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Internet Printing Protocol (IPP):
Job Progress Attributes

12   Status of this Memo

22   **Abstract**

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

26   "job-collation-type" (type2 enum)
27   "sheet-completed-copy-number" (integer(0:MAX))
28   "sheet-completed-document-number" (integer(0:MAX))
29   "impressions-completed-current-copy" (integer(0:MAX))
30

31   This document also defines a new "sheet-collate" Job Template attribute to control sheet collation and to
32   help with the interpretation of the job progress attributes. These new attributes may also be used by
33   themselves in combination with the IPP/1.1 "job-impressions-completed" attribute as useful job progress
34   monitoring attributes and/or may be passed in an IPP Notification (see [ipp-ntfy]).
35

35 The full set of IPP documents includes:

36   Design Goals for an Internet Printing Protocol [RFC2567]
37   Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
38   Internet Printing Protocol/1.1: Model and Semantics [ipp-mod]
39   Internet Printing Protocol/1.1: Encoding and Transport [ipp-pro]
40   Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]
41   Mapping between LPD and IPP Protocols [RFC2569]
42   Internet Printing Protocol/1.0 & 1.1: Event Notification Specification [ipp-ntfy]

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
45 included in a printing protocol for the Internet. It identifies requirements for three types of users: end
46 users, operators, and administrators. It calls out a subset of end user requirements that are satisfied in
47 IPP/1.0. A few OPTIONAL 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
50 IPP specification documents, and gives background and rationale for the IETF working group's major
51 decisions.

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

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

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

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

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

73

73

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89

1   New Job Template attribute

1.1   "sheet-collate" (type2 keyword)

```
+==================+=====================+=====================+
| Job Attribute    |Printer: Default Value|  Printer: Supported |
|                  |      Attribute       |   Values Attribute  |
+==================+=====================+=====================+
| sheet-collate    | sheet-collate-default| sheet-collate-      |
| (type2 keyword)  | (type2 keyword)      |  supported (1setOf  |
|                  |                      |    type2 keyword)   |
+------------------+---------------------+---------------------+
```

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

Standard keyword values are:

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

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

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

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

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

This attribute is affected by "multiple-document-handling." The "multiple-document-handling" attribute describes the collation of documents, and the "sheet-collate" attribute describes the semantics of collating individual pages within a document. To better explain the interaction between these two attributes the term "set" is introduced. A "set" is a logical boundary between the delivered media sheets of a printed job. For-example, in the case of a ten page single document with collated pages and a request for 50 copies, each of the 50 printed copies of the document constitutes a "set." In the above example if the pages were uncollated, then 50 copies of each of the individual pages within the document would represent each "set".

128   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 sequence, represents a "set."
'collated'	'single-document-new-sheet'	Each copy of the concatenated documents, with their pages 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 "s
'uncollated'	'single-document-new-sheet'	Each media sheet of the concatenated documents is printed 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 reje 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 reje the job and return the status "client-error-conflicting-attributes."

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

132 2   IPP Job Description attributes for monitoring Job Progress

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

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

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

145   1. "job-impressions-completed" - counts the total number of impressions stacked for the job
146   (see [ipp-mod] section 4.3.18.2)

147   2. "impressions-completed-current-copy" - counts the number of impressions stacked for the
148   current document copy

149   3. "sheet-completed-copy-number" - identifies the number of the copy for the current document
150   being stacked where the first copy is 1.

151   4. "sheet-completed-document-number" - identifies the current document within the job that is
152   being stacked where the first document in a job is 1. NOTE: this attribute SHOULD NOT be
153   implemented for implementations that only support one document per job.

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

157

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

158

"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

159

160

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

161

"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

162

163

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

164

"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

165

166   ### *2.1 "job-collation-type" (type2 enum)*

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

171   The Standard enum values are:

172
173   '1'   'other': not one of the defined values

174
175   '2'   'unknown': the collation type is unknown

176
177   '3'   'uncollated-sheets': No collation of the sheets within each document copy, i.e., each sheet
178   of a document that is to produce multiple copies is replicated before the next sheet
179   in the document is processed and stacked. If the device has an output bin collator,
180   the 'uncollated-sheets(3)' value may actually produce collated sheets as far as the
181   user is concerned (in the output bins). However, when the job collation is the
182   'uncollated-sheets(3)' value, job progress is indistinguishable to a monitoring
183   application between a device that has an output bin collator and one that does not.
184

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

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

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

207   *2.2   "sheet-completed-copy-number" (integer(0:MAX))*

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

213   *2.3   "sheet-completed-document-number" (integer(0:MAX))*

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

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

220   *2.4   "impressions-completed-current-copy" (integer(0:MAX))*

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

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

227

3   Conformance Requirements

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

4   IANA Considerations

233   IANA will be called on to register the attributes defined in this document, using the procedures outlined
234   in [ipp-mod].

5   Internationalization Considerations

236   The IPP extensions defined in this document require the same internationalization considerations as any
237   of the Job Template and Job Descriptions attributes defined in IPP/1.1 [ipp-mod].

6   Security Considerations

239   The IPP extensions defined in this document require the same security considerations as any of the Job
240   Template attributes and Job Descriptions attributes defined in IPP/1.1 [ipp-mod].

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