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Internet Printing Protocol (IPP): Job Progress Attributes

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21 Abstract

22 This document defines four new Job Description attributes for monitoring job progress to be registered as
23 extensions to IPP/1.0 [RFC2566] and IPP/1.1 [RFC2911]. These attributes are drawn from the PWG Job
24 Monitoring MIB [rfc2707]. The new Job Description attributes are:

25 "job-collation-type" (type2 enum)
26 "sheet-completed-copy-number" (integer(0:MAX))
27 "sheet-completed-document-number" (integer(0:MAX))
28 "impressions-completed-current-copy" (integer(0:MAX))
29

30 This document also defines a new "sheet-collate" Job Template attribute to control sheet collation and to help
31 with the interpretation of the job progress attributes. These new attributes may also be used by themselves in
32 combination with the IPP/1.1 "job-impressions-completed" attribute as useful job progress monitoring
33 attributes and/or may be passed in an IPP Notification (see [ipp-ntfy]).

34

34 The full set of IPP documents includes:

35 Design Goals for an Internet Printing Protocol [RFC2567]

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

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

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

39 Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]

40 Mapping between LPD and IPP Protocols [RFC2569]

41 Internet Printing Protocol/1.0 & 1.1: Event Notification Specification [ipp-ntfy]

42

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

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

51 The "Internet Printing Protocol/1.1: Model and Semantics" document describes a simplified model with
52 abstract objects, their attributes, and their operations that are independent of encoding and transport. It
53 introduces a Printer and a Job object. The Job object optionally supports multiple documents per Job. It also
54 addresses security, internationalization, and directory issues.

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

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

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

67 The "Event Notification Specification" document defines OPTIONAL operations that allow a client to
68 subscribe to printing related events. Subscriptions include "Per-Job subscriptions" and "Per-Printer
69 subscriptions". Subscriptions are modeled as Subscription objects. Four other operations are defined for
70 subscription objects: get attributes, get subscriptions, renew a subscription, and cancel a subscription.

71

71

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88

89 1 New Job Template attribute

90 1.1 sheet-collate (type2 keyword)

91	+=====+=====+=====+		
92	Job Attribute	Printer: Default Value	Printer: Supported
93		Attribute	Values Attribute
94	+=====+=====+=====+		
95	sheet-collate	sheet-collate-default	sheet-collate-
96	(type2 keyword)	(type2 keyword)	supported (1setOf
97			type2 keyword)
98	+-----+-----+-----+		

99 This attribute specifies whether or not the media sheets of each copy of each printed document in a job are to
100 be in sequence, when multiple copies of the document are specified by the 'copies' attribute.

101 Standard keyword values are:

102 'uncollated': each print-stream sheet is printed a number of times in succession equal to the value of the
103 'copies' attribute, followed by the next print-stream sheet.

104 'collated': each copy of each document is printed with the print-stream sheets in sequence, followed by the
105 next document copy.

106 For example, suppose a document produces two media sheets as output, and "copies" is equal to '6'. For the
107 'uncollated' case, six copies of the first media sheet are printed followed by six copies of the second media
108 sheet. For the 'collated' case, one copy of each of the six sheets are printed followed by another copy of each
109 of the six media sheets.

110 Whether the effect of sheet collation is achieved by placing copies of a document in multiple output bins or in
111 the same output bin with implementation defined document separation is implementation dependent. Also
112 whether it is achieved by making multiple passes over the job or by using an output sorter is implementation
113 dependent.

114 Note: IPP/1.0 [RFC2566] and IPP/1.1 [RFC2911] is silent on whether or not sheets within documents are
115 collated. The "sheet-collate-supported" Printer attribute permits a Printer object to indicate whether or not it
116 collates sheets with each document and whether it allows the client to control sheet collation. An
117 implementation is able to indicate that it supports uncollated sheets, collated sheets, or both, using the
118 'uncollated', 'collated', or both 'uncollated' and 'collated' values, respectively.

119 This attribute is affected by "multiple-document-handling." The "multiple-document-handling" attribute
120 describes the collation of documents, and the "sheet-collate" attribute describes the semantics of collating
121 individual pages within a document. To better explain the interaction between these two attributes the term
122 "set" is introduced. A "set" is a logical boundary between the delivered media sheets of a printed job. For-

123 example, in the case of a ten page single document with collated pages and a request for 50 copies, each of
 124 the 50 printed copies of the document constitutes a "set." In the above example if the pages were uncollated,
 125 then 50 copies of each of the individual pages within the document would represent each "set".

126 The following table describes the interaction of "sheet-collate" with multiple document handling.

"sheet-collate"	"multiple-document-handling"	Semantics
'collated'	'single-document'	Each copy of the concatenated documents, with their pages in sequence, represents a "set."
'collated'	'single-document-new-sheet'	Each copy of the concatenated documents, with their pages in sequence, represents a "set."
'collated'	'separate-documents-collated-copies'	Each copy of each separate document, with its pages in sequence, represents a "set."
'collated'	'separate-documents-uncollated-copies'	Each copy of each separate document, with its pages in sequence, represents a "set."
'uncollated'	'single-document'	Each media sheet of the document is printed a number of times equal to the "copies" attribute; which constitutes a "set."
'uncollated'	'single-document-new-sheet'	Each media sheet of the concatenated documents is printed a number of times equal to the "copies" attribute; which constitutes a "set."
'uncollated'	'separate-documents-collated-copies'	This is a degenerate case, and the printer object MUST reject the job and return the status, "client-error-conflicting-attributes."
'uncollated'	'separate-documents-uncollated-copies'	This is a degenerate case, and the printer object MUST reject the job and return the status "client-error-conflicting-attributes."

127

128 From the above table it is obvious that the implicit value of the "sheet-collate" attribute in a printer that
 129 does not support the "sheet-collate" attribute, is 'collated.' The semantics of "multiple-document-handling"
 130 are otherwise nonsensical in the case of separate documents.

131 2 IPP Job Description attributes for monitoring Job Progress

132 The following IPP Job Description attributes are proposed to be added to IPP through the type2 registration
 133 procedures. They are useful for monitoring the progress of a job. They are also used at attributes in the
 134 notification content in a notification report [ipp-ntfy].

135 There are a number of Job Description attributes for monitoring the progress of a job. These objects and
 136 attributes count the number of K octets, impressions, sheets, and pages requested or completed. For
 137 impressions and sheets, "completed" means stacked, unless the implementation is unable to detect when each
 138 sheet is stacked, in which case stacked is approximated when processing of each sheet completes. There are
 139 objects and attributes for the overall job and for the current copy of the document currently being stacked.
 140 For the latter, the rate at which the various objects and attributes count depends on the sheet and document
 141 collation of the job.

142 Consider the following four Job Description attributes that are used to monitor the progress of a job's
143 impressions:

- 144 1. "job-impressions-completed" - counts the total number of impressions stacked for the job (see
145 [RFC2911] section 4.3.18.2)
- 146 2. "impressions-completed-current-copy" - counts the number of impressions stacked for the current
147 document copy
- 148 3. "sheet-completed-copy-number" - identifies the number of the copy for the current document being
149 stacked where the first copy is 1.
- 150 4. "sheet-completed-document-number" - identifies the current document within the job that is being
151 stacked where the first document in a job is 1. NOTE: this attribute SHOULD NOT be implemented
152 for implementations that only support one document per job.

153 For each of the three types of job collation, a job with three copies of two documents (1, 2), where each
154 document consists of 3 impressions, the four variables have the following values as each sheet is stacked for
155 one-sided printing:

156

156 **"job-collation-type" = 'uncollated-sheets(3)'**

157

"job-impressions-completed"	"impressions-completed-current-copy"	"sheet-completed-copy-number"	"sheet-completed-document-number"
0	0	0	0
1	1	1	1
2	1	2	1
3	1	3	1
4	2	1	1
5	2	2	1
6	2	3	1
7	3	1	1
8	3	2	1
9	3	3	1
10	1	1	2
11	1	2	2
12	1	3	2
13	2	1	2
14	2	2	2
15	2	3	2
16	3	1	2
17	3	2	2
18	3	3	2

158

159

159 **"job-collation-type" = 'collated-documents(4)'**

160

"job-impressions-completed"	"impressions-completed-current-copy"	"sheet-completed-copy-number"	"sheet-completed-document-number"
0	0	0	0
1	1	1	1
2	2	1	1
3	3	1	1
4	1	1	2
5	2	1	2
6	3	1	2
7	1	2	1
8	2	2	1
9	3	2	1
10	1	2	2
11	2	2	2
12	3	2	2
13	1	3	1
14	2	3	1
15	3	3	1
16	1	3	2
17	2	3	2
18	3	3	2

161

162

162 **"job-collation-type" = 'uncollated-documents(5)'**

163

"job-impressions- completed"	"impressions- completed-current- copy"	"sheet- completed-copy- number"	"sheet-completed- document- number"
0	0	0	0
1	1	1	1
2	2	1	1
3	3	1	1
4	1	2	1
5	2	2	1
6	3	2	1
7	1	3	1
8	2	3	1
9	3	3	1
10	1	1	2
11	2	1	2
12	3	1	2
13	1	2	2
14	2	2	2
15	3	2	2
16	1	3	2
17	2	3	2
18	3	3	2

164

165 **2.1 job-collation-type (type2 enum)**

166 Job Collation includes sheet collation and document collation. Sheet collation is defined to be the ordering of
 167 sheets within a document copy. Document collation is defined to be ordering of document copies within a
 168 multi-document job. The value of the "job-collation-type" is affected by the value of the "sheet-collate" Job
 169 Template attribute (see section 1.1), if supplied and supported.

170 The Standard enum values are:

171 '1' 'other': not one of the defined values

172

173 '2' 'unknown': the collation type is unknown

174

175 '3' 'uncollated-sheets': No collation of the sheets within each document copy, i.e., each sheet of a
 176 document that is to produce multiple copies is replicated before the next sheet in the
 177 document is processed and stacked. If the device has an output bin collator, the
 178 'uncollated-sheets(3)' value may actually produce collated sheets as far as the user is
 179 concerned (in the output bins). However, when the job collation is the 'uncollated-

180 sheets(3)' value, job progress is indistinguishable to a monitoring application between
181 a device that has an output bin collator and one that does not.

182
183 '4' 'collated-documents': Collation of the sheets within each document copy is performed within the
184 printing device by making multiple passes over either the source or an intermediate
185 representation of the document. In addition, when there are multiple documents per
186 job, the i'th copy of each document is stacked before the j'th copy of each document,
187 i.e., the documents are collated within each job copy. For example, if a job is
188 submitted with documents, A and B, the job is made available to the end user as: A,
189 B, A, B, The 'collated-documents(4)' value corresponds to the IPP [RFC2911]
190 'separate-documents-collated-copies' keyword value of the "multiple-document-
191 handling" attribute.

192
193 If the job's "copies" attribute is '1' (or not supplied), then the "job-collation-type"
194 attribute is defined to be '4'.

195
196 '5' 'uncollated-documents': Collation of the sheets within each document copy is performed within the
197 printing device by making multiple passes over either the source or an intermediate
198 representation of the document. In addition, when there are multiple documents per
199 job, all copies of the first document in the job are stacked before the any copied of
200 the next document in the job, i.e., the documents are uncollated within the job. For
201 example, if a job is submitted with documents, A and B, the job is mad available to
202 the end user as: A, A, ..., B, B, The 'uncollated-documents(5)' value
203 corresponds to the IPP [RFC2911] 'separate-documents-uncollated-copies'
204 keyword value of the "multiple-document-handling" attribute.

205 2.2 sheet-completed-copy-number (integer(0:MAX))

206 The number of the copy being stacked for the current document. This number starts at 0, is set to 1 when the
207 first sheet of the first copy for each document is being stacked and is equal to n where n is the nth sheet
208 stacked in the current document copy. If the value is unknown, the Printer MUST return the 'unknown' out-
209 of-band value (see [RFC2911] section 4.1), rather than the -2 value used in some MIBs [rfc2707].

210 2.3 sheet-completed-document-number (integer(0:MAX))

211 The ordinal number of the document in the job that is currently being stacked. This number starts at 0,
212 increments to 1 when the first sheet of the first document in the job is being stacked, and is equal to n where n
213 is the nth document in the job, starting with 1. If the value is unknown, the Printer MUST return the 'unknown'
214 out-of-band value (see [RFC2911] section 4.1), rather than the -2 value used in some MIBs [rfc2707].

215 Implementations that only support one document jobs SHOULD NOT implement this attribute.

2.4 impressions-completed-current-copy (integer(0:MAX))

The number of impressions completed by the device for the current copy of the current document so far. For printing, the impressions completed includes interpreting, marking, and stacking the output. For other types of job services, the number of impressions completed includes the number of impressions processed. If the value is unknown, the Printer MUST return the 'unknown' out-of-band value (see [RFC2911] section 4.1), rather than the -2 value used in some MIBs [rfc2707].

This value SHALL be reset to 0 for each document in the job and for each document copy.

3 Conformance Requirements

This section summarizes the Conformance Requirements detailed in the definitions in this document. In general each of the attributes defined in this document are OPTIONAL for a Printer to support, so that Printer implementers MAY implement any combination of attributes.

4 IANA Considerations

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

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

4.1 Attribute Registrations

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

`ftp.isi.edu/iana/assignments/ipp/attributes/`

The registry entry will contain the following information:

Job Template attributes:	Ref.	Section:
<code>sheet-collate (type2 keyword)</code>	RFC NNNN	1.1
Job Description attributes:	Ref.	Section:
<code>job-collation-type (type2 enum)</code>	RFC NNNN	2.1
<code>sheet-completed-copy-number (integer(0:MAX))</code>	RFC NNNN	2.2
<code>sheet-completed-document-number (integer(0:MAX))</code>	RFC NNNN	2.3
<code>impressions-completed-current-copy (integer(0:MAX))</code>	RFC NNNN	2.4

247 **5 Internationalization Considerations**

248 The IPP extensions defined in this document require the same internationalization considerations as any of the
249 Job Template and Job Descriptions attributes defined in IPP/1.1 [RFC2911].

250 **6 Security Considerations**

251 The IPP extensions defined in this document require the same security considerations as any of the Job
252 Template attributes and Job Descriptions attributes defined in IPP/1.1 [RFC2911].

253 **7 References**

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