release-Job (extension)	[PWG5100.5]
897	Send-Document (extension)	[PWG5100.5]
898	Send-URI (extension)	[PWG5100.5]
899	Set-Document-Attributes	[PWG5100.5]

900 14.5 Attribute Group Registrations

901 The attribute groups defined in this specification will be published by IANA according to the
 902 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

903 <http://www.iana.org/assignments/ipp-registrations>

904 The registry entries will contain the following information:

905	Value	Attribute Group Name	Reference
-----	-------	----------------------	-----------

906 -----
907 0x09 document-attributes-tag [PWG5100.5]

908 **15. Overview of Changes**

909 **15.1 IPP Document Object v1.1**

910 The following changes were made to the previous version of this specification [PWG5100.5-
911 2003]:

- 912 • Printers no longer need to support multiple Document Jobs, as the Document object
913 and associated operations are useful even for single Document Jobs;
- 914 • Rationale and model sections have been added;
- 915 • References now point to the current versions of dependent documents and
916 specifications at the time of publication;
- 917 • The "document-charset" operation attribute has been added to this specification;
- 918 • The Delete-Document operation has been made OBSOLETE because it destroys
919 accounting information;
- 920 • Additional semantics for the DEPRECATED Reprocess-Job and Restart-Job
921 operations have been removed because those operations SHOULD NOT be
922 implemented or used;
- 923 • The "ipp-attribute-fidelity" and "job-mandatory-attributes" operation attributes are no
924 longer promoted to persistent Job and Document attributes because they are only
925 utilized during Job Creation;
- 926 • The "compression" Document Status attribute has been made OBSOLETE because
927 it serves no purpose;
- 928 • The "document-digital-signature" Document Status attribute has been made
929 OBSOLETE because it serves no purpose;
- 930 • The "document-format-details" and "document-format-details-detected" Document
931 Status attributes have been moved to the IPP Job Extensions v2.0 specification;
- 932 • The "document-format-version" and "document-format-version-detected" Document
933 Status attributes have been made OBSOLETE because they have serious
934 interoperability issues; and

- 935 • The "impressions-completed-current-copy" and "sheet-completed-copy-number"
936 Document Status attributes have been made OBSOLETE because the parent
937 specification (RFC 3381) is OBSOLETE.

938 16. References

939 16.1 Normative References

- 940 [BCP14] S. Bradner, "Key words for use in RFCs to Indicate Requirement
941 Levels", RFC 2119/BCP 14, March 1997,
942 <https://tools.ietf.org/html/bcp14>
- 943 [ISO10646] "Information technology -- Universal Coded Character Set (UCS)",
944 ISO/IEC 10646:2011
- 945 [PWG5100.1] S. Kennedy, M. Sweet, "IPP Finishings 2.1", PWG 5100.1-2017,
946 February 2017, [https://ftp.pwg.org/pub/pwg/candidates/cs-
947 ipppfinishings21-20170217-5100.1.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippfinishings21-20170217-5100.1.pdf)
- 948 [PWG5100.2] T. Hastings, R. Bergman, "Internet Printing Protocol (IPP): 'output-bin'
949 attribute extension", PWG 5100.2-2001, February 2001,
950 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippoutputbin10-20010207-
951 5100.2.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippoutputbin10-20010207-5100.2.pdf)
- 952 [PWG5100.3] K. Ocke, T. Hastings, "Internet Printing Protocol (IPP): Production
953 Printing Attributes - Set 1", PWG 5100.3-2001, February 2001,
954 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-
955 5100.3.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-5100.3.pdf)
- 956 [PWG5100.11] T. Hastings, "Internet Printing Protocol (IPP): Job and Printer
957 Extensions - Set 2 (JPS2)", PWG 5100.11-2010, October 2010,
958 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-
959 20101030-5100.11.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-20101030-5100.11.pdf)
- 960 [RFC3380] T. Hastings, R. Herriot, C. Kugler, H. Lewis, "Internet Printing Protocol
961 (IPP): Job and Printer Set Operations", RFC 3380, September 2002,
962 <https://tools.ietf.org/html/rfc3380>
- 963 [RFC3998] C. Kugler, H. Lewis, T. Hastings, "Internet Printing Protocol (IPP): Job
964 and Printer Administrative Operations", RFC 3998, March 2005,
965 <https://tools.ietf.org/html/rfc3998>
- 966 [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange",
967 RFC 5198, March 2008, <https://tools.ietf.org/html/rfc5198>

- 968 [RFC7230] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
969 Message Syntax and Routing", RFC 7230, June 2014,
970 <https://tools.ietf.org/html/rfc7230>
- 971 [STD63] F. Yergeau, "UTF-8, a transformation format of ISO 10646", RFC
972 3629/STD 63, November 2003, <https://tools.ietf.org/html/std63>
- 973 [STD92] M. Sweet, I. McDonald, "Internet Printing Protocol/1.1", STD 92, June
974 2018, <https://tools.ietf.org/html/std92>
- 975 [UAX9] Unicode Consortium, "Unicode Bidirectional Algorithm", UAX#9, May
976 2018, <https://www.unicode.org/reports/tr9>
- 977 [UAX14] Unicode Consortium, "Unicode Line Breaking Algorithm", UAX#14,
978 May 2018, <https://www.unicode.org/reports/tr14>
- 979 [UAX15] M. Davis, M. Duerst, "Unicode Normalization Forms", Unicode
980 Standard Annex 15, May 2018, <https://www.unicode.org/reports/tr15>
- 981 [UAX29] Unicode Consortium, "Unicode Text Segmentation", UAX#29, May
982 2018, <https://www.unicode.org/reports/tr29>
- 983 [UAX31] Unicode Consortium, "Unicode Identifier and Pattern Syntax",
984 UAX#31, June 2018, <https://www.unicode.org/reports/tr31>
- 985 [UNICODE] Unicode Consortium, "Unicode Standard", Version 11.0.0, June 2018,
986 <https://www.unicode.org/versions/Unicode11.0.0/>
- 987 [UTS10] Unicode Consortium, "Unicode Collation Algorithm", UTS#10, May
988 2018, <https://www.unicode.org/reports/tr10>
- 989 [UTS35] Unicode Consortium, "Unicode Locale Data Markup Language",
990 UTS#35, March 2018, <https://www.unicode.org/reports/tr35>
- 991 [UTS39] Unicode Consortium, "Unicode Security Mechanisms", UTS#39, May
992 2018, <https://www.unicode.org/reports/tr39>

993 **16.2 Informative References**

- 994 [PWG5100.5-2003] D. Carney, T. Hastings, P. Zehler, "Standard for The Internet Printing
995 Protocol (IPP): Document Object", PWG 5100.5-2003 (obsoleted by
996 this specification), October 2003,
997 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippdocobject10-20031031-
998 5100.5.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippdocobject10-20031031-5100.5.pdf)

- 999 [PWG5100.7-2003] T. Hastings, P. Zehler, "Standard for The Internet Printing Protocol
1000 (IPP): Job Extensions", PWG 5100.7-2003, October 2003,
1001 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-
1002 5100.7.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-5100.7.pdf)
- 1003 [RFC3381-OBSOLETE]
1004 T. Hastings, H. Lewis, R. Bergman, "Internet Printing Protocol (IPP):
1005 Job Progress Attributes", RFC 3381 (obsoleted by RFC 8011),
1006 September 2002, <https://tools.ietf.org/html/rfc3381>
- 1007 [UTR17] Unicode Consortium "Unicode Character Encoding Model", UTR#17,
1008 November 2008, <https://www.unicode.org/reports/tr17>
- 1009 [UTR23] Unicode Consortium "Unicode Character Property Model", UTR#23,
1010 May 2015, <https://www.unicode.org/reports/tr23>
- 1011 [UTR33] Unicode Consortium "Unicode Conformance Model", UTR#33,
1012 November 2008, <https://www.unicode.org/reports/tr33>
- 1013 [UNISECFAQ] Unicode Consortium "Unicode Security FAQ", November 2013,
1014 <https://www.unicode.org/faq/security.html>
1015

1016 17. Author's Address

1017 Primary author:

1018 Michael Sweet
1019 Apple Inc.
1020 One Apple Park Way
1021 MS 111-HOMC
1022 Cupertino CA 95014
1023 USA

1024 Send comments to the PWG IPP Mailing List:

1025 ipp@pwg.org (subscribers only)

1026 To subscribe, see the PWG web page:

1027 <http://www.pwg.org/>

1028 Implementers of this specification are encouraged to join the IPP Mailing List in order to
1029 participate in any discussions of clarification issues and review of registration proposals for
1030 additional attributes and values.

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1037