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                 Internet Printing Protocol (IPP):
                    Job Progress Attributes

Status of this Memo

Abstract

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

The full 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 [ipp-mod]
  Internet Printing Protocol/1.1: Encoding and Transport [ipp-pro]
  Internet Printing Protocol/1.1: Implementer's Guide [ipp-iig]
  Mapping between LPD and IPP Protocols [RFC2569]
  Internet Printing Protocol/1.0 & 1.1: Event Notification
     Specification [ipp-ntfy]

The "Design Goals for an Internet Printing Protocol" document takes a
broad look at distributed printing functionality, and it 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. A few OPTIONAL operator operations have been
added to IPP/1.1.

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
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 that are independent of encoding and transport. It
introduces a Printer and a Job object. The Job object optionally
supports multiple documents per Job. It also addresses security,
internationalization, and directory issues.

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 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 a
new scheme named 'ipp' 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.

The "Event Notification Specification" document 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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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".

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-   This is a degenerate case, and the
              documents-   printer object MUST reject the job
              uncollated-   and return the status "client-error-
              copies   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.

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[2](#) 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 at 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 processing of each sheet completes.
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 [ipp-mod] 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-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

2.1 "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 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 1.1), 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 to 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 [ipp-mod] '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 the 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 mad available to the end user as: A, A, ...,
          B, B, ... The 'uncollated-documents(5)' value
          corresponds to the IPP [ipp-mod] 'separate-documents-
          uncollated-copies' keyword value of the "multiple-
          document-handling" attribute.

2.2 "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 [ipp-mod]

[section 4.1](#)), rather than the -2 value used in some MIBs [[rfc2707](#)].

[2.3](#) "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
[[ipp-mod](#)] [section 4.1](#)), rather than the -2 value used in some MIBs
[[rfc2707](#)].

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 [ipp-mod] 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

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

5 Internationalization Considerations

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

6 Security Considerations

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

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