IPP Job Extensions v2.0
(JOBEXT)

Status: Prototype

Abstract: This specification extends the Job management, monitoring, and processing capabilities of IPP.

This is a PWG Working Draft. For a definition of a "PWG Working Draft", see:


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## Table of Contents

1. Introduction .................................................................................................................. 9
   1.1 Document Natural Language and Character Set ..................................................... 9
   1.2 Attribute Fidelity ....................................................................................................... 9
   1.3 Rendering Optimizations ........................................................................................ 9
   1.4 Printing on a Specific Output Device ...................................................................... 9
   1.5 Results of Job/Document Processing ..................................................................... 9
   1.6 Job Scheduling and Lifecycle ................................................................................ 10
   1.7 Job Operations ........................................................................................................ 10
   1.8 Obsolete Attributes and Values .............................................................................. 10

2. Terminology ................................................................................................................ 11
   2.1 Conformance Terminology ......................................................................................
   2.2 Printing Terminology ............................................................................................... 11
   2.3 Protocol Role Terminology ..................................................................................... 11
   2.4 Other Terminology .................................................................................................. 12
   2.5 Acronyms and Organizations ................................................................................ 12

3. Requirements ............................................................................................................. 12
   3.1 Rationale ................................................................................................................ 12
   3.2 Use Cases ................................................................................................................ 13
       3.2.1 Print a Plain Text File ....................................................................................... 13
       3.2.2 Print a Document Using a Matching Size ......................................................... 13
       3.2.3 Force a Document to Print on a Specific Media Size ...................................... 13
       3.2.4 Print a Presentation with Best Quality ............................................................ 13
       3.2.5 Print Using a Specific Output Device ................................................................. 13
       3.2.6 Monitor Whether Jobs are Printed Correctly ..................................................... 13
       3.2.7 Hold a Job Until a Specific Date and Time ......................................................... 14
       3.2.8 Delay Output Until a Specific Time Period ........................................................ 14
       3.2.9 Submit a Variable Number of Documents in a Job ........................................... 14
       3.2.10 Cancel a Job After a Specific Time Period ...................................................... 14
       3.2.11 Cancel Multiple Jobs ....................................................................................... 14
       3.2.12 Resubmit a Job ................................................................................................. 14
       3.2.13 Retain Jobs for a Specific Time Period ............................................................ 14
       3.2.14 Keep Job History Information for a Specific Time Period ............................... 14
   3.3 Exceptions .............................................................................................................. 15
       3.3.1 Too Many Jobs on a Printer .............................................................................. 15
       3.3.2 Too Many Documents in a Job ......................................................................... 15
       3.4 Out of Scope ......................................................................................................... 15

4. New Operations ........................................................................................................... 16
   4.1 Cancel-Jobs ............................................................................................................. 16
       4.1.1 Cancel-Jobs Request ......................................................................................... 16
       4.1.2 Cancel-Jobs Response ....................................................................................... 17
   4.2 Cancel-My-Jobs ...................................................................................................... 17
       4.2.1 Cancel-My-Jobs Request ................................................................................ 17
       4.2.2 Cancel-My-Jobs Response .............................................................................. 18
   4.3 Close-Job ................................................................................................................. 18
4.3.1 Close-Job Request ................................................................. 19
4.3.2 Close-Job Response ............................................................ 19
4.4 Resubmit-Job ______________________________________________ 20
4.4.1 Resubmit-Job Request ....................................................... 21
4.4.2 Resubmit-Job Response ...................................................... 21
5. Attributes ................................................................................. 23
5.1 Operation Attributes .............................................................. 23
5.1.1 job-hold-until-time (dateTime) ............................................ 23
5.1.2 job-ids (1setOf integer(1:MAX)) ........................................ 23
5.1.3 job-mandatory-attributes (1setOf keyword) ....................... 23
5.2 Document and Job Status Attributes ...................................... 23
5.2.1 errors-count (integer(0:MAX)) ........................................... 23
5.2.2 print-content-optimize-actual (1setOf type2 keyword) ....... 24
5.2.3 warnings-count (integer(0:MAX)) ...................................... 24
5.3 Document and Job Template Attributes .................................. 24
5.3.1 output-device (name(127)) ................................................ 24
5.3.2 print-content-optimize (type2 keyword) ............................ 24
5.4 Job Template Attributes ......................................................... 24
5.4.1 job-cancel-after (integer(0:MAX)) ..................................... 24
5.4.2 job-delay-output-until (type2 keyword | name(MAX)) ......... 24
5.4.3 job-delay-output-until-time (dateTime) ................................. 25
5.4.4 job-hold-until-time (dateTime) ............................................. 25
5.4.5 job-retain-until (type2 keyword | name(MAX)) .................... 26
5.4.6 job-retain-until-interval (integer(0:MAX)) ........................ 26
5.4.7 job-retain-until-time (dateTime) .......................................... 26
5.5 Printer Description Attributes ............................................... 27
5.5.1 document-charset-default (charset) ...................................... 27
5.5.2 document-charset-supported (1setOf charset) ......................... 27
5.5.3 document-natural-language-default (naturalLanguage) ........ 27
5.5.4 document-natural-language-supported (1setOf naturalLanguage) 27
5.5.5 job-cancel-after-default (integer(0:MAX) | no-value) .......... 27
5.5.6 job-cancel-after-supported (rangeOfInteger(0:MAX)) .......... 27
5.5.7 job-creation-attributes-supported (1setOf keyword) ............ 27
5.5.8 job-delay-output-until-default (type2 keyword | name(MAX)). 28
5.5.9 job-delay-output-until-supported (1setOf (type2 keyword | name(MAX)))) ................................................................. 28
5.5.10 job-delay-output-until-time-supported (rangeOfInteger(0:MAX)) ........................................................................ 28
5.5.11 job-history-attributes-configured (1setOf keyword) .......... 28
5.5.12 job-history-attributes-supported (1setOf keyword) ........... 28
5.5.13 job-history-interval-configured (integer(0:MAX)) .............. 28
5.5.14 job-history-interval-supported (rangeOfInteger(0:MAX)) .... 28
5.5.15 job-ids-supported (boolean) .............................................. 29
5.5.16 job-mandatory-attributes-supported (boolean) ................. 29
5.5.17 job-retain-until-default (type2 keyword | name(MAX)) ....... 29
5.5.18 job-retain-until-interval-default (integer(0:MAX) | no-value) 29
5.5.19 job-retain-until-interval-supported (rangeOfInteger(0:MAX)) 29
5.5.20 job-retain-until-supported (1setOf (type2 keyword | name(MAX))) 29
5.5.21 job-retain-until-time-supported (rangeOfInteger(0:MAX)) ................................................................. 29
5.5.22 job-spooling-supported (type2 keyword) .................................................................................................. 29
5.5.23 media-col-database (1setOf collection) ..................................................................................................... 30
5.5.24 output-device-supported (1setOf name(127)) .......................................................................................... 31
5.5.25 print-content-optimize-default (type2 keyword) ......................................................................................... 31
5.5.26 print-content-optimize-supported (1setOf type2 keyword) ......................................................................... 31
5.5.27 which-jobs-supported (1setOf type2 keyword) .......................................................................................... 31
5.6 Printer Status Attributes .................................................................................................................................. 31
5.6.1 printer-detailed-status-messages (1setOf text(MAX)) .................................................................................... 31
6. Additional Semantics for Existing Operations ................................................................................................... 32
6.1 Create-Job, Print-Job, Print-URI, Validate-Job: job-mandatory-attributes ......................................................... 32
6.2 Create-Job, Print-Job, Print-URI: server-error-too-many-jobs Status Code ....................................................... 32
6.3 Get-Jobs Operation: "job-ids (1setOf integer(1:MAX))" .................................................................................. 32
6.4 Hold-Job Operation: "job-hold-until-time (dateTime)" .................................................................................... 32
6.5 Print-Job, Print-URI, Send-Document, Send-URI: server-error-too-many-documents Status Code ............... 33
6.6 Set-Job-Attributes Operation: "job-hold-until-time (dateTime)" ...................................................................... 33
7. Additional Values for Existing Attributes ........................................................................................................... 33
7.1 job-state-reasons (1setOf type2 keyword) ....................................................................................................... 33
7.2 media (type2 keyword | name(MAX)) ............................................................................................................... 34
7.3 media-col (collection) ......................................................................................................................................... 34
7.3.1 media-grain (type2 keyword | name(MAX)) ................................................................................................. 34
7.3.2 media-thickness (integer(1:MAX)) ................................................................................................................ 34
7.3.3 media-tooth (type2 keyword | name(MAX)) .................................................................................................. 34
7.4 pdl-override-supported (type2 keyword) .......................................................................................................... 35
7.5 which-jobs (type2 keyword) .......................................................................................................................... 35
8. New Status Codes .................................................................................................................................................. 36
8.1 server-error-too-many-jobs (0x050B) ................................................................................................................ 36
8.2 server-error-too-many-documents (0x050C) ..................................................................................................... 36
9. Obsolete Attributes ................................................................................................................................................. 37
9.1 Obsolete Operation Attributes ......................................................................................................................... 37
9.2 Obsolete Job Status Attributes ........................................................................................................................ 37
9.3 Obsolete Job Template Attributes .................................................................................................................. 38
9.4 Obsolete Printer Description Attributes .......................................................................................................... 38
10. Obsolete Values ..................................................................................................................................................... 39
10.1 Obsolete "job-state-reasons" Values ................................................................................................................ 39
11. Conformance Requirements ................................................................................................................................ 39
11.1 Printer Conformance Requirements ................................................................................................................ 39
11.2 Client Conformance Requirements ................................................................................................................ 39
12. Internationalization Considerations .................................................................................................................. 39
13. Security Considerations ....................................................................................................................................... 40
14. IANA Considerations ........................................................................................................................................... 41
14.1 Attribute Registrations ...................................................................................................................................... 41
14.2 Attribute Keyword Value Registrations .......................................................................................................... 43
14.3 Type2 enum Registrations .................................................................................................................................. 45
14.4 Operation Registrations .................................................................................................................................... 45
List of Tables

Table 1 - Obsolete Operation Attributes ........................................................................ 37
Table 2 - Obsolete Job Status Attributes ........................................................................ 37
Table 3 - Obsolete Job Template Attributes .................................................................. 38
Table 4 - Obsolete Printer Description Attributes ......................................................... 38
1. Introduction

This specification extends the Job management, monitoring, and processing capabilities of IPP. This specification obsoletes portions of the previous version of this specification [PWG5100.7-2003] - a list of changes can be found in section 15. This specification also incorporates the relevant portions of the obsolete IPP Job and Printer Extensions - Set 2 [PWG5100.11-2010] specification.

1.1 Document Natural Language and Character Set

Certain Document formats are ambiguous about the natural language and character set used in a file. The Internet Printing Protocol/1.1 [STD92] defines the "document-natural-language" operation attribute to specify the natural language in Document Creation operations, but does not provide a way to specify the character set. In addition, there is no way for a Client to discover which languages and character sets are supported by a Printer for a given Document format. This specification defines attributes for specifying and discovering supported languages and character sets.

1.2 Attribute Fidelity

The Internet Printing Protocol/1.1 [STD92] defines the "ipp-attribute-fidelity" operation attribute to enforce the fidelity of all attributes in the Job Creation request. This specification defines an operation attribute to enforce the fidelity of a subset of attributes in the Job Creation request.

1.3 Rendering Optimizations

Most Printers are able to optimize output for different kinds of Document data, for example using a higher resolution for black text and lines, however the Internet Printing Protocol/1.1 [STD92] only defines the "print-quality" and "printer-resolution" Job Template attributes that specify the overall quality and resolution of the output. This specification defines an attribute with corresponding values for specifying the type of optimizations to perform.

1.4 Printing on a Specific Output Device

The Internet Printing Protocol/1.1 [STD92] defines the "output-device-assigned" Job Status attribute but does not define corresponding Job Template or Printer Description attributes for specifying which Output Device to use for a Job.

1.5 Results of Job/Document Processing

The Internet Printing Protocol/1.1 [STD92] defines some Job Status attributes and values but none of them provide information about processing issues that do not prevent a Job or...
Document from being printed. This specification defines attributes and values for discovering those processing issues.

1.6 Job Scheduling and Lifecycle

The Internet Printing Protocol/1.1 [STD92] defines the "job-hold-until (keyword | name(MAX))" Job Template attribute to hold a Job for processing until a named time period. This specification defines an additional Job Template attribute that holds the Job for processing until the specified date and time.

This specification also includes the "job-delay-output-until (keyword | name(MAX))" and "job-delay-output-unti-time (dateTime)" Job Template attributes [PWG5100.11-2010] that delay output of a Job until the specified time.

In addition, this specification defines Job Template attributes to schedule when a pending Job is canceled automatically, Job Template attributes to specify when a Job should transition from the retained phase to the history phase, and Printer Description attributes to specify how long a Job stays in the history phase.

1.7 Job Operations

The Internet Printing Protocol/1.1 [STD92] defines many operations that operate on a single Job object. This specification defines new operations that:

- Cancel all Jobs on a given Printer;
- Cancel all Jobs owned by a User on a given Printer;
- Close a Job in the 'pending' state that is still open for additional Document submissions; and
- Resubmit an existing Job for processing as a new Job, potentially with different Job Template attributes and values.

This specification also extends the Get-Jobs operation to support additional values for the "which-jobs" operation attribute.

1.8 Obsolete Attributes and Values

The original version of this specification [PWG5100.7-2003] defines several attributes and values that have proven problematic from an interoperability and privacy standpoint. This specification obsoletes these attributes and values.
2. Terminology

2.1 Conformance Terminology

Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD, SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as defined in Key words for use in RFCs to Indicate Requirement Levels [BCP14]. The term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement that applies when a specified condition is true.

The term DEPRECATED is used for previously defined and approved protocol elements that SHOULD NOT be used or implemented. The term OBSOLETE is used for previously defined and approved protocol elements that MUST NOT be used or implemented.

2.2 Printing Terminology

Normative definitions and semantics of printing terms are imported from the Internet Printing Protocol/1.1 [STD92].

Document: An object created and managed by a Printer that contains the description, processing, and status information. A Document object may have attached data and is bound to a single Job.

Job: An object created and managed by a Printer that contains description, processing, and status information. The Job also contains zero or more Document objects.

Logical Device: a print server, software service, or gateway that processes jobs and either forwards or stores the processed job or uses one or more Physical Devices to render output.

Output Device: a single Logical or Physical Device

Physical Device: a hardware implementation of an endpoint device, e.g., a marking engine, a fax modem, etc.

2.3 Protocol Role Terminology

This document also defines the following protocol roles to specify unambiguous conformance requirements:

Client: Initiator of outgoing connections and sender of outgoing operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

Printer: Listener for incoming connections and receiver of incoming operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one or more Physical Devices or a Logical Device.
2.4 Other Terminology

Completed Job: a Job in the 'aborted', 'canceled', or 'completed' state.

Document Creation Operation: operations that accept Document Content. Specifically:
Print-Job, Print-URI, Send-Document and Send-URI. Note: Print-Job and Print-URI are both Job Creation and Document Creation operations.

Job Creation Operation: operations that create Job objects, specifically: Print-Job, Print-URI, and Create-Job [STD92].

Not Completed Job: a Job in the 'pending', 'pending-held', 'processing', or 'processing-stopped' state.

Retained Job: a Completed Job whose attributes and Document data are still available to the Printer.

2.5 Acronyms and Organizations

IANA: Internet Assigned Numbers Authority, http://www.iana.org/


3. Requirements

3.1 Rationale

The Internet Printing Protocol/1.1 [STD92] defines many attributes and values for specifying how Jobs and Documents are processed by a Printer. Given the need for managing Jobs, specifying Job processing options, and retrieving processing status information, this specification should:

1. Define attributes and values that specify the Document character set and rendering optimizations;
2. Define an attribute for doing selective fidelity enforcement;
3. Define a media size for automatically printing Documents on the correct size;
4. Define attributes and values that allow a Client to discover the results of Document processing;
5. Define attributes for delaying the output from a Job until a specified time period;
6. Define attributes for holding a Job until a specified date and time;
7. Define attributes for retaining a Job for a specified time period;
8. Define attributes for configuring the Job history attributes and time period;
9. Define attributes for automatically canceling a Job after a specified time period;
10. Define operations for managing one or more Jobs; and
11. Define values that allow a Client to monitor specific groups of Jobs.

Rationale for the changes from the previous versions of this specification can be found in section 15.

### 3.2 Use Cases

#### 3.2.1 Print a Plain Text File

Jane has a plain text file report using a character set other than UTF-8 that she would like to print. She submits the file for printing using her Client software, which allows her to specify the exact character set used for the report.

#### 3.2.2 Print a Document Using a Matching Size

John is viewing a document in a web browser and decides to print it. He submits the file for printing from the browser which specifies the output should be formatted for US Letter or ISO A4 media, as available on the printer.

#### 3.2.3 Force a Document to Print on a Specific Media Size

Elizabeth has a contract that must be printed on US Legal media. She uses her Client software to submit the print job, specifying that US Legal size must be used with no substitutions.

#### 3.2.4 Print a Presentation with Best Quality

Bob wants to print a presentation. He submits the presentation for printing using his Client software, specifying that the output should be optimized for text and graphics.

#### 3.2.5 Print Using a Specific Output Device

Sally needs to print a poster on a specific output device. She uses her Client software to select the large format printer associated with the local print service and submit the poster for printing.

#### 3.2.6 Monitor Whether Jobs are Printed Correctly

Mary is the administrator for the office printers and wants to know whether users are having difficulty printing their documents. She uses Client software to query the history of jobs on each printer, including any errors or warnings that were encountered during processing.
3.2.7 Hold a Job Until a Specific Date and Time

John wants to withhold printing of a weekly newsletter until Monday morning. He uses his Client software to submit the print job with the correct date and time.

3.2.8 Delay Output Until a Specific Time Period

Bob has a large print job he would like printed overnight. He uses his Client software to submit the job for printing, specifying that output should not begin until 6pm.

3.2.9 Submit a Variable Number of Documents in a Job

Elizabeth has a print job that contains a variable number of documents for printing. She uses her Client software to create a new job and then add each document to the job. When she is sure she has all of the documents for the job, she uses her Client software to close the job so that the printer can begin processing the documents for printing.

3.2.10 Cancel a Job After a Specific Time Period

Sally operates a high-volume printer for her company. She configures the printer to automatically cancel any jobs that take longer than four hours to print so as to maintain the availability of the printer to other users.

3.2.11 Cancel Multiple Jobs

Bob needs to cancel a group of jobs that were incorrectly submitted to a printer. He uses his Client software to send a request to cancel a list of those jobs. The printer then cancels the jobs all at once.

3.2.12 Resubmit a Job

Mary needs to reprint a job with different settings. She uses her Client software to pick a retained job on the printer, chooses the settings to use for the reprint, and submits the reprint request. The printer then makes a copy of the original job, substituting any new settings for the copied job.

3.2.13 Retain Jobs for a Specific Time Period

John's company needs to retain all print jobs for at least one year for legal reasons. He configures the printer with a default retention policy of one year, allowing users to specify longer periods of time as needed.

3.2.14 Keep Job History Information for a Specific Time Period

Bob's company needs to keep an accounting history of all print jobs for at least one year. He configures the printer to keep the job history for at least one year, including the job identifier, owner, name, and number of pages.
3.3 Exceptions

3.3.1 Too Many Jobs on a Printer
Jane has several documents to print for a meeting. While submitting the documents for printing from her Client software, the printer responds that there are too many queued jobs.

3.3.2 Too Many Documents in a Job
Bob is submitting multiple documents in a single job. While submitting the documents from his Client software, the printer responds that there are too many documents in the job.

3.4 Out of Scope
The following are considered out of scope for this specification:

1. Definition of new file formats; and
2. Definition of new protocol bindings.

3.5 Design Requirements
The design requirements for this specification are:

1. Define attributes for supported languages and character sets in Document data;
2. Define attributes and values to describe the kind of processing optimizations that should be performed on Document data;
3. Define an attribute to specify fidelity requirements;
4. Define attributes to select an Output Device for printing;
5. Define attributes and values to report processing errors and warnings;
6. Define attributes to hold Jobs until a specific date and time;
7. Define attributes to cancel Jobs after a specific time period;
8. Define attributes and values to retain Jobs for a specific time period;
9. Define an operation to close an open Job;
10. Define attributes and operations to cancel groups of Jobs;
11. Define an operation to resubmit a Job with new Job Template attributes; and
12. Define sections to register all attributes, values, and operations with IANA.
4. New Operations

4.1 Cancel-Jobs

This REQUIRED operation allows the Operator or Administrator for the Printer to cancel a list of Not Completed Jobs or all Not Completed Jobs on the Printer. This operation works like the Cancel-Job operation [STD92] except that it works on a number of Jobs at once. If the Printer cannot cancel all of the requested Jobs successfully, it MUST NOT cancel any and MUST return an error code along with the list of offending "job-id" values.

Access Rights: The authenticated user [STD92] performing this operation must be an Operator or Administrator of the Printer. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

4.1.1 Cancel-Jobs Request

The following groups of attributes are part of a Cancel-Jobs request.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Client MUST supply and the Printer MUST support both of these attributes.

"printer-uri" (uri):

The Client MUST supply and the Printer MUST support the "printer-uri" operation attribute which is the target Printer for the operation.

"job-ids" (1setOf integer(1:MAX)):

The Client MAY supply and the Printer MUST support this operation attribute which specifies the target Job(s) for the operation.

"requesting-user-name" (name(MAX)) and
"requesting-user-uri" (uri):

The Client SHOULD supply and the Printer MUST support these attributes.

"message" (text(127)):

The Client MAY supply and the Printer MAY support this attribute, which provides a message to the Operator. How or where to display this message to the Operator (if at all) is an implementation decision.
4.1.2 Cancel-Jobs Response

The following groups of attributes are part of Cancel-Jobs response.

Group 1: Operation Attributes

"attributes-charset" (charset) and "attributes-natural-language" (naturalLanguage):

The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or "detailed-status-message" (text(MAX)):

The Printer MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [STD92] for details on returning Unsupported Attributes.

4.2 Cancel-My-Jobs

This REQUIRED operation allows a User to cancel a list of Not Completed Jobs or all their own Not Completed Jobs on the Printer. This operation works like the Cancel-Job operation [STD92] except that it works on a number of Jobs at once. If the Printer cannot cancel all of the requested Jobs successfully, it MUST NOT cancel any and MUST return an error code along with the list of offending "job-id" values.

Access Rights: The authenticated user [STD92] performing this operation must be the Job owner. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

4.2.1 Cancel-My-Jobs Request

The following groups of attributes are part of a Cancel-My-Jobs request.

Group 1: Operation Attributes

"attributes-charset" (charset) and "attributes-natural-language" (naturalLanguage):

The Client MUST supply and the Printer MUST support both of these attributes.

"printer-uri" (uri):

The Client MUST supply and the Printer MUST support the "printer-uri" operation attribute which is the target Printer for the operation.
"job-ids" (1setOf integer(1:MAX)):

The Client MAY supply and the Printer MUST support this operation attribute which specifies the target Job(s) for the operation.

"requesting-user-name" (name(MAX)) and "requesting-user-uri" (uri):

The Client SHOULD supply and the Printer MUST support these attributes.

"message" (text(127)):

The Client MAY supply and the Printer MAY support this attribute, which provides a message to the Operator. How or where to display this message to the Operator (if at all) is an implementation decision.

4.2.2 Cancel-My-Jobs Response

The following groups of attributes are part of a Cancel-My-Jobs response.

Group 1: Operation Attributes

"attributes-charset" (charset) and "attributes-natural-language" (naturalLanguage):

The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or "detailed-status-message" (text(MAX)):

The Printer MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [STD92] for details on returning Unsupported Attributes.

4.3 Close-Job

This REQUIRED operation allows a Client to close a Job that was created using the Create-Job [STD92] operation. It is semantically similar to a Send-Document [STD92] operation with the "last-document" operation attribute supplied with a 'true' value with no Document data, except that the Printer MUST NOT add an additional Document object when accepting a Close-Job operation.

A Client SHOULD check whether the Printer supports the Close-Job operation by querying the values of the "operations-supported" [STD92] Printer Description attribute.
Access Rights: The authenticated user [STD92] performing this operation must be either the Job owner or an Operator or Administrator of the Printer. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.

4.3.1 Close-Job Request

The following attributes are part of a Close-Job request.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Client MUST supply and the Printer MUST support both of these attributes.

"printer-uri" (uri) and "job-id" (integer(1:MAX)):

The Client MUST supply and the Printer MUST support the "printer-uri" and "job-id" operation attributes which are the target Job for the operation.

"requesting-user-name" (name(MAX)) and
"requesting-user-uri" (uri):

The Client SHOULD supply and the Printer MUST support these attributes.

4.3.2 Close-Job Response

The following attributes are part of a Close-Job response.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or
"detailed-status-message" (text(MAX)):

The Printer MAY return one or both of these attributes.

Group 2: Unsupported Attributes

See [STD92] for details on returning Unsupported Attributes.

Group 3: Job Attributes
"job-state" (type1 enum):

The Printer MUST return the Job's REQUIRED "job-state" attribute. The value of this attribute along with the value of the "job-state-reasons" attribute is a "snapshot" of the new Job's state when the Printer returns the response.

"job-state-reasons" (1setOf type2 keyword):

The Printer MUST return the Job's REQUIRED "job-state-reasons" attribute.

"job-state-message" (text(MAX)):

The Printer SHOULD return the Job's RECOMMENDED "job-state-message" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "job-state-message" attribute is not supported and will not be returned in a subsequent Job query.

"number-of-intervening-jobs" (integer(0:MAX)):

The Printer SHOULD return the Job's RECOMMENDED "number-of-intervening-jobs" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "number-of-intervening-jobs" attribute is not supported and will not be returned in a subsequent Job query.

4.4 Resubmit-Job

This RECOMMENDED operation allows a Client to create a copy of a Retained Job and change or add attributes for the new Job. Once accepted, a Printer MUST create a new Job object and assign a unique "job-id" and "job-uri" value for the new Job, just as if the Client had sent a Create-Job request. Operation and Job Template attributes from the original Job are copied to the new Job unless overridden in the Resubmit-Job request. If any of the Documents in the Job were passed by reference (Print-URI or Send-URI), the Printer MUST re-fetch the data.

Printers MUST reject a Resubmit-Job request if the Job is not retained or is in the 'pending', 'pending-held', 'processing', or 'processing-stopped' states with the status 'client-error-not-possible'. Otherwise, the Printer returns a status code as defined for the Print-Job [STD92] operation.

Access Rights: The authenticated user [STD92] performing this operation must be either the Job owner or an Operator or Administrator of the Printer. Otherwise, the Printer MUST reject the operation and return 'client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as appropriate.
4.4.1 Resubmit-Job Request

The following attributes are part of a Resubmit-Job request.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Client MUST supply and the Printer MUST support both of these attributes.

"printer-uri" (uri) and "job-id" (integer(1:MAX)):

The Client MUST supply and the Printer MUST support the "printer-uri" and
"job-id" operation attributes which are the target Job for the operation.

"requesting-user-name" (name(MAX)) and
"requesting-user-uri" (uri):

The Client SHOULD supply and the Printer MUST support these attributes.

"ipp-attribute-fidelity" (boolean) or "job-mandatory-attributes" (1setOf keyword):

The Client MAY supply and the Printer MUST support either of these attributes.

Group 2: Job Template Attributes

The Client MAY supply and the Printer MUST support Job Template attributes to
apply to the newly created Job. The 'delete-attribute' out-of-band value MAY be
used to remove an attribute that was specified in the original Job.

4.4.2 Resubmit-Job Response

The following attributes are part of a Close-Job response.

Group 1: Operation Attributes

"attributes-charset" (charset) and
"attributes-natural-language" (naturalLanguage):

The Printer MUST return both of these attributes.

"status-message" (text(255)) and/or
"detailed-status-message" (text(MAX)):

The Printer MAY return one or both of these attributes.
Group 2: Unsupported Attributes

See [STD92] for details on returning Unsupported Attributes.

Group 3: Job Attributes

"job-id" (integer(1:MAX)):

The Printer MUST return the new Job's "job-id" attribute.

"job-state" (type1 enum):

The Printer MUST return the Job's REQUIRED "job-state" attribute. The value of this attribute along with the value of the "job-state-reasons" attribute is a "snapshot" of the new Job's state when the Printer returns the response.

"job-state-reasons" (1setOf type2 keyword):

The Printer MUST return the Job's REQUIRED "job-state-reasons" attribute.

"job-state-message" (text(MAX)):

The Printer SHOULD return the Job's RECOMMENDED "job-state-message" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "job-state-message" attribute is not supported and will not be returned in a subsequent Job query.

"job-uri" (uri):

The Printer MUST return the new Job's "job-uri" attribute.

"number-of-intervening-jobs" (integer(0:MAX)):

The Printer SHOULD return the Job's RECOMMENDED "number-of-intervening-jobs" attribute. If the Printer supports this attribute, then it MUST be returned in the response. If this attribute is not returned in the response, the Client can assume that the "number-of-intervening-jobs" attribute is not supported and will not be returned in a subsequent Job query.
5. Attributes

5.1 Operation Attributes

5.1.1 job-hold-until-time (dateTime)

This RECOMMENDED attribute specifies the date and time after which the Job MUST become a candidate for processing. Printers that support this attribute MUST support the "job-hold-until" [STD92] operation attribute.

Clients MUST NOT supply both the "job-hold-until-time" and "job-hold-until" [STD92] operation attributes in a Hold-Job request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

5.1.2 job-ids (1setOf integer(1:MAX))

This REQUIRED attribute specifies a list of "job-id" [STD92] values for the Cancel-Jobs (section 4.1), Cancel-My-Jobs (section 4.2), and Get-Jobs (section 6.1) operations.

5.1.3 job-mandatory-attributes (1setOf keyword)

This REQUIRED attribute identifies which Job Template attributes the Printer MUST support in the Job Creation request in order to accept the Job. The values are the names of Job Template attributes, for example, 'job-hold-until', 'copies', and 'media'. In order to identify a member attribute of a collection attribute, the keyword names of both the collection attribute and the member attribute are given separated by a period (.) character. For example, to make the “media” attribute of the “cover-front” collection attribute mandatory, supply the keyword value ‘cover-front.media’.

Note: As with "ipp.attribute-fidelity", the “job-mandatory-attributes” attribute does not determine whether the Printer overrides the PDL with the identified Job Template attributes, as that functionality is defined by the "pdl.override-supported" Printer Description attribute [STD92].

5.2 Document and Job Status Attributes

5.2.1 errors-count (integer(0:MAX))

This RECOMMENDED attribute reports the number of errors encountered processing the Job as a whole. An error is reported when some portion of the printed output is not present, such as a glyph encountered which isn’t in a Printer’s font or an image in a page was in a format that the Printer didn't support, though the Printer did support the overall Document format.
5.2.2 print-content-optimize-actual (1setOf type2 keyword)

This RECOMMENDED attribute reports the "print-content-optimize" value(s) that the Printer actually used to produce the Job.

5.2.3 warnings-count (integer(0:MAX))

This RECOMMENDED attribute reports the number of warnings encountered processing the Job as a whole. A warning is reported when no information is lost but the appearance of the printed output might not be as expected.

5.3 Document and Job Template Attributes

5.3.1 output-device (name(127))

This attribute requests a named Output Device for a Printer that fans-out to multiple devices. If omitted, the Printer selects the best Output Device for the Job in an implementation dependent manner.

5.3.2 print-content-optimize (type2 keyword)

This RECOMMENDED attribute specifies the type of content optimization to perform on the Document data. Keyword values specify the type of content to optimize, including:

- 'graphics': Graphs and line drawings.
- 'photo': Photographs.
- 'text': Text.
- 'text-and-graphics': Text and graphics.

5.4 Job Template Attributes

5.4.1 job-cancel-after (integer(0:MAX))

This RECOMMENDED attribute specifies the maximum number of seconds allowed for processing a Job. When specified, the Printer cancels the Job automatically if it cannot be completed within the specified timeframe. The completion timer does not begin until the Job enters the 'processing' state'.

5.4.2 job-delay-output-until (type2 keyword | name(MAX))

This RECOMMENDED attribute specifies a time period in the future when the Printer will produce the output for the Job. If the specified time period has not yet arrived, the Printer MUST set the Job's "job-state-reasons" value to 'job-delay-output-until-specified'. The Printer MUST NOT produce any output until the time period arrives but MAY perform pre-
processing. When the time period arrives, the Job MUST become a candidate for output, including any processing required to produce the output. The only way to alter the delay period for a Job is by using the Set-Job-Attributes [RFC3380] operation.

Standard keyword values for named time periods are:

- 'day-time': Delay output until daylight, typically 6am to 6pm.
- 'evening': Delay output until the evening, typically from 6pm to 12am.
- 'indefinite': Delay output indefinitely; the time period can be changed using the Set-Job-Attributes [RFC3380] operation.
- 'night': Delay output until the night, typically from 12am to 6am.
- 'no-delay-output': Do not delay the output.
- 'second-shift': Delay output until the second work shift, typically from 4pm to 12am.
- 'third-shift': Delay output until the third work shift, typically from 12am to 8am.
- 'weekend': Delay output until the weekend.

Clients MUST NOT supply both the "job-delay-output-until" and "job-delay-output-until-time" (section 5.4.3) Job Template attributes in a Job Creation request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

Note: Unlike the "job-hold-until" [STD92] Job Template attribute, the "job-delay-output-until" attribute does not cause the Job to enter the 'pending-held' state.

5.4.3 job-delay-output-until-time (dateTime)

This RECOMMENDED attribute specifies a date and time when the Printer will produce the output for the Job. If the specified time period has not yet arrived, the Printer MUST set the Job's "job-state-reasons" value to 'job-delay-output-until-specified'. The Printer MUST NOT produce any output until the time period arrives but MAY perform pre-processing. When the time period arrives, the Job MUST become a candidate for output, including any processing required to produce the output. The only way to alter the delay period for a Job is by using the Set-Job-Attributes [RFC3380] operation.

Clients MUST NOT supply both the "job-delay-output-until-time" and "job-delay-output-until" (section 5.4.2) Job Template attributes in a Job Creation request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

Note: Unlike the "job-hold-until-time" (section 5.4.4) Job Template attribute, the "job-delay-output-until-time" attribute does not cause the Job to enter the 'pending-held' state.
5.4.4 job-hold-until-time (dateTime)

This RECOMMENDED attribute specifies the date and time after which the Job MUST become a candidate for processing. Printers that support this attribute MUST support the "job-hold-until" [STD92] Job Template attribute.

Clients MUST NOT supply both the "job-hold-until-time" and "job-hold-until" [STD92] Job Template attributes in a Job Creation request. If a Client supplies both attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

5.4.5 job-retain-until (type2 keyword | name(MAX))

This RECOMMENDED attribute specifies how long the Job remains in the Job Retention phase of a Job's life cycle [STD92]. Standard values include:

- 'end-of-day': Retain the Job until the end of the current day.
- 'end-of-month': Retain the Job until the end of the current month.
- 'end-of-week': Retain the Job until the end of the current week.
- 'indefinite': Retain the Job indefinitely.
- 'none': Do not retain the Job.

Clients MUST NOT supply the "job-retain-until", "job-retain-until-interval" (section 5.4.6), and/or "job-hold-until-time" (section 0) Job Template attributes together in a Job Creation request. If a Client supplies more than one of these attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

5.4.6 job-retain-until-interval (integer(0:MAX))

This RECOMMENDED attribute specifies the number of seconds the Job remains in the Job Retention phase of a Job's life cycle [STD92].

Clients MUST NOT supply the "job-retain-until", "job-retain-until-interval", and/or "job-hold-until-time" (section 0) Job Template attributes together in a Job Creation request. If a Client supplies more than one of these attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

5.4.7 job-retain-until-time (dateTime)

This RECOMMENDED attribute specifies the date and time when the Job can leave the Job Retention phase of a Job's life cycle [STD92].

Clients MUST NOT supply the "job-retain-until" (section 5.4.5), "job-retain-until-interval" (section 5.4.6), and/or "job-hold-until-time" Job Template attributes together in a Job
Creation request. If a Client supplies more than one of these attributes, the Printer MUST reject the request and return the 'client-error-conflicting-attributes' status code.

5.5 Printer Description Attributes

5.5.1 document-charset-default (charset)

This CONDITIONALLY REQUIRED attribute specifies the default charset that the Printer will assume for charset-ambiguous Document formats when the Client omits the "document-charset" operation attribute [PWG5100.5]. Printers that support the "document-charset" operation attribute MUST support this attribute.

5.5.2 document-charset-supported (1setOf charset)

This CONDITIONALLY REQUIRED attribute lists the charsets that the Printer supports for charset-ambiguous Document formats. Printers that support the "document-charset" operation attribute [PWG5100.5] MUST support this attribute.

5.5.3 document-natural-language-default (naturalLanguage)

This CONDITIONALLY REQUIRED attribute specifies the default natural language that the Printer will assume for Document data when the Client omits the "document-natural-language" operation attribute [STD92]. Printers that support the "document-natural-language" attribute MUST support this attribute.

5.5.4 document-natural-language-supported (1setOf naturalLanguage)

This CONDITIONALLY REQUIRED attribute lists the natural languages supported for Printer-supported Document formats. Printers that support the "document-natural-language" attribute MUST support this attribute.

5.5.5 job-cancel-after-default (integer(0:MAX) | no-value)

This CONDITIONALLY REQUIRED attribute specifies the default value for the "job-cancel-after" (section 5.4.1) Job Template attribute. Printers that support the "job-cancel-after" attribute MUST support this attribute.

5.5.6 job-cancel-after-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the range of values supported for the "job-cancel-after" (section 5.4.1) Job Template attribute. Printers that support the "job-cancel-after" attribute MUST support this attribute.

5.5.7 job-creation-attributes-supported (1setOf keyword)

This REQUIRED attribute lists the names of the operation and Job Template attributes that can be sent in a Job Creation or Validate-Job request.
5.5.8 job-delay-output-until-default (type2 keyword | name(MAX))

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job-delay-output-until" (section 5.4.2) Job Template attribute. Printers that support the "job-delay-output-until" attribute MUST support this attribute.

5.5.9 job-delay-output-until-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "job-delay-output-until" (section 5.4.2) Job Template attribute. Printers that support the "job-delay-output-until" attribute MUST support this attribute.

5.5.10 job-delay-output-until-time-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the range of time values supported by the "job-delay-output-until-time" (section 5.4.3) Job Template attribute. Printers that support the "job-delay-output-until-time" attribute MUST support this attribute.

5.5.11 job-history-attributes-configured (1setOf keyword)

This REQUIRED attribute lists the Job attributes that will be retained in the history phase of each Job. IPP/1.1 [STD92] specifies that at least the "job-id", "job-printer-uri", "job-state", and "job-state-reasons" attributes MUST be retained in the history phase. Printers that support the "job-history-attributes-configured" (section N.M.P) attribute MUST support this attribute.

5.5.12 job-history-attributes-supported (1setOf keyword)

This REQUIRED attribute lists the Job attributes that can be retained in the history phase of each Job. Printers that support the "job-history-attributes-configured" (section N.M.P) attribute MUST support this attribute.

5.5.13 job-history-interval-configured (integer(0:MAX))

This REQUIRED attribute specifies the minimum number of seconds that a Job will remain in the history phase of its lifecycle [STD92]. Printers SHOULD have a default configured value of at least 60 seconds to allow Clients to discover the disposition of any Jobs that have reached a terminating state. Printers that support the "job-history-interval-configured" (section N.M.P) attribute MUST support this attribute.

5.5.14 job-history-interval-supported (rangeOfInteger(0:MAX))

This REQUIRED attribute specifies the range of values that are supported for the "job-history-interval-configured" Printer Description attribute. Printers that support the "job-history-interval-configured" (section N.M.P) attribute MUST support this attribute.
5.5.15 job-ids-supported (boolean)

This REQUIRED attribute specifies whether the "job-ids" operation attribute (section 5.1.2) is supported.

5.5.16 job-mandatory-attributes-supported (boolean)

This REQUIRED attribute specifies that the "job-mandatory-attributes" operation attribute (section 5.1.3) is supported. Printers MUST report a value of 'true' for this attribute.

5.5.17 job,retain-until-default (type2 keyword | name(MAX))

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job,retain-until" (section 5.4.5) Job Template attribute. Printers that support the "job,retain-until" attribute MUST support this attribute.

5.5.18 job,retain-until-interval-default (integer(0:MAX) | no-value)

This CONDITIONALLY REQUIRED attribute specifies the default value of the "job,retain-until-interval" (section 5.4.6) Job Template attribute. Printers that support the "job,retain-until-interval" attribute MUST support this attribute.

5.5.19 job,retain-until-interval-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the supported values of the "job,retain-until-interval" (section 5.4.6) Job Template attribute. Printers that support the "job,retain-until-interval" attribute MUST support this attribute.

5.5.20 job,retain-until-supported (1setOf (type2 keyword | name(MAX)))

This CONDITIONALLY REQUIRED attribute lists the supported values of the "job,retain-until" (section 5.4.5) Job Template attribute. Printers that support the "job,retain-until" attribute MUST support this attribute.

5.5.21 job,retain-until-time-supported (rangeOfInteger(0:MAX))

This CONDITIONALLY REQUIRED attribute specifies the supported values of the "job,retain-until-time" (section 5.4.7) Job Template attribute. Printers that support the "job,retain-until-time" attribute MUST support this attribute.

5.5.22 job-spooling-supported (type2 keyword)

This REQUIRED attribute specifies whether Jobs are spooled before the Document data is processed. The value of this attribute returned in a Get-Printer-Attributes response MAY depend on the "document-format" attribute supplied in the Get-Printer-Attributes request [STD92]. If the Printer does not support this attribute, then the spooling behavior is implementation dependent.
Standard keyword values include:

'automatic': The Printer chooses whether to process the Document data as it is received or after spooling (storage).

'spool': The printer processes the Document data after it has been spooled (stored).

'stream': The printer processes the Document data as it is received.

5.5.23 media-col-database (1setOf collection)

This REQUIRED attribute lists the set of pre-defined "media-col" collections available in the Printer's media database. This attribute is similar to “media-col-ready” [PWG5100.3] but returns the entire set of pre-defined "media-col" collections known by the Printer instead of just the media loaded in the Printer. If this attribute is supported, the members of the collections correspond to the supported members of the "media-col" [PWG5100.3] Job/Document Template attribute.

Because the number and size of values of this attribute can be very large, the Printer MUST NOT return this attribute in the response to the Get-Printer-Attributes operation unless the Client explicitly requests it by including the 'media-col-database' value in the "requested-attributes" [STD92] operation attribute.

In order to limit the number and size of values of this attribute, Printers MAY exclude the "media-source" and/or "media-type" member attributes from collection values when all values of the corresponding member attribute are supported when combined with the other member attributes and values.

For example, a Printer that supports ISO A4, ISO DL Envelope, US Letter, US Legal, and US #10 Envelope media, a single removable tray and a multi-purpose tray, and cardstock, envelopes, plain paper, labels, letterhead, and transparency media types might report the following attributes and values:

```plaintext
media-size-supported={...
media-source-supported='by-pass-tray','main','manual'
media-type-supported='cardstock','envelope','labels','stationery','stationery-letterhead','transparency'
media-col-database={
  /* ISO A4 cardstock only from manual feed */
  media-size={
    x-dimension=21000
    y-dimension=29700
  }
  media-source='manual'
  media-type='cardstock'
},
  /* ISO A4 transparency only from manual feed */
  media-size={
    x-dimension=21000
    y-dimension=29700
  }
```
930  }
931  media-source='manual'
932  media-type='transparency'
933  },{
934  /* ISO A4 plain paper from any source */
935  media-size={
936    x-dimension=21000
937    y-dimension=29700
938  }
939  media-type='stationery'
940  },{
941  /* ISO A4 letterhead from any source */
942  media-size={
943    x-dimension=21000
944    y-dimension=29700
945  }
946  media-type='stationery-letterhead'
947 },..., /* Lots of other values */

5.5.24 output-device-supported (1setOf name(127))

This CONDITIONALLY REQUIRED attribute lists the supported "output-device" values. Printers MUST support this attribute if the "output-device" Job Template attribute (section 5.3.1) is supported.

5.5.25 print-content-optimize-default (type2 keyword)

This CONDITIONALLY REQUIRED attribute specifies the default "print-content-optimize" (section 5.3.2) value. Printers that support the "print-content-optimize" attribute MUST support this attribute.

5.5.26 print-content-optimize-supported (1setOf type2 keyword)

This CONDITIONALLY REQUIRED attribute lists the supported "print-content-optimize" (section 5.3.2) values. Printers that support the "print-content-optimize" attribute MUST support this attribute.

5.5.27 which-jobs-supported (1setOf type2 keyword)

This REQUIRED attribute lists the supported values for the "which-jobs" operation attribute [STD92] that is used with the Get-Jobs operation [STD92].

5.6 Printer Status Attributes

5.6.1 printer-detailed-status-messages (1setOf text(MAX))

This attribute specifies additional detailed and technical information about the Printer, including information such as fault and warning messages, in the same way that the "job-detailed-status-messages" [STD92] Job Status attribute provides additional information.
6. Additional Semantics for Existing Operations

6.1 Create-Job, Print-Job, Print-URI, Validate-Job: job-mandatory-attributes

This specification extends the Create-Job, Print-Job, Print-URI, and Validate-Job operations to support the "job-mandatory-attributes" operation attribute (section 5.1.3) in the request sent by the Client, which specifies a list of Job Template attributes that MUST be supported by the Printer for the request to be accepted.

The Client MAY supply and the Printer MUST accept the “job-mandatory-attributes” operation attribute in any Job Creation or Validate-Job request.

The Printer MUST reject the Job Creation request if the Client supplies an unsupported Job Template attribute or value in the request that is included in this list of "job-mandatory-attributes" values.

If the Client supplies both the “job-mandatory-attributes” and "ipp-attribute-fidelity" operation attributes, the Printer MUST ignore the “job-mandatory-attributes" attribute.

6.2 Create-Job, Print-Job, Print-URI: server-error-too-many-jobs Status Code

This specification extends the Job Creation operations to return the 'server-error-too-many-jobs' status code value when the Printer is currently unable to create a new Job object.

6.3 Get-Jobs Operation: "job-ids (1setOf integer(1:MAX))"

The “job-ids” (section 5.1.2) operation attribute, if supplied, specifies a list of target Jobs to be returned in the response to a Get-Jobs [STD92] request. Printers MUST support it in Get-Jobs requests to limit the list of Jobs that are returned.

If the Client supplies the "job-ids" operation attribute in a Get-Jobs request, the Client MUST NOT also supply any of the following operation attributes in the same request: "limit", "my-jobs", or "which-jobs". If the Client does supply prohibited operation attributes, the Printer MUST reject the request and return the ‘client-error-conflicting-attributes' status code.

6.4 Hold-Job Operation: "job-hold-until-time (dateTime)"

The "job-hold-until-time" (section 5.1.1) operation attribute can be provided to specify a date and time when the Job will become a candidate for processing. Printers that support the
"job-hold-until-time" attribute and Hold-Job operation MUST support its use with the Hold-Job operation. If accepted, the "job-hold-until-time" operation attribute is copied to the Job, replacing any existing "job-hold-until" [STD92] or "job-hold-until-time" attribute.

Clients MUST NOT send both the "job-hold-until" [STD92] and "job-hold-until-time" operation attributes in a Hold-Job request. If both attributes are sent, Printers MUST reject the request and return the 'client-error-conflicting-attributes' status code.

6.5 Print-Job, Print-URI, Send-Document, Send-URI: server-error-too-many-documents Status Code

This specification extends the Document Creation operations to return the 'server-error-too-many-documents' status code value when the Printer is currently unable to create a new Document object.

6.6 Set-Job-Attributes Operation: "job-hold-until-time (dateTime)"

The "job-hold-until-time" (section 5.4.4) Job Template attribute can be provided to specify a date and time when the Job will become a candidate for processing. Printers that support the "job-hold-until-time" attribute and Set-Job-Attributes operation MUST support its use with the Set-Job-Attributes operation. If accepted, the "job-hold-until-time" operation attribute is copied to the Job, replacing any existing "job-hold-until" [STD92] or "job-hold-until-time" attribute.

Clients MUST NOT send both the "job-hold-until" [STD92] and "job-hold-until-time" Job Template attributes in a Set-Job-Attributes request. If both attributes are sent, Printers MUST reject the request and return the 'client-error-conflicting-attributes' status code.

7. Additional Values for Existing Attributes

7.1 job-state-reasons (1setOf type2 keyword)

This specification adds the following new keyword values for the "job-state-reasons" Job Status attribute [STD92]:

'digital-signature-did-not-verify': One or more documents in the Job contains a digital signature that could not be verified by the Printer.

'errors-detected': The Printer has detected one or more errors during processing of the Job.

'job-delay-until-specified': The Job's output is delayed because the "job-delay-output-until" or "job-delay-output-until-time" Job Template attribute was specified.
'warnings-detected': The Printer has detected one or more warnings during processing of the Job.

7.2 media (type2 keyword | name(MAX))

This specification adds the following new keyword value for the "media" Job Template attribute [STD92]:

'choice_iso_a4_210x297mm_na_letter_8.5x11in': Print using US Letter or ISO A4 media (whichever is available).

Note: The semantics of the 'choice' prefix are documented in the PWG Media Standardized Names v2.0 (MSN2) specification [PWG5101.1].

7.3 media-col (collection)

This specification adds the "media-grain", "media-thickness", and "media-tooth" member attributes to the "media-col" Job/Document Template attribute.

7.3.1 media-grain (type2 keyword | name(MAX))

This member attribute specifies the desired grain of the media being specified [ISO10175]. Grain affects the curl and the folding of the media. Some marking engines are sensitive to the resulting curl. Standard keyword values for "media-grain" include:

'x-direction': The direction of the paper fibers is in the cross-feed direction of the media.

'y-direction': The direction of the paper fibers is in the feed direction of the media.

7.3.2 media-thickness (integer(1:MAX))

This member attribute specifies the thickness of the media [JDF] in hundreds of millimeters (1/2540th of an inch).

7.3.3 media-tooth (type2 keyword | name(MAX))

This member attribute specifies the tooth (or roughness) of the media [ISO10175]. The tooth is particularly important for marking engines that use pens (e.g. plotters) to mark the media - the type of pen used matches the tooth of the media for best resolution.

Standard keyword values for "media-tooth" include:

'antique': Rougher than 'vellum' [JDF].

'calendared': Extra smooth or polished, uncoated paper [JDF].
'coarse': Rough finish.

'fine': Smoother finish than 'smooth'.

'linen': Finish like coarse woven cloth [JDF].

'medium': Regular finish.

'smooth': Smooth finish [JDF].

'stipple': Fine pebble finish [JDF].

'uncaledared': Rough, unpolished and uncoated papers [JDF].

'vellum': Slightly rough surface [JDF].

7.4 pdl-override-supported (type2 keyword)

This specification defines a new 'guaranteed' value for the "pdl-override-supported" [STD92] Printer Description attribute. This value indicates that the Printer guarantees that:

1. Document and/or Job Template attribute values take precedence over instructions of any form embedded anywhere in the Document data;

2. Document and/or Job Template attributes that have only a single supported value take precedence over instructions of any form embedded anywhere in the Document data, even if the attribute is not included in the Job or Document Creation request; and

3. No PDL instruction is performed that does not correspond to a current value in the corresponding "xxx-supported" Printer Description attribute.

If a Printer cannot honor the advertised "pdl-override-supported" value for a Job, it can abort the Job, stop the Printer, hold the Job, or substitute a supported value. This choice can be fixed by the implementation or configurable by the Administrator and can depend on the Document and/or Job Template attribute.

7.5 which-jobs (type2 keyword)

This specification adds the following new keyword values for the "which-jobs" operation attribute [STD92]:

'aborted': Any Job in the 'aborted' state.

'all': All Jobs regardless of state.

'canceled': Any Job in the 'canceled' state.
'pending': Any Job in the 'pending' state.

'pending-held': Any Job in the 'pending-held' state.

'processing': Any Job in the 'processing' state.

'processing-stopped': Any Job in the 'processing-stopped' state.

8. New Status Codes

This section defines additional status code values.

8.1 server-error-too-many-jobs (0x050B)

The Client has attempted to create a Job using any of the Job Creation operations which would exceed the capacity of the Printer. The Client can retry the unmodified request.

8.2 server-error-too-many-documents (0x050C)

The Client has attempted to create a Document using any of the Document Creation operations which would exceed the capacity of the Printer for this Job. The Client can retry the unmodified request.
9. Obsolete Attributes

9.1 Obsolete Operation Attributes
Table 1 lists the operation attributes from the previous version of this specification [PWG5100.7-2003] which are now obsolete.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>document-digital-signature (type2 keyword)</td>
<td>Not usable</td>
</tr>
<tr>
<td>document-format-details (1setOf collection)</td>
<td>Interoperability issues and privacy concerns</td>
</tr>
<tr>
<td>document-format-version (text(127))</td>
<td>Interoperability issues</td>
</tr>
</tbody>
</table>

9.2 Obsolete Job Status Attributes
Table 2 lists the Job Status attributes from the previous version of this specification [PWG5100.7-2003] which are now obsolete.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>compression-supported (type2 keyword)</td>
<td>Not usable</td>
</tr>
<tr>
<td>document-charset-supported (charset)</td>
<td>Superseded by PWG 5100.5</td>
</tr>
<tr>
<td>document-digital-signature-supplied (type2 keyword)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-format-details-supported (1setOf collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-format-supplied (mimeMediaType)</td>
<td>Superseded by PWG 5100.5</td>
</tr>
<tr>
<td>document-format-version-supplied (text(127))</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-message-supplied (text(MAX))</td>
<td>Superseded by PWG 5100.5</td>
</tr>
<tr>
<td>document-name-supplied</td>
<td>Superseded by PWG 5100.5</td>
</tr>
<tr>
<td>document-natural-language-supplied (naturalLanguage)</td>
<td>Superseded by PWG 5100.5</td>
</tr>
<tr>
<td>ipp-attribute-fidelity (boolean)</td>
<td>Only used at time of creation</td>
</tr>
<tr>
<td>job-copies-actual (integer(1:MAX))</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-cover-back-actual (collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-cover-front-actual (collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-actual (1setOf type2 enum)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-col-actual (1setOf collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-mandatory-attributes (1setOf keyword)</td>
<td>Only used at time of creation</td>
</tr>
<tr>
<td>output-device-actual (1setOf name(127))</td>
<td>Redundant</td>
</tr>
</tbody>
</table>
9.3 Obsolete Job Template Attributes

Table 3 lists the Job Templates attributes from the previous version of this specification [PWG5100.7-2003] which are now obsolete.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>job-copies (integer(1:MAX))</td>
<td>Interoperability issues</td>
</tr>
<tr>
<td>job-cover-back (collection)</td>
<td>Interoperability issues</td>
</tr>
<tr>
<td>job-cover-front (collection)</td>
<td>Interoperability issues</td>
</tr>
<tr>
<td>job-finishings (1setOf type2 enum)</td>
<td>Interoperability issues</td>
</tr>
<tr>
<td>job-finishings-col (1setOf collection)</td>
<td>Interoperability issues</td>
</tr>
</tbody>
</table>

9.4 Obsolete Printer Description Attributes

The following Printer Description attributes from the previous version of this specification [PWG5100.7-2003] which are now obsolete.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>document-digital-signature-default (type2 keyword)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-digital-signature-supported (1setOf type2 keyword)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-format-details-default (collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-format-details-supported (1setOf keyword)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-format-version-default (text(127))</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>document-format-version-supported (1setOf text(127))</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-copies-default (integer(1:MAX))</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-copies-supported (rangeOfInteger(1:MAX))</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-cover-back-default (collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-cover-back-supported (1setOf keyword)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-cover-front-default (collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-cover-front-supported (1setOf keyword)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-col-default (1setOf collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-col-ready (1setOf collection)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-col-supported (1setOf keyword)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-default (1setOf type2 enum)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-ready (1setOf type2 enum)</td>
<td>Obsolete parent attribute</td>
</tr>
<tr>
<td>job-finishings-supported (1setOf type2 enum)</td>
<td>Obsolete parent attribute</td>
</tr>
</tbody>
</table>
10. Obsolete Values

10.1 Obsolete "job-state-reasons" Values

The 'digital-signature-type-not-supported' and 'job-digital-signature-wait' keyword values from the previous version of this specification [PWG5100.7-2003] are now obsolete because the corresponding Job Template attribute is obsolete.

11. Conformance Requirements

11.1 Printer Conformance Requirements

In order for a Printer to claim conformance to this specification, a Printer MUST support:

1. The new operations defined in section 4;
2. The operation attributes defined in 5.1;
3. The Job Status attributes defined in section 5.2 that correspond to any supported Job Template attributes defined in section 5.3;
4. The Document Status attributes defined in section 5.2 that correspond to any supported Document Template attributes defined in section 5.3;
5. The Printer Description attributes defined in section 5.5 that correspond to any supported Document/Job Template attributes defined in section 5.3;
6. The additional semantics defined in section 6;
7. The additional values defined in section 7;
8. The internationalization considerations defined in section 12; and
9. The security considerations defined in section 13.

11.2 Client Conformance Requirements

In order for a Client to claim conformance to this specification, a Client MUST support:

1. The internationalization considerations defined in section 12; and
2. The security considerations defined in section 13.

12. Internationalization Considerations

For interoperability and basic support for multiple languages, conforming implementations MUST support:

1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8) [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
2. The Unicode Format for Network Interchange [RFC5198] which requires transmission of well-formed UTF-8 strings and recommends transmission of normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].
Unicode NFC is defined as the result of performing Canonical Decomposition (into base characters and combining marks) followed by Canonical Composition (into canonical composed characters wherever Unicode has assigned them).

**WARNING** – Performing normalization on UTF-8 strings received from Clients and subsequently storing the results (e.g., in Job objects) could cause false negatives in Client searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now 'hidden').

Implementations of this specification SHOULD conform to the following standards on processing of human-readable Unicode text strings, see:

- Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical
- Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping
- Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]
- Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences
- Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization
- Unicode Collation Algorithm [UTS10] – sorting
- Unicode Locale Data Markup Language [UTS35] – locale databases

Implementations of this specification are advised to also review the following informational documents on processing of human-readable Unicode text strings:

- Unicode Character Encoding Model [UTR17] – multi-layer character model
- Unicode Character Property Model [UTR23] – character properties
- Unicode Conformance Model [UTR33] – Unicode conformance basis

### 13. Security Considerations

The IPP extensions defined in this document require the same security considerations as defined in the Internet Printing Protocol/1.1 [STD92].

Implementations of this specification SHOULD conform to the following standard on processing of human-readable Unicode text strings, see:


Implementations of this specification are advised to also review the following informational document on processing of human-readable Unicode text strings:
Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

14. IANA Considerations

14.1 Attribute Registrations

The attributes defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

http://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

<table>
<thead>
<tr>
<th>Document Status attributes:</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>compression-supplied(obsolete) (type2 keyword)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-charset-supplied(obsolete) (charset)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-digital-signature-supplied(obsolete) (type2 keyword)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-format-details-supplied(obsolete) (1setOf collection)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-format-supplied(obsolete) (mimeMediaType)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-format-version-supplied(obsolete) (text(127))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-message-supplied(obsolete) (text(MAX))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-name-supplied(obsolete) (name(MAX))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-natural-language-supplied(obsolete) (naturalLanguage)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>errors-count (integer(0:MAX))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>output-device-actual(obsolete) (1setOf name(127))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>print-content-optimize-actual (1setOf type2 keyword)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>warnings-count (integer(0:MAX))</td>
<td>[PWG5100.7]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Document Template attributes:</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>output-device (name(127))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>print-content-optimize (type2 keyword)</td>
<td>[PWG5100.7]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Job Status attributes:</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>compression-supplied(obsolete) (type2 keyword)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-charset-supplied(obsolete) (charset)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-digital-signature-supplied(obsolete) (type2 keyword)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-format-details-supplied(obsolete) (1setOf collection)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-format-supplied(obsolete) (mimeMediaType)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-format-version-supplied(obsolete) (text(127))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-message-supplied(obsolete) (text(MAX))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-name-supplied(obsolete) (name(MAX))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>document-natural-language-supplied(obsolete) (naturalLanguage)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>errors-count (integer(0:MAX))</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>ipp-attribute-fidelity(obsolete) (boolean)</td>
<td>[PWG5100.7]</td>
</tr>
</tbody>
</table>
job-copies-actual(obsolete) (integer(1:MAX)) [PWG5100.7]
job-cover-back-actual(obsolete) (collection) [PWG5100.7]
job-cover-front-actual(obsolete) (collection) [PWG5100.7]
job-finishings-actual(obsolete) (isetOf type2 enum) [PWG5100.7]
job-finishings-col-actual(obsolete) (isetOf collection) [PWG5100.7]
job-mandatory-attributes(obsolete) (isetOf keyword) [PWG5100.7]
output-device-actual(obsolete) (isetOf name(127)) [PWG5100.7]
print-content-optimize-actual (isetOf type2 keyword) [PWG5100.7]
warnings-count (integer(0:MAX)) [PWG5100.7]

Job Template attributes: Reference
-----------------------------
job-cancel-after (integer(0:MAX)) [PWG5100.7]
job-copies(obsolete) (integer(1:MAX)) [PWG5100.7]
job-cover-back(obsolete) (collection) [PWG5100.7]
job-cover-front(obsolete) (collection) [PWG5100.7]
job-delay-output-until (type2 keyword | name(MAX)) [PWG5100.7]
job-delay-output-until-time (dateTime) [PWG5100.7]
job-hold-until-time (dateTime) [PWG5100.7]
job-finishings(obsolete) (isetOf type2 enum) [PWG5100.7]
job-finishings-col(obsolete) (isetOf collection) [PWG5100.7]
job-retain-until (type2 keyword | name(MAX)) [PWG5100.7]
job-retain-until-interval (integer(0:MAX)) [PWG5100.7]
job-retain-until-time (dateTime) [PWG5100.7]
output-device (name(127)) [PWG5100.7]
print-content-optimize (type2 keyword) [PWG5100.7]

Operation attributes: Reference
-------------------------------
document-digital-signature(obsolete) (type2 keyword) [PWG5100.7]
document-format-details(obsolete) (isetOf collection) [PWG5100.7]
document-format-version(obsolete) (text(127)) [PWG5100.7]
job-retain-until-time (dateTime) [PWG5100.7]
job-copies (isetOf integer(1:MAX)) [PWG5100.7]
job-mandatory-attributes (isetOf keyword) [PWG5100.7]

Printer Description attributes: Reference
----------------------------------------
document-charset-default (charset) [PWG5100.7]
document-charset-supported (isetOf charset) [PWG5100.7]
document-digital-signature-default(obsolete) (type2 keyword) [PWG5100.7]
document-digital-signature-supported(obsolete) (isetOf type2 keyword) [PWG5100.7]
document-format-details-default(obsolete) (collection) [PWG5100.7]
document-format-details-supported(obsolete) (isetOf keyword) [PWG5100.7]
document-format-version-default(obsolete) (text(127)) [PWG5100.7]
document-format-version-supported(obsolete) (isetOf text(127)) [PWG5100.7]
document-natural-language-default (naturalLanguage) [PWG5100.7]
document-natural-language-supported (isetOf naturalLanguage) [PWG5100.7]
job-cancel-after-default (integer(0:MAX) | no-value) [PWG5100.7]
job-cancel-after-supported (rangeOfInteger(0:MAX)) [PWG5100.7]
job-copies-default(obsolete) (integer(1:MAX)) [PWG5100.7]
1 job-copies-supported(obsolete) (rangeOfInteger(1:MAX)) [PWG5100.7]
2 job-cover-back-default(obsolete) (collection) [PWG5100.7]
3 job-cover-back-supported(obsolete) (1setOf keyword) [PWG5100.7]
4 job-cover-front-default(obsolete) (collection) [PWG5100.7]
5 job-cover-front-supported(obsolete) (1setOf keyword) [PWG5100.7]
6 job-creation-attributes-supported (1setOf keyword) [PWG5100.7]
7 job-delay-output-until-default (type2 keyword | name(MAX)) [PWG5100.7]
8 job-delay-output-until-interval-supported (rangeOfInteger(0:MAX)) [PWG5100.7]
9 job-delay-output-until-supported (1setOf (type2 keyword | name(MAX))) [PWG5100.7]
10 job-delay-output-until-time-supported (rangeOfInteger(0:MAX)) [PWG5100.7]
11 job-finishings-col-default(obsolete) (1setOf collection) [PWG5100.7]
12 job-finishings-col-ready(obsolete) (1setOf collection) [PWG5100.7]
13 job-finishings-col-supported(obsolete) (1setOf keyword) [PWG5100.7]
14 job-finishings-default(obsolete) (1setOf type2 enum) [PWG5100.7]
15 job-finishings-ready(obsolete) (1setOf type2 enum) [PWG5100.7]
16 job-finishings-supported(obsolete) (1setOf type2 enum) [PWG5100.7]
17 job-history-attributes-configured (1setOf keyword) [PWG5100.7]
18 job-history-attributes-supported (1setOf keyword) [PWG5100.7]
19 job-history-interval-configured (integer(0:MAX)) [PWG5100.7]
20 job-history-interval-supported (rangeOfInteger(0:MAX)) [PWG5100.7]
21 job-ids-supported (boolean) [PWG5100.7]
22 job-mandatory-attributes-supported (boolean) [PWG5100.7]
23 job-retain-until-default (type2 keyword | name(MAX)) [PWG5100.7]
24 job-retain-until-interval-supported (rangeOfInteger(0:MAX)) [PWG5100.7]
25 job-retain-until-supported (1setOf (type2 keyword | name(MAX))) [PWG5100.7]
26 job-retain-until-time-supported (rangeOfInteger(0:MAX)) [PWG5100.7]
27 job-spooling-supported (type2 keyword) [PWG5100.7]
28 media-col-database (1setOf collection) [PWG5100.7]
29 output-device-supported (1setOf name(127)) [PWG5100.7]
30 print-content-optimize-default (type2 keyword) [PWG5100.7]
31 print-content-optimize-supported (1setOf type2 keyword) [PWG5100.7]
32 which-jobs-supported (1setOf type2 keyword) [PWG5100.7]
33
34 Printer Status attributes:
35
36 printer-detailed-status-messages (1setOf text(MAX)) [PWG5100.7]

### 14.2 Attribute Keyword Value Registrations

The keyword values defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

```
http://www.iana.org/assignments/ipp-registrations
```

The registry entries will contain the following information:

<table>
<thead>
<tr>
<th>Attributes (attribute syntax)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keyword Attribute Value</td>
<td>----------</td>
</tr>
<tr>
<td>job-delay-output-until</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>(type2 keyword</td>
<td>name(MAX))</td>
</tr>
</tbody>
</table>
day-time
evening
indefinite
night
no-delay-output
second-shift
third-shift
weekend
job-delay-output-until-default (type2 keyword | name(MAX))
job-delay-output-until-supported (1setOf (type2 keyword | name(MAX)))
job-retain-until (type2 keyword | name(MAX))
end-of-day
end-of-month
end-of-week
indefinite
none
job-retain-until-default (type2 keyword | name(MAX))
job-retain-until-supported (1setOf (type2 keyword | name(MAX)))
job-state-reasons (1setOf type2 keyword)
digital-signature-did-not-verify
digital-signature-type-not-supported(obsolete)
errors-detected
job-delay-output-until-specified
job-digital-signature-wait(obsolete)
warnings-detected
media (type2 keyword | name(MAX))
choice_iso_a4_210x297mm_na_letter_8.5x11in
pdl-override-supported (type2 keyword)
guaranteed
print-content-optimize (type2 keyword)
graphics
photo
text
text-and-graphics
print-content-optimize-actual (1setOf type2 keyword)
print-content-optimize-default (type2 keyword)
print-content-optimize-supported (1setOf type2 keyword)
which-jobs (type2 keyword)
aborted
canceled
14.3 Type2 enum Registrations

The attributes defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

http://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

<table>
<thead>
<tr>
<th>Attributes (attribute syntax)</th>
<th>Enum Value</th>
<th>Enum Symbolic Name</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>operations-supported (isetOf type2 enum)</td>
<td>0x0038</td>
<td>Cancel-Jobs</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td></td>
<td>0x0039</td>
<td>Cancel-My-Jobs</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td></td>
<td>0x003A</td>
<td>Close-Job</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td></td>
<td>0x003B</td>
<td>Resubmit-Job</td>
<td>[PWG5100.7]</td>
</tr>
</tbody>
</table>

14.4 Operation Registrations

The operations defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

http://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

<table>
<thead>
<tr>
<th>Operation Name</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancel-Jobs</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Cancel-My-Jobs</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Close-Job</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Create-Job(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Hold-Job(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Print-Job(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Print-URI(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Resubmit-Job</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Send-Document(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Send-URI(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Set-Job-Attributes(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>Validate-Job(Extension)</td>
<td>[PWG5100.7]</td>
</tr>
</tbody>
</table>
14.5 Status Code Registrations

The status codes defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

http://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

<table>
<thead>
<tr>
<th>Value</th>
<th>Status Code Name</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0500:0x05FF</td>
<td>Server Error:</td>
<td>[PWG5100.7]</td>
</tr>
<tr>
<td>0x050B</td>
<td>server-error-too-many-jobs</td>
<td></td>
</tr>
<tr>
<td>0x050C</td>
<td>server-error-too-many-documents</td>
<td></td>
</tr>
</tbody>
</table>
15. Overview of Changes

15.1 IPP Job Extensions v2.0

The following changes were made to the previous version of this specification [PWG5100.7-2003]:

- A rationale section was added, including use cases, exceptions, and requirements;
- References now point to the current versions of dependent documents and specifications at the time of publication;
- Read-only attributes are now defined and registered as status attributes;
- A REQUIRED "job-mandatory-attributes-supported" Printer Description attribute has been added to indicate support for the "job-mandatory-attributes" Job Template attribute;
- The "job-hold-until-time" and "job-ids" operation attributes were moved from the OBSOLETE IPP Job and Printer Extensions - Set 3 [PWG5100.11-2010] specification;
- The "job-delay-output-until", "job-delay-output-until-time", and "job-hold-until-time" Job Template attributes were moved from the OBSOLETE IPP Job and Printer Extensions - Set 3 [PWG5100.11-2010] specification;
- The "job-creation-attributes-supported", "job-spooling-supported", "media-col-database", "printer-detailed-status-messages", and "which-jobs-supported" Printer attributes were moved from the OBSOLETE IPP Job and Printer Extensions - Set 3 [PWG5100.11-2010] specification;
- The "media-grain", "media-thickness", and "media-tooth" member attributes of the "media-col" Document/Job Template attribute were moved from the OBSOLETE IPP Job and Printer Extensions - Set 3 [PWG5100.11-2010] specification;
- RECOMMENDED "job,retain-until", "job,retain-until-interval", and "job,retain-until-time" Job Template attributes were added to control the Job Retention phase of a Job's lifecycle;
- REQUIRED "job-history-attributes-configured", "job-history-attributes-supported", "job-history-interval-configured", and "job-history-interval-supported" Printer Description attributes were added to control the Job History phase of a Job's lifecycle;
- The "document-charset" operation attribute and corresponding operation semantics are now defined in PWG 5100.5: IPP Document Object v1.1;
• The "document-digital-signature" operation attribute and corresponding Document Status, Job Status, and Printer Description attributes have been made obsolete because of interoperability issues;

• The "document-format-details" operation attribute and corresponding Document Status, Job Status, and Printer Description attributes have been made obsolete because of interoperability issues and privacy concerns;

• The "document-format-version" operation attribute and corresponding Document Status, Job Status, and Printer Description attributes have been made obsolete because of interoperability issues;

• The "job-copies" Job Template attribute and corresponding Job Status and Printer Description attributes have been made obsolete because of interoperability issues;

• The "job-cover-back" Job Template attribute and corresponding Job Status and Printer Description attributes have been made obsolete because of interoperability issues;

• The "job-cover-front" Job Template attribute and corresponding Job Status and Printer Description attributes have been made obsolete because of interoperability issues;

• The "job-finishings" Job Template attribute and corresponding Job Status and Printer Description attributes have been made obsolete because of interoperability issues;

• The "job-finishings-col" Job Template attribute and corresponding Job Status and Printer Description attributes have been made obsolete because of interoperability issues; and

• The 'digital-signature-type-not-supported' and 'job-digital-signature-wait' values for the "job-state-reasons" attribute have been made obsolete because of interoperability issues.

16. References

16.1 Normative References


<table>
<thead>
<tr>
<th>Citation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWG5100.5</td>
<td>M. Sweet, &quot;IPP Document Object v1.1&quot;, PWG 5100.5-YYYY, Month YYYY, <a href="https://ftp.pwg.org/pub/pwg/candidates/cs-ippdocobject11-YYYYMMDD-5100.5.pdf">pdf</a></td>
</tr>
<tr>
<td>UAX9</td>
<td>Unicode Consortium, “Unicode Bidirectional Algorithm”, UAX#9, May 2018, <a href="https://www.unicode.org/reports/tr9">html</a></td>
</tr>
<tr>
<td>UAX31</td>
<td>Unicode Consortium, &quot;Unicode Identifier and Pattern Syntax&quot;, UAX#31, June 2018, <a href="https://www.unicode.org/reports/tr31">html</a></td>
</tr>
<tr>
<td>UNICODE</td>
<td>Unicode Consortium, &quot;Unicode Standard&quot;, Version 11.0.0, June 2018, <a href="https://www.unicode.org/versions/Unicode11.0.0/">html</a></td>
</tr>
</tbody>
</table>
16.2 Informative References


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Send comments to the PWG IPP Mailing List:
ipp@pwg.org (subscribers only)

To subscribe, see the PWG web page:
http://www.pwg.org/

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.

The editors would like to especially thank the following individuals who also contributed significantly to the development of this document:

Tom Hastings (author of v1.0)
Peter Zehler (author of v1.0)
18. Change History

18.1 March 15, 2019

- Version: 2.0
- Section 2.1: OBSOLETED -> OBSOLETE
- Section 2.4: Cleaned out unused terms, added definitions of Completed Job, Not Completed Job, and Retained Job
- Sections 5 and 6: Updated conformance requirements

18.2 March 8, 2019

- Status: Prototype
- Abstract: Reworded for updated scope
- Section 1: Reworded for updated scope, added discussion of obsolete JPS2 bits moving here
- Section 2.1: Added definitions of OBSOLETED and DEPRECATED
- Section 3: Added rationale, use cases, and design requirements for attributes and operations from JPS2.
- New section 4 for operations from JPS2
- Section 5: Made most attributes RECOMMENDED, added job-creation-attributes-supported, job-delay-output-until-xxx, job-history-xxx, job-hold-until-time, job-ids, job-spooling-supported, media-col-database, printer-detail-status-messages from JPS2
- Section 5: Added new job-history-xxx and job-retain-until-xxx attributes
- New section 6 for additional semantics (imported from JPS2)
- Section 7: Added pdl-override-supported, which-jobs values, media-col member attributes.

18.3 October 23, 2018

- Status: Interim
• Updated references to the first version of 5100.7 to include year and exclude the full name.

• Abstract and intro: Clarified that this specification is defining attributes and values.

• Editorial changes

• Added reference to the MSN2 spec.

18.4 September 26, 2018

• Brought back the job-mandatory-attributes operation attribute, which is still needed.

• Added a rationale, use case, and design requirement for selective fidelity/job-mandatory-attributes.

• Added Additional Semantics and Operation Registrations sections for using job-mandatory-attributes with job creation/validation operations.

• Added Additional Semantics and Operation Registrations sections for returning the too-many-jobs/documents status codes.

18.5 September 25, 2018

Initial revision.