                   Internet Printing Protocol (IPP):
                       Job Progress Attributes

Status of this Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

Abstract

   This document defines four new Job Description attributes for
   monitoring job progress to be registered as OPTIONAL extensions to
   the Internet Printing Protocol (IPP/1.0 and IPP/1.1). These
   attributes are drawn from the PWG Job Monitoring MIB. This document
   also defines a new "sheet-collate" Job Template attribute to control
   sheet collation and to help with the interpretation of the job
   progress attributes.

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[1](#) Introduction

   This document defines four new Job Description attributes for
   monitoring job progress to be registered as OPTIONAL extensions to
   IPP/1.0 [[RFC2566](#)] and IPP/1.1 [[RFC2911](#)]. These attributes are drawn
   from the PWG Job Monitoring MIB [[RFC2707](#)]. See [section 10](#) for a
   description of the base IPP documents. The new Job Description
   attributes are:

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

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

2 Terminology

This section defines terminology used throughout this document.

2.1 Conformance Terminology

Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD
NOT, MAY, NEED NOT, and OPTIONAL, have special meaning relating to
conformance, as defined in RFC 2119 [RFC2119] and [RFC2911] section
12.1. If an implementation supports the extension defined in this
document, then these terms apply; otherwise, they do not. These
terms define conformance to this document only; they do not affect
conformance to other documents, unless explicitly stated otherwise.

2.2 Other terminology

This document uses terms such as Job object (or Job), IPP Printer
object (or Printer), "operation", "attribute", "keyword", "support",
and "impression". These terms have special meaning and are defined
in the model terminology [RFC2911], section 12.2.

3 Job Template attributes

3.1 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 is 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 [RFC2911] are 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".

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".

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

4 IPP Job Description attributes for monitoring Job Progress

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

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

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

1. "job-impressions-completed" - counts the total number of
   impressions stacked for the job (see [RFC2911] section
   4.3.18.2).

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

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

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

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

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

"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

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

"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

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

"job-impressions-completed"	"impressions-completed-current-copy"	"sheet-completed-copy-t 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

[4.1](#) job-collation-type (type2 enum)

Job Collation includes sheet collation and document collation. Sheet
collation is defined to be the ordering of sheets within a document
copy. Document collation is defined to be the ordering of document
copies within a multi-document job. The value of the "job-
collation-type" is affected by the value of the "sheet-collate" Job
Template attribute (see [section 3.1](#)), if supplied and supported.

The Standard enum values are:

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

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

   '3' 'uncollated-sheets': No collation of the sheets within each
                document copy, i.e., each sheet of a document that
                is to produce multiple copies, is replicated before
                the next sheet in the document is processed and
                stacked. If the device has an output bin collator,
                the 'uncollated-sheets(3)' value may actually

produce collated sheets as far as the user is
concerned (in the output bins). However, when the
job collation is the 'uncollated-sheets(3)' value,
job progress is indistinguishable from a monitoring
application between a device that has an output bin
collator and one that does not.

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

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

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

4.2 **sheet-completed-copy-number (integer(0:MAX))**

The number of the copy being stacked for the current document. This
number starts at 0, is set to 1 when the first sheet of the first
copy for each document is being stacked and is equal to n where n is
the nth sheet stacked in the current document copy. 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].

4.3 **sheet-completed-document-number (integer(0:MAX))**

The ordinal number of the document in the job that is currently being
stacked. This number starts at 0, increments to 1 when the first
sheet of the first document in the job is being stacked, and is equal
to n where n is the nth document in the job, starting with 1. 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].

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

4.4 **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 MUST be reset to 0 for each document in the job and for
each document copy.

5 **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 client and/or a Printer
to support, so that client and Printer implementers MAY implement any
combination of these attributes.

6 IANA Considerations

This section contains registration information for IANA to add to the
IPP Registry according to the procedures defined in RFC 2911
[RFC2911], section 6. The resulting registrations will be published
in the http://www.iana.org/assignments/ipp-registrations registry.

6.1 Attributes

```
Job Template attributes:                           Ref.      Section:
sheet-collate (type2 keyword)                      RFC 3381     3.1
sheet-default (type2 keyword)                      RFC 3381     3.1
sheet-supported (1setOf type2 keyword)             RFC 3381     3.1

Job Description attributes:                         Ref.      Section:
job-collation-type (type2 enum)                    RFC 3381     4.1
sheet-completed-copy-number (integer(0:MAX))       RFC 3381     4.2
sheet-completed-document-number (integer(0:MAX))RFC 3381        4.3
impressions-completed-current-copy (integer(0:MAX))
                                                   RFC 3381     4.4
```

6.2 Keyword Attribute Values

The following table provides registration information for all of the
attributes defined in this document that have keyword values. These
keywords are to be registered according to the procedures defined in
RFC 2911 [RFC2911] section 6.1.

```
sheet-collate (type2 keyword)                      RFC 3381     3.1
  'uncollated'                                     RFC 3381     3.1
  'collated'                                       RFC 3381     3.1
sheet-collate-default (type2 keyword)              RFC 3381     3.1
  See "sheet-collate" attribute
sheet-collate-supported (1setOf type2 keyword)     RFC 3381     3.1
  See "sheet-collate" attribute
```

6.3 Enum Attribute Values

The following table provides registration information for all of the
attributes defined in this document that have enum values. These
enums are to be registered according to the procedures defined in RFC
2911 [RFC2911] section 6.1.

```
job-collation-type (type2 enum)                    RFC 3381     4.1
  '1'    'other'                                   RFC 3381     4.1
  '2'    'unknown'                                 RFC 3381     4.1
  '3'    'uncollated-sheets'                       RFC 3381     4.1
  '4'    'collated-documents'                      RFC 3381     4.1
  '5'    'uncollated-documents'                    RFC 3381     4.1
```

7 Internationalization Considerations

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

8 Security Considerations

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

9 References

9.1 Normative References

   [RFC2910]   Herriot, R., Butler, S., Moore, P. and R. Turner,
               "Internet Printing Protocol/1.1: Encoding and Transport",
               RFC 2910, September 2000.

   [RFC2911]   Hastings, T., Herriot, R., deBry, R., Isaacson, S. and P.
               Powell, "Internet Printing Protocol/1.1: Model and
               Semantics", RFC 2911, September 2000.

9.2 Informative References

   [RFC2565]   Herriot, R., Butler, S., Moore, P. and R. Turner,
               "Internet Printing Protocol/1.0: Encoding and Transport",
               RFC 2565, April 1999.

   [RFC2566]   deBry, R., Hastings, T., Herriot, R., Isaacson, S. and P.
               Powell, "Internet Printing Protocol/1.0: Model and
               Semantics", RFC 2566, April 1999.

   [RFC2567]   Wright, F.D., "Design Goals for an Internet Printing
               Protocol", RFC 2567, April 1999.

   [RFC2568]   Zilles, S., "Rationale for the Structure and Model and
               Protocol for the Internet Printing Protocol", RFC 2568,
               April 1999.

   [RFC2569]   Herriot, R., Hastings, T., Jacobs, N. and J. Martin,
               "Mapping between LPD and IPP Protocols", RFC 2569, April
               1999.

   [RFC2707]   Bergman, R., Hastings, T., Isaacson, S. and H. Lewis, "PWG
               Job Monitoring MIB - V1", RFC 2707, November 1999.

   [RFC3196]   Hastings, T., Manros, C., Zehler, P., Kugler, C. and H.
               Holst, "Internet Printing Protocol/1.1: Implementor's
               Guide", RFC 3196, November 2001.

   [ipp-ntfy] Herriot, R., Hastings, T., et. al., "Internet Printing
               Protocol (IPP): Event Notification and Subscriptions",
               Work in Progress.

10 Description of the Base IPP Documents

   The base set of IPP documents includes:

      Design Goals for an Internet Printing Protocol [RFC2567]
      Rationale for the Structure and Model and Protocol for the
      Internet Printing Protocol [RFC2568]
      Internet Printing Protocol/1.1: Model and Semantics [RFC2911]
      Internet Printing Protocol/1.1: Encoding and Transport [RFC2910]
      Internet Printing Protocol/1.1: Implementer's Guide [RFC3196]
      Mapping between LPD and IPP Protocols [RFC2569]

   The "Design Goals for an Internet Printing Protocol" document takes a
   broad look at distributed printing functionality, and enumerates
   real-life scenarios that help to clarify the features that need to be
   included in a printing protocol for the Internet. It identifies
   requirements for three types of users: end users, operators, and
   administrators. It calls out a subset of end user requirements that
   are satisfied in IPP/1.0 [RFC2566, RFC2565]. A few OPTIONAL operator
   operations have been added to IPP/1.1 [RFC2911, RFC2910].

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

   The "Internet Printing Protocol/1.1: Model and Semantics" document
   describes a simplified model with abstract objects, their attributes,
   and their operations. The model introduces a Printer and a Job. The
   Job supports multiple documents per Job. The model document also
   addresses how security, internationalization, and directory issues
   are addressed.

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

"application/ipp". This document defines the 'ipp' scheme for
identifying IPP printers and jobs.

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

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

In addition to the base IPP documents, the "Event Notification
Specification" document [ipp-ntfy] defines OPTIONAL operations that
allow a client to subscribe to printing related events.
Subscriptions include "Per-Job subscriptions" and "Per-Printer
subscriptions". Subscriptions are modeled as Subscription objects.
Four other operations are defined for subscription objects: get
attributes, get subscriptions, renew a subscription, and cancel a
subscription.

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    To subscribe to the ipp mailing list, send the following email:

       1) send it to majordomo@pwg.org
       2) leave the subject line blank
       3) put the following two lines in the message body:
             subscribe ipp
             end

    Implementers of this specification document are encouraged to join
    the IPP Mailing List in order to participate in any discussions of
    clarification issues and review of registration proposals for
    additional attributes and values. In order to reduce spam, the
    mailing list rejects mail from non-subscribers, so you must subscribe
    to the mailing list in order to send a question or comment to the
    mailing list.

12 Full Copyright Statement

Acknowledgement