

1 **IPP Document object - operations and attributes**

2
3 From: Tom Hastings, Peter Zehler 9 issues are highlighted like this.

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7 Remember to preserve the revision marks in the sections that combine the “document-state” and
8 “document-state-reasons” with the RFC2911 “job-state” and “job-state-reasons” descriptions.
9

10 **Abstract**

11
12 This document is an IPP extension proposal to extend the IPP/PWG semantics to include a Document
13 object. The Job object is said to contain one or more Document objects which are passive objects operated
14 on by the Job. The Document object is created by the existing Send-Document and Send-URI operations.
15 However, a client can supply additional Document Template attributes with each document and new
16 Document Description attributes are defined. Also there are seven new operations defined for Documents
17 once they have been created.
18

19 The purpose for specifying the Document object, is so that we can have a common specification for use in
20 IPP, the PWG Semantic Model, the PWG PSI project, and the Free Standards Group Job Ticket API which
21 all have a Document object.
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55 1 Introduction and Summary

56 This specification is a proposal to extend the IPP semantics to include a Document object. The Job object
57 is said to contain one or more Document objects. The Document object is created by the existing Send-
58 Document and Send-URI operations. The extension is to add a (new) Document Attributes group (and tag)
59 to the request which contains any Document Template attributes to be applied to this Document object
60 being created, overriding any corresponding Job Template attribute supplied at the job level (including the
61 “document-overrides” operation attributes at the Job or Document level).

62
63 Part of the extension is to allow the client to supply printing instructions, called Document Template
64 attributes, when creating each Document object. An IPP Printer object implementation MAY support most
65 of the existing Job Template attributes as Document Template attributes as well. (The PWG Semantic
66 Model currently calls the Job Template attributes and Document Template attributes simply “Processing”
67 attributes).

68
69 The Document object is a passive object¹ and is operated upon by the Job. However, there are 7 new
70 operations that affect the Document object after it is created. This document specifies the semantics of
71 these seven new operations: Cancel-Current-Document, Cancel-Document, Delete-Document, Get-
72 Document-Attributes, Get-Documents, Set-Document-Attributes, and Validate-Document by comparing
73 them to the corresponding Job operations.

74
75 This specification also specifies the life cycle of the Document object by defining the “document-state” and
76 “document-state-reasons” attributes. No “document-state-message” is defined since the Job’s “job-state-
77 message” text message can identify individual documents when that is needed. Finally, the analogous
78 Document Descriptions attributes that correspond to the Job Description attributes are proposed.

79
80 The intent is to propose this specification as an IPP extension and which will be referenced as part of the
81 PWG Semantic Model. The purpose for specifying the Document object, is so that we can have a common
82 specification for use in IPP, the PWG Semantic Model, the PWG PSI project, and the Free Standards
83 Group Job Ticket API which all have a Document object.

84
85 **ISSUE 01: Should we publish this document as an IETF standards track document or as an IEEE-ISTO**
86 **standard? If the former, since the IETF IPP WG is in the process of being closed down when all the current**
87 **specifications are published, Peter and Tom will propose the specification as individual authors standards**
88 **track contribution (after PWG review). If the latter, it will be published as one more IEEE-ISTO standard**
89 **in the 5100.n series.**

¹ The Document object is *not* a sub-job. If Job trees are desired where sub-jobs can be on different network nodes, such as in JDF, then a separate specification should be generated for Job trees.

90 **2 Document Operations**

91 The Document object semantics are as parallel to the Job object semantics as possible. Therefore, most of
 92 the Job operations have analogous Document operations as shown in Table 1. Operations that can apply
 93 only to an entire job, have no analogous document operation as indicated. This extension adds 7 new
 94 Document operations that operate on the Document object once it is created by either of the existing two:
 95 Send-Document and Send-URI operations.
 96

97 Note: By Document object we mean the object once it become a contained part of a Job object, not
 98 before or after. So a Document object does not represent data in a repository.
 99

100 Table 1 compares the Job and Document operations. The two Conf. columns indicate the conformance
 101 requirements (REQUIRED = REQ, OPTIONAL = OPT) for the Job and Document operations respectively.
 102 A “REQ” in the Document Conformance column means if the Document object is supported. Whether a
 103 Document operation is a method on the Job object or the Document object depends on the modeling regime
 104 and is not an essential part of the semantics described here, since these semantics are intended to apply to
 105 both to object-oriented and object-based protocols, APIs, and implementations.

106 **Table 1 - Document operations compared to Job operations**

Job operations	Job Conf.	Document operations	Doc Conf
Cancel-Current-Job Sets “job-state” to ‘canceled’ and “job-state-reasons” to ‘canceled-by-xxx’. Sets “document-state” to ‘canceled’ and “document-state-reasons” to ‘canceled-by-xxx’ for any documents that have not yet reached a terminal state (‘completed’, ‘canceled’, or ‘aborted’).	OPT	Cancel-Current-Document Cancels processing of the current Document no matter for which Job, set the “document-state” attributes of the current documents in the job to ‘canceled’, and proceed with processing the next Document of the current Job or with the next Job if the current Job has no more Document objects. Its an operator emergency method. In some modeling regimes, it may be a Device method, rather than a Job or Document method. Inputs: same as Cancel-Current-Job, plus an OPTIONAL “document-number” operation attribute which the Printer checks to see if the current document being processed is the specified document, else the Printer rejects the operation in a manner analogous to the handling of the OPTIONAL “job-id” input parameter to both Cancel-Current-Job and Cancel-Current-Document, if supplied. Outputs: same as Cancel-Current-Job	OPT
Cancel-Job Sets “job-state” to ‘canceled’ and “job-state-reasons” to ‘canceled-by-xxx’. Sets “document-state” to ‘canceled’ and “document-state-reasons” to ‘canceled-by-xxx’ for	REQ	Cancel-Document Cancels the processing of the document content for the specified Document object in the job, sets the specified document’s “document-state” attribute to ‘canceled’, but does not remove the document from the Job, so that the Job can be resubmitted later. Thus Cancel-Document has the same semantics as Cancel-Job, which only cancels the processing of the job, and doesn’t delete the job/document itself. See Delete-Document to delete the	OPT

Job operations	Job Conf.	Document operations	Doc Conf
any documents that have not yet reached a terminal state ('completed', 'canceled', or 'aborted').		<p>Document object itself immediately. This operation does not affect the states of any of the other documents in the job. If the job was processing and there are no further documents to process, the job moves to the 'completed' state as usual whenever there is no more processing to be done.</p> <p>Note: Unlike Reprocess-Job, there is no Reprocess-Document. However, the Reprocess-Job and Restart-Job operations will process all documents in the job, including ones that have been canceled by Cancel-Document.</p> <p>Inputs: same as Cancel-Job, plus a REQUIRED "document-number" operation attribute.</p> <p>Outputs: same as Cancel-Job.</p>	
<p>Create-Job The operation and Job Template attributes remain at the job level on the Job object. Document objects inherit the job level attributes unless the Document Creation operation supplies the attribute. However, the Printer MUST NOT copy down job level attributes to the Document object, including "document-overrides" (except operation attributes that initialize Document Description attributes marked with an "*" in Table 4)</p>	OPT	N/A. See <i>Send-Document</i> and <i>Send-URI</i>	
Get-Job-Attributes	REQ	<p>Get-Document-Attributes Returns all or selected attributes and values of the specified Document object. Two new group names are defined: 'document-template' and 'document-description'. Only attributes that were supplied by any client explicitly for the Document object, i.e., in a Send-Document, Send-URI, or Set-Document-Attributes operations are returned. Document attributes supplied as members of the "document-overrides" operation attribute on the Job Creation operations are not returned. In other words, a client sees what clients submitted at the Document level; the Printer MUST NOT merge the attributes</p>	REQ

Job operations	Job Conf.	Document operations	Doc Conf
		that were supplied at the Job level in this response (except Document Description attributes marked with an "*" in Table 4). Inputs: same as Get-Job-Attributes, plus a REQUIRED "document-number" operation attribute. Outputs: same as Get-Job-Attributes.	
Get-Jobs	REQ	Get-Documents Returns all or selected attributes and values of all Document objects in the specified Job. Two new group names are defined: 'document-template' and 'document-description'. Only attributes that were supplied by any client explicitly for the Document object, i.e., in a Send-Document, Send-URI, or Set-Document-Attributes operations are returned. Document attributes supplied as members of the "document-overrides" operation attribute on the Job Creation operations are not returned. In other words, a client sees what clients submitted at the Document level; the Printer MUST NOT merge the attributes that were supplied at the Job level in this response (except Document Description attributes marked with an "*" in Table 4). Inputs: same as Get-Jobs, plus a REQUIRED "job-id" or "job-uri" operation attribute. Outputs: same as Get-Jobs.	REQ
Hold-Job Sets "job-state" to 'pending-held' and "job-state-reasons" to 'job-hold-until-specified'. The Documents' "document-state" and "document-state-reasons" are unaffected.		<i>N/A, can only hold an entire job.</i>	
Print-Job	REQ	Send-Document (existing operation - see [RFC2911]) Adds a Document object to the Job that include actual document content. The extension is to add the (new) Document Attributes group (and tag) to the request which contains any Document Template attributes to be applied to this document, overriding any corresponding Job Template attribute supplied at the job level (including "document-overrides" operation attributes at the Job or Document level). It is a method on the Job object.	REQ
Print-URI	OPT	Send-URI (existing operation - see [RFC2911]) Adds a Document object to the Job that contains a URL for the specified document content. The extension is to add the (new) Document Attributes group (and tag) to the request which contains any Job Template attributes to be applied to this	OPT

Job operations	Job Conf.	Document operations	Doc Conf
		document, overriding any corresponding Job Template attribute supplied at the job level (including “document-overrides” operation attributes at the Job or Document level). The device then pulls the document content data as needed. It is a method on a Job object.	
Promote-Job	OPT	<i>N/A, can only promote an entire job</i>	
Purge-Jobs Requires operator/administrator privileges.	OPT	Delete-Document Deletes the specified Document object and its data immediately if the Document is still in the ‘pending’ or ‘pending-held’ state, else reject the request. The “document-number” values are not re-assigned, so that the deleted document leaves a hole in the document numbering space for the job. A subsequent Get-Document-Attributes request for this document will return a ‘client-error-not-found’ status code. This operation is similar to the Purge-Jobs operation which immediately deletes all jobs from the Printer. However, Delete-Document only deletes a single Document from the Job. Requires operator/administrator privileges, otherwise a rogue client could submit, then delete, at will using up valuable spooling space. Unprivileged users use Cancel-Document which go through the normal accounting, if any. Inputs: Same as Cancel-Document. Outputs: Same as Cancel-Document.	
Release-Held-New-Jobs	OPT	<i>N/A, can only release entire jobs</i>	
Release-Job	OPT	<i>N/A, can only release an entire job</i>	
Reprocess-Job	OPT	<i>N/A, can only reprocess an entire job</i>	
Restart-Job	OPT	<i>N/A, can only restart an entire job</i>	
Resume-Job If there are no other reasons to hold the job, changes “job-state” to ‘pending’ and removes ‘job-hold-until-specified’ value from “job-state-reasons”. The Documents’ “document-state” and “document-state-reasons” are unaffected.	OPT	<i>N/A, can only resume an entire job</i>	
Schedule-Job-After	OPT	<i>N/A, can only schedule an entire job</i>	
Set-Job-Attributes	OPT	Set-Document-Attributes Changes the values of the specified Document object attributes.	OPT

Job operations	Job Conf.	Document operations	Doc Conf
		<p>If the specified Document object didn't have the attribute, the attribute is added to the Document object. Such set attributes override any corresponding attributes supplied at the job level, including any "document-overrides" operation attributes supplied at the job or document level.</p> <p>Inputs: same as Set-Job-Attributes, plus a REQUIRED "document-number" operation attribute.</p> <p>Outputs: same as Set-Job-Attributes.</p>	
<p>Suspend-Current-Job Sets "job-state" to 'processing-stopped' and "job-state-reasons" to 'job-suspended-by-xxx'. The Documents' "document-state" and "document-state-reasons" are unaffected.</p>	OPT	<p><i>N/A, can only suspend an entire job in order to run another one</i></p>	
<p>Validate-Job</p>	REQ	<p>Validate-Document Checks that the print instructions and the document data are available. Note: The PWG PSI has added this operation for documents. Inputs: Same as Validate-Job, with the addition of an OPTIONAL "document-uri" operation attribute to be checked. Outputs: same as Validate-Job.</p>	REQ

108 **3 Operation Attributes for the Job and Document Creation operations**

109 This section lists the Operation attributes that are used in Job Creation operations and Document Creation
 110 operations. Operation attributes relate to the operation and do not depend on the printing capabilities of the

3.1 Operation Attributes supplied in Job Creation and Document Creation requests

111 Printer.

112
 113 Table 2 lists the Operation attributes that clients supply in Job Creation operation *requests*: Print-Job, Print-
 114 URI, and Create-Job and in Document Creation operation *requests*: Send-Document and Send-URI. The
 115 value of the “ipp-attribute-fidelity” operation attribute does *not* affect the Printer’s handling of the other
 116 operation attributes, only its handling of the Job Template attributes (see section 4).
 117

118 The “Supplied” column indicates whether the Operation attribute can be supplied in a Job Creation
 119 operation (Job = y) and/or a Document Creation operation (Doc = y). The Conformance column indicates
 120 the conformance requirements for what the client supplies in a request and the Printer supports in a
 121 request. The Reference and Section columns list the IETF or IEEE-ISTO specification which defines the
 122 semantics of the attribute
 123

124 **Table 2 - Operation Attributes supplied in Job and Document Creation operation requests**

Operation attribute	Attribute Syntax	Supplied		Conformance		Reference	Section
		Job	Doc	Client supply	Printer support		
attributes-charset *	charset	y	y	MUST	MUST	[RFC2911]	3.1.4
attributes-natural-language *	naturalLanguage	y	y	MUST	MUST	[RFC2911]	3.1.4
compression	type3 keyword	y	y	MAY	MUST	[RFC2911]	3.2.1.1
document-format	mimeMediaType	y	y	MAY	MUST	[RFC2911]	3.2.1.1
document-name	name(MAX)	y	y	MAY	MUST	[RFC2911]	3.2.1.1
document-natural-language	naturalLanguage	y	y	MAY	MAY	[RFC2911]	3.2.1.1
document-overrides	1setOf collection	-	y ²	MAY	MAY	[override]	5.1
document-uri	uri	-	y	MAY	MAY	[RFC2911]	3.2.2
input-document-number	integer(1:MAX)	-	y	MAY	MAY	[override]	9.2

² The “document-overrides” (collection) attribute MAY be supplied by the client in a Send-Document or Send-URI request as an Operation attribute to apply document overrides to this and/or subsequent documents in the job. See the “page-overrides” Job Template attribute in Table 3 for the listing of the member attributes. However, with the introduction of the Document object, the “document-overrides” (collection) attribute SHOULD NOT be used (either as a Job Template attribute or an Operation attribute). Instead, the client simply supplies the Document Template attributes (see Table 3) for each Document Creation request (in a new Document Template attribute group) without needing a collection.

Operation attribute	Attribute Syntax	Supplied		Conformance		Reference	Section
		Job	Doc	Client supply	Printer support		
ipp-attribute-fidelity	boolean	y	y	MAY	MUST	[RFC2911]	3.2.1.1
job-impressions	integer(0:MAX)	y	y	MAY	MAY	[RFC2911]	3.2.1.1
job-k-octets	integer(0:MAX)	y	y	MAY	MAY	[RFC2911]	3.2.1.1
job-media-sheets	integer(0:MAX)	y	y	MAY	MAY	[RFC2911]	3.2.1.1
job-name	name(MAX)	y	-	MAY	MUST	[RFC2911]	4.3.5
last-document	boolean	-	y	MAY	MUST	[RFC2911]	3.3.1.1
operation-id *	integer(1:0x8FFF)	y	y	MUST	MUST	[RFC2911]	3.1.2
page-overrides	1 setOf collection	-	y ³	MAY	MAY	[override]	
printer-uri *	uri	y	y	MUST	MUST	[RFC2911]	3.1.5
request-id *	integer(1:MAX)	y	y	MUST	MUST	[RFC2911]	3.1.2
requesting-user-name *	name(MAX)	y	y	SHOULD	MUST	[RFC2911]	3.2.1.1
version-number *	X.Y	y	y	MUST	MUST	[RFC2911]	3.1.8

* - indicates attributes that are defined for *all* operations, not just Job Creation and Document Creation operations

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126
127

³ The “page-overrides” (collection) attribute MAY be supplied by the client in a Send-Document or Send-URI request as an Operation attribute to apply page overrides to this and/or subsequent documents in the job. See the “page-overrides” Job Template attribute in Table 3 for the listing of the member attributes. However, with the introduction of the Document object, the “page-overrides” (collection) attribute SHOULD be more simply supplied as one of the Document Template attributes for this document only.

128 4 Job Template attributes

129 Table 3 lists the Job Template attributes used in the Job Creation operations: Print-Job, Print-URI, and
130 Create-Job and in Document Creation operations: Send-Document and Send-URI. Most of these Job
131 Template attributes can also be supplied as Document Overrides or Page Overrides, using the “document-
132 overrides” and “page-overrides” Job Template collection attributes, respectively (see [coll]). ,
133

134 According to [coll], the “document-overrides” (collection) attribute MAY be supplied by the client in a
135 Send-Document or Send-URI request as an Operation attribute to apply document overrides to this and/or
136 subsequent documents in the job. See the “document-overrides” Job Template attribute in Table 3 for the
137 listing of the member attributes. However, with the introduction of the Document object, the “document-
138 overrides” (collection) attribute SHOULD NOT be used (either as a Job Template attribute or an Operation
139 attribute). Instead, the client simply supplies the Document Template attributes (see Table 3) for each
140 Document Creation request (in a new Document Template attribute group) without needing a collection.
141

142 ISSUE 02: What do we want to do with the “document-overrides” collection attributes when supporting
143 the Document object, which is no longer needed as either a Job Template, Document Template, or
144 operation attribute in Job and Document Creation requests?
145

146 Similarly, according to [coll], the “page-overrides” (collection) attribute MAY be supplied by the client in a
147 Send-Document or Send-URI request as an Operation attribute to apply page overrides to this and/or
148 subsequent documents in the job. See the “page-overrides” Job Template attribute in Table 3 for the listing
149 of the member attributes. However, with the introduction of the Document object, the “page-overrides”
150 (collection) attribute SHOULD be more simply supplied as one of the Document Template attributes for
151 this document only.
152

153 ISSUE 03: What do we want to do with the “page-overrides” collection attributes when supporting the
154 Document object, which is still needed as a Job Template and Document Template attribute for overriding
155 attributes in specified page ranges, but is not needed as an operation attribute on Document Creation
156 requests?
157

158 The “Supplied” column indicates whether the attribute can be supplied at the job, document, or page level
 159 with the following semantics:
 160

Supplied	Description
J=y:	The attributes MAY be supplied as Job Template attributes at the Job Level in a Job Creation request in which case each Document inherits the Job Template attribute as a default which is used unless an attribute at the document level is also supplied). Note: The “multiple-document-handling” attribute controls whether extensive attributes, such as “finishing”, “copies”, affect the entire job as a whole (‘single-xxx’ values) or affect each document separately (‘separate-xxx’ values).
D=y:	The attribute MAY be supplied at the Document Level as Document Template attributes in a Document Creation operation, in which case they override any Job Template attributes supplied at the job level and any “document-overrides” supplied at the Job or Document level.
P=y:	The attribute MAY be supplied as a member of the (1) “page-ranges” Job Template attribute at the Job Level in a Job Creation operation or (2) “page-ranges” Document Template attribute at the Document Level to affect the specified range of pages.

161
 162 Job Template and Document Template attributes are OPTIONAL for a Printer to support and for a client to
 163 supply in a Job Creation or Document Creation request or a Document Overrides or Page Overrides. If a
 164 Printer supports a Job Template or Document Template attribute, then it MUST copy the supplied attribute
 165 to the Job or Document object, respectively so that a client MAY query the attributes in subsequent Get-
 166 Job-Attributes/Get-Jobs and Get-Document-Attributes/Get-Documents operations, respectively. The effect
 167 of Job Template Attributes supplied in Job Creation requests are inherited by the Document objects, unless
 168 the Document Creation operation supplies the attribute with a different value. However, the Printer MUST
 169 NOT propagate Job Template attributes supplied in Job Creation operations to the Document object.
 170 Similarly, the Printer MUST NOT promote Document Template attributes up to the Job object when no
 171 corresponding Job Template attribute was supplied in the Job Creation operation. Thus the Printer returns
 172 in queries only Job Template and Document Template attributes that were actually supplied by a client.
 173

174 **ISSUE 04: Is this query behavior for Job and Document objects OK?**

175
 176 However, if a Job Template collection attribute is supported (see [coll]), then there are conformance
 177 requirements for which member attributes MUST be supported and which member attributes a client
 178 MUST supply as indicated in the Conformance column for each collection member attribute in Table 3.

Table 3 - Job Template and Document Template attributes

Job Template / Document Template attribute name	Attribute Syntax	Supplied			Conformance		Reference
		J	D	P	Client supply	Printer support	
copies	integer(1:MAX)	y ⁴	y	n	MAY	MAY	RFC2911 §4.2.5
cover-back	collection	y	y	n	MAY	MAY	prod-print §3.1
media	type3 keyword name(MAX)				MAY be neither or one of, but NOT both	MUST	prod-print §3.1.1
media-col	collection					MAY	prod-print §3.1.1
cover-type	type2 keyword				MUST	MUST	prod-print §3.1.2
cover-front	collection	y	y	n	MAY	MAY	prod-print §3.1
media	type3 keyword name(MAX)				MAY be neither or one of, but NOT both	MUST	prod-print §3.1.1
media-col	collection					MAY	prod-print §3.1.1
cover-type	type2 keyword				MUST	MUST	prod-print §3.1.2
document-overrides	collection	y	n	n	MAY	MAY	override §5.1
input-documents	1setOf rangeOfInteger(MAX)				MUST be one or the other, but NOT both	MUST	override §5.1.1
output-documents	1setOf rangeOfInteger(MAX)					MUST	override §5.1.2
document-copies	1setOf rangeOfInteger(MAX)				MAY	MAY	override §5.1.3
document-format	mimeMediaType				MAY	MUST	override §5.1.4
document-name	name (MAX)				MAY	MUST	override §5.1.5
compression	type3 keyword				MAY	MUST	override §5.1.6
document-natural-language	naturalLanguage				MAY	MAY	override §5.1.7
page-ranges	1setOf rangeOfInteger (1:MAX)				MAY	MAY	override §5.1.8
<i>any other Job Template attributes that affect documents, such as “media” or “media-col”</i>					MAY	MAY	

⁴ The IPP “copies” attribute is an *extensive* attribute, so its effect when supplied at the job level is not always inherited by the documents in a multi-document job. Instead, its effect depends on the value of the “multiple-document-handling” Job Template attribute. The ‘single-document’ and ‘single-document-new-sheet’ values produce copies of the job as a whole with the multiple input documents concatenated into a single output document for each job copy. The ‘separate-document-uncollated-copies’ value produce N copies of the first input document followed by N copies of the second input document, etc. The ‘separate-document-collated-copies’ produce N successive job copies, each job copy consisting of 1 copy of the first document followed by 1 copy of the second document, etc.

Job Template / Document Template attribute name	Attribute Syntax	Supplied			Conformance		Reference
		J	D	P	Client supply	Printer support	
finishings	1setOf type2 enum	y ⁵	y	y	MAY be neither or one of, but NOT both	MAY, MUST if “finishin g-col” is supported	RFC2911 §4.2.6
finishings-col	collection	y ⁵	y	y		MAY	prod-print §3.2
finishing-template	name(MAX)				MAY	MAY	prod-print §3.2.1
stitching	collection				MAY	MAY	prod-print §3.2.2
stitching-reference-edge	type2 keyword				MUST	MUST	prod-print §3.2.2.1
stitching-offset	integer (0:MAX)				MUST	MUST	prod-print §3.2.2.2
stitching-locations	1setOf integer(0:MAX)				MUST	MUST	prod-print §3.2.2.3
force-front-side	1setOf integer(1:MAX)	y ⁶	y	y	MAY	MAY	prod-print §3.3
imposition-template	type2 keyword name(MAX)	y	y	y	MAY	MAY	prod-print §3.4
insert-sheet	1setOf collection	y ⁶	y	y	MAY	MAY	prod-print §3.5
insert-after-page-number	integer(0:MAX)				MUST	MUST	prod-print §3.5.1
insert-count	integer(0:MAX)				MAY	MUST	prod-print §3.5.2
media	type3 keyword name(MAX)				MUST be one or the other, but NOT both	MUST	prod-print §3.5.3
media-col	collection					MAY	prod-print §3.5.3

⁵ The IPP “finishings” and “finishings-col” attributes are *extensive* attributes, so their effect when supplied at the job level is not always inherited by the documents in a multi-document job. Instead, their effect depends on the value of the “multiple-document-handling” Job Template attribute. The ‘single-document’ and ‘single-document-new-sheet’ cause the finishing to be applied to each job copy as a whole. The ‘separate-documents-collated-copies’ and ‘separate-document-uncollated-copies’ values cause the finishing to be applied to each document.

⁶ The effect of the IPP “force-front-side” and “insert-sheet” attributes when supplied at the job level of a multi-document job depends on the value of the “multiple-document-handling” Job Template attribute. For the ‘single-document’ and ‘single-document-new-sheet’ values, the pages are numbered as a single set from 1 to n for the job as a whole. For the ‘separate-documents-collated-copies’ and ‘separate-document-uncollated-copies’ values, the pages are numbered from 1 to n for each document separately.

Job Template / Document Template attribute name	Attribute Syntax	Supplied			Conformance		Reference
		J	D	P	Client supply	Printer support	
job-account-id	name(MAX)	y	n	n	MAY	MAY	prod-print §3.6
job-accounting-sheets	collection	y	n	n	MAY	MAY	prod-print §3.8
job-accounting-sheets-type	type3 keyword name(MAX)				MUST	MUST	prod-print §3.8.1
media	type3 keyword name(MAX)				MAY be neither or one of, but NOT both	MUST	prod-print §3.8.2
media-col	collection					MAY	prod-print §3.8.2
job-accounting-output-bin	type3 keyword name(MAX)				MAY	MAY	prod-print §3.8.3
job-accounting-user-id	name(MAX)	y	n	n	MAY	MAY	prod-print §3.7
job-error-sheet	collection	y	n	n	MAY	MAY	prod-print §3.9
job-error-sheet-type	type3 keyword name(MAX)				MUST	MUST	prod-print §3.9.1
job-error-sheet-when	type2 keyword				MAY	MAY	prod-print §3.9.2
media	type3 keyword name(MAX)				MAY be neither or one of, but NOT both	MUST	prod-print §3.9.3
media-col	collection					MAY	prod-print §3.9.3
job-hold-until	type3 keyword name(MAX)	y	n	n	MAY	MAY	RFC2911 §4.2.2
job-message-to-operator	text(MAX)	y	n	n	MAY	MAY	prod-print §3.10
job-priority	integer(1:100)	y	n	n	MAY	MAY	RFC2911 §4.2.1
job-sheet-message	text(MAX)	y	n	n	MAY	MAY	prod-print §3.12
job-sheets	type3 keyword name(MAX)	y	n	n	MAY be neither or one of, but NOT both	MAY, MUST if “job-sheets-col” supported	RFC2911 §4.2.3
job-sheets-col	collection	y	n	n		MAY	prod-print §3.11
job-sheets	type3 keyword name(MAX)				MUST	MUST	prod-print §3.11.1
media	type3 keyword name(MAX)				MUST be one or the other, but NOT both	MUST	prod-print §3.11.2
media-col	collection					MAY	prod-print §3.11.2

Job Template / Document Template attribute name	Attribute Syntax	Supplied			Conformance		Reference
		J	D	P	Client supply	Printer support	
media	type3 keyword name(MAX)	y	y	y	MAY be neither or one of, but NOT both	MAY, MUST if “media-col” supported	RFC2911 §4.2.11
media-col	collection	y	y	y		MAY	
media-key	type3 keyword name(MAX)				MAY	MAY	prod-print §3.13.1
media-type	type3 keyword name(MAX)				MAY	MAY	prod-print §3.13.2
media-info	text(255)				MAY	MAY	prod-print §3.13.3
media-color	type3 keyword name(MAX)				MAY	MAY	prod-print §3.13.4
media-preprinted	type3 keyword name(MAX)				MAY	MAY	prod-print §3.13.5
media-hole-count	integer(0:MAX)				MAY	MAY	prod-print §3.13.6
media-order-count	integer(1:MAX)				MAY	MAY	prod-print §3.13.7
media-size	collection				MAY	MUST	prod-print §3.13.8
x-dimension	integer(0:MAX)				MUST	MUST	prod-print §3.13.8.1
y-dimension	integer(0:MAX)				MUST	MUST	prod-print §3.13.8.2
media-weight-metric	integer(0:MAX)				MAY	MAY	prod-print §3.13.9
media-front-coating	type3 keyword name(MAX)				MAY	MAY	prod-print §3.13.10
media-back-coating	type3 keyword name(MAX)				MAY	MAY	prod-print §3.13.10
media-recycled	type3 keyword name(MAX)				MAY	MAY	prod-print §3.13.11
media-input-tray-check	type3 keyword name(MAX)	y	y	y	MAY	MAY	prod-print §3.14

Job Template / Document Template attribute name	Attribute Syntax	Supplied			Conformance		Reference
		J	D	P	Client supply	Printer support	
multiple-document-handling	type2 keyword	y	n	n	MAY	MUST if multiple document jobs supported	RFC2911 §4.2.4
number-up	integer(1:MAX)	y	y	y	MAY	MAY	RFC2911 §4.2.9
orientation-requested	type2 enum	y	y	y	MAY	MAY	RFC2911 §4.2.10
output-bin	type2 keyword name(MAX)	y	n	n	MAY	MAY	output-bin §2.1
page-delivery	type2 keyword	y	y	n	MAY	MAY	prod-print §3.15
page-order-received	type2 keyword	y	y	n	MAY	MAY	prod-print §3.16
page-overrides	1setOf collection	y ⁷	y	n/a	MAY	MAY	override §5.2
input-documents	1setOf rangeOfInteger(MAX)				MUST be one or the other, but NOT both	MUST	override §5.2.1
output-documents	1setOf rangeOfInteger(MAX)					MUST	override §5.2.2
document-copies	1setOf rangeOfInteger(MAX)				MAY	MAY	override §5.2.3
pages	1setOf rangeOfInteger(MAX)				MUST	MUST	override §5.2.4
<i>any other Job Template attributes that affect pages, such as “media” or “media-col”</i>					MAY	MAY	
page-ranges	1setOf rangeOfInteger(1:MAX)	y ⁷	y	n/a	MAY	MAY	RFC2911 §4.2.7
pages-per-subset	1setOf integer(1:MAX)	y ⁸	y	n/a	MAY	MAY	prod-print §5.3
presentation-direction-number-up	type2 keyword	y	y	y	MAY	MAY	prod-print §3.17

⁷ The effect of the IPP “page-overrides” and “page-ranges”, attributes when supplied at the job level of a multi-document job depends on the value of the “multiple-document-handling” Job Template attribute. For the ‘single-document’ and ‘single-document-new-sheet’ values, the pages are numbered as a single set from 1 to n for the job as a whole. For the ‘separate-documents-collated-copies’ and ‘separate-document-uncollated-copies’ values, the pages are numbered from 1 to n for each document separately.

⁸ The IPP “pages-per-subset” attribute can only be used when the “multiple-document-handling” Job Template attribute is ‘separate-documents-collated-copies’ or ‘separate-documents-uncollated-copes’, since the purpose of the “pages-per-subset” attribute is to produce separate output documents for each subset. Otherwise, the Printer MUST ignore the “pages-per-subset” attribute.

Job Template / Document Template attribute name	Attribute Syntax	Supplied			Conformance		Reference
		J	D	P	Client supply	Printer support	
print-quality	type2 enum	y	y	y	MAY	MAY	RFC2911 §4.2.13
printer-resolution	resolution	y	y	y	MAY	MAY	RFC2911 §4.2.12
separator-sheets	collection	y	y	y	MAY	MAY	prod-print §3.18
separator-sheets-type	type3 keyword name(MAX)				MUST	MUST	prod-print §3.18.1
media	type3 keyword name(MAX)				MAY be neither or one of, but NOT both	MUST	prod-print §3.18.2
media-col	collection					MAY	prod-print §3.18.2
sheet-collate	type2 keyword	y	y	n	MAY	MAY	job-prog §3.1
sides	type2 keyword	y	y	y	MAY	MAY	RFC2911 §4.2.8
x-image-position	type2 keyword	y	y	y	MAY	MAY	prod-print §3.19.2
x-image-shift	integer(MIN:MAX)	y	y	y	MAY	MAY	prod-print §3.19.3
x-side1-image-shift	integer(MIN:MAX)	y	y	y	MAY	MAY	prod-print §3.19.4
x-side2-image-shift	integer(MIN:MAX)	y	y	y	MAY	MAY	prod-print §3.19.5
y-image-position	type2 keyword	y	y	y	MAY	MAY	prod-print §3.19.6
y-image-shift	integer(MIN:MAX)	y	y	y	MAY	MAY	prod-print §3.19.7
y-side1-image-shift	integer(MIN:MAX)	y	y	y	MAY	MAY	prod-print §3.19.8
y-side2-image-shift	integer(MIN:MAX)	y	y	y	MAY	MAY	prod-print §3.19.9

181 **5 Job and (new) Document Description attributes**

182 Table 4 lists the Job Description and Document Description attributes. Job Description and Document
 183 Description attributes are Job object and Document object attributes, respectively, that are filled in by the
 184 Printer. Some Job/Document Description attribute values are supplied by the client in the Job/Document
 185 Creation operation using corresponding Operation attributes as flagged with an “*”.
 186

187 The column labeled “attribute syntax” indicates the attribute syntax (see [RFC2911] section 4.1). The
 188 Printer conformance is indicated along with the reference to the specification in which the attribute is
 189 defined. The conformance for Document Description attributes (if the Printer supports the Document
 190 object) is the same as the corresponding Job Description attributes.
 191

192 Note: There are no corresponding Page Range (or Page Override) Description attributes. The Page Range
 193 is not an object with a state and it cannot be queried.
 194

195 Legend:

196 **[job-]** indicates an attribute that shouldn’t have had a “job-” prefix in its name in [RFC2911], so that the
 197 same attribute could also apply to the Document object as a Document Description attribute. Note:
 198 For the PWG Semantic Model, the “job-” prefix is proposed to be dropped.
 199

200 **ISSUE 05: Should we sort the attributes ignoring the [job-]? Current the “job-” is used in the sort**
 201 **for attributes.**
 202

203 **ISSUE 06: How will we register these attributes with IANA, since they will be registered for IPP**
 204 **use, with the “job-” prefix. Do we add the ones without “job-” as aliases to the IANA registry as is**
 205 **done for charset registrations?**
 206

207 “-” indicates that the Job or Document attribute is *not* defined.

208 “*” indicates a fundamental Job and/or Document Description attribute that the client MAY supply the
 209 values for in a corresponding Operation attribute. Such a Job Level attribute is a client-supplied
 210 default for each of the Document objects, in case the client doesn’t supply the corresponding
 211 Operation attribute at the Document level. Furthermore, when the client supplies the value at the
 212 Job level, but not at the Document level, the Printer MUST appear to copy down the value to each
 213 Document object as returned in Get-Document-Attributes and Get-Documents operation responses.

214 ** indicates Job Description attributes to hold the corresponding Operation attributes supplied by the
 215 client or defaulted by the Printer. This behavior is new to go with the Document object extension.
 216

Table 4 - Job and (new) Document Description attributes

IPP Job Description / Document Description attribute name	IPP Attribute Syntax	Job	Doc	Printer conformance	Reference
attributes-charset	charset	y	y	MUST	RFC2911 §4.3.19
attributes-natural-language	naturalLanguage	y	y	MUST	RFC2911 §4.3.20

IPP Job Description / Document Description attribute name	IPP Attribute Syntax	Job	Doc	Printer conformance	Reference
compression**	(type3 keyword)	y*	y*	MUST	RFC2911 §3.2.1.1
current-page-order	type2 keyword	y ⁹	y	MAY	prod-print §4.1
date-time-at-completed	dateTime	y	y	MAY	RFC2911 §4.3.14.7
date-time-at-creation	dateTime	y	y	MAY	RFC2911 §4.3.14.5
date-time-at-processing	dateTime	y	y	MAY	RFC2911 §4.3.14.6
document-format**	documentFormat	y*	y*	MUST	RFC2911 §3.2.1.1
document-name**	name(MAX)	y*	y*	MUST	RFC2911 §3.2.1.1
document-natural-language**	naturalLanguage	y*	y*	MAY	RFC2911 §3.2.1.1
document-number	integer(0:MAX)	-	y	MUST	§(new)n/a
document-state	type1 enum	-	y	MUST	(new)n/a
document-state-reasons	1setOf type2 keyword	-	y	MUST	(new)n/a
impressions-completed-current-copy	integer(0:MAX)	y	y	MAY	job-prog §4.4
job-collation-type	type2 enum	y	-	MAY	job-prog §4.1
[job-]detailed-status-message	1setOf text (MAX)	y	y	MAY	RFC2911 §4.3.10
[job-]document-access-errors	1setOf text(MAX)	y	y	MAY	RFC2911 §4.3.11
job-id	integer(1:MAX)	y	- ¹⁰	MUST	RFC2911 §4.3.2
[job-]impressions	integer(0:MAX)	y	y*	MAY	RFC2911 §4.3.17.2
[job-]impressions-completed	integer(0:MAX)	y	y	MAY	RFC2911 §4.3.18.2
[job-]k-octets	integer(0:MAX)	y	y*	MAY	RFC2911 §4.3.17.1
[job-]k-octets-processed	integer(0:MAX)	y	y	MAY	RFC2911 §4.3.18.1
[job-]media-sheets	integer(0:MAX)	y	y*	MAY	RFC2911 §4.3.17.3
[job-]media-sheets-completed	integer(0:MAX)	y	y	MAY	RFC2911 §4.3.18.3
job-message-from-operator	text(127)	y	-	MAY	RFC2911 §4.3.16
[job-]more-info	uri	y	y	MAY	RFC2911 §4.3.4
job-name	name(MAX)	y	- ¹¹	MUST	RFC2911 §4.3.5
job-originating-user-name	name (MAX)	y	-	MUST	RFC2911 §4.3.6
[job-]printer-up-time	integer (1:MAX)	y	y	MUST	RFC2911 §4.3.14.4
job-printer-uri	uri	y	-	MUST	RFC2911 §4.3.3
job-state	type1 enum	y	- ¹²	MUST	RFC2911 §4.3.7
job-state-message	text(MAX)	y	- ¹³	MAY	RFC2911 §4.3.9

⁹ When documents in a multiple document job have the same page order, the Printer populates both the Job and Document “current-page-order” with the same value, so that clients that only know about the Job Description attribute will get a value. When the page orders differ, the Printer doesn’t populate the “current-page-order” Job Description attribute, but only the Document Description attribute of each Document.

¹⁰ The Document Description attribute that corresponds to the “job-id” Job Description attribute is the (new) “document-number” attribute.

¹¹ The Document Description attribute that corresponds to the “job-name” Job Description attribute is the (existing) “document-name” attribute defined in [RFC2911].

¹² The Document Description attribute that corresponds to the “job-state” Job Description attribute is the (new) “document-state” attribute.

IPP Job Description / Document Description attribute name	IPP Attribute Syntax	Job	Doc	Printer conformance	Reference
job-state-reasons	1setOf type2 keyword	y	- ¹⁴	MUST	RFC2911 §4.3.8
job-uri	uri	y	-	MUST	RFC2911 §4.3.1
[job-]warnings-count	integer(0:MAX)	y	y	MAY	override §6.1
last-document	boolean	-	y*	MAY	RFC2911 §4.3.12
number-of-documents	integer(0:MAX)	y	-	MAY	RFC2911 §4.3.15
number-of-intervening-jobs	integer(0:MAX)	y	-	MAY	RFC2911 §4.3.13
output-device-assigned	name(127)	y	-	MAY	RFC2911 §4.3.7.2
sheet-completed-copy-number	integer(0:MAX)	y	y	MAY	job-prog §4.2
sheet-completed-document-number	integer(0:MAX)	y	-	MAY	job-prog §4.3
time-at-completed	integer (MIN:MAX)	y	y	MUST	RFC2911 §4.3.14.3
time-at-creation	integer (MIN:MAX)	y	y	MUST	RFC2911 §4.3.14.1
time-at-processing	integer (MIN:MAX)	y	y	MUST	RFC2911 §4.3.14.2

217 “*” and “**” See the description in the Legend before the table.
 218

219 Most of the existing “job-state” and “job-state-reasons” Job Description attribute values apply equally well
 220 to individual documents in a multi-document job (with removal of the ‘job-’ prefix for those that apply to
 221 both Job and Document). Furthermore, the job states are completely service-type neutral, so they can apply
 222 to scanning, faxing, formatting processes as well. The job state reasons have a number of reasons that are
 223 print service specific, but most can apply to other types of service as well. The reason for separating state
 224 from reasons, is so that the states can be the fundamental states that most implementations have, while the
 225 state reasons can vary depending on the sophistication of the system. The states are the ones that clients are
 226 most likely to base actions upon, and the state reasons are more information, both for programs and people.
 227

228 The descriptions of the new “document-state” and “document-state-reasons” attributes are merged in with
 229 the existing “job-state” and “job-state-reasons”. Such merging shows the parallelism in the description to
 230 aid understanding and implementation and so that future maintenance will continue this strong parallelism.
 231 The “/” character separates the words: Job from Document so that the same description can serve for both
 232 Job and Document objects.
 233

¹³ There is no Document Description attribute that corresponds to the “job-state-message”. Printers can use the “job-state-message” to describe any document level conditions.

¹⁴ The Document Description attribute that corresponds to the “job-state-reasons” Job Description attribute is the (new) “document-state-reasons” attribute.

5.1 job-state (type1 enum) <Job>

234 **5.2 document-state (type1 enum) <Document>**

235 This REQUIRED “job-state” attribute and the OPTIONAL “document-state” attribute identifies the
 236 current state of the job and document, respectively. Even though IPP defines seven values for
 237 job/document states (plus the out-of-band 'unknown' value - see [RFC2911] section 4.1), implementations
 238 only need to support those states which are appropriate for the particular implementation. In other words,
 239 an IPP Printer object implementation supports only those job/document states implemented by the output
 240 device and available to the IPP Printer object implementation.

241 Table 5 lists the “job-state” and “document-state” attribute values.

242 **Table 5 - "job-state" and "document-state" attribute values**

<u>Values</u>	<u>“job-state”</u>	<u>“document-state”</u>
<u>3 pending</u>	<u>y</u>	<u>y</u>
<u>4 pending-held</u>	<u>y</u>	<u>n/a</u>
<u>5 processing</u>	<u>y</u>	<u>y</u>
<u>6 processing-stopped</u>	<u>y</u>	<u>n/a</u>
<u>7 canceled</u>	<u>y</u>	<u>y</u>
<u>8 aborted</u>	<u>y</u>	<u>y</u>
<u>9 completed</u>	<u>y</u>	<u>y</u>

243

244 The (JD) and (J) notation below indicates whether the keyword is defined for the “job-state” and
 245 “document-state” attributes or just the “job-state” attribute as indicated in Table 5. Standard enum values
 246 are:

Value	Symbolic Name and Description
'3'	'pending' (JD): The job is a candidate to start processing, but is not yet processing. <u>The document has not started to be processed at all.</u>
'4'	'pending-held' (D): The job is not a candidate for processing for any number of reasons but will return to the 'pending' state as soon as the reasons are no longer present. The job's "job-state-reason" attribute MUST indicate why the job is no longer a candidate for processing. <u>The 'pending-held' state does not apply to the Document object's “document-state” attribute.</u>
'5'	'processing' (JD): One or more of: <ol style="list-style-type: none"> 1. The job is using, or is attempting to use, one or more purely software processes that are analyzing, creating, or interpreting a PDL, etc., 2. The job is using, or is attempting to use, one or more hardware devices that are interpreting a PDL, making marks on a medium, and/or performing finishing, such as stapling, etc.,

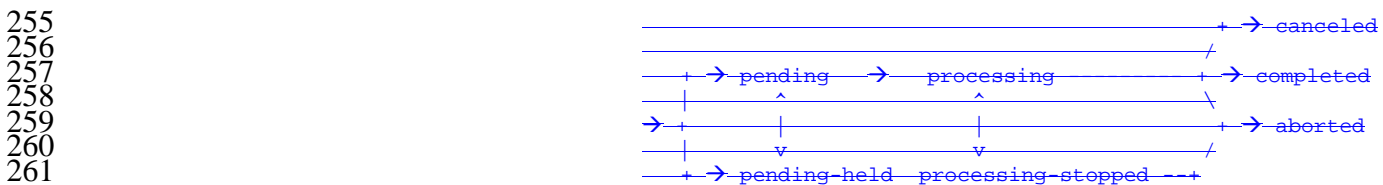
Value	Symbolic Name and Description
	<p>3. The Printer object has made the job ready for printing, but the output device is not yet printing it, either because the job hasn't reached the output device or because the job is queued in the output device or some other spooler, awaiting the output device to print it.</p> <p>When the job is in the 'processing' state, the entire job/<u>document</u> state includes the detailed status represented in the Printer object's "printer-state", "printer-state-reasons", and "printer-state-message" attributes.</p> <p><u>On the other hand, the 'processing' state for the Document indicates that the Document has begun to be processed. Even if the job stops being processed, the Document remains in the 'processing' state until it moves to one of the three terminal states.</u></p> <p>Implementations MAY, though they NEED NOT, include additional values in the job's/<u>document</u>'s "job-state-reasons"/"<u>document-state-reasons</u>" attribute to indicate the progress of the job/<u>document</u>, such as adding the 'job-printing'/'<u>printing</u>' value to indicate when the output device is actually making marks on paper and/or the 'processing-to-stop-point' value to indicate that the IPP object is in the process of canceling or aborting the job/<u>document</u>. Most implementations won't bother with this nuance.</p>
'6'	<p>'processing-stopped' (D): The job has stopped while processing for any number of reasons and will return to the 'processing' state as soon as the reasons are no longer present.</p> <p>The job's "job-state-reason" attribute MAY indicate why the job has stopped processing. For example, if the output device is stopped, the 'printer-stopped' value MAY be included in the job's "job-state-reasons" attribute.</p> <p>Note: When an output device is stopped, the device usually indicates its condition in human readable form locally at the device. A client can obtain more complete device status remotely by querying the Printer object's "printer-state", "printer-state-reasons" and "printer-state-message" attributes.</p>
'7'	<p><u>The 'processing-stopped' state does not apply to the Document object's "document-state" attribute.</u></p> <p>'canceled' (JD): The job/<u>document</u> has been canceled by a Cancel-Job/<u>Cancel-Document</u> operation and the Printer object has completed canceling the job/<u>document</u> and all job/<u>document</u> status attributes have reached their final values for the job/<u>document</u>. While the Printer object is canceling the job/<u>document</u>, the job/<u>document</u> remains in its current state, but the job's/<u>document</u>'s "job-state-reasons"/"<u>document-state-reasons</u>" attribute SHOULD contain the 'processing-to-stop-point' value and one of the 'canceled-by-user', 'canceled-by-operator', or 'canceled-at-device' value. When the job/<u>document</u> moves to the 'canceled' state, the 'processing-to-stop-point' value, if present, MUST be removed, but the 'canceled-by-</p>

Value	Symbolic Name and Description
	xxx', if present, MUST remain.
'8'	'aborted' (JD): The job/document has been aborted by the system, usually while the job/document was in the 'processing' or 'processing-stopped' state and the Printer has completed aborting the job/document and all job/document status attributes have reached their final values for the job/document. While the Printer object is aborting the job/document, the job/document remains in its current state, but the job's/document's "job-state-reasons"/"document-state-reasons" attribute SHOULD contain the 'processing-to-stop-point' and 'aborted-by-system' values. When the job/document moves to the 'aborted' state, the 'processing-to-stop-point' value, if present, MUST be removed, but the 'aborted-by-system' value, if present, MUST remain.
'9'	'completed' (JD): The job/document has completed successfully or with warnings or errors after processing and all of the job/document media sheets have been successfully stacked in the appropriate output bin(s) and all job/document status attributes have reached their final values for the job/document. The job's/document's "job-state-reasons"/"document-state-reasons" attribute SHOULD contain one of: 'completed-successfully', 'completed-with-warnings', or 'completed-with-errors' values.

247 The final value for this attribute MUST be one of: 'completed', 'canceled', or 'aborted' before the Printer
 248 removes the job/document altogether. The length of time that jobs/document remain in the 'canceled',
 249 'aborted', and 'completed' states depends on implementation.

250 Jobs/documents reach one of the three terminal states: 'completed', 'canceled', or 'aborted', after the
 251 jobs/documents have completed all activity, including stacking output media, after the jobs/documents have
 252 completed all activity, and all job/document status attributes have reached their final values for the
 253 job/document.

254 The following figure shows the normal job state transitions



262 **5.2.1 The "job-state" attribute and the Job Life Cycle**

263 The "job-state" attribute is one of the most important Job Description attributes. Figure 1 shows the values
 264 of the "job-state" attribute and the Job object life cycle as affected by actions on the Job, Printer, and job
 265 processing.

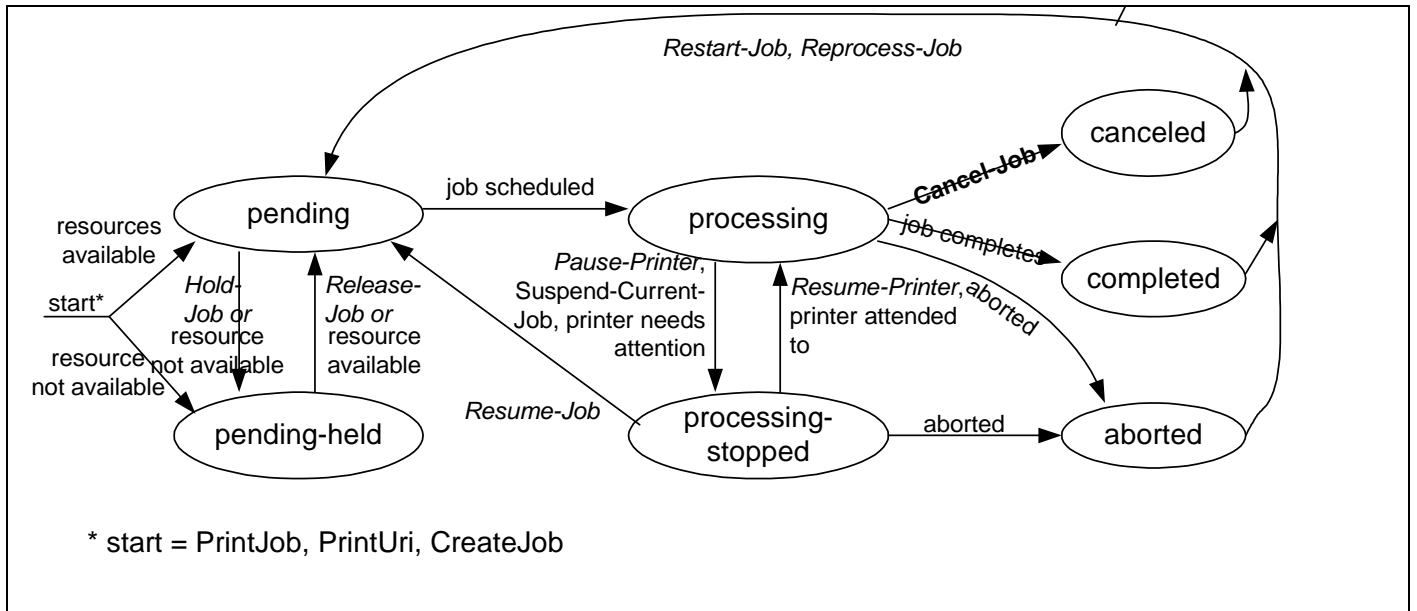


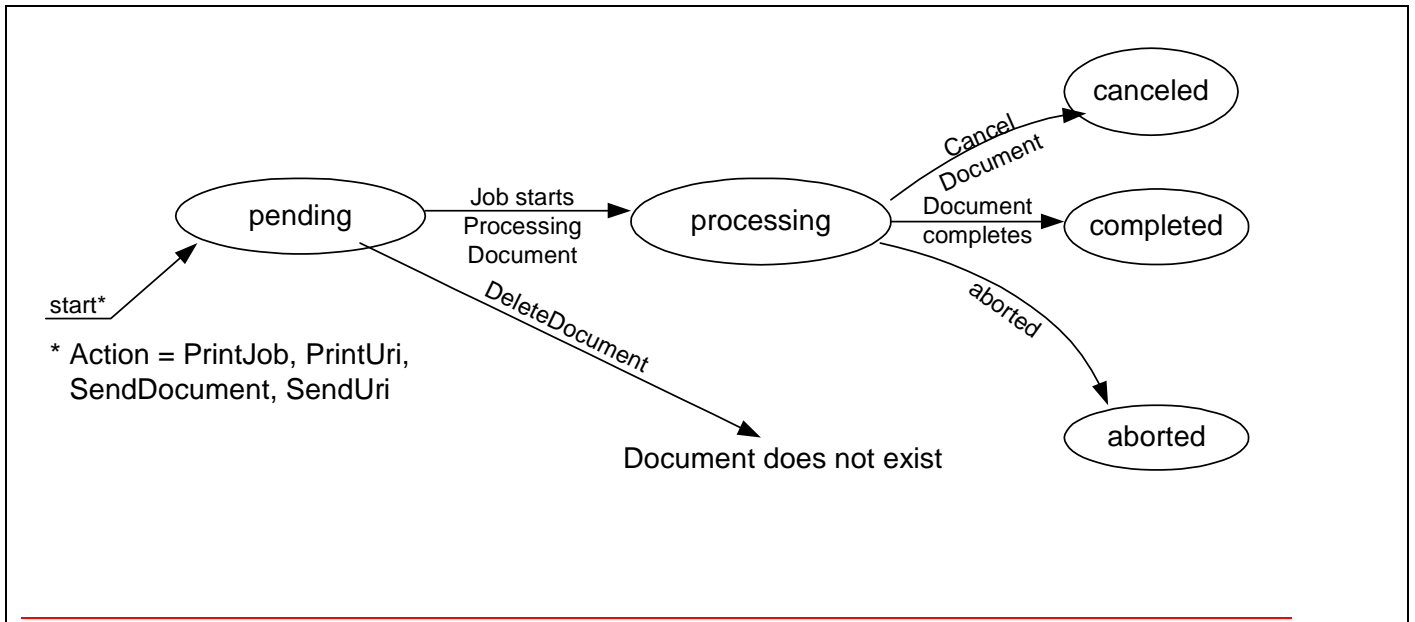
Figure 1 - The “job-state” Job Description attribute and the Job object life cycle

Normally a job progresses from left to right. Other state transitions are unlikely, but are not forbidden. Not shown are the transitions to the 'canceled' state from the 'pending', 'pending-held', and 'processing-stopped' states.

5.2.2 The “document-state” Document Description attribute and the Document object life Cycle

The “document-state” attribute is one of the most important Document Description attributes. Figure 2 shows the values of the “document-state” attribute and the Document object life cycle as affected by actions on the Job, Document, Printer, and job processing. Documents are not active objects and their life cycle is closely tied to the lifecycle of a Job¹⁵. Documents basically have three states. The first is waiting to be processed by a Job (i.e. pending). The second state is from the time the Job first starts processing the Document (i.e., processing) and until it reaches one of its terminal states. The third state for a Document is one of its terminal states (i.e., completed, canceled, or aborted).

¹⁵ The Document object is not really a sub-job. If the Document object were its own independent active object, i.e., were a sub-job, then the Document state would affect the job state and there would be complex and debatable roll-up rules for how the various “document-state” values of all of the Job’s document are rolled up to give a single value for the Job’s “job-state” attribute. Instead, the Job state reflects the overall processing of the job and is the same whether or not the Document object is supported.



282

283 **Figure 2 The “document-state” Document Description attribute and the Document object life Cycle**
 284 A Document object has a much simpler life cycle than a Job object. A Document always progress from left
 285 to right in the state diagram. No other state transitions are defined.

286 **5.2.3 Forwarding Servers:**

287 As with all other IPP attributes, if the implementation can not determine the correct value for this attribute,
 288 it SHOULD respond with the out-of-band value 'unknown' (see [RFC2911] Section 4.1) rather than try to
 289 guess at some possibly incorrect value and give the end user the wrong impression about the state of the
 290 Job/Document object. For example, if the implementation is just a gateway into some printing system from
 291 which it can normally get status, but temporarily is unable, then the implementation should return the
 292 'unknown' value. However, if the implementation is a gateway to a printing system that never provides
 293 detailed status about the print job/document, the implementation MAY set the IPP Job/Document object's
 294 state to 'completed', provided that it also sets the 'queued-in-device' value in the job's/document's "job-
 295 state-reasons"/“document-state-reasons” attribute (see “job-state-reasons”/“document-state-reasons”
 296 attribute below).

297 **5.2.4 Partitioning of Job/Document States:**

298 This section partitions the 7-job/document states into phases: Job/Document Not Completed,
 299 Job/Document Retention, Job/Document History, and Job/Document Removal. This section also explains
 300 the 'job-restartable' value of the "job-state-reasons" Job Description attribute for use with the Restart-Job
 301 operation.

302 **Job/Document Not Completed:** When a job is in the 'pending', 'pending-held', 'processing', or 'processing-
 303 stopped' states, the job is not completed. When a Document is in the ‘pending’ or ‘processing’ state, it is
 304 not completed.

305 **Job Retention:** When a job enters one of the three terminal job states: 'completed', 'canceled', or 'aborted',
 306 the IPP Printer object MAY "retain" the job in a restartable condition for an implementation-defined time

307 period. This time period MAY be zero seconds and MAY depend on the terminal job state. This phase is
 308 called Job Retention. While in the Job Retention phase, the job's document data is retained and a client
 309 may restart the job using the Restart-Job operation. If the IPP object supports the Restart-Job operation,
 310 then it SHOULD indicate that the job is restartable by adding the 'job-restartable' value to the job's "job-
 311 state-reasons" attribute (see Section 5.3) during the Job Retention phase. If the Printer supports the
 312 Document object, then the Get-Document-Attributes and Get-Documents operations MUST be supported
 313 while the job is in the Job Retention phase.

314 **Job History:** After the Job Retention phase expires for a job, the Printer object deletes the document data
 315 for the job and the job becomes part of the Job History. The Printer object MAY also delete any number of
 316 the job attributes. Since the job is no longer restartable, the Printer object MUST remove the 'job-
 317 restartable' value from the job's "job-state-reasons" attribute, if present. If the implementation supports the
 318 Document object, it SHOULD retain at least the "document-state" and "document-state-reasons" attributes
 319 on the Document object during the Job History phase which can be queried using the Get-Document-
 320 Attributes and Get-Documents operations.

321 **Job Removal:** After the job has remained in the Job History for an implementation-defined time, such as
 322 when the number of jobs exceeds a fixed number or after a fixed time period (which MAY be zero
 323 seconds), the IPP Printer removes the jJob and Document objects from the system.

324 Using the Get-Jobs/Get-Documents operation and supplying the 'not-completed' value for the "which-jobs"
 325 operation attribute, a client is requesting jobs/documents in the Job/Documents Not Completed phase.
 326 Using the Get-Jobs/Get-Documents operation and supplying the 'completed' value for the "which-jobs"
 327 operation attribute, a client is requesting jobs/documents in the Job Retention and Job History phases.
 328 Using the Get-Job-Attributes/Get-Document-Attributes operation, a client is requesting a job/documents in
 329 any phase except Job Removal. After Job Removal, the Get-Job-Attributes/Get-Document-Attributes and
 330 Get-Jobs/Get-Documents operations no longer are capable of returning any information about a
 331 job/document.

332 NOTE: The semantics of this attribute or the set of valid values may be different for different document

5.3 job-state-reasons (1setOf type2 keyword) <Job>

333 formats.

334 5.4 document-state-reasons (1setOf type2 keyword) <Document>

335 The REQUIRED "job-state-reasons" attribute provides additional information about the job's current
 336 state, i.e., information that augments the value of the job's "job-state" attribute. The OPTIONAL
 337 "document-state-reasons" attribute provides additional information about the document's current state, i.e.,
 338 information that augments the value of the document's "document-state" attribute. When the Printer
 339 supports the Document object, the Printer SHOULD support the same values for both the "job-state-
 340 reasons" and the "document-state-reasons" attribute for those attributes that are defined for both (indicated
 341 with "(JD)" below).

342 These values MAY be used with any job or document state or states for which the reason makes sense.
 343 Some of these value definitions indicate conformance requirements; the rest are OPTIONAL. Furthermore,
 344 when implemented, the Printer MUST return these values when the reason applies and MUST NOT return
 345 them when the reason no longer applies whether the value of the Job's "job-state" attribute or the
 346 Document's "document-state" attribute changed or not. When the Job or Document does not have any
 347 reasons for being in its current state, the value of the Job's "job-state-reasons" attribute or Document's
 348 "document-state-reasons" attribute MUST be 'none'.

349 Note: While values cannot be added to the "job-state" or "document-state" attributes without impacting
 350 deployed clients that take actions upon receiving "job-state" or "document-state" values, it is the intent that
 351 additional "job-state-reasons" and "document-state-reasons" values can be defined and registered without
 352 impacting such deployed clients. In other words, the "job-state-reasons" and the "document-state-reasons"
 353 attributes is-are intended to be extensible.

354 The following standard keyword values are defined for the "job-state-reasons" and/or "document-state-
 355 reasons" attributes as shown in Table 6. In Table 6 the keywords are listed in alphabetic order (ignoring
 356 the "[job-]" prefix), while in their descriptions following, they are listed in the most likely order of
 357 occurrence.

358 When the Document object is supported, the Printer implementation SHOULD still support the
 359 corresponding Job level "job-state-reasons", so that clients that do not support the Document object will
 360 receive the same information. Also it is usually more convenient for the client to obtain just the Job level
 361 status.

362 **Notation:**

363 [job-] indicates a state reason keyword value that shouldn't have had a "job-" prefix in its name in
 364 [RFC2911], so that the same value could also apply at the Document level as a "document-state-
 365 reasons" attribute value. Note: For the PWG Semantic Model, the "job-" prefix will be dropped.
 366 For purposes of sorting in Table 6, the "[job-]" prefix is ignored, since the PWG Semantic Model
 367 name is proposed without the prefix.

368
 369 ISSUE 07: Should we sort the attributes values including the [job-]? Currently the "job-" is
 370 ignored in the sort for attribute values.

371
 372 ISSUE 08: How will we register these attribute values with IANA, since they will be registered for
 373 IPP use, with the "job-" prefix. Do we add the ones without "job-" as aliases to the IANA registry
 374 as is done for charset registrations?

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 376
 377 "-" indicates that the Job or Document value is *not* defined.
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Table 6 - "job-state-reasons" and "document-state-reasons" attribute values

IPP Job Description / Document Description attribute name	IPP Attribute Syntax plus Values	Job	Doc	Printer conformance	Reference
job-state-reasons	1setOf type2 keyword	y	- ¹⁶	MUST	RFC2911 §4.3.8
document-state-reasons	1setOf type2 keyword	-	y	MUST	(new)
	'aborted-by-system'	y	y	MAY	RFC2911 §4.3.8
	'[job-]canceled-at-device'	y	y	MAY	RFC2911 §4.3.8
	'[job-]canceled-by-operator'	y	y	MAY	RFC2911 §4.3.8
	'[job-]canceled-by-user'	y	y	MAY	RFC2911 §4.3.8
	'[job-]completed-successfully'	y	y	MAY	RFC2911 §4.3.8
	'[job-]completed-with-errors'	y	y	MAY	RFC2911 §4.3.8
	'[job-]completed-with-warnings'	y	y	MAY	RFC2911 §4.3.8
	'compression-error'	y	y	MAY	RFC2911 §4.3.8
	'document-access-error'	y	y	MAY	RFC2911 §4.3.8
	'document-format-error'	y	y	MAY	RFC2911 §4.3.8
	'[job-]incoming'	y	y	MAY	RFC2911 §4.3.8
	'[job-]interpreting'	y	y	MAY	RFC2911 §4.3.8
	'job-data-insufficient'	y	-	MAY	RFC2911 §4.3.8
	'job-hold-until-specified'	y	-	MAY	RFC2911 §4.3.8
	'job-queued'	y	-	MAY	RFC2911 §4.3.8
	' <u>job-restartable</u> '	<u>y</u>	<u>-</u>	<u>MAY</u>	RFC2911 §4.3.8
	'job-resuming'	y	-	MAY	RFC2911 §4.3.8
	'job-suspended'	y	-	MAY	ops-set2 §9.1
	'none'	y	y	MUST	RFC2911 §4.3.8
	'[job-]outgoing'	y	y	MAY	RFC2911 §4.3.8
	'printer-stopped'	y	-	MAY	RFC2911 §4.3.8
	'printer-stopped-partly'	y	-	MAY	RFC2911 §4.3.8
	'[job-]printing'	y	y	MAY	RFC2911 §4.3.8
	'processing-to-stop-point'	y	-	MAY	RFC2911 §4.3.8
	' <u>queued-in-device</u> '	<u>y</u>	<u>y</u>	<u>MAY</u>	RFC2911 §4.3.8
	'[job-]queued-for-marker'	y	y	MAY	RFC2911 §4.3.8
	'resources-are-not-ready'	y	y	MAY	RFC2911 §4.3.8
	'resources-are-not-supported'	y	y	MAY	prod-print §6.1
	'service-off-line'	y	-	MAY	RFC2911 §4.3.8
	'submission-interrupted'	y	y	MAY	RFC2911 §4.3.8

¹⁶ The Document Description attribute that corresponds to the "job-state-reasons" Job Description attribute is the (new) "document-state-reasons" attribute.

IPP Job Description / Document Description attribute name	IPP Attribute Syntax plus Values	Job	Doc	Printer conformance	Reference
	'[job-]transforming'	y	y	MAY	RFC2911 §4.3.8
	'unsupported-compression'	y	y	MUST	RFC2911 §4.3.8
	'unsupported-document-format'	y	y	MUST	RFC2911 §4.3.8
	'[job-]warnings-detected'	y	y	MAY	override §7.1

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For ease of understanding, the following value descriptions are presented in the order in which the reasons are likely to occur (if implemented), starting with the 'none' 'job-incoming'-value. Note: The order is improved over that in [RFC2911]. The (JD), (J), and (D) notation is identical to the "Job" and "Doc" columns in Table 6 indicating whether the keyword is defined for the "job-state-reasons" and/or "document-state-reasons" attributes:

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'none' (JD): There are no reasons for the job's or document's current state. This state reason is semantically equivalent to "job-state-reasons" or "document-state-reasons" attribute without any value and MUST be used when there is no other value, since the 1setOf attribute syntax requires at least one value.

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'job-hold-until-specified' (J): The value of the job's "job-hold-until" attribute was specified with a time period that is still in the future. The job MUST NOT be a candidate for processing until this reason is removed and there are no other reasons to hold the job. This value SHOULD be supported if the "job-hold-until" Job Template attribute is supported.

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'resources-are-not-supported' (JD): At least one of the resources needed by the job/document, such as media, fonts, resource objects, etc., is not supported on any of the physical printers for which the job/document is a candidate. This condition MAY be detected when the job/document is accepted, or subsequently while the job/document is pending or processing, depending on implementation. The job/document may (1) remain in its current state, (2) be moved to the 'pending-held' state, depending on implementation and/or job scheduling policy, or (3) scheduled normally, but the Printer is put into the 'stopped' state when the job/document is attempted to be processed on the Printer. This value is intended for use with an implementation that supports the "user-defined-values-supported" Printer attribute (see [prod-print] section 6.1) which allows a job to be accepted with an unsupported 'name' value.

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'resources-are-not-ready' (JD): At least one of the resources needed by the job/document, such as media, fonts, resource objects, etc., is not ready on any of the physical printer's for which the job/document is a candidate. This condition MAY be detected when the job/document is accepted, or subsequently while the job/document is pending or processing, depending on implementation. The job/document may remain in its current state or be moved to the 'pending-held' state, depending on implementation and/or job/document scheduling policy.

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'[**job-**]incoming' (JD): Either (1) the Printer has accepted the Create-Job operation and is expecting additional Send-Document and/or Send-URI operations or (2) the Printer is retrieving/accepting document data as a result of a Print-Job, Print-URI, Send-Document or Send-URI operation.

- 415 'job-data-insufficient' (**J**): The Create-Job operation has been accepted by the Printer, but the Printer
416 is expecting additional document data before it can move the job into the 'processing' state.
417 If a Printer starts processing before it has received all data, the Printer removes the 'job-
418 data-insufficient' reason, but the 'job-incoming' remains. If a Printer starts processing after it
419 has received all data, the Printer removes the 'job-data-insufficient' reason and the 'job-
420 incoming' at the same time.
- 421 'unsupported-compression' (**JD**): The job/document was aborted by the system because the Printer
422 determined while attempting to decompress the document-data's that the compression is
423 actually not among those supported by the Printer. This value **MUST** be supported, since
424 "compressions is a **REQUIRED** operation attribute.
- 425 'compression-error' (**JD**): The job/document was aborted by the system because the Printer
426 encountered an error in the document-data while decompressing it. If the Printer posts this
427 reason, the document-data has already passed any tests that would have led to the
428 'unsupported-compression' job-state-reason/document-state-reason.
- 429 'document-access-error' (**JD**): After accepting a Print-URI or Send-URI request, the Printer could
430 not access one or more documents passed by reference. This reason is intended to cover any
431 file access problem, including file does not exist and access denied because of an access
432 control problem. The Printer **MAY** also indicate the document access error using the "job-
433 document-access-errors" Job Description attribute (see the description of "job-document-
434 access-errors" above). Whether the Printer aborts the job/document and moves the
435 job/document to the 'aborted' job state or prints all documents that are accessible and moves
436 the job/document to the 'completed' job/document state and adds the 'completed-with-errors'
437 value in the job's "job-state-reasons" or document's "document-state-reasons" attribute
438 depends on implementation and/or site policy. This value **SHOULD** be supported if the
439 Print-URI or Send-URI operations are supported.
- 440 'unsupported-document-format' (**JD**): The job/document was aborted by the system because the
441 document-data's document-format is not among those supported by the Printer. If the client
442 specifies the document-format as 'application/octet-stream', the printer **MAY** abort the
443 job/document and post this reason even though the format is a member of the "document-
444 format-supported" printer attribute, but not among the auto-sensed document-formats. This
445 value **MUST** be supported, since "document-format" is a **REQUIRED** operation attribute.
- 446 'document-format-error' (**JD**): The job/document was aborted by the system because the Printer
447 encountered an error in the document-data while processing it. If the Printer posts this
448 reason, the document-data has already passed any tests that would have led to the
449 'unsupported-document-format' job-state-reason/document-state-reason.
- 450 'submission-interrupted' (**JD**): The job or document was not completely submitted for some
451 unforeseen reason, such as: (1) the Printer has crashed before the job was closed by the
452 client, (2) the Printer or the document transfer method has crashed in some non-recoverable
453 way before the document data was entirely transferred to the Printer, (3) the client crashed
454 or failed to close the job before the time-out period. See the description of the "multiple-
455 operation-time-out" Printer attribute in [RFC2911] Section 4.4.3.1.
- 456 'job-outgoing' (**JD**): The Printer is transmitting the job/document to the output device.

- 457 'job-queued' (J): Job is in the 'processing' state, but more specifically, the Printer has queued the
458 document data.
- 459 '[job-]transforming' (JD): Job/document is in the 'processing' state, but more specifically, the Printer
460 is interpreting document data and producing another electronic representation.
- 461 '[job-]interpreting' (JD): Job/document is in the 'processing' state, but more specifically, the Printer
462 is interpreting the document data.
- 463 '[job-]queued-for-marker' (JD): Job/document is in any of the 'pending-held', 'pending', or
464 'processing' states, but more specifically, the Printer has completed enough processing of the
465 document to be able to start marking and the job/document is waiting for the marker.
466 Systems that require human intervention to release jobs using the Release-Job operation, put
467 the job into the 'pending-held' job state. Systems that automatically select a job to use the
468 marker put the job into the 'pending' job state or keep the job in the 'processing' job state
469 while waiting for the marker, depending on implementation. All implementations put the
470 job/document into (or back into) the 'processing' state when marking does begin.
- 471 '[job-]printing' (JD): The output device is marking media. This value is useful for Printers which
472 spend a great deal of time processing (1) when no marking is happening and then want to
473 show that marking is now happening or (2) when the job/document is in the process of being
474 canceled or aborted while the job/document remains in the 'processing' state, but the
475 marking has not yet stopped so that impression or sheet counts are still increasing for the
476 job/document.
- 477 'printer-stopped-partly' (J): The value of the Printer's "printer-state-reasons" attribute contains the
478 value 'stopped-partly'.
- 479 'printer-stopped' (J): The value of the Printer's "printer-state" attribute is 'stopped'.
- 480 'job-suspended' (J): The job has been suspended while processing using the Suspend-Current-Job
481 operation and other jobs can be processed on the Printer. The Job can be resumed using the
482 Resume-Job operation which removes this value. Note: Documents cannot be suspended
483 and there is no Suspend-Current-Documnet operation.
- 484 '[job-]canceled-by-user' (JD): The job/document was canceled by the owner of the job using the
485 Cancel-Job/Cancel-Documnet request, i.e., by a user whose authenticated identity is the
486 same as the value of the originating user that created the Job object, or by some other
487 authorized end-user, such as a member of the job owner's security group. This 'job-
488 canceled' value SHOULD be supported. The 'canceled-by-user' value SHOULD be
489 supported for the "document-state-reasons" attributes if the Cancel-Documnet operation is
490 supported.
- 491 '[job-]canceled-by-operator' (JD): The job/document was canceled by the operator using the
492 Cancel-Job/Cancel-Documnet request, i.e., by a user who has been authenticated as having
493 operator privileges (whether local or remote). If the security policy is to allow anyone to
494 cancel anyone's job/document, then these values may be used when the job/document is
495 canceled by other than the owner of the job. For such a security policy, in effect, everyone
496 is an operator as far as canceling jobs/documents is concerned. These values SHOULD be
497 supported if the implementation permits canceling by other than the owner of the job.

- 498 'job- canceled-at-device' (JD): The job/document was canceled by an unidentified local user, i.e., a
 499 user at a console at the device. This value SHOULD be supported if the implementation
 500 supports canceling jobs/documents at the console.
- 501 'aborted-by-system' (JD): The job/document (1) is in the process of being aborted, (2) has been
 502 aborted by the system and placed in the 'aborted' state, or (3) has been aborted by the system
 503 and placed in the 'pending-held' state, so that a user or operator can manually try the
 504 job/document again. This value SHOULD be supported.
- 505 'processing-to-stop-point' (J): The requester has issued a Cancel-Job/Cancel-Document operation or
 506 the Printer object has aborted the job/document, but is still performing some actions on the
 507 job/document until a specified stop point occurs or job/document termination/cleanup is
 508 completed.
 509 If the implementation requires some measurable time to cancel the job/document in the
 510 'processing' or 'processing-stopped' job/document states, the IPP object MUST use this value
 511 to indicate that the Printer object is still performing some actions on the job/document while
 512 the job/document remains in the 'processing' or 'processing-stopped' state. After all the
 513 job's/document's job/document description attributes have stopped incrementing, the Printer
 514 object moves the job/document from the 'processing' state to the 'canceled' or 'aborted'
 515 job/document states.
- 516 'service-off-line' (J): The Printer is off-line and accepting no jobs. All 'pending' jobs are put into
 517 the 'pending-held' state. This situation could be true if the service's or document transform's
 518 input is impaired or broken.
- 519 'job- warnings-detected' (JD): If the Printer supports these values, the Printer MUST add the value
 520 ~~it~~ to "job-state-reasons" / "document-state-reasons" when it generates the first warning
 521 message. That is, a single occurrence of this value is present in the "job-state-reasons" /
 522 "document-state-reasons" if the Printer has generated one or more warnings.
- 523 'job- completed-successfully' (JD): The job/document completed successfully. There were no
 524 warnings or errors in printing. This value SHOULD be supported.
- 525 'job- completed-with-warnings' (JD): The job/document completed with warnings. This value
 526 SHOULD be supported if the implementation detects warnings.
- 527 'job- completed-with-errors' (JD): The job/document completed with errors (and possibly
 528 warnings too) . This value SHOULD be supported if the implementation detects errors.
- 529 'job-restartable' (J): This job is retained (see the description of "job-state" above, specifically
 530 "Partitioning of Job States") and is currently able to be restarted using the Restart-Job
 531 operation (see [RFC2911] Section 3.3.7). If 'job-restartable' is a value of the job's "job-state-
 532 reasons" attribute, then the IPP object MUST accept a Restart-Job operation for that job.
 533 This value SHOULD be supported if the Restart-Job operation is supported.
- 534 'queued-in-device' (JD): The job/document has been forwarded to a device or print system that is
 535 unable to send back status. The Printer sets the job's/document's "job-state-" / "document-
 536 state" attribute to 'completed' and adds the 'queued-in-device' value to the job's/document's
 537 "job-state-reasons" / "document-state-reasons" attribute to indicate that the Printer has no
 538 additional information about the job/document and never will have any better information.
 539 See the description of the "job-state" / "document-state" attribute above, specifically the
 540 portion on "Forwarding Servers".

541 NOTE: The semantics of this attribute or the set of valid values may be different for different document
542 formats.

543 **6 Printer Description attributes**

544 TBD - one to list the Document Template keyword attribute names supported.

545 **ISSUE 09: What other Printer Description attributes are needed, if any?**

546 **7 References**

547 [coll]

548 deBry, R., Hastings, T., Herriot, R., Ocke, K., and P. Zehler, "Internet Printing Protocol (IPP): The
549 'collection' attribute syntax", <draft-ietf-ipp-collection-05.txt>, work in progress, July 17, 2001.

550 [job-prog]

551 Hastings, T., Lewis, H., and R. Bergman, "Internet Printing Protocol (IPP): Job Progress
552 Attributes", <draft-ietf-ipp-job-prog-03.txt> work in progress, July 17, 2001.

553 [ntfy]

554 Herriot, R., Hastings, T., Shepherd, M., deBry, R., Isaacson, S., Martin, J., and R. Bergman,
555 "Internet Printing Protocol/1.1: Event Notifications and Subscriptions", <draft-ietf-ipp-not-spec-
556 08.txt>, November 19, 2001.

557 [output-bin]

558 Hastings, T., and R. Bergman, "Internet Printing Protocol (IPP): output-bin attribute extension",
559 IEEE-ISTO 5100.2-2001, February 7, 2001, <ftp://ftp.pwg.org/pub/pwg/standards/pwg5100.2.pdf>.

560 [prod-print]

561 Ocke, K., Hastings, T., "Internet Printing Protocol (IPP): Production Printing Attributes - Set1",
562 IEEE-ISTO 5100.3-2001, February 12, 2001, <ftp://ftp.pwg.org/pub/pwg/standards/pwg5100.3.pdf>.

563 [rfc2911]

564 R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.1: Model and
565 Semantics", RFC 2911, September 2000.

566