IPP Enterprise Printer Extensions (EPE)

Status: Initial

Abstract: This specification defines extensions to IPP/1.1 [STD92] for the Job Proof Print Feature and Job Storage Feature, and some similar IPP extensions to enable authenticated release workflows used in institutional IT environments serving a large number of users such as corporate businesses or universities.

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8. Printer Description Attributes

8.1 job-cancel-after-default (integer(1:MAX) | no-value)
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8.4 job-password-encryption-supported (1setOf (type2 keyword | name(MAX)))
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8.9 job-phone-number-default (uri)
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8.12 job-recipient-name-supported (boolean)
8.13 job-storage-supported (1setOf boolean)
8.14 job-storage-access-supported (1setOf type2 keyword)
8.15 job-storage-disposition-supported (1setOf type2 keyword)
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9. Additional Values and Semantics for Existing IPP Attributes

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1. Introduction

This specification defines Operation attributes, Job Template attributes, and Printer Description attributes summarized in Table 1 to add support for several new features to IPP as an extension to IPP/1.1 [STD92].

<table>
<thead>
<tr>
<th>Attribute Name (syntax)</th>
<th>Conformance</th>
</tr>
</thead>
<tbody>
<tr>
<td>job-cancel-after (integer(1:MAX))</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-cancel-after-default (integer(1:MAX)</td>
<td>no-value)</td>
</tr>
<tr>
<td>job-cancel-after-supported (rangeOfInteger(1:MAX))</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-password (octetString(255))</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-password-supported (integer(0:255))</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-password-action (type2 keyword)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-password-action-supported (1setOf type2 keyword)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-password-encryption (type2 keyword</td>
<td>name(MAX))</td>
</tr>
<tr>
<td>job-password-encryption-supported (1setOf (type2 keyword</td>
<td>name(MAX)))</td>
</tr>
<tr>
<td>job-password-length-supported (rangeOfInteger (0:255))</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-password-repertoire-configured (type2 keyword)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-password-repertoire-supported (1setOf type2 keyword)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-phone-number (uri)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-phone-number-default (uri)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-phone-number-supported (boolean)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-recipient-name (name(MAX))</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-recipient-name-default (name(MAX))</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-recipient-name-supported (boolean)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-storage (collection)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-storage-access-supported (1setOf type2 keyword)</td>
<td>RECOMMENDED</td>
</tr>
<tr>
<td>job-storage-disposition-supported (1setOf type2 keyword)</td>
<td>RECOMMENDED</td>
</tr>
</tbody>
</table>
2. Terminology

This section defines the following additional terms that are used throughout this document.

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 [RFC2119]. The term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement that applies when a specified condition is true.

2.2 Printing Terminology

Normative definitions and semantics of printing terms are imported from IETF Printer MIB v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1: Model and Semantics [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 a endpoint device, e.g., a marking engine, a fax modem, etc.

2.3 Protocol Role Terminology

This document also defines the following protocol roles in order 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 Job State Terminology

This document defines features that influence the trajectory of a Job through the various Job
states. The states defined for "job-state" [STD92] and the transitions between these states
are illustrated in Figure 1.

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

Job Retention: The phase when a Job is in its terminal state ('canceled', 'aborted', or
'completed') before it has been stripped of its Document data.

Job History: After the Job Retention phase expires for a Job, the Printer deletes the
Document data for the Job and the Job becomes part of the Job History. The Printer MAY
also delete any number of the Job attributes.

Job Removal: After the Job has remained in the Job History for an implementation-defined
time, such as when the number of Jobs exceeds a fixed number or after a fixed time period
(which MAY be zero seconds), the IPP Printer removes the Job from the system.

'pending': The Job is a candidate to start processing but is not yet processing.

'pending-held': The Job is not a candidate for processing for any number of reasons but will
return to the 'pending' state as soon as the reasons are no longer present.

'processing': The Job is a candidate to start processing but is not yet processing.

'processing-stopped': The Job is a candidate to start processing but is not yet processing.

'canceled': The Job has been canceled by a Cancel-Job operation or by some method out-of-band of IPP, the Printer has completed canceling the Job, and all Job Status attributes
have reached their final values for the Job.

'aborted': The Job has been aborted by the system, usually while the Job was in the
'processing' or 'processing-stopped' state, the Printer has completed aborting the Job, and
all Job Status attributes have reached their final values for the Job.

'completed': The Job has completed successfully or with warnings or errors after processing,
all of the Job Media Sheets have been successfully stacked in the appropriate output bin(s),
and all Job Status attributes have reached their final values for the Job.
Figure 1 - IPP Job States and Transitions
2.5 Other Terminology

**Document Creation Operations**: The operations that create Document objects: Print-Job, Print-URI, Send-Document and Sent-URI [STD92].

**Job Creation operation**: One of the operations that creates a Job object: Print-Job, Print-URI and Create-Job. The Restart-Job operation [STD92] is not considered a Job Creation operation, since the Printer re-uses the existing Job object. The Validate-Job operation is not considered a Job Creation operation because no Job object is created. Therefore, when a statement also applies to either the Restart-Job and/or the Validate-Job operation, they are mentioned explicitly.

**Job Instructions**: Information that affects how the Job and its associated documents are to be processed. This includes the Job Template Attributes, some Operation Request Attributes, and other attributes (such as defaults) that are applied to a job.

**Job Submission Operations**: The Job Submission Operations are the IPP operations that create Jobs and Documents: Print-Job, Print-URI, Create-Job, Send-Document and Send-URI [STD92].

**Password Protected Job**: The Job that has a password permanently attached to it to authorize its printing. The Printer challenges a User to provide the matching password to authorize printing the Job. If the Job is duplicated as during a Resubmit-Job operation or control panel-initiated reprinting, the password will be included in the new Job.

**Precedence**: The specification of the order or ranking of a series of instructions or attributes from multiple sources referring to the same functionality. See section 4.2 of this specification for a description of the Attribute Precedence model.

**Print-stream pages**: The sequence of pages according to the definition of pages in the language used to express the document data defined relative to the Input Document. See section 2.5 of [PWG5100.3] for more information.

**Production Printer**: A Printer that produces large quantities of high-quality output, that often requires operator participation to make decisions as to the choice of job and its parameters.

**Proof Print Job**: A Proof Print Job is a Retained Job that the Printer retains (until removed by a Delete-Job or Purge-Jobs operation or aged out by the Printer using a different policy than for ordinary completed Jobs) after printing a proof so that a copy of it can be printed any time after it has been proofed using the Reprocess-Job or Resubmit-Job operations, rather than aging the job out after an implementation-defined period.

**Raster image**: A binary bitmap representation of an image.

**Retained Job**: A Retained Job is a job that the Printer retains in the so-called Job Retention Phase (see [STD92] section 5.3.7.2 Partitioning of Job States) in the Job’s terminal state (‘completed’, ‘aborted’, or ‘canceled’) after processing it, for an implementation-defined
period (including zero seconds) or removed by an explicit Delete-Job or Purge-Jobs
operation. An exact copy of a Retained Job can be processed using a Reprocess-Job
operation. A modified copy of a Retained Job can be processed using a Resubmit-Job
operation.

RIP: Raster Image Processor - a page description language interpreter.

Stored Job: A Stored Job is a Retained Job that has reached the 'completed' state and that
has identifying characteristics marking it as a Stored Job instead of simply as a previously
processed Job. The Printer retains a Stored Job indefinitely, unless otherwise configured,
so that it can be listed and selected for reprinting at some time in the future.

2.6 Acronyms and Organizations

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

3. Requirements

3.1 Rationale for IPP Enterprise Printer Extensions

IETF and PWG IPP printing standards define:

(a) A rationale for an abstract model of printing (to support alternate encodings and
protocols) in section 3 of the IETF IPP Rationale [RFC2568];

(b) A set of design goals for submitting and canceling Jobs in a printing protocol in section
3.1.4 'Submitting a Print Job', section 3.1.6 'Canceling a Print Job' (for End User), and
section 3.2.2 'Changing Print and Job Status' (for Operator) of the IETF IPP Design
Goals [RFC2567];

(c) An abstract model of a Print Service (i.e., ISO DPA Logical Printer) and a Print Device
(i.e., ISO DPA Physical Printer) in section 3.1 of IETF IPP/1.1 [STD92];

(d) A set of abstract operations for canceling or deleting Print Jobs in section 4.3.3
'Cancel-Job Operation' (for End User) and section 4.2.9 'Purge-Jobs Operation' (for
Operator) of IETF IPP/1.1 [STD92] and section 4.2 'Cancel-Current-Job Operation'
(for Job Owner or Operator) of IETF IPP Job and Printer Administrative Operations
[RFC3998];
(e) A set of abstract operations for reprinting Print Jobs in section 4.3.7 'Restart-Job Operation' (same job-id, overwrites accounting data) of IETF IPP/1.1 [STD92] and section 4.1 'Reprocess-Job Operation' (new job-id, original processing instructions) of IETF IPP Job and Printer Administrative Operations [RFC3998];

(f) A set of abstract operations for controlling Print Jobs in section 3.3.5 'Hold-Job Operation' (Job Owner and Operator) and section 3.3.6 'Release-Job Operation' (Job Owner and Operator) of IETF IPP/1.1 [STD92] and section 4.3.1 'Suspend-Current-Job Operation' (Job Owner and Operator) and section 4.3.2 'Resume-Job Operation' (Job Owner and Operator) of IETF IPP Job and Printer Administrative Operations [RFC3998]; and

(g) A set of abstract attributes for production printing features in PWG IPP Production Printing Attributes - Set1 [PWG5100.3].

Some IPP Printers already support proofing, saving, and reprinting of large Print Jobs as well as canceling of sets of selected Print Jobs via vendor proprietary operations and attributes. Therefore, this IPP Enterprise Printer Extensions specification should:

(1) Support proofing Jobs using IPP Job Creation operations;

(2) Support storing Jobs using IPP Job Creation operations;

(3) Support reprinting stored or proofed Jobs with different processing instructions;

(4) Support canceling multiple Jobs in single IPP operations;

(5) Support the management, configuration, and maintenance of these extended IPP Printers;

(6) Encourage adoption of modern IPP-based printing infrastructures; and

(7) Discourage the proliferation of vendor proprietary IPP operations and attributes that damage IPP interoperability by duplicating IETF or PWG IPP standard operations and attributes.

### 3.2 Use Cases

#### 3.2.1 Password Protected Job

Frank works in a sales office that is large enough for him to have privacy concerns, but not so large that the printers are integrated into the IT infrastructure in a sophisticated manner. He is editing a sensitive business report that contains financial data. He wants to make sure that, if he prints it to the office's MFD printer, he can be confident he will be the only one that
will be able to pick it up or re-print it. The MFD supports Password Protected Jobs, so Frank provides a "Job Password" when he prints it. The MFD waits to print the Job until someone has provide the matching password. Frank goes to the MFD, finds the held job, enters the matching password at the prompt, and the Job is printed.

### 3.2.2 Authenticated Job Release

James works in a large law office where the printers are integrated into the IT AAA infrastructure. He is editing a set of documents for a client. He wants to make sure that, if he prints it to the office's MFD printer, he can be confident he will be the only one that will be able to pick it up or re-print it. The MFD supports Authenticated Job Release, so James selects "Authenticated Release" when he prints it. The Printer challenges James' laptop for authentication credentials, and James provides them to the Client. MFD waits to print the Job until someone has provide the matching password. Frank goes to the MFD, finds the held job, enters the matching password at the prompt, and the Job is printed.

### 3.2.3 Proof Print

Alice, Bob, and Charlie work in the system engineering department of a large software vendor. They collaborate to find, describe, and evaluate software feature requirements for financial management tools in their requirements database.

Alice is an artist and chooses their standard fonts and writes style sheets and layout guides for their software requirements specifications. Bob is a quiet, steady worker and an excellent proofreader. Charlie is a good talker who does the interviewing of the marketers and engineers.

Once a month, Charlie extracts from their database all of the detailed software requirements for each project into a spreadsheet. He also extracts all the high-level software requirements into a word processing document. Charlie then submits a single Print Job with two Documents [PWG100.5] (the spreadsheet and the word processing document) for a proof print of 3 copies (single-sided and portrait). Alice searches for layout and visual content errors, while Bob looks for typos and missing words. Charlie commits their fixes to the database, regenerates the source documents, and does another cycle of proof print.

Finally, Charlie wants to produce 60 copies (2-up, two-sided, and landscape) of the retained proof Print Job. So, he reprints the saved Print Job (without sending the document data again) but specifying overrides of some processing instructions.

### 3.2.4 Job Storage

Vincent is an administrative assistant for a school. The school provides its teachers with paper forms for documenting their class assignments and attendance. Vincent makes these forms available on the school's web site and also on the school's primary printer / copier multi-function device (MFD) as a Stored Job accessible by any accounts in the Faculty user
group. He sends an email to the school faculty letting them know that the Stored Job is available for reprinting.

Lily is a teacher. She has run out of her supply of the assignment tracking form. She goes to the school's office, logs in using her faculty account, and selects Stored Jobs. Among the Jobs visible to her account, she finds and chooses the assignment tracking form from the MFD's Stored Jobs list on its control panel, chooses to have 30 copies made, and taps Print. The copies are printed, and she returns to her classroom.

3.3 Exceptions

3.3.1 Password Protected Job

Velma is one of Frank's co-workers. She is very competitive and also has questionable business ethics. She goes to the department's MFD to see if she can re-print any of Frank's reports. She finds his latest draft report and tries to re-print it. The Job Velma selected is a Password Protected Job. The MFD presents a password challenge UI to request the Job Password. Velma doesn't know it, so she clicks "Cancel" and goes to the break room to brood.

3.4 Out of Scope

The following are considered out of scope for this document:

1. How the Printer manages its storage for stored jobs or pending jobs
2. How the Printer implements authentication and authorization

3.5 Design Requirements

This IPP Enterprise Printer Extensions design should:

1. Follow the naming conventions defined in IETF IPP/1.1 [STD92], including keyword value (lowercase) and hyphenation requirements;
2. Optimize compatibility with existing IETF and PWG IPP operations when making design decisions in defining new operations and attributes;
3. Define new attributes in support of the Password Protected Job feature;
4. Define new attributes in support of the Job Storage feature;
5. Define new attributes in support of the Proof Print feature;
6. Define additional attributes.

4. Semantics Common to More Than One Attribute

4.1 Overview

<table>
<thead>
<tr>
<th></th>
<th>&quot;job-password&quot;</th>
<th>&quot;job-storage&quot;</th>
<th>&quot;proof-print&quot;</th>
<th>&quot;job-retain-until&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;job-password&quot;</td>
<td>n/a</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>&quot;job-storage&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;proof-print&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2 Password Protected Job Feature

The Password Protected Job Feature enables a user to protect a Job with a password that is required for authorizing printing or reprinting the Job. The password is permanently attached to the Job and persists in the Job until it enters the Job History phase. If the Job is copied, the password is preserved in the new copy. This feature can be combined with the Job Storage Feature or the Proof Print feature.

4.3 Proof Print Feature

4.3.1 Original

The Proof Print Feature enables a User to print a Proof Print Job and to save it as part of job processing in such a way that users can submit a request to print a copy of the Proof Print Job at a later time. A Client requests a Printer to print and save a Proof Print Job by supplying the "proof-print" Job Template attribute (section 6.5) when submitting the job. In this case, the Printer retains the Proof Print Job indefinitely in the so-called Job Retention Phase (see [STD92] section 5.3.7.2 Partitioning of Job Sates) in the job's terminal state ("completed", "aborted", or "canceled") after processing it, rather than aging the job out after an implementation-defined period. In other words, a Proof Print Job is just a Retained Job that the Printer is retaining indefinitely. A Client can then request the Printer to reprint a copy of the Proof Print Job using the Resubmit-Job operation [PWG5100.7]. See section 12.5 Conformance Requirements for the REQUIRED "proof-print" Job Template attribute for additional conformance requirements for Clients and Printers.
4.3.2 New

The Proof Print Feature enables a User to print a first copy of a Proof Print Job, and then moves the Job to the 'pending-held' state. If the User finds the output of that first copy to be satisfactory, the User can release the Job to complete its processing to produce the remaining number of copies.

4.4 Job Storage Feature

The Job Storage Feature enables a User to "store" a Job and its Documents in their originally submitted and unprocessed form, so that the Job might be selected for reprinting at a later time. A Stored Job's visibility will depend on its access settings; it might be visible to all users, or might only be visible to the originating user, or a particular group. A Client requests a Job be treated as a Stored Job by supplying the "job-storage" Job Template attribute (section XXX) when submitting the Job Creation operation.

As with the Job Save and Reprint Feature, the Printer retains the Job indefinitely in the Job Retention Phase (see [STD92] section 5.3.7.2 "Partitioning of Job States") in the job's terminal state ('completed', 'aborted', or 'canceled') after processing it, rather than aging the job out after an implementation-defined period.

4.4.1 Creating Stored Jobs

A Job becomes a Stored Job when the "job-storage" Job Template is specified in its creation and it has reached the 'completed' state.

4.4.2 Identifying and Listing Stored Jobs

A Job indicates its Job Storage status using one of the "job-state-reasons" keywords for the Job Storage Feature defined in section 9.3.2. A Client can get a listing of Stored Jobs by specifying either the 'stored-public' or 'stored-owner' keyword for the "which-jobs" attribute (section 9.1) in a Get-Jobs operation [STD92].

4.4.3 Reprinting Stored Jobs

This section defines the method by which to reprint a copy of the Saved Job using the Resubmit-Job operation. The Reprocess-Job operation, defined in [RFC3998], has been deprecated. The Resubmit-Job operation is defined in this document and operates on any Retained Job.

4.4.3.1 Reprinting Stored Jobs using the Resubmit-Job operation

The Resubmit-Job operation [PWG5100.7] re-processes a copy of any Retained Job with the ability to supply additional operation and Job Template attributes that will affect the processing of that copy of the Job by either overriding the values of existing attributes or providing additional attributes. The Resubmit-Job operation has the same structure as the
Print-URI operation (see [STD92] section 4.2.2) except that the “job-id” (integer(1:MAX)) operation attribute MUST take the place of the “document-uri” (uri) operation attribute.

4.4.3.2 Reprinting Stored Jobs using the Printer Control Panel

Stored Jobs can be reprinted using the Printer's control panel (control console). The details of the user experience and presentation are beyond the scope of this document, but ought to reflect the semantics of the Job Storage feature defined in this IPP Enterprise Printer Extensions specification.

5. New Operation Attributes for Existing Operations

This section defines additional Operation attributes for existing IPP operations.

5.1 job-password (octetString(255)) for Job Creation operations

This operation attribute allows a User to specify a password for that Job, causing the Job to become a Password Protected Job. The Printer will only print a Password Protected Job after the same password value has been entered into the Printer's control panel.

The Client encrypts the password acquired by the job submitting application using one of the methods specified by the "job-password-encryption-supported" attribute. The encrypted password value is sent to the Printer as the value of the "job-password" attribute. If a "job-password" value is provided, other than a zero-length string, the Printer MUST disposition the Job according to the "job-password-action" operation attribute; if the "job-password-action" attribute is absent, the Printer MUST put the Job in the 'pending-held' state and add the 'job-password-wait' value to the Job's "job-state-reasons" attribute.

The Printer uses the same encryption method specified in the "job-password-encryption" attribute on this password. When the locally-supplied encrypted password matches the value of the Job's "job-password" attribute, the Job removes the 'job-password-wait' value from its "job-state-reasons" attribute to indicate that that condition is no longer preventing processing. The method in which the password is entered and validated at the Printer is implementation dependent. If the Password Protected Job is released by the User while another Job is printing, the Password Protected Job SHOULD be the next Job printed after the current Job, unless the Printer has another Job which has a higher priority than the Password Protected Job as determined by the "job-priority" attribute.

This Operation attribute may OPTIONALLY be included in the request of the following Job Creation operations: Print-Job, Print-URI, and Create-Job.

The "job-password" attribute value MUST NOT be returned in a Get-Job-Attributes response or be provided via any non-IPP protocol.

The Job MUST preserve its "job-password" attribute, if it has one, for its entire lifespan. If a copy of a Job is created by a Resubmit-Job operation or via some mechanism out-of-band...
of IPP, the new copy MUST have a copy of the "job-password" attribute so that it is also a Password Protected Job.

5.2 job-password-action (type2 keyword)

The "job-password-action" operation attribute specifies how a Job is processed when the "job-password" operation attribute (section 5.1) is included in a Job Creation request. If the Client supplies the "job-password" attribute but does not supply the "job-password-action" attribute, the Client and the Printer MUST assume the value is 'hold-job', to preserve backward compatibility with the earlier definition of "job-password" [PWG5100.11]. The value specified by this operation attribute MUST be one of the values specified by the Printer's "job-password-action-supported" attribute (section 8.3).

Standard keyword values include:

- 'hold-job': The Job is placed in the 'pending-held' state and is released when the "job-password" value is entered at the Printer's console. The Job MUST NOT be retained once it has reached its terminal state ('completed', aborted' or 'canceled'). This is the semantic originally specified for the "job-password" operation attribute (section 5.1).

- 'process-and-retain': The Job is placed in the 'pending' state and it scheduled for processing without waiting for the User to enter the "job-password" value at the Printer's console.

- 'retain-only': The Job is placed in the 'completed' state as soon as all Documents are received by the Printer. The Printer will require a matching password for all reprints.

Once in a terminating state, the Job is retained according to the current value of its "job-retain-until-xxx" attributes.

5.3 job-password-encryption (type2 keyword | name(MAX)) for Job Creation operations

The "job-password-encryption" Operation attribute specifies the type of encryption used to create the value specified by the "job-password" operation attribute in the request of the following Job Creation operations: Print-Job, Print-URI, and Create-Job. The Client MUST supply this operation attribute whenever the "job-password" attribute is supplied. The value MUST be one of the values specified in the Printer's "job-password-encryption-supported" attribute (section 8.3).

6. Job Template Attributes

Job Template attributes describe job processing behavior and conform to a set of rules. See [STD92] for the complete text of the rules that apply to each Job Template attribute called "xxx".
6.1 job-cancel-after (integer(1:MAX))

This Job Template attribute specifies the maximum number of seconds that are allowed for processing a Job. The cancel timer does not begin until the Job enters the 'processing' state. If the Job is canceled because of this timer, the Printer MUST add the 'job-canceled-after-timeout' keyword (section 9.3.1) to the "job-state-reasons" Job Status attribute.

6.2 job-phone-number (uri)

This Job Template attribute contains the contact telephone number for the Job. If supported, the Printer MUST accept the 'tel:' URI scheme [RFC2806] and MAY accept other schemes, such as the 'fax:' scheme [RFC2806]. Any processing by the Printer of the "job-phone-number" attribute is implementation-dependent.

6.3 job-recipient-name (name(MAX))

This Job Template attribute contains the name of the person that is to receive the output of the Job. The value of the "job-recipient-name" attribute is commonly printed on job sheets printed with the job. An example of another use of the "job-recipient-name" attribute is if the Printer accesses a database to get job delivery instructions for the recipient of a job. A zero-length value indicates that there is no job recipient name.

If the Client omits this attribute in a Job Creation request, the Printer MAY use the "job-recipient-name-default" attribute value, unless it has not been configured by the administrator, or MAY use the "authenticated user" name (see [MOD1.1] section 8.3), depending on implementation.

6.4 job-storage (collection)

The "job-storage" Job Template attribute is a collection whose members specify how a Printer processes a Job to become a Stored Job. See section 4.4 for a full description of the Job Storage Feature.

This attribute MAY be used with the "job-password" attribute for a Password Protected Job that is also a Stored Job.

6.4.1 job-storage-access (type2 keyword)

The "job-storage-access" member attribute specifies the access restrictions on the Stored Job. The value MUST be one of the keywords specified by the Printer's "job-storage-access-supported" Printer Description attribute (section 8.13). The "job-storage-access" member attribute MUST be preserved by the Job as a member of the "job-storage" Job Status attribute (section 7.1).
6.4.2 job-storage-disposition (type2 keyword)

The "job-storage-disposition" member attribute specifies how the Job is to be handled by the Printer during the 'processing' state. The value MUST be one of the values specified by the Printer's "job-storage-disposition-supported" Printer Description attribute (section 8.15).

The "job-storage-disposition" member attribute MUST NOT be preserved by the Job as a member of the "job-storage" Job Status attribute (section 7.1).

6.4.3 job-storage-group (name(MAX))

This member attribute specifies the group, if any, in which the Stored Job is listed. The value specified by the "job-storage-access" attribute (section 6.4.1) coordinates with the value of this attribute. If the "job-storage-access" attribute is 'group', then the value of this attribute MUST be one of the values specified by the Printer's "job-storage-group-supported" Printer Description attribute (section 8.16).

6.5 proof-print (collection)

This Job Template attribute indicates to the Printer that this Job is a Proof Print Job. This attribute allows a user to specify the attributes of the proof print(s) of the job that are to be printed prior to the printing the full run of the job. After the proof prints have been produced, the Printer MUST retain the completed job as a Proof Print Job for a period of time sufficient to allow users to proof the job, rather than aging it out after an implementation-defined period which SHOULD be longer than the period for ordinary completed Jobs (see Job Retention phase in [STD92] section 5.3.7.2 Partitioning of Job States). When a Proof Print Job is reprinted using any of the operations that reprint a Retained Job (e.g., Reprocess-Job or Resubmit-Job), the Printer MUST NOT copy the "proof-print" attribute from the Proof Print Job to the copy of the Proof Print Job so that the job is not re-proofed again. Only if the Resubmit-Job operation supplies its own "proof-print" attribute, will the copied job be proofed.

A Client MUST be able to supply and a Printer MUST support this attribute in order to claim support of this IPP Enterprise Printer Extensions Specification, respectively. See section 12.5 Conformance Requirements for the REQUIRED "proof-print" Job Template attribute for additional conformance requirements for Clients and Printers.

Table 2 lists the member attributes of the "proof-print" collection attribute.

<table>
<thead>
<tr>
<th>Member Attribute Name</th>
<th>Request</th>
<th>Printer Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>proof-printcopies</td>
<td>MUST</td>
<td>MUST</td>
</tr>
<tr>
<td>media</td>
<td></td>
<td>MUST</td>
</tr>
</tbody>
</table>
6.5.1 proof-print-copies (integer (0:MAX))

The "proof-print-copies" member attribute specifies the number of copies the Printer MUST produce in the proof job. The proof print(s) are produced using the Job Template attributes specified with the Job, except any overridden by member attributes in this collection.

If the "proof-print-copies" value is 0, then no proof prints are produced.

After the requested number of proof prints have been successfully produced by the Printer, then the Printer transitions the job to the 'completed' state and retains the job for a period of time that is long enough for the users to proof the output of the Proof Print Job, rather than aging the job out.

6.5.2 media (type2 keyword | name(MAX)) or media-col (collection)

Either the "media" (see [STD92]) or the "media-col" member attribute is used to indicate the media that the Printer MUST use for the specified "proof-print-copies" of the Proof Job. The member attributes are the same as those for the "media-col" attribute defined in [PWG5100.3] and in section 11.5 of this specification.

The Client MUST supply either the "media" or the "media-col" member attribute, but NOT both. If the Client supplies such a malformed request by supplying neither or both, the Printer MUST (depending on implementation) either (1) reject the request and return the 'client-error-bad-request' status code (see [STD92]) or (2) use either the "media" or the "media-col" member attribute, independent of the value of the "ipp-attribute-fidelity" attribute supplied by the Client.

Since this "media" member attribute has the same name as the "media" Job Template attribute (defined [STD92]), the "media-supported" (1setOf (type2 keyword | name(MAX))) Printer attribute identifies the values of this "media" member attribute (as well as the values of the "media" Job Template attribute) that the Printer supports, i.e., the names of the supported media. A value that is provided for the "media" member attribute in the collection would have the same effect as if the job were submitted with that value as the value of the "media" Job Template attribute.

Since this "media-col" member attribute has the same name as the "media-col" Job Template attribute (defined in [PWG5100.3] and in section 11.5 of this specification), the "media-col-supported" Printer attribute identifies the keyword names of the member attributes supported in this "media-col" member attribute (as well as the keyword names of the "media-col" Job Template attribute), i.e., the names of the member attributes that the Printer supports.
7. Job Status Attributes

7.1 job-storage (collection)

The "job-storage" Job Status attribute labels the Job as a Stored Job and specifies the storage handling requirements the Printer MUST follow. All the members of this Job Storage attribute are the same as those specified for the "job-storage" Job Template attribute (section 6.4).

8. Printer Description Attributes

8.1 job-cancel-after-default (integer(1:MAX) | no-value)

This Printer Description attribute provides the default value of the "job-cancel-after" Job Template attribute (section 6.1).

8.2 job-cancel-after-supported (rangeOfInteger(1:MAX))

This Printer Description attribute provides the allowed range of values for the "job-cancel-after" Job Template attribute (section 6.1).

8.3 job-password-action-supported (type2 keyword)

The "job-password-action-supported" Printer Description attribute specifies the Printer's supported password actions. A password action defines how a Job is processed when the "job-password" operation attribute (section 5.1) is included in a Job Creation request.

Standard password action keyword values include:

- 'hold-job': The Job is placed in the 'pending-held' state and is released when the "job-password" value is entered at the Printer's console. The Job MUST NOT be retained once it has reached its terminal state ('completed', aborted' or 'canceled'). This is the semantic originally specified for the "job-password" operation attribute (section 5.1).

- 'process-and-retain': The Job is placed in the 'pending' state and it scheduled for processing without waiting for the User to enter the "job-password" value at the Printer's console.

- 'retain-only': The Job is placed in the 'completed' state as soon as all Documents are received by the Printer. The Printer will require a matching password for all reprints.

Once in a terminating state, the Job is retained according to the current value of its "job-retain-until" and/or "job-retain-until-time" attributes.
8.4 job-password-encryption-supported (1setOf (type2 keyword | name(MAX)))

The "job-password-encryption-supported" Printer Description attribute specifies which encryption methods the Printer supports for Secure Print.

If the "job-password" operation attribute is supported, then this attribute MUST be supported. Standard keyword values are in Table 3. The 'md2', 'md4', 'md5', and 'sha' keywords have been DEPRECATED. Others may be deprecated in the future as the state of the art of cryptography evolves.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'none'</td>
<td>The &quot;job-password&quot; attribute value is passed in the clear. No encryption has been applied. This value might also be used when the entire Operation is sent over a secure connection.</td>
</tr>
<tr>
<td>'md2'</td>
<td>The encryption method uses the MD2 hash algorithm defined in RFC 1319. [1]</td>
</tr>
<tr>
<td>'md4'</td>
<td>The encryption method uses the MD4 hash algorithm defined in RFC 1320. [1]</td>
</tr>
<tr>
<td>'md5'</td>
<td>The encryption method uses the MD5 hash algorithm defined in RFC 1321. [1]</td>
</tr>
<tr>
<td>'sha'</td>
<td>The encryption method uses the Secure Hash Algorithm 1 defined by the National Institute of Standards and Technology. [1]</td>
</tr>
<tr>
<td>'sha2-224'</td>
<td>The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 224 bits.</td>
</tr>
<tr>
<td>'sha2-256'</td>
<td>The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 256 bits.</td>
</tr>
<tr>
<td>'sha2-384'</td>
<td>The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 384 bits.</td>
</tr>
<tr>
<td>'sha2-512'</td>
<td>The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 512 bits.</td>
</tr>
</tbody>
</table>
'sha2-512_224' The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 224 bits.

'sha2-512_256' The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 256 bits.

'sha3-224' The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 224 bits.

'sha3-256' The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 256 bits.

'sha3-384' The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 384 bits.

'sha3-512' The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 512 bits.

'sha3-512_224' The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 224 bits.

'sha3-512_256' The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 256 bits.

'shake-128' The encryption method uses the SHAKE128 method defined by the National Institute of Standards and Technology, with an output size of 128 bits.

'shake-256' The encryption method uses the SHAKE256 method defined by the National Institute of Standards and Technology, with an output size of 256 bits.

[1] - Deprecated

8.5 job-password-length-supported (rangeOfInteger (0:255))

The 4.1 "job-password-length-supported" Printer Description attribute specifies the minimum and maximum supported length of the unencrypted password, measured in characters. The
character set encoding is specified by the "job-password-repertoire-configured" attribute (Section XX). The Printer is configured to accept an empty password if the range's minimum value is 0 (zero).

This attribute complements the existing "job-password-supported" attribute [PWG5100.11], which specifies the maximum password length supported before encryption, measured in octets.

8.6 job-password-repertoire-supported (1setOf (type2 keyword))

The "job-password-repertoire-supported" attribute enumerates the job password repertoires (allowable characters, character sets and encodings) the Printer can be configured to use.

The keywords are named according to a 'REGISTRY_ENCODING_RANGE' naming structure convention. Table 4 lists the standard keywords. Vendor repertoire keywords, prefixed with "vendor_ " to indicate a vendor-specific registry, may also be used. Vendor repertoire keywords SHOULD be registered with the PWG to achieve interoperability. As an example, a vendor may choose to register the 'vendor_us-ascii_lowercase' keyword to specify a repertoire limited to using only lowercase characters from the US ASCII encoding.

The "utf-8" encoding name indicates the use of Network Unicode [RFC5198].

Table 4 - job-password-repertoire-supported keyword definitions

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'iana_us-ascii_digits'</td>
<td>Value must consist of only ASCII digits (0x30-0x39)</td>
</tr>
<tr>
<td>'iana_us-ascii_letters'</td>
<td>Value must consist of only US ASCII letters (0x41-0x5A, 0x61-0x7A)</td>
</tr>
<tr>
<td>'iana_us-ascii_complex'</td>
<td>Value must consist of US ASCII letters and numbers, with at least one uppercase letter, one lowercase letter, and one digit (0x30-0x39, 0x41-0x5A, 0x61-0x7A)</td>
</tr>
<tr>
<td>'iana_us-ascii_any'</td>
<td>Value must consist of US ASCII printable characters (0x20-0x7e)</td>
</tr>
<tr>
<td>'iana_utf-8_digits'</td>
<td>Value must consist of only UTF-8 numerical digits</td>
</tr>
<tr>
<td>'iana_utf-8_letters'</td>
<td>Value must consist of UTF-8 letters</td>
</tr>
<tr>
<td>'iana_utf-8_any'</td>
<td>Value must consist of UTF-8 printable characters</td>
</tr>
</tbody>
</table>
8.7 job-password-repertoire-configured (type2 keyword)

The "job-password-repertoire-configured" attribute indicates the password repertoire currently configured for this Printer. The value of this attribute MUST be one of the values specified in the Printer's "job-password-repertoire-supported" attribute (section XX). A supporting Client can use this attribute's value to limit User input so that the value in "job-password" will comply with the configured password repertoire.

8.8 job-password-supported (integer(0:255))

The "job-password-supported" Printer Description attribute indicates the maximum length that the Printer will accept for the unencrypted password which the Client will encrypt as the value of the "job-password" Operation Attribute. A conforming Printer MUST be able to accept 255 octets without truncation. However, a Printer MAY be implemented as a gateway to another print system that cannot accept the full 255-octet range, in which case the Client MUST NOT allow an unencrypted password greater than the length specified by this attribute.

8.9 job-phone-number-default (uri)

The default value supplied by the Printer if the Client omits the 'job-phone-number" Job Template attribute. This attribute SHOULD use the 'tel:' scheme [RFC2806].

8.10 job-phone-number-supported (boolean)

A true value indicates that the Printer accepts the "job-phone-number" attribute.

8.11 job-recipient-name-default (name(MAX))

The default value supplied by the Printer if the Client omits the 'job-recipient-name" Job Template attribute.

8.12 job-recipient-name-supported (boolean)

This attribute indicates whether the Printer accepts the "job-recipient-name" attribute.

8.13 job-storage-supported (1setOf keyword)

This attribute indicates whether the Printer supports the Job Storage feature, and what members are supported by the Printer.
8.14 job-storage-access-supported (1setOf type2 keyword)

This attribute specifies the Job Storage access modes supported by the Printer. Standard keywords for the "job-storage-access" attribute are listed in Table 5.

**Table 5 - Standard keywords for "job-storage-access-supported"**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;group&quot;</td>
<td>Visible to only the group to which the submitting most authenticated user is a member</td>
</tr>
<tr>
<td>&quot;owner&quot;</td>
<td>Visible to only the submitting most authenticated user</td>
</tr>
<tr>
<td>&quot;public&quot;</td>
<td>Visible to all users (may still be password protected)</td>
</tr>
</tbody>
</table>

8.15 job-storage-disposition-supported (1setOf type2 keyword)

This attribute specifies the Job Storage dispositions supported by the Printer. Standard keywords for the "job-storage-access" attribute are listed in Table 6.

**Table 6 - Standard keywords for "job-storage-disposition-supported"**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;none&quot;</td>
<td>The Printer MUST print the Job. The Printer MUST NOT retain the Job in the Job Retention phase; it MUST move it immediately to the Job History phase.</td>
</tr>
<tr>
<td>&quot;print-and-store&quot;</td>
<td>The Printer MUST print the Job. If the Job reaches the 'completed' state, it MUST retain the Job in the Job Retention phase.</td>
</tr>
<tr>
<td>&quot;store-only&quot;</td>
<td>The Printer MUST NOT print the Job. The Printer MUST retain the Job in the Job Retention phase.</td>
</tr>
</tbody>
</table>

8.16 job-storage-group-supported (1setOf name(MAX))

This attribute specifies the user groups to which a Stored Job could be made visible when it is stored, using the "job-storage-group" member (section 6.4.3) of the "job-storage" attribute (section 6.4). The value of this attribute will list different values if returned in an authenticated Get-Printer-Attributes or Get-User-Printer-Attributes response.
8.17 proof-print-default (collection)

This attribute specifies the default value of "proof-print" MUST use when not supplied in a request. A Printer MUST support the same member attributes for this default collection as it supports for the corresponding "proof-print" Job Template attribute.

8.18 proof-print-supported (1setOf type2 keyword)

This attribute specifies which member attributes of "proof-print" the Printer supports.

9. Additional Values and Semantics for Existing IPP Attributes

This section defines additional values for existing attributes. The existing text for those attributes is not reproduced here in order to prevent deviations.

9.1 job-hold-until (type2 keyword | name(MAX))

This IPP Enterprise Printer Extensions specification defines additional keyword values for the "job-hold-until" Job Template attribute [STD92] to support

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'owner-authorized'</td>
<td>Hold the Job until the Owner has authorized it to be released. The Printer MAY challenge the User for credentials to have the Job released. This provides functionality similar to the &quot;job-password&quot; operation attribute (section 5.1). Whereas the &quot;job-password&quot; attribute causes the Printer to challenge the User for the Job's password to release the Job to processing, this causes the Printer to challenge the User for authenticating credentials for a user account that is authorizes the Job to be released to processing.</td>
</tr>
<tr>
<td>'button-press'</td>
<td>Hold the Job until a button press on the Output Device's control panel authorizes it to be released to processing.</td>
</tr>
</tbody>
</table>

9.2 which-jobs (type2 keyword) and which-jobs-supported (1setOf type2 keyword)

This IPP Enterprise Printer Extensions specification defines additional keyword values for the IPP "which-jobs" operation attribute of the Get-Jobs operation [STD92] and the “which-
jobs-supported" Printer Description attribute [PWG5100.7] to support filtering for Proof Print Jobs and Stored Jobs.

Table 8 - Additional Keywords for "which-jobs" and "which-jobs-supported"

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'proof-print'</td>
<td>Proof Print Jobs, i.e., Jobs that have been submitted using the &quot;proof-print&quot; Job Template attribute and which are in the 'completed', 'canceled', or 'aborted' state. If the &quot;proof-print&quot; Job Template attribute is supported, this value MUST be supported.</td>
</tr>
<tr>
<td>'stored-public'</td>
<td>Public Stored Jobs, i.e., Jobs that have been stored using the &quot;job-storage &quot; Job Template attribute where the &quot;job-storage-access&quot; member attribute specifies 'public', and which are in the 'completed' state. If the &quot;job-storage&quot; Job Template attribute is supported, this value MUST be supported.</td>
</tr>
<tr>
<td>'stored-owner'</td>
<td>Private Stored Jobs, i.e., Jobs that have been stored using the &quot;job-storage &quot; Job Template attribute where the &quot;job-storage-access&quot; member attribute specifies 'owner', and which have reached the 'completed' state. If the &quot;job-storage&quot; Job Template attribute is supported, this value MUST be supported.</td>
</tr>
</tbody>
</table>

A Client that specifies the 'stored-owner' keyword MUST be prepared for an authentication challenge from the Printer.

9.3 job-state-reasons (1setOf type2 keyword) Job Description attribute

9.3.1 Additional Semantics for "job-state-reasons" attribute for "job-cancel-after"

This section adds additional semantics to the 'job-hold-until-specified' value defined in support of the "job-cancel-after" attribute (section 6.1):

Table 9 - Additional Keywords for "job-state-reasons" supporting "job-cancel-after"

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'job-canceled-after-timeout'</td>
<td>The Job was canceled because the timer with a duration specified by the &quot;job-cancel-after&quot; attribute (section 7.4) to the &quot;job-state-reasons&quot; Job Status attribute.</td>
</tr>
</tbody>
</table>
9.3.2 Additional Semantics for "job-state-reasons" attribute for the "job-storage" attribute

This section defines additional values that are defined in support of the "job-storage" attribute (section 6.4).

Many of the existing "job-state-reasons" attribute values can apply to a 'save-only' Job as well as a Job submitted for printing. If the value of the "job-storage-disposition" attribute is store-only, the "job-state-reasons" attribute MAY be set with existing values such as 'job-incoming', 'resources-are-not-ready' (such as a font), 'job-interpreting', and 'job-queued'.

Likewise, errors that occur on a Stored Job MAY have existing "job-state-reasons" attribute values such as 'job-data-insufficient', 'document-access-error', 'submission-interrupted', 'job-canceled-by-user', 'aborted-by-system', etc.

There are also new four new "job-state-reasons" keyword values REQUIRED that support a Stored Job: 'job-storing', 'job-stored-successfully', 'job-stored-with-warnings', and 'job-stored-with-errors'. The existing 'job-completed-successfully', 'job-completed-with-warnings', and 'job-completed-with-errors' values are also clarified in the list above for implementations that support the "job-save-disposition" Job Template attribute, in such a way that these values remain compatible with Printers and Clients that do not support job saving. Table 10 defines the meanings of these 4 new "job-state-reasons" keywords.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>'job-stored-successfully'</td>
<td>The job was successfully saved. The Printer MUST also supply 'job-completed-successfully', except when &quot;job-storage-disposition&quot; = 'store-only'. If the &quot;job-storage&quot; Job Template attribute is supported, this value MUST be supported.</td>
</tr>
<tr>
<td>'job-stored-with-errors'</td>
<td>The job did not save successfully (whether or not it was printed successfully, printed with warnings, printed with errors, or not printed). The Printer MUST ensure that none of the saved job is accessible, if it was unable to successfully save all of the job. If the &quot;job-storage&quot; Job Template attribute is supported, this value MUST be supported.</td>
</tr>
<tr>
<td>'job-stored-with-warnings'</td>
<td>The job was saved with warnings. If the &quot;job-storage&quot; Job Template attribute is supported, this value MUST be supported.</td>
</tr>
<tr>
<td>'job-storing'</td>
<td>The Printer is transmitting the job to the save location. This is similar to the 'job-printing' value. If the &quot;job-storage&quot; Job Template attribute is supported, this value MUST be supported.</td>
</tr>
</tbody>
</table>

Table 11 enumerates the possible combinations of print and save success, warning, and error conditions. Note that two values occur only when there are print warnings/errors and a save error.
### Table 11 - Values of "job-state-reasons" attribute for various job conditions

<table>
<thead>
<tr>
<th></th>
<th>Not storing</th>
<th>Store was successful</th>
<th>Store was unsuccessful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not printing</td>
<td>&lt;not possible&gt;</td>
<td>'job-completed-successfully'</td>
<td>'job-stored-with-errors'</td>
</tr>
<tr>
<td>Print successful</td>
<td>'job-completed-successfully'</td>
<td>'job-completed-successfully'</td>
<td>'job-stored-with-errors'</td>
</tr>
<tr>
<td>Print warnings and errors</td>
<td>'job-completed-with-errors'</td>
<td>'job-completed-with-errors'</td>
<td>'job-completed-with-errors', 'job-stored-with-errors'</td>
</tr>
</tbody>
</table>

### 10. Conformance Requirements

This section summarizes the Conformance Requirements detailed in the definitions in this document for Client and Printer objects (servers or devices).

#### 10.1 Conformance Requirements for this specification

In order for a client and a Printer to claim conformance to this IPP Enterprise Printer Extensions Specification, a Client MUST be able to supply and a Printer MUST support the following:

1. The Cancel-Jobs operation (section 5.1)
2. The Cancel-My-Jobs operation (section 5.2)
3. The Close-Job operation (section 5.3)
4. The Resubmit-Job operation (section 5.4)
5. The Reprocess-Job operation [RFC3998]
6. The "job-ids" Operation attribute (section 6.3) in the Get-Jobs operation [RFC2911] (section 3.2.6)
7. The "job-ids" Operation attribute (section 6.3) in the Purge-Jobs operation [RFC2911] (section 3.2.9), if Purge-Jobs operation is supported (section 6.4)
8. The "proof-print" Job Template attribute (sections 7.11). See also section 12.5 Conformance Requirements for the REQUIRED "proof-print" Job Template attribute

9. The "job-ids-supported" Printer Description attribute (section 10.2)

10. The "which-jobs-supported" Printer Description attribute (see section 10.9 for which values)

The other attributes defined in this specification are OPTIONAL for a client to be able to supply and for a Printer to support.

10.2 Conditional Conformance Requirements for Printers

The following conditional conformance requirements are defined:

<table>
<thead>
<tr>
<th>If the Printer supports:</th>
<th>then the Printer MUST also support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;job-hold-until-time&quot; Job Template attribute in Job Creation operations</td>
<td>• &quot;job-hold-until&quot; Job Template attribute ([STD92])</td>
</tr>
<tr>
<td></td>
<td>• Hold-Job operation with the &quot;job-hold-until&quot; ([STD92]) and &quot;job-hold-until-time&quot; (section Error! Reference source not found.) Operation attributes</td>
</tr>
<tr>
<td></td>
<td>• Release-Job operation [STD92].</td>
</tr>
<tr>
<td>&quot;job-delay-output-until-time&quot; Job Template attribute in Job Creation operations</td>
<td>• &quot;job-delay-output-until&quot; Job Template attribute (section 6.1)</td>
</tr>
<tr>
<td></td>
<td>• Set-Job-Attributes operation (section Error! Reference source not found.)</td>
</tr>
</tbody>
</table>

11. Internationalization Considerations

For interoperability and basic support for multiple languages, conforming implementations MUST support the Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8) [RFC3629] encoding of Unicode [UNICODE] [ISO10646] and the Unicode Format for Network Interchange [RFC5198].

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 [RFC 5198]
• 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 in XML and other Markup Languages [UTR20] – XML usage
• Unicode Character Property Model [UTR23] – character properties
• Unicode Conformance Model [UTR33] – Unicode conformance basis

12. Security Considerations

In addition to the security considerations described in the IPP/1.1: Model and Semantics [STD92], implementations of this specification SHOULD conform to the following standards on processing of human-readable Unicode text strings:

• Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks
• Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

13. IANA Considerations

13.1 IPP Attribute and Keyword Value Registrations

This section contains the exact registration information for IANA to update according to the procedures defined in [STD92].

The registry entries will contain the following information:

<table>
<thead>
<tr>
<th>Job Template attributes:</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>job-cancel-after (integer(1:MAX))</td>
<td>[IPPEPE]</td>
</tr>
</tbody>
</table>
13.2 Attribute Value Registrations

The attributes defined in this specification will be published by IANA according to the procedures in IPP/1.1 Model and Semantics [STD92] section 7.1 in the following file:

http://www.iana.org/assignments/ipp-registrations
The registry entries will contain the following information:

<table>
<thead>
<tr>
<th>Attribute (attribute syntax)</th>
<th>Keyword Attribute Value</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>job-hold-until</td>
<td>(type2 keyword)</td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-hold-until-supported</td>
<td>(1setOf (type2 keyword))</td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>owner-authorized</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>button-press</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-password-action</td>
<td>(type2 keyword)</td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-password-action-supported</td>
<td>(1setOf (type2 keyword))</td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>hold-job</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>process-and-retain</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>retain-only</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-password-encryption</td>
<td>(type2 keyword</td>
<td>name(MAX))</td>
</tr>
<tr>
<td>job-password-encryption-supported</td>
<td>(1setOf (type2 keyword</td>
<td>name(MAX))</td>
</tr>
<tr>
<td>md2</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>md4</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>md5</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>none</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha2-224</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha2-256</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha2-384</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha2-512</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha2-512_224</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha2-512_256</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha3-224</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha3-256</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha3-384</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha3-512</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha3-512_224</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>sha3-512_256</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>shake-256</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>shake-512</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-save-disposition-supported</td>
<td>(1setOf type2 keyword)</td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>save-disposition</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>save-info</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-spooling-supported</td>
<td>(type2 keyword)</td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>automatic</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>spool</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>stream</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-state-reasons</td>
<td>(type2 keyword)</td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-delay-output-until-specified</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-password-wait</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-printed-successfully</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-printed-with-errors</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-printed-with-warnings</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-resuming</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-retain-until-specified</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-saved-successfully</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-saved-with-errors</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-saved-with-warnings</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-saving</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-spooling</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-streaming</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
<tr>
<td>job-suspended-by-operator</td>
<td></td>
<td>[IPPEPE]</td>
</tr>
</tbody>
</table>
14. References

14.1 Normative References


[PWG5100.7] M. Sweet, I. McDonald, S. Kennedy, "IPP Job Extensions v2.0", March 2018, ???

14.2 Informative References


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16. Change History

16.1 March 27, 2019

Initial revision based on an abandoned update to JPS2v2 and discussions on the IPP WG reflector.