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Status: Interim

Abstract: This specification defines the conceptual Job Release, Job Storage, Job Print Policy, Job Proof and Suspend, and Job Proof Print features for IPP, to support printing workflows important to institutional IT environments such as corporate businesses, governments, and universities.

This specification was previously titled "IPP Job and Printer Extensions - Set 2".

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1. Introduction

This specification defines the conceptual IPP Job Release, Job Storage, Job Print Policy, Job Proof and Suspend, and Job Proof Print features, to support printing workflows important to institutional IT environments such as corporate businesses, governments, and universities.

This specification updates "IPP Job and Printer Extensions - Set 2" [PWG5100.11-2010]. Section ‎14.1 lists the changes since that earlier revision of this specification.

1. Terminology

This section defines the following terms used throughout this document.

* 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.

* 1. 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].

*Administrator*: An End User who is also authorized to manage all aspects of an Output Device or Printer, including creating the printer instances and controlling the authorization of other End Users and Operators. [STD92]

*Console*: The physical control interface used to display the state of the Printer and change its settings. This may also refer to a network management service or protocol e.g. SNMPv3, HTTPS/HTML, SSH, etc.

*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. [STD92]

*Document Creation Operation:* An IPP operation that creates a Document object i.e. Print-Job, Print-URI, Send-Document and Send-URI. [STD92]

*End User*: A person or software process that is authorized to perform basic printing functions, including finding/locating a Printer, creating a local instance of a Printer, viewing Printer status, viewing Printer capabilities, submitting a Print Job, viewing Print Job status, and altering the attributes of a Print Job. [STD92]

*Final Copies*: The copies a Printer produces if a Proof and Suspend Job is approved. If the Proof and Suspend Job is rejected, the Final Copies are not produced.

*Input Page:* A page according to the definition of "pages" in the language used to express the Document data. [STD92]

*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. [STD92]

*Job Creation Operation:* An IPP operation that creates a Job object i.e. Create-Job, Print-Job, and Print-URI. The Restart-Job operation 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. [STD92]

*Job Submission Operation:* An IPP operation that creates Jobs and/or Documents i.e. Create-Job, Print-Job, Print-URI, Send-Document and Send-URI [STD92].

*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. [STD92]

*Operator*: An End User that also has special rights on the Output Device or Printer. The Operator typically monitors the status of the Printer and manages and controls the Jobs at the Output Device [STD92]. The Operator can query and control the Printer, Jobs, and Documents based on site policy. [STD92]

*Output Device*: a single Logical or Physical Device. [STD92]

*Password Release Job*: A Job that has a permanently attached password to authorize processing the Job. If the Job is copied, the new copy preserves the original password to preserve the authorization requirement.

*Physical Device*: a hardware implementation of an endpoint device, e.g., a marking engine, a fax modem, etc. [STD92]

*PIN Printing*: A Password Release Job that uses a numerical password ("PIN").

*Proof Copies*: The copies a Printer produces when initially processing a Proof and Suspend Job.

*Proof and Suspend Job*: A Job that produces Proof Copies when first in the 'processing' state, then is moved by the Printer to the 'processing-stopped' state for approval or rejection. If approved, the Printer moves the Job back into the 'processing' state to produce the Final Copies. If rejected, the Printer moves the Job immediately into the 'canceled' state.

*Proof Job:* A Job retained by the Printer after the initial "proof" set of copies has been produced, to enable the remaining copies to be printed at some later time, rather than aging the Job out after an implementation-defined period.

*Release Action:* An action performed at the Physical Device to allow a Release Job in its initial 'pending-held' state to proceed to the 'processing' state.

*Release Job*: A Job submitted to a print service with annotations indicating that the receiving Printer is to withhold the Job from processing until the Printer receives some release action, such as a button press on its Console, a Job password, or user authentication credentials, to authorize the Printer to release the Job into the 'processing' state.

*Release Printing*: A workflow where Release Jobs are submitted to a print service and held until the User provides necessary information to release the Job into the 'processing' state. The necessary information may depend on the solution but might include information such as a username and password, swiping an identification card or credit card in a card reader on the Printer, or simply pushing a button. The print service can be hosted on a Physical Device or a Logical Device such as a centralized print service or print service provider.

*Retained Job:* A Job that the Printer retains in the Job Retention Phase [STD92] once the Job has reached its terminal state (‘completed’, ‘aborted’, or ‘canceled’), for an implementation-defined period.

*Stored Job:* A Retained Job that has reached the 'completed' state and that has identifying attributes marking it as a Stored Job instead of simply as a previously processed Job. The Documents in a Stored Job are maintained in their originally submitted state and format. The Printer retains a Stored Job for an implementation-defined period, unless otherwise configured, so that it can be listed and selected for reprinting at some time in the future.

* 1. 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.

* 1. Acronyms and Organizations

*IANA*: Internet Assigned Numbers Authority, <https://www.iana.org/>

*IETF*: Internet Engineering Task Force, <https://www.ietf.org/>

*ISO*: International Organization for Standardization, <https://www.iso.org/>

*PIN*: Personal Identification Number

*PWG*: Printer Working Group, <https://www.pwg.org/>

1. Requirements
   1. Rationale for IPP Enterprise Printing Extensions v2.0

IETF and PWG IPP printing standards define 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]. Some IPP Printers already support proofing, saving, and reprinting of large Print Jobs via vendor proprietary operations and attributes.

Therefore, this specification SHOULD extend IPP so that it supports:

1. Creating a Proof Job using IPP Job Creation Operations;
2. Creating a Stored Job using IPP Job Creation Operations;
3. Creating a new Job using IPP from a Stored Job or Proof Job, with the new Job having possibly different processing instructions;
4. Creating a Release Job using IPP Job Creation Operations;
5. Releasing a Release Job using IPP Job operations;

These extensions to IPP SHOULD be designed in such a way that Proof Jobs, Stored Jobs and Release Jobs can interoperate, so that a single Job could be a Release Job, a Stored Job and a Proof Job.

* 1. Use Cases
     1. Releasing a Job with a Button Press

Lisa is a high school student. She has finished writing a paper for her Ancient History class and wants to print a copy to turn into her teacher. She wants to have the Printer hold the Job until she releases it so that it isn't sitting in the output tray. She selects the "Button Press" option in the print options dialog window and clicks "Print" to submit the Job. The printer holds the Job. When Lisa goes to the Printer, it is listed on the control panel screen. She pushes the "OK" button and the Job prints.

* + 1. Releasing a Job with a Job Password

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 workgroup printer, he can be confident only people with the original password can pick it up or re-print it. Frank sees that the workgroup printer supports the Job Password Release Action, so he selects the "Job Password" option in the print options dialog window, overrides the automatically generated unique password with one of his choosing, and clicks "Print" to submit the Job. The workgroup printer delays printing the Job until someone first provides the matching password. Frank goes to the workgroup printer, observes that his Job Password protected Release Job is listed on the control panel screen, selects it, and enters the job's password at the prompt. The printer prints the Job Password protected Release Job , and Frank can relax knowing the printed Job was safe from others' view.

* + 1. Releasing a Job with User Authorization

James works in a large law office where the printers are integrated into the IT AAA (Authentication, Authorization, Accounting) infrastructure. He is editing a set of documents for a client. He wants to make sure that he will be the only one able to collect the printed copy or reprint it if he submits it to the office's workgroup printer.

James selects the "Authorized Release" option in the print options dialog window and clicks "Print" to submit the Job. The workgroup printer challenges James' laptop for authentication credentials, and James provides them to the Client. The Job is submitted to the workgroup printer, which holds the Job until James logs into it and releases it.

James goes to the workgroup printer, logs into it with his identity badge and selects the held Job to release it. The workgroup printer prints the Job and James takes it back to his desk.

* + 1. Storing a Job for Later Reprinting

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 on the school's workgroup printer 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.

* + 1. Reprinting a Stored Job

Lily is a teacher. She has run out of her supply of assignment tracking forms. She goes to the school's office, logs in using her faculty account, and selects Stored Jobs on its control panel. Among the Stored Jobs listed, she finds the assignment tracking form that had been stored by Vincent. She selects that Stored Job for reprinting, choosing to have 30 copies made, and taps Print. The copies are printed, and she returns to her classroom with the newly printed copies.

* + 1. Proof Printing

Abby, Brian, and Cyrus 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.

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

Once a month, Cyrus extracts from their database all the detailed software requirements for each project into a spreadsheet. He also extracts all the high-level software requirements into a word processing document. Cyrus then submits a single Print Job with two Documents [PWG5100.5] (the spreadsheet and the word processing document) for a proof print of 3 copies (single-sided and portrait).

Abby searches for layout and visual content errors, while Brian looks for typos and missing words. Cyrus commits their fixes to the database, regenerates the source documents, and does another cycle of proof print.

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

* + 1. Print Policy for Some Users Limits Print Capabilities

Sue wants to print her report on her department's workgroup printer. She wants to print it in color to make the color graphs look best. However, she has abused her printing privileges, so her department head has instructed the network administrator to restrict her user account's ability to print in color.

Sue opens the document on her laptop, chooses to print, and selects the department's workgroup printer. The Printer authenticates the laptop using Sue's credentials, and then provides the laptop with the print choices available for Sue's account, which does not include color printing. Sue decides whether to print it in black-and-white anyway or to print from one of the campus printing centers, where she can pay to print in color.

Sue's experience and the underlying IPP interaction is illustrated in the sequence diagram in Figure 1.

Figure - Use Case 3.2.7 Sequence Diagram for Sue's Experience



Bob is an associate professor in the same department as Sue. His account has no limitations for color printing. He opens a document on his tablet, taps to print, and selects the department's workgroup printer. His tablet presents print options including the option of printing in color. Bob chooses to print in color, and prints his document, which prints in color as he expects.

Bob's experience and the underlying IPP interaction is illustrated in the sequence diagram in Figure 2.

Figure - Use Case 3.2.7 Sequence Diagram for Bob's Experience



* + 1. User Not Listed in Print Policy Denied Ability to Print in Color

Duncan is at the office and needs to print a 5-page report that contains color diagrams before his next meeting. His office user account has been granted permission by his office network administrator to print in color. Duncan opens the document on his tablet, taps to print, and selects the desired Printer. The tablet fetches the Printer's default capabilities, and then authenticates using Duncan's user account to retrieve the print options available to him as per his account's print policy, including the option to print in color or monochrome. He prints the document using the color option, retrieves the hardcopy from the printer, and then goes on to his meeting.

Duncan's experience and the underlying IPP interaction is illustrated in the sequence diagram in Figure 3.

Figure - Use Case 3.2.7 Sequence Diagram for Duncan's Experience



Ed is visiting Duncan's office and needs to print a 3-page document. Ed is not listed as a user in the print policy. Ed opens the document on his laptop, clicks to print, and selects the Printer Duncan pointed out to him. The laptop does not support print policies or does but has no valid credentials. The Printer provides Ed's laptop with the default print capabilities. When the Job is submitted to the Printer, the Printer rejects the Job or identifies the setting that were adjusted, since unknown users don't have the right to print in color on this printer.

Ed's experience and the underlying IPP interaction is illustrated in the sequence diagram in Figure 4.

Figure - Use Case 3.2.7 Sequence Diagram for Ed's Experience



* 1. Exceptions
     1. Incorrect Job Password Prevents Release

Velma is one of Frank's co-workers. She is very competitive and has questionable business ethics. She goes to the department's workgroup printer to see if she can re-print any of Frank's jobs. Many of Frank's jobs are submitted as requiring user account authorization to release or reprint and are not visible to her, but she finds one Job Frank submitted using password release. She suspects this Job is the latest draft of a key report and tries to re-print it. The Job she selected is a Job Password protected Release Job , so the workgroup printer presents a password challenge UI to authorize re-printing. Velma doesn't know it, so she guesses a few times, gives up, and goes to the break room to brood.

* + 1. Incorrect User Credentials Prevents Release

Wilbur is a corporate spy who has infiltrated the offices of James' law firm. He is hoping that he can acquire documents pertaining to a case, but he cannot access the documents on the law firm's computers. He hopes he will be able to reprint documents on the printers since they are not as carefully protected. He goes to the control panel and looks for the printer's Job History. The printer does allow listing the Job history to unauthenticated users, so he looks through the past jobs, selects one and taps "Print". He is challenged to log into the printer using matching account credentials, but he doesn't have credentials that are authorized access to any of the jobs in the history. Wilbur gives up and goes looking for a recycle bin to plunder.

* 1. Out of Scope

The following are out of scope for this specification:

1. Specifying the methods used by the Printer to manage its storage for Stored Jobs or pending Jobs;
2. Defining specific methods for multi-factor authentication for PIN and Release Printing, e.g., smart cards;
3. Specifying the methods used by the Printer to implement authentication and authorization; and
4. Specifying the methods used by the Printer to present features on its Console.
   1. Design Requirements

The design requirements for this specification are:

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 an IPP operation to allow a Client to obtain supported Printer capabilities for a specific End User;
4. Define new attributes and values to support the conceptual Job Release feature;
5. Define new attributes and values to support the conceptual Job Storage feature;
6. Define new operations, attributes and values to support the conceptual Job Print Policy feature;
7. Define new attributes to support the conceptual Job Proof and Suspend feature;
8. Define new attributes to support the conceptual Job Proof Print feature;
9. Define additional attributes to support other minor enhancements to IPP that relate to the significant features defined in this specification;
10. Define security requirements necessary to support the features specified; and
11. Define sections to register all attributes, values, and operations with IANA.
12. IPP Model for Enterprise Printing

This specification extends the Internet Printing Protocol/1.1 [STD92] model to add support for the conceptual Job Release, Job Storage, Job Print Policy, Job Proof and Suspend, and Job Proof Print features. A few other IPP attributes and attribute values are also defined to better satisfy the use cases in section ‎3.2.

* 1. Job Release

An IPP Client uses the Job Release feature to request a Printer hold a Job in the 'pending-held' state until that Printer receives the specified Release Action to release the Job to processing. A Client can request Job Release by including the "job-release-action" operation attribute (section ‎6.1.3) in a Job Creation Operation.

This specification defines three Release Actions: Button Press, Job Password, and User Authorization. The Printer's supported Release Actions are listed in its "job-release-action-supported" Printer Description attribute (section ‎6.4.13). The Printer can be configured with a default Release Action, indicated by the "job-release-action-default" Printer Description attribute (section ‎6.4.12). The default Release Action cannot be 'job-password'.

Table 1 lists the defined Release Actions and their corresponding "job-state-reasons" keyword indicators (section ‎8.2).

Table - Release Actions for Job Release

|  |  |  |
| --- | --- | --- |
| Release Action | "job-release-action" | "job-state-reasons" indicators |
| (none) | 'none' | n/a |
| Button Press | 'button-press' | 'job-held-for-button-press' 'job-held-for-release' |
| Job Password | 'job-password' | 'job-password-wait' 'job-held-for-release' |
| User Authorization | 'owner-auth' | 'job-held-for-authorization' 'job-held-for-release' |

* 1. Job Storage

An IPP Client uses the Job Storage feature to request that the Printer "store" a Job and its Documents as part of processing, to make the Job available for later reprinting. A Client can request Job Storage by supplying the "job-storage" Job Template attribute (section ‎6.1.3) in the Job Creation Operation, which includes how the Printer should process the Job and who has access to the Stored Job. The Client can specify whether the Job is accessible by all users, only the job owner, or users that are members of one of the supported groups listed by the Printer. The Printer's "job-storage-supported", "job-storage-access-supported", "job-storage-disposition-supported", and "job-storage-group-supported" Printer Description attributes list the Printer's supported Job Storage options.

* + 1. Stored Jobs

The Job becomes a Stored Job when it has reached the 'completed' state [STD92], is in the Job Retention phase [STD92], and the Printer has restored the Job's original Documents submitted by the Client before processing. The Job's storage status is indicated by the "job-state-reasons" Job Status attribute [STD92] keywords 'job-stored-successfully', 'job-stored-with-errors', 'job-stored-with-warnings', or 'job-storing' (section ‎8.2). The Printer retains the Stored Job for an implementation-defined period in the Job Retention Phase (see [STD92] section 5.3.7.2 "Partitioning of Job States"), which is longer than the implementation-defined period used for conventional Jobs. As with other Jobs, the Client can explicitly specify the retention period using the "job-retain-until", "job-retain-until-interval", and "job-retain-until-time" attributes [PWG5100.7].

* + 1. Find and Evaluate a Stored Job

A Client gets a list of Stored Jobs from the Printer using the Get-Jobs operation [STD92] supplying the "which-jobs" operation attribute with either the 'stored-public', 'stored-group' or 'stored-owner' keyword. A Client can search the Job's "job-state-reasons" Job Status attribute for the 'job-stored-successfully', 'job-stored-with-errors', 'job-stored-with-warnings', or 'job-storing' keywords (section ‎8.2) to identify a Stored Job and evaluate its disposition.

* + 1. Print a Copy of a Stored Job

There are two methods defined to print a copy of the Stored Job: using the Resubmit-Job operation [PWG5100.7]; and by direct interaction with the Console.

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 Client MUST be prepared for an authentication challenge.

An End User can request the Printer to print a Stored Job using its Console. The details of the user experience and presentation on the Console are beyond the scope of this document.

* 1. Job Print Policy

An IPP Client uses the Job Print Policy feature to request the Printer provide the Printer's attributes and capabilities filtered specifically to the Client's most authenticated user. The request is made using the Get-User-Printer-Attributes operation (section ‎5.1), which is semantically analogous to the existing Get-Printer-Attributes IPP operation [STD92] but with the key difference that the Printer is expected to challenge the Client for authentication. By convention, the Get-Printer-Attributes is expected to never challenge the Client for authentication. A Printer declares its support for the Job Print Policy feature by including the 'Get-User-Printer-Attributes' keyword in its "operations-supported" Printer Description attribute [STD92].

* 1. Job Proof
     1. Job Proof and Suspend

An IPP Client uses the Job Proof and Suspend feature to request the Printer create a Job as a Proof and Suspend Job, which is a single Job used to produce both the Proof Copies and Final Copies (if approved). A Printer supporting Job Proof and Suspend will print the number of Proof Copies specified by the "proof-copies" Job Template attribute (section ‎6.2.4) when the Job is initially in the 'processing' state. Once the Printer produces these "proof" copies, it moves the Proof and Suspend Job to the 'processing-stopped' state to await approval or rejection and adds the 'job-suspended-for-approval' keyword to the "job-state-reasons" attribute [STD92]. A Client can supply the 'proof-and-suspend' keyword for the "which-jobs" operation attribute in a Get-Jobs request to get the list of Proof and Suspend Jobs awaiting approval.

A Client approves the Proof and Suspend Job using a Resume-Job operation, or rejects it using a Cancel-Job operation. The Printer can provide the ability to approve or reject a Proof and Suspend Job on its Console. If the End User approves the Proof and Suspend Job, the Printer moves the Job back into the 'processing' state and produces the Final Copies. If the End User rejects the Proof and Suspend Job, the Printer moves the Proof and Suspend Job to the 'canceled' terminal state.

Note: A print service might force (via policy) that multiple copy Jobs automatically produce a proof copy followed by N-1 copies once approved/released.

* + 1. Job Proof Print (DEPRECATED)

Job Proof Print [PWG5100.11-2010] enables a Client to submit a Job as a Proof Job. Job Proof Print is DEPRECATED because it is more complex and as of this writing hasn't been implemented by any Clients or Printers despite it being ten years old.

When processed, a Proof Job produces the specified number of proof copies and proof settings. Once the Proof Job reaches the 'completed' state, the Printer retains the Proof Job so that it is available for resubmission once the proof copies have been reviewed. If the Job is satisfactory, a Client can request the Printer to produce the "normal" copies using the Resubmit-Job operation [PWG5100.7]. The Printer might also provide a method to do this via its Console. The Printer will clean up abandoned Proof Jobs after an implementation-defined time if it has not been concluded by moving the retained Proof Job to the Job History phase [STD92].

1. New Operations
   1. Get-User-Printer-Attributes

This RECOMMENDED operation is semantically analogous to the Get-Printer-Attributes operation [STD92] but the Printer filters the set of attributes and attribute values in the response based on the most authenticated user. The authenticated user ([STD92] RFC 8011 section 9.3) performing this operation MUST be either a User permitted to create Print Jobs or an Operator or Administrator for the Printer. Otherwise, the Printer MUST reject the operation and return the appropriate status-code ('client-error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized').

The Client MUST be prepared to handle an HTTP authentication challenge in response to a Get-User-Printer-Attributes request. If the Client initiates the Get-User-Printer-Attributes operation over an HTTP connection without TLS, the Client MUST be prepared to receive an HTTP 426 response to upgrade the connection to TLS [RFC2817][RFC8446]. A Printer MUST send a Get-User-Printer-Attributes response over Secure Transport for authentication methods that require a secure channel, as defined in [STD92].

A Printer MUST support all the same operation attributes for a Get-User-Printer-Attributes operation that it supports with a Get-Printer-Attributes operation, including those a Client can use to request a filtered response: “document-format” [STD92]; “first-index” [PWG5100.13]; “limit” [PWG5100.13]; and any of the attributes named by “printer-get-attributes-supported” [PWG5100.13].

* + 1. Get-User-Printer-Attributes Request

The following groups of attributes are supplied as part of the Get-User-Printer-Attributes 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, as described in [STD92] Section 4.1.4.1.
* "printer-uri" (uri):
  + The Client MUST supply and the Printer MUST support this attribute, which specifies the target for this operation, as described in [STD92] Section 4.1.5.
* "requesting-user-name" (name(MAX)):
  + The Client MUST supply and the Printer MUST support this attribute, as described in [STD92] Section 9.3.
* “requesting-user-uri” (uri):
  + The Client SHOULD supply and the Printer MUST support this attribute, as described in [PWG5100.13] section 5.1.6.
* “requesting-user-vcard” (1setOf text(MAX)):
  + The Client SHOULD supply and the Printer MUST support this attribute, as described in [PWG5100.SYSTEM] section 7.1.6.
* "requested-attributes" (1setOf keyword):
  + This attribute MAY be supplied by the Client and MUST be supported by the Printer as described in [STD92] Section 4.2.5.1.
* "document-format" (mimeMediaType):
  + The Client SHOULD supply this attribute, as described in [STD92] Section 4.2.5.1.
    1. Get-User-Printer-Attributes Response

The Printer returns the following sets of attributes as part of the Get-User-Printer-Attributes response:

Group 1: Operation Attributes

* "attributes-charset" (charset) and "attributes-natural-language" (naturalLanguage):
  + The Client MUST support and the Printer MUST supply both of these attributes, as described in [STD92] Section 4.1.4.1.
* Status Message:
  + In addition to the REQUIRED status-code returned, the response MAY include the "status-message" (text(255)) and/or the "detailed-status-message" (text(MAX)) operation attribute as described in [STD92] Appendix B and Section 4.1.6.

Group 2: Unsupported Attributes

* See [STD92] Section 4.1.7 for details on returning unsupported attributes.

Group 3: Printer Attributes

* This group contains the set of requested attributes and their values for the authenticated user. See [STD92] Section 4.2.5.2 for details.

1. New Attributes
   1. Operation Attributes

Table 2 lists the operation attributes defined in this specification, each with its corresponding conformance requirements.

Table - New Operation Attributes

|  |  |
| --- | --- |
| Attribute | **Printer Support** |
| job-password | CONDITIONALLY REQUIRED |
| job-password-encryption | CONDITIONALLY REQUIRED |
| job-release-action | CONDITIONALLY REQUIRED |
| job-storage | CONDITIONALLY REQUIRED |

* + 1. job-password (octetString(255))

This CONDITIONALLY REQUIRED operation attribute allows a User to specify a password for that Job. A Printer that supports the Job Password Release Action for the Job Release feature MUST support this attribute. The Printer will only process a Job created with a "job-password" after the Printer has received the matching password value on its control panel.

Printers and Clients that support this attribute SHOULD support Secure Transport. Printers SHOULD negotiate a TLS session prior to accepting a Validate-Job or Job Creation request containing this attribute. Clients SHOULD negotiate a TLS session prior to sending a Validate-Job or Job Creation request containing this attribute.

The Client "encrypts" the password string using one of the methods listed in the Printer's "job-password-encryption-supported" Printer Description attribute (section ‎6.4.3). The encrypted password value is sent to the Printer as the value of the "job-password" operation attribute, and the method used is sent as the value of the "job-password-encryption" operation attribute.

When the Printer receives a password on its the control panel, it encrypts the password using the same encryption method specified by the Job's "job-password-encryption" attribute. If that value matches the value of the Job's "job-password" Job Status attribute, the Printer releases the Job to processing. The method in which the password is entered and validated at the Printer is implementation dependent.

If a Job Password protected Release Job is released by the User while another Job is printing, the Job Password protected Release Job SHOULD be the next Job printed after the current Job, unless the Printer has another Job which has a higher priority than the Job Password protected Release Job as determined by the "job-priority" attribute.

If the Printer's "job-password-repertoire-configured" Printer Description attribute (section ‎6.4.5) specifies one of the UTF-8 repertoires, the Client and the Printer MUST normalize the encoding of the provided password value to use Network Unicode UTF-8 encoding [RFC5198] [UAX15] to prevent binary differences in the cleartext password values, which will cause differences in the outputs of the chosen hashing function specified by the associated "job-password-encryption" attribute (section ‎0).

The Printer MUST set the Job's initial state according to the methodology specified in section ‎4.1. The Job MUST add the 'job-password-wait' keyword to its "job-state-reasons" attribute at the time the Job is created. When the Printer has received the matching password and the Job is released to processing, the Job removes the 'job-password-wait' keyword its "job-state-reasons" attribute to indicate that that condition is no longer preventing processing.

A Client MAY include this operation attribute in a Job Creation Operation (Print-Job, Print-URI, and Create-Job) request, as per section ‎7.1. A Client MUST NOT include this operation attribute in a Validate-Job request, as per section ‎7.3.

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 the new copy is also a Password Release Job. The "job-password" Job Status attribute value MUST NOT be returned in any IPP response. The "job-password" Job Status attribute value MUST NOT be accessible via any non-IPP protocol.

* + 1. job-password-encryption (type2 keyword)

This CONDITIONALLY REQUIRED operation attribute specifies the cryptographic hash method the Client used to obfuscate the value of the "job-password" operation attribute supplied in the same operation. A Printer that supports the Job Password Release Action for the Job Release feature MUST support this attribute. The Client MUST supply this operation attribute whenever the Client supplies the "job-password" operation attribute (section ‎6.1.1) in a Job Creation Operation or a Validate-Job operation. The value MUST be one of the values listed by the Printer's "job-password-encryption-supported" attribute (section ‎6.4.3).

Note: The original definition of this attribute also included the "name(MAX)" syntax in its syntax definition, but site-local or vendor-unique hashing algorithms were never used, so that syntax is now OBSOLETE.

* + 1. job-release-action (type2 keyword)

This CONDITIONALLY REQUIRED operation attribute supplies the release action that the Printer awaits to receive before it moves the Job to the 'pending' state. The supplied value MUST be one of the values listed in the Printer's "job-release-action-supported" Printer Description attribute (section ‎6.4.13). Table 3 lists the keywords defined in this specification.

Table - "job-release-action" Keywords

|  |  |
| --- | --- |
| Keyword | Meaning |
| 'none' | The Printer moves the Job at once to the 'pending' state unless other dependencies must also be satisfied before processing. |
| 'button-press' | A button press on the Console releases the Job to the 'processing' state. |
| 'job-password' | A password matching the Job's "job-password" hidden Job Status attribute provided at the Console releases the Job to the 'processing' state. When a Client supplies this keyword, it MUST also supply the "job-password" and "job-password-encryption" operation attributes. |
| 'owner-authorized' | Authorization from the Job Owner at the Console releases the Job to the 'processing' state. A supporting Client supplying this keyword MUST be prepared to for an authentication challenge. |

The Printer MUST initialize a newly created Release Job's "job-state" Job Status attribute [STD92] to 'pending-held'. If the Release Job is also a Stored Job with "job-storage-disposition" set to 'store-only' (section ‎6.1.4.2) and no other condition requires the Job to be kept in the 'pending-held' state, then the Printer MUST initialize a newly created Release Job's "job-state" Job Status attribute to 'pending' so that it is a candidate for immediate processing.

When the User releases a Release Job, the Printer moves the Job to the ‘pending’ or ‘processing’ state unless there are other dependencies that prevent its immediate processing. When the Printer releases the Job, it removes the indicator keywords listed in Table 1 from the Job's “job-state-reasons” Job Status attribute.

All Printers supporting Job Release MUST support the "job-spooling-supported" Printer Description attribute [PWG5100.7]. A Client supporting Job Release SHOULD support multiple Job spooling when the target Printer's "job-spooling-supported" Printer Description attribute is set to 'spool' or 'automatic'. If the Printer's "job-spooling-supported" Printer Description attribute is set to 'stream', the could might be unable to receive additional Jobs until the Release Job has been released, or the Client might have to keep open the TCP connection until the Job has been released, which could cause an adverse use of resources on the Client.

If a Client supplies this attribute specifying the 'job-password' keyword, it MUST supply the "job-password" (section ‎6.1.1) and "job-password-encryption" (section ‎6.1.2) operation attributes. A Printer MUST reject an operation that includes this attribute supplying the 'job-password' keyword but both the "job-password" or "job-password-encryption" operation attributes are not present. If a Client supplies the "job-password" and "job-password-encryption" operation attributes but does not supply this attribute, then the original semantics of "job-password" and "job-password-encryption" apply.

If a Client supplies this attribute specifying either the 'button-press' or 'owner-authorized' keywords, it MUST NOT supply the "job-password" or "job-password-encryption" operation attributes. A Printer MUST reject an operation that includes this attribute supplying either the 'button-press' or 'owner-authorized' keyword values and that also includes either the "job-password" or "job-password-encryption" operation attributes.

* + 1. job-storage (collection)

This CONDITIONALLY REQUIRED operation attribute is a collection whose members specify how a Printer processes a Job to become a Stored Job and who has access to the Stored Job. A Printer that supports the Job Storage feature MUST support this attribute. See section ‎4.2 for a full description of the Job Storage feature. The Printer copies the "job-storage" attribute received in a Job Creation Operation into the corresponding Job as a Job Status attribute (section ‎6.3.1).

This attribute MAY be used with the "job-release-action" attribute (section ‎6.1.3) to create a Release Job that is also a Stored Job. A Client determines whether a Printer supports Stored Jobs that are also Release Jobs by first finding the 'job-storage' keyword in the Printer's "printer-get-attributes-supported" Printer Description attribute, then sending an empty "job-storage" collection as an operation attribute in a new Get-Printer-Attributes request, and finally detecting that the response contains both the "job-storage-supported" Printer Description attribute (section ‎6.4.17) and the “job-release-action-supported” Printer Description attribute (section ‎6.4.13).

* + - 1. job-storage-access (type2 keyword)

This REQUIRED 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 ‎6.4.12). The "job-storage-access" member attribute MUST be preserved by the Job as a member of the "job-storage" Job Status attribute (section ‎6.3.1). Table 4 lists the keywords defined in this specification.

Table - "job-storage-access-supported" Keywords

|  |  |  |
| --- | --- | --- |
| Keyword | Meaning | Conformance Requirements |
| "group" | Accessible only by members of the group named by the "job-storage-group" member attribute (section ‎6.1.4.3) | MAY |
| "owner" | Accessible only by the Job Owner | MUST |
| "public" | Accessible by all users | MUST |

* + - 1. job-storage-disposition (type2 keyword)

This REQUIRED member attribute specifies how the Printer processes the Job. The value MUST be one of the values specified by the Printer's "job-storage-disposition-supported" Printer Description attribute (section ‎6.4.15). Table 5 lists the keywords defined in this specification.

Table - "job-storage-disposition-supported" Keywords

|  |  |  |
| --- | --- | --- |
| Keyword | Meaning | Conformance Requirements |
| 'none' | The Printer MUST print the Job. The Printer MUST NOT retain the Job; it MUST move it immediately to the Job History phase. | MAY |
| 'print-and-store" | The Printer MUST print the Job. If the Job reaches the 'completed' state, the Printer MUST retain the Job in the Job Retention phase. | MUST |
| 'store-only' | The Printer MUST NOT print the Job. The Printer MUST retain the Job in the Job Retention phase. | MUST |

If the Client specifies 'save-only' for this member attribute and specifies operation attribute or Job Template attributes requesting that this Job be a Release Job, a newly created Job MUST be processed immediately to allow it to become a Stored Job, since processing will not produce any physical output.

A Client MUST NOT supply the “proof-print” operation attribute (section ‎6.2.4) when the “job-storage-disposition” member attribute specifies ‘save-only’. A Printer MUST reject a Job Creation Operation where the Client supplies both the “proof-print” operation attribute and the “job-storage-disposition” member attribute specifying ‘save-only’.

The "job-storage-disposition" member attribute MUST NOT be preserved by the Job as a member of the "job-storage" Job Status attribute (section ‎6.3.1).

* + - 1. job-storage-group (name(MAX))

This member attribute specifies the group that has access to this Stored Job. If the "job-storage-access" attribute is 'group', then this member attribute MUST be present. The value of this attribute MUST be one of the values specified by the Printer's "job-storage-group-supported" Printer Description attribute (section ‎6.4.20).

* 1. Job Template Attributes

Table 6 lists the Job and Document Template attributes defined in this specification, each with its corresponding conformance requirements.

Table - New Job and Document Template Attributes

|  |  |
| --- | --- |
| Attribute | **Printer Support** |
| job-cancel-after | OPTIONAL |
| job-phone-number | OPTIONAL |
| job-recipient-name | OPTIONAL |
| proof-copies | CONDITIONALLY REQUIRED |
| proof-print | DEPRECATED |

* + 1. job-cancel-after (integer(1:MAX))

This OPTIONAL Job Template attribute specifies the maximum number of seconds the Printer allows for processing the Job. The Printer starts timing the processing when it puts the Job in the 'processing' state. If the Printer moves the Job into the 'processing-stopped' state, it stops the timer. The Printer resumes timing when it moves the Job back into the 'processing' state. If the Job is canceled because of this timer, the Printer MUST add the 'job-canceled-after-timeout' keyword to the "job-state-reasons" Job Status attribute (section ‎8.2).

* + 1. job-phone-number (uri)

This OPTIONAL Job Template attribute supplies 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]. How the Printer processes the “job-phone-number” attribute is implementation-dependent.

* + 1. job-recipient-name (name(MAX))

This OPTIONAL Job Template attribute supplies the name of the person that is to receive the output of the 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 value held by the Printer's “job-recipient-name-default” Printer Description attribute, unless it has not been configured by the administrator, or MAY use the “authenticated user” name [STD92], depending on implementation.

* + 1. proof-copies (integer(1:MAX))

This CONDITIONALLY REQUIRED Job Template attribute supplies the requested number of Proof Copies the Printer produces before suspending the Job's processing, indicating this Job is a Proof and Suspend Job. A Printer that supports the conceptual Job Proof and Suspend feature MUST support this attribute. Once the Printer produces the Proof Copies, it suspends the Job by moving it into the 'processing-stopped' state, awaiting approval. If approved, the Printer moves the Job back into the 'processing' state and produces the Final Copies.

If a Client supplies this attribute in a Job Creation Operation, it MUST also supply the "copies" Job Template attribute [STD92]. The Client MUST specify a value for the "proof-copies" attribute that is less than the value for the "copies" attribute. The value of the "copies" attribute is the total number of copies the Printer will produce for the Job, including both Proof Copies and Final Copies. As an example, if "copies" = 14 and "proof-copies" = 2, then initial processing will produce 2 Proof Copies and approval will produce 12 Final Copies.

* + 1. proof-print (collection)

This DEPRECATED Job Template attribute indicates this Job is a Proof Job. The members of this collection indicate the number of "proof" copies to produce and any of the attributes the Printer names in its "proof-print-supported" Printer Description attribute (section ‎6.4.22). A Printer that supports the Job Proof Print feature MUST support this attribute.

When printing the proof copies, the Printer prioritizes the Job member attributes in the "proof-print" collection over the other Job Template attributes, to allow for special processing for the proof copies. After the proof prints have been produced, the Printer MUST retain the completed Job as a Proof Job to allow the proof prints to be reviewed. This retention period SHOULD be longer than the period for ordinary completed Jobs [STD92]. The implementation-defined period can be overridden using the "job-retain-until", "job-retain-until-interval", or "job-retain-until-time" attribute [PWG5100.7].

When a Proof Job is concluded, using any of the operations that reprint a Retained Job (e.g., Reprocess-Job or Resubmit-Job), the Printer MUST remove the “proof-print” attribute from the copy of the Proof Job so that the Job is not proofed again. Only if the Resubmit-Job operation supplies its own “proof-print” attribute, will the copied Job be re-proofed.

This attribute MAY be used with the "job-password" attribute (section ‎6.1.1), however this may prevent the initial copies or the "job-release-action” attribute (section ‎6.1.3) to create a Release Job that is also a Proof Job. A Client determines whether a Printer supports Proof Jobs that are also Release Jobs by first finding the 'proof-print' keyword in the Printer's "printer-get-attributes-supported" Printer Description attribute, then sending an empty "proof-print" collection as an operation attribute in a new Get-Printer-Attributes request, and finally detecting that the response contains both the "proof-print-supported" Printer Description attribute (section ‎6.4.22) and the “job-release-action-supported” Printer Description attribute (section ‎6.4.13).

Table 7 lists the member attributes of the "proof-print" collection attribute.

Table 7 - "proof-print" Member Attributes

|  |  |  |
| --- | --- | --- |
| Member Attribute Name | Request | Printer Support |
| proof-print-copies | MUST | MUST |
| media | MUST include one or the other, but MUST NOT include both | MUST |
| media-col | MAY |
| {Any attributes listed in "proof-print-supported" (‎6.4.22)} | MAY | MAY |

* + - 1. proof-print-copies (integer (0:MAX))

This REQUIRED member attribute supplies the requested number of proof copies the Printer produces when the Job is processed. The range of allowed values is reported by the Printer's "proof-print-copies-supported" Printer Description attributes (section ‎6.4.19). This number is separate from the "copies" Job Template attribute. A Proof Job where "proof-print-copies" is 4 and "copies" is 10 will ultimately produce 14 copies.

If the "proof-print-copies" value is 0 (zero), then no proof prints are produced. There are legacy environments that provide a simple short-lived "job storage" feature using Proof Print using this [PWG5100.11-2010], but the preferred method for doing "job-storage" is using the Job Storage feature described in section ‎4.2.

* + - 1. media (type2 keyword | name(MAX)) or media-col (collection)

These CONDITIONALLY REQUIRED member attributes supplies the requested media the Printer MUST use for the specified "proof-print-copies" of the Proof Job. These member attributes are identical to the "media" [STD92] or the "media-col" [PWG5100.7] Job Template attributes. The Client MUST supply either the "media" or the "media-col" member attribute but MUST NOT supply both. If a Printer receives a Job Creation request that includes neither or both in a "proof-print" Job Template attribute, the Printer MUST either reject the request and return the 'client-error-bad-request' status code [STD92], or accept the request and use the "media" or "media-col" member attribute, independent of the value of the "ipp-attribute-fidelity" attribute [STD92] supplied by the Client, depending on implementation.

* 1. Job Status Attributes

Table 6 lists the Job Status attributes defined in this specification, each with its corresponding conformance requirements.

Table - New Job Status Attributes

|  |  |
| --- | --- |
| Attribute | **Printer Support** |
| job-release-action | CONDITIONALLY REQUIRED |
| job-storage | CONDITIONALLY REQUIRED |
| parent-job-id | CONDITIONALLY REQUIRED |
| parent-job-uuid | CONDITIONALLY REQUIRED |

* + 1. job-release-action (type2 keyword)

This CONDITIONALLY REQUIRED Job Status attribute indicates the Job's Release Action as configured by the Client using the "job-release-action" operation attribute (section ‎6.1.3). The Printer releases the Job to the 'processing' state only after the Printer has received the specified action.

This Job Status attribute MUST be preserved with the Job until the Job's Document Content is removed (e.g. not before the Job has entered the Job History phase [STD92]). If the Release Job is copied, as in the case of reprinting a Stored Job or completing a Proof Job, this Job Status attribute and value MUST be included in the new copy to preserve Job protection.

* + 1. job-storage (collection)

This CONDITIONALLY REQUIRED Job Status attribute indicates this Job is a Stored Job. This attribute contains a complete copy of the "job-storage" operation attribute (section ‎6.1.3) provided in the Job Creation operation, including all its members. If the Printer supports the "job-storage" operation attribute, then it MUST support this Job Status attribute.

When a Printer copies a Stored Job, it MUST NOT include this Job Status attribute in the new copy.

* + 1. parent-job-id (integer(1:MAX))

This CONDITIONALLY REQUIRED Job Status attribute indicates the “job-id” [STD92] of the Job that was copied to create this Job. A Printer that supports the Resubmit-Job operation MUST support this attribute.

* + 1. parent-job-uuid (uri(45))

This CONDITIONALLY REQUIRED Job Status attribute indicates the “job-uuid” [PWG5100.13] of the Job that was copied to create this Job. A Printer that supports the Resubmit-Job operation MUST support this attribute.

* 1. Printer Description Attributes

Table 9 lists the Printer Description attributes defined in this specification, each with its corresponding conformance requirement.

Table - New Printer Description Attributes

|  |  |
| --- | --- |
| Attribute | Printer Support |
| job-cancel-after-default | CONDITIONALLY REQUIRED |
| job-cancel-after-supported | CONDITIONALLY REQUIRED |
| job-password-encryption-supported | CONDITIONALLY REQUIRED |
| job-password-length-supported | CONDITIONALLY REQUIRED |
| job-password-repertoire-supported | CONDITIONALLY REQUIRED |
| job-password-repertoire-configured | CONDITIONALLY REQUIRED |
| job-password-supported | CONDITIONALLY REQUIRED |
| job-phone-number-default | CONDITIONALLY REQUIRED |
| job-phone-number-supported | CONDITIONALLY REQUIRED |
| job-recipient-name-default | CONDITIONALLY REQUIRED |
| job-recipient-name-supported | CONDITIONALLY REQUIRED |
| job-storage-access-supported | CONDITIONALLY REQUIRED |
| job-storage-disposition-supported | CONDITIONALLY REQUIRED |
| job-storage-group-supported | CONDITIONALLY REQUIRED |
| job-storage-supported | CONDITIONALLY REQUIRED |
| printer-detailed-status-messages | OPTIONAL |
| proof-copies-supported | CONDITIONALLY REQUIRED |
| proof-print-copies-supported | DEPRECATED |
| proof-print-default | DEPRECATED |
| proof-print-supported | DEPRECATED |
| which-jobs-supported | CONDITIONALLY REQUIRED |

* + 1. job-cancel-after-default (integer(1:MAX) | no-value)

This CONDITIONALLY REQUIRED Printer Description attribute provides the value the Printer will use for the "job-cancel-after" Job Template attribute (section ‎6.2.1) if a Client omits it from a Job Creation Operation request. A Printer that supports the "job-cancel-after" Job Template attribute MUST support this attribute.

* + 1. job-cancel-after-supported (rangeOfInteger(1:MAX))

This CONDITIONALLY REQUIRED Printer Description attribute indicates the allowed range of values the Printer will accept for the "job-cancel-after" Job Template attribute (section ‎6.2.1). A Printer that supports the "job-cancel-after" Job Template attribute MUST support this attribute.

* + 1. job-password-encryption-supported (1setOf type2 keyword)

This CONDITIONALLY REQUIRED Printer Description attribute lists the cryptographic hashes the Printer supports for obfuscating the cleartext password value accepted from the User by the Client. A Printer that supports the "job-password-encryption" operation attribute (section ‎6.1.2) MUST support this attribute.

Note: The original definition of this attribute also included the "name(MAX)" syntax in its syntax definition, but as site-local or vendor-unique hashing algorithms were never used and are of little value, that syntax is now DEPRECATED.

Table 10 lists the keywords defined in this specification. The 'md2', 'md4', 'md5', and 'sha' keywords are DEPRECATED.

Table - "job-password-encryption-supported" Keywords

| Keyword | Description |
| --- | --- |
| 'none' | The "job-password" attribute value is passed in the clear. No cryptographic hashing has been applied. This method SHOULD NOT be used unless the entire operation is sent over Secure Transport. |
| 'md2' | The MD2 hash algorithm [RFC1319] [RFC6149], with an output size of 128 bits – DEPRECATED |
| 'md4' | The MD4 hash algorithm [RFC1320] [RFC6150], with an output size of 128 bits – DEPRECATED |
| 'md5' | The MD5 hash algorithm [RFC1321] [RFC6151], with an output size of 128 bits - DEPRECATED |
| 'sha' | The Secure Hash Algorithm 1 [RFC6234] [FIPS180-4], with an output size of 160 bits - DEPRECATED |
| 'sha2-224' | The Secure Hash Algorithm 2 [RFC6234] [FIPS180-4], with an output size of 224 bits. |
| 'sha2-256' | The Secure Hash Algorithm 2 [RFC6234] [FIPS180-4], with an output size of 256 bits. |
| 'sha2-384' | The Secure Hash Algorithm 2 [RFC6234] [FIPS180-4], with an output size of 384 bits. |
| 'sha2-512' | The Secure Hash Algorithm 2 [RFC6234] [FIPS180-4], with an output size of 512 bits. |
| 'sha2-512\_224' | The Secure Hash Algorithm 2 [RFC6324] [FIPS180-4], with an output size of 512 bits, truncated to 224 bits. |
| 'sha2-512\_256' | The Secure Hash Algorithm 2 [RFC6234] [FIPS180-4], with an output size of 512 bits, truncated to 256 bits. |
| 'sha3-224' | The Secure Hash Algorithm 3 [FIPS202], with an output size of 224 bits. |
| 'sha3-256' | The Secure Hash Algorithm 3 [FIPS202], with an output size of 256 bits. |
| 'sha3-384' | The Secure Hash Algorithm 3 [FIPS202], with an output size of 384 bits. |
| 'sha3-512' | The Secure Hash Algorithm 3 [FIPS202], with an output size of 512 bits. |
| 'sha3-512\_224' | The Secure Hash Algorithm 3 [FIPS202], with an output size of 512 bits, truncated to 224 bits. |
| 'sha3-512\_256' | The Secure Hash Algorithm 3 [FIPS202], with an output size of 512 bits, truncated to 256 bits. |
| 'shake-128' | The SHAKE128 method [FIPS202], with an output size of 128 bits. |
| 'shake-256' | The SHAKE256 method [FIPS202], with an output size of 256 bits. |

* + 1. job-password-length-supported (rangeOfInteger (0:255))

This CONDITIONALLY REQUIRED Printer Description attribute indicates the minimum and maximum number of characters the Printer supports for the unencrypted job password string. The length of a character in octets is defined by the character set used by the currently configured password repertoire (section ‎6.4.5). A Printer that supports the "job-password" operation attribute (section ‎6.1.1) MUST support this attribute.

The Printer MUST accept an empty password if the range's minimum value is 0 (zero). This attribute complements the "job-password-supported" attribute (section ‎0), which specifies the maximum password length supported before encryption, measured in octets.

* + 1. job-password-repertoire-configured (type2 keyword)

This CONDITIONALLY REQUIRED Printer Description attribute indicates the Printer's currently configured password repertoire. A Printer that supports the "job-password" operation attribute (section ‎6.1.1) MUST support this attribute. The value of this attribute MUST be one of the values specified in the Printer's "job-password-repertoire-supported" attribute (section ‎6.4.5).

* + 1. job-password-repertoire-supported (1setOf type2 keyword)

This CONDITIONALLY REQUIRED Printer Description attribute lists the password repertoires (allowable characters, character sets and encodings) the Printer is configured to use by its Operator. A Printer that supports the "job-password" operation attribute (section ‎6.1.1) MUST support this attribute. A Client interested in printing should ignore this attribute and instead use the "job-password-repertoire-configured" attribute (section ‎6.4.5) to identify the Printer's currently configured Job password repertoire.

The keywords follow a 'REGISTRY\_ENCODING\_RANGE' naming structure. Table 11 lists the keywords defined in this specification. The "utf-8" encoding element in this context means Network Unicode [RFC5198].

Table - "job-password-repertoire-supported" Keywords

|  |  |
| --- | --- |
| Keyword | Description |
| 'iana\_us-ascii\_digits' | Value must consist of only ASCII digits (0x30-0x39) |
| 'iana\_us-ascii\_letters' | Value must consist of only US ASCII letters (0x41-0x5A, 0x61-0x7A) |
| 'iana\_us-ascii\_complex' | 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) |
| 'iana\_us-ascii\_any' | Value must consist of US ASCII printable characters (0x20-0x7e) |
| 'iana\_utf-8\_digits' | Value must consist of only UTF-8 numerical digits |
| 'iana\_utf-8\_letters' | Value must consist of UTF-8 letters |
| 'iana\_utf-8\_any' | Value must consist of UTF-8 printable characters |

Vendors MAY implement their own repertoire keywords, prefixed with "vendor\_". Vendors SHOULD register their vendor repertoire keywords 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.

* + 1. job-password-supported (integer(0:255))

This CONDITIONALLY REQUIRED Printer Description attribute indicates the Printer's maximum unencrypted password length measured in octets. A Printer that supports the "job-password" operation attribute (section ‎6.1.1) MUST support this attribute. A conforming Printer provides 0 (zero) for this attribute if "job-password" is supported but administratively disabled.

A conforming Printer MUST be able to accept 255 octets without truncation. However, a Printer MAY serve as a Logical Device for another print system that can only accept shorter passwords.

* + 1. job-phone-number-default (uri)

This CONDITIONALLY REQUIRED Printer Description attribute provides the value the Printer will use for the "job-phone-number" Job Template attribute (section ‎6.2.2) if a Client omits it from a Job Creation Operation request. This attribute SHOULD use the 'tel:' URI scheme [RFC2806]. A Printer that supports the "job-phone-number" Job Template attribute (section ‎6.2.2) MUST support this attribute.

* + 1. job-phone-number-supported (boolean)

This CONDITIONALLY REQUIRED Printer Description attribute indicates whether the "job-phone-number" Job Template attribute (section ‎6.2.2) is supported. A true value indicates that the Printer accepts the “job-phone-number” Job Template attribute. A Printer that supports the "job-phone-number" Job Template attribute MUST support this attribute.

* + 1. job-recipient-name-default (name(MAX))

This CONDITIONALLY REQUIRED Printer Description attribute provides the value the Printer will use for the "job-recipient-name” Job Template attribute (section ‎6.2.3) if a Client omits it from a Job Creation Operation request. A Printer that supports the "job-recipient-name" Job Template attribute (section ‎6.2.3) MUST support this attribute.

* + 1. job-recipient-name-supported (boolean)

This CONDITIONALLY REQUIRED Printer Description attribute indicates whether the Printer accepts the “job-recipient-name” Job Template attribute (section ‎6.2.3). A Printer that supports the "job-recipient-name" Job Template attribute MUST support this attribute.

* + 1. job-release-action-default (type2 keyword)

This CONDITIONALLY REQUIRED Printer Description attribute provides the value the Printer will use for the "job-release-action” operation attribute (section ‎6.1.3) if a Client omits it from a Job Creation Operation request. A Printer MUST NOT supply the 'job-password' keyword for this attribute.

* + 1. job-release-action-supported (1setOf type2 keyword)

This CONDITIONALLY REQUIRED Printer Description attribute lists the keywords the Printer will accept for the 'job-release-action' operation attribute (section ‎6.1.3).

* + 1. job-storage-access-supported (1setOf type2 keyword)

This CONDITIONALLY REQUIRED Printer Description attribute lists the keywords the Printer will accept for the "job-storage-access" member of the "job-storage" operation attribute (section ‎6.1.4.1). A Printer that supports Job Storage MUST support this attribute. Table 4 lists the keywords defined by this specification.

* + 1. job-storage-disposition-supported (1setOf type2 keyword)

This CONDITIONALLY REQUIRED Printer Description attribute lists the keywords the Printer will accept for the "job-storage-disposition" member of the "job-storage" operation attribute (section ‎6.1.4.2). A Printer that supports Job Storage MUST support this attribute. Table 5 lists the keywords defined by this specification.

* + 1. job-storage-group-supported (1setOf name(MAX))

This CONDITIONALLY REQUIRED Printer Description attribute lists the group names the Printer will accept for the "job-storage-group" member of the "job-storage" operation attribute (section ‎6.1.4.3). A Printer that lists the 'job-storage-group' keyword in its "job-storage-supported" Printer Description attribute (section ‎6.4.17) MUST support this attribute. The values provided by this attribute MAY vary based on the identity of the authenticated user (see [STD92] RFC 8011 section 9.3).

A Printer that supports Job Storage and that includes the 'group' keyword in its "job-storage-access-supported" Printer Description attribute (section ‎6.4.12) MUST support this attribute.

* + 1. job-storage-supported (1setOf keyword)

This CONDITIONALLY REQUIRED Printer Description attribute lists the Printer's supported member attributes for the "job-storage" operation attribute (section ‎6.1.4), indicating the Printer supports Job Storage. A Printer that supports Job Storage MUST support this attribute. Table 12 lists the keywords defined in this specification.

Table - "job-storage-supported" Keywords

|  |  |
| --- | --- |
| Keyword | Printer Conformance Requirements |
| 'job-storage-access' | MUST |
| 'job-storage-disposition' | MUST |
| 'job-storage-group' | MAY |

* + 1. printer-detailed-status-messages (1setOf text(MAX))

This OPTIONAL Printer Description attribute lists status messages providing detailed technical information about the Printer such as fault and warning messages, in the same way “job-detailed-status-messages” provides additional information about a Job. The Printer MAY localize the message or messages but is not required to do so since they are intended for consumption by the Administrator or other experienced technical persons. Clients MUST NOT attempt to parse the value(s) of this attribute.

* + 1. proof-copies-supported (rangeOfInteger(1:MAX))

This CONDITIONALLY REQUIRED Printer Description attribute indicates the range of values the Printer will accept for the "proof-copies" Job Template attribute (section ‎6.2.4). A Printer that supports Job Proof and Suspend MUST support this attribute.

A "proof-copies-default" Printer Description attribute was intentionally left undefined.

* + 1. proof-print-copies-supported (rangeOfInteger(0:MAX))

This DEPRECATED Printer Description attribute indicates the range of values the Printer supports for the "proof-print-copies" member attribute of the "proof-print" Job Template attribute (section ‎6.2.5.1).

* + 1. proof-print-default (collection)

This DEPRECATED Printer Description attribute provides the value the Printer will use for the "proof-print" Job Template attribute (section ‎6.2.5) if a Client omits it from a Job Creation Operation request. Printers SHOULD NOT implement this attribute.

* + 1. proof-print-supported (1setOf keyword)

This DEPRECATED Printer Description attribute lists the Job Template attributes the Printer supports as members of a "proof-print" Job Template attribute (section ‎6.2.4).

1. Additional Semantics for Existing Operations
   1. Create-Job, Print-Job, and Print-URI Operations: "job-password" and "job-password-encryption"

A Printer that supports the "job-password" operation attribute (section ‎6.1.1) and the "job-password-encryption" operation attribute (section ‎6.1.2) MUST validate the values supplied and return the 'client-error-bad-request' status code if the values are invalid or not supported.

A Printer MUST NOT return the "job-password" attribute in the Unsupported Attributes Group to prevent the leaking of security information. A Printer MAY return the "job-password-encryption" attribute in the Unsupported Attributes Group.

A Client MUST use Secure Transport when it supplies the 'none' keyword for the "job-password-encryption" operation attribute.

* 1. Create-Job, Print-Job, and Print-URI Operations: "job-storage"

A Printer that supports the "job-storage" operation attribute (section ‎6.1.3) MUST validate the set of members and values supplied. If a Printer receives any members or values that are invalid or not supported, it MUST return the 'client-error-attributes-or-values-not-supported' status code. A Printer MAY return the "job-storage" attributes in the Unsupported Attributes Group.

* 1. Get-Jobs Operation: "job-storage-group"

When a Client supplies the 'stored-group' keyword for the "which-jobs" attribute in a Get-Jobs request, the Client MUST supply a "job-storage-group" attribute in the Get-Jobs request. The Client MUST supply one of the groups listed by the Printer's "job-storage-group-supported" Printer Description attribute (section ‎6.4.16).

* 1. Resubmit-Job and Reprocess-Job Operations: "job-storage"

If the Printer supports the Job Storage feature (section ‎4.2) and also supports the DEPRECATED Reprocess-Job operation, the Reprocess-Job operation MUST support reprocessing a Stored Job.

* 1. Resubmit-Job and Reprocess-Job Operations: "parent-job-id" and "parent-job-uuid"

When a Printer copies a Job in response to a Resubmit-Job or a DEPRECATED Reprocess-Job operation request, the Printer MUST add the "parent-job-id" (section ‎6.3.3) and "parent-job-uuid" (section ‎6.3.4) Job Status attributes to the new Job.

* 1. Validate-Job Operation: "job-password" and "job-password-encryption"

A Client MAY send the "job-password" operation attribute (section ‎6.1.1) and/or the "job-password-encryption" operation attribute (section ‎0) in a Validate-Job request [STD92] if Secure Transport is used. A Printer MUST validate the values of the "job-password" and "job-password-encryption" attributes and report unsupported attributes or values. A Printer MUST discard these attributes and values along with the rest of the values as per the semantics of the Validate-Job operation. A Printer MUST NOT return the "job-password" attribute in a Validate-Job response.

A Client MUST use Secure Transport when it supplies the 'none' keyword for the "job-password-encryption" operation attribute. When "job-password-encryption" is 'none', the Printer validates the contents of the "job-password" value. Otherwise, the Printer validates the length of the hash string for the specified encryption hash algorithm.

Note: Printers conforming to [PWG5100.11-2010] can reject a Validate-Job request containing "job-password" and/or "job-password-encryption" operation attributes and return the 'client-error-bad-request' status code as this was previously disallowed.

1. Additional Values and Semantics for Existing IPP Attributes

This section defines new values for existing attributes defined in other specifications.

* 1. ipp-features-supported (1setOf type2 keyword)

This specification defines new keyword values for the "ipp-features-supported" Printer Description attribute [PWG5100.13] to enable the Printer to indicate its support for one or more of the conceptual features defined in section ‎4 of this specification. Table 13 lists the new keywords defined in this specification.

Table - "ipp-features-supported" Additional Keywords

|  |  |
| --- | --- |
| Keyword | Conformance Requirement |
| 'job-release' | CONDITIONALLY REQUIRED if the Printer supports the conceptual Job Release feature |
| 'job-storage' | CONDITIONALLY REQUIRED if the Printer supports the conceptual Job Storage feature |
| 'print-policy | CONDITIONALLY REQUIRED if the Printer supports the conceptual Job Print Policy feature |
| 'proof-and-suspend' | CONDITIONALLY REQUIRED if the Printer supports the conceptual Job Proof and Suspend feature |
| 'proof-print' | CONDITIONALLY REQUIRED if the Printer supports the conceptual Job Proof Print feature |

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

This specification defines new keywords for the "job-state-reasons" attribute [STD92] to support the Job Release feature (section ‎4.1), the Job Storage feature (section ‎4.2), and the Job Proof Print feature (section ‎4.4), as well as other keywords to report additional conditions. Table 14 lists the new keywords defined in this specification.

Table - "job-state-reasons" Additional Keywords

|  |  |  |
| --- | --- | --- |
| Keyword |  | Description and Conformance Requirements |
| 'conflicting-attributes' |  | The Job contains Job Template or Document Template attributes with conflicting values. Used in cases of fan-out [STD92], might not cause a Job to be aborted vs. conflicts detected at submission time that prevent Job Creation.  REQUIRED |
| 'job-canceled-after-timeout' |  | The Printer canceled the Job because the time span specified by the "job-cancel-after" Job Template attribute elapsed before the Job could be processed.  CONDITIONALLY REQUIRED [1] |
| 'job-held-for-authorization' |  | The Printer is holding the Job in the 'pending-held' state until the Printer receives authenticated authorization to release it to processing.  CONDITIONALLY REQUIRED [4] |
| 'job-held-for-button-press' |  | The Printer is holding the Job in the 'pending-held' state until the Printer receives a button press or similar physical input to release it to processing.  CONDITIONALLY REQUIRED [3] |
| 'job-held-for-release' |  | The Printer is holding the Job awaiting a Release Action to release it to processing.  CONDITIONALLY REQUIRED [2] or [3] or [4] |
| 'job-password-wait' |  | The Printer is holding the Job in the 'pending-held' state until the Printer receives a password value that matches the Job's "job-password" value to release it to processing.  CONDITIONALLY REQUIRED [2] |
| 'job-printed-successfully' |  | The Job was successfully printed but was not successfully stored as indicated by ‘job-stored-with-warnings’ or ‘job-stored-with-errors’. If the Job was not requested to be stored, the Printer MUST use the ‘job-completed-successfully’ keyword instead.  CONDITIONALLY REQUIRED [5] |
| 'job-printed-with-errors' |  | The Job was printed with errors but was successfully stored as indicated by ‘job-stored-successfully’ or was not successfully saved as indicated by ‘job-stored-with-warnings’ or ‘job-stored-with-errors’. If the Job was not requested to be stored, the Printer MUST use the ‘job-completed-with-errors’ keyword instead.  CONDITIONALLY REQUIRED [5] |
| 'job-printed-with-warnings' |  | The Job was printed with warnings but was successfully stored as indicated by ‘job-stored-successfully’ or was not successfully stored as indicated by ‘job-stored-with-warnings’ or ‘job-stored-with-errors’. If the Job was not requested to be stored, the Printer MUST use the ‘job-completed-with-warnings’ value instead.  CONDITIONALLY REQUIRED [5] |
| 'job-resuming' |  | The Printer is moving the Job from the 'processing-stopped' state to the 'processing' state.  CONDITIONALLY REQUIRED [9] |
| 'job-stored' |  | The Printer successfully created this Job as a Stored Job. The Printer MUST also supply ‘job-completed-successfully’, except when “job-storage-disposition” = ‘save-only’.  CONDITIONALLY REQUIRED [5] |
| 'job-storing' |  | The Printer is in the process of storing the Job to its storage location, like how the 'job-printing' keyword indicates that printing is in progress.  CONDITIONALLY REQUIRED [5] |
| 'job-suspended-by-operator' |  | The Job has been indefinitely suspended by the Operator.  CONDITIONALLY REQUIRED [8] |
| 'job-suspended-by-system' |  | The Job has been indefinitely suspended by the Printer’s system software during normal processing of the Job.  CONDITIONALLY REQUIRED [8] |
| 'job-suspended-by-user' |  | The Job has been indefinitely suspended by the originating user.  CONDITIONALLY REQUIRED [8] |
| 'job-suspended-for-approval' |  | The Proof and Suspend Job is in the 'processing-stopped' state awaiting approval to produce the Final Copies or rejection and cancelation.  CONDITIONALLY REQUIRED [6] |
| 'job-suspending' |  | The Printer is in the process of moving the Job from the 'processing' state to the 'processing-stopped' state.  CONDITIONALLY REQUIRED [8] |
| 'unsupported-attributes-or-values' |  | The Job Template or Document Template attributes contain unsupported attributes or values. Used in cases of fan-out [STD92], might not cause a Job to be aborted vs. conflicts detected at submission time that prevent Job Creation.  REQUIRED |

Notes:

[1] REQUIRED if the Printer supports the "job-cancel-after" Job Template attribute  
[2] REQUIRED if the Printer supports the Password Job Release  
[3] REQUIRED if the Printer supports the Button Press Job Release  
[4] REQUIRED if the Printer supports the User Authorization Job Release  
[5] REQUIRED if the Printer supports Job Storage  
[6] REQUIRED if the Printer supports Job Proof and Suspend  
[7] REQUIRED if the Printer supports "job-spooling-supported"  
[8] REQUIRED if the Printer supports the Suspend-Current-Job operation [RFC3998]  
[9] REQUIRED if the Printer supports the Resume-Job operation [RFC3998]

The semantics of the ‘job-completed-successfully’, 'job-completed-with-warnings’, and ‘job-completed-with-errors’ keywords [STD92] are also clarified in the list above for implementations that support the "job-storage-disposition" member attribute of "job-storage" (section ‎6.1.4.2), in such a way that these values remain compatible with Printers and Clients that do not support Job Storage.

Table 15 enumerates the possible combinations of print and store success, warning, and error conditions. Note that two values occur only when there are print warnings/errors and a store error.

Table 15 - Values of "job-state-reasons" attribute for various Job conditions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Not storing | | Store successful |  |
| Not printing | <not possible> | | 'job-completed-successfully' |  |
| Print successful | 'job-completed-successfully' | | 'job-completed-successfully' |  |
| Print warnings | 'job-completed-with-warnings' |  | 'job-completed-with-warnings' | |
| Print errors | 'job-completed-with-errors' |  | 'job-completed-with-errors' | |
| Print warnings and errors | 'job-completed-with-errors' |  | 'job-completed-with-errors' | |



* 1. which-jobs (type2 keyword)

This specification defines additional keyword values for the IPP "which-jobs" operation attribute for the Get-Jobs operation [STD92], and the “which-jobs-supported” Printer Description attribute [PWG5100.7], to support filtering for Proof Jobs as well as different accessibility levels of Stored Jobs. **Error! Reference source not found.** lists the new keywords defined in this specification.

* + 1. 'proof-print'

Proof Jobs (section ‎6.2.5) which are in the ‘completed’, ‘canceled’, or ‘aborted’ terminal state. A Printer that supports the "proof-print" Job Template attribute MUST support this keyword.

* + 1. 'proof-and-suspend'

Proof and Suspend Jobs (section ‎6.2.4) which are in the ‘processing-stopped' state. A Printer that supports the "proof-copies" Job Template attribute MUST support this keyword.

* + 1. 'stored-group'



Group Stored Jobs that have reached the ‘completed’ state. A Printer that supports the 'group' keyword in its "job-storage-access-supported" Printer Description attribute MUST support this keyword. A Client supplying this keyword for "which-jobs" MUST be prepared to handle an authentication challenge from the Printer. A Client supplying this keyword MUST also supply a "job-storage-group" operation attribute (section ‎7.3).

* + 1. 'stored-owner'

Private Stored Jobs that have reached the ‘completed’ state. A Printer that provides the 'owner' keyword in its "job-storage-access-supported" Printer Description attribute MUST support this keyword. A Client supplying the 'stored-owner' keyword for "which-jobs" MUST be prepared to handle an authentication challenge from the Printer.

* + 1. 'stored-public'

Public Stored Jobs that have reached the ‘completed’ state. A Printer that supports the 'public' keyword in its "job-storage-access-supported" Printer Description attribute MUST support this keyword.

1. Obsolete Attributes and Values
   1. Obsolete Attributes

Table 16 lists the attributes defined in [PWG5100.11-2010] that are OBSOLETE.

Table - Obsolete Attributes

|  |  |
| --- | --- |
| Attribute | Explanation |
| job-save-disposition | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| pdl-init-file | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-default | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-entry | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-entry-supported | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-location | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-location-supported | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-name | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-name-supported | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| pdl-init-file-name-subdirectory-supported | The PDL Init File minor feature [PWG5100.11-2010] has been removed. |
| save-disposition | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-disposition-supported | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-document-format | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-document-format-default | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-document-format-supported | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-info | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-info-supported | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-location | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-location-default | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-location-supported | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-name | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-name-supported | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| save-name-subdirectory-supported | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |

* 1. Obsolete Values

Table 17 lists the values defined in [PWG5100.11-2010] that are OBSOLETE.

Table - Obsolete Values

|  |  |  |
| --- | --- | --- |
| Attribute | Value | Explanation |
| job-state-reasons | 'job-saved-successfully' | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| job-state-reasons | 'job-saved-with-errors' | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| job-state-reasons | 'job-saved-with-warnings' | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| job-state-reasons | 'job-saving' | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |
| which-jobs | 'saved' | The Job Save and Reprint feature [PWG5100.11-2010] has been replaced by the Job Storage feature. |

1. Conformance Requirements

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

* 1. Printer Conformance Requirements

A Printer claiming conformance with this specification MUST support:

1. The internationalization considerations defined in section ‎11; and
2. The security considerations defined in section ‎12.

The Printer MUST also support at least one of the features defined in section ‎4 of this specification.

* + 1. Job Release

A Printer supporting the Button Press method for the Job Release feature defined in section ‎4.1 MUST support:

1. The "job-release-action" attribute and its 'button-press' keyword defined in section ‎6.1.3;
2. The 'job-release' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
3. The status codes defined in section ‎8.2.

A Printer supporting the Owner Authorized method for the Job Release feature defined in section ‎4.1 MUST support:

1. The "job-release-action" attribute and its 'owner-authorized' keyword defined in section ‎6.1.3;
2. The 'job-release' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
3. The status codes defined in section ‎8.2.

A Printer supporting the Job Password method for the Job Release feature defined in section ‎4.1 MUST support:

1. The "job-release-action" attribute and its 'job-password' keyword defined in section ‎6.1.3;
2. The "job-password" operation attribute defined in section ‎6.1.1 and the "job-password-encryption" operation attribute defined in section ‎0;
3. The "job-password-supported", "job-password-encryption-supported", "job-password-length-supported", "job-password-repertoire-configured", and "job-password-repertoire-supported" Printer Description attributes defined in section ‎6.4;
4. The 'job-release' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
5. The status codes defined in section ‎8.2.
   * 1. Job Storage

A Printer claiming support for the Job Storage feature defined in section ‎4.2 MUST support:

1. The "job-storage" operation attribute defined in section ‎6.1.3;
2. The 'job-storage' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
3. The 'stored-public' and 'stored-owner' keywords defined in section ‎8.3 for the "which-jobs" operation attribute defined in [STD92];
4. The status codes defined in section ‎8.2.
   * 1. Job Print Policy

A Printer claiming support for the Job Print Policy feature defined in section ‎4.3 MUST support:

1. The Get-User-Printer-Attributes operation defined in section ‎5.1.
2. The 'print-policy' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
   * 1. Job Proof and Suspend

A Printer claiming support for the Job Proof and Suspend feature defined in section ‎4.4.1 MUST support:

1. The "proof-copies" Job Template attribute defined in section ‎6.2.4;
2. The 'proof-and-suspend' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
3. The status codes defined in section ‎8.2.
   * 1. Job Proof Print

A Printer claiming support for the Job Proof Print feature defined in section ‎4.4.2 MUST support:

1. The "proof-print" Job Template attribute defined in section ‎6.2.5;
2. The 'proof-print' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
3. The status codes defined in section ‎8.2.
   1. Client Conformance Requirements

A Client claiming conformance with this specification MUST support:

1. The internationalization considerations defined in section ‎11; and
2. The security considerations defined in section ‎12.

The Client MUST also support at least one of the features defined in section ‎4 of this specification.

* + 1. Job Release

A Client supporting the Button Press method for the Job Release feature defined in section ‎4.1 MUST support:

1. The "job-release-action" attribute and its 'button-press' keyword defined in section ‎6.1.3;
2. The status codes defined in section ‎8.2.

A Client supporting the Owner Authorized method for the Job Release feature defined in section ‎4.1 MUST support:

1. The "job-release-action" attribute and its 'owner-authorized' keyword defined in section ‎6.1.3;
2. The status codes defined in section ‎8.2.

A Client supporting the Job Password method for the Job Release feature defined in section ‎4.1 MUST support:

1. The "job-release-action" attribute and its 'job-password' keyword defined in section ‎6.1.3;
2. The "job-password" operation attribute defined in section ‎6.1.1 and the "job-password-encryption" operation attribute defined in section ‎0;
3. The "job-password-supported", "job-password-encryption-supported", "job-password-length-supported", "job-password-repertoire-configured", and "job-password-repertoire-supported" Printer Description attributes defined in section ‎6.4;
4. The status codes defined in section ‎8.2.
   * 1. Job Storage

A Client claiming support for the Job Storage feature defined in section ‎4.2 MUST support:

1. The "job-storage" operation attribute defined in section ‎6.1.3;
2. The 'stored-public' and 'stored-owner' keywords defined in section ‎8.3 for the "which-jobs" operation attribute defined in [STD92];
3. The status codes defined in section ‎8.2.
   * 1. Job Print Policy

A Client claiming support for the Job Print Policy feature defined in section ‎4.3 MUST support:

1. The Get-User-Printer-Attributes operation defined in section ‎5.1.
   * 1. Job Proof and Suspend

A Printer claiming support for the Job Proof and Suspend feature defined in section ‎4.4.1 MUST support:

1. The "proof-copies" Job Template attribute defined in section ‎6.2.4;
2. The 'proof-and-suspend' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
3. The status codes defined in section ‎8.2.
   * 1. Job Proof Print

A Client claiming support for the Job Proof Print feature defined in section ‎4.4.2 MUST support:

1. The "proof-print" Job Template attribute defined in section ‎6.2.5;
2. The 'proof-print' keyword for the "ipp-features-supported" Printer Description attribute defined in section ‎8.1;
3. The status codes defined in section ‎8.2.
4. 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) [STD63] 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 [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

1. 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

((Add content for job-password and job-storage.))

1. IANA Considerations
   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:

<https://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Operation attributes: Reference

---------------------------------------- ------------

job-password (octetString(255)) [IPPEPX]

job-password-encryption (type2 keyword) [IPPEPX]

job-release-action (type2 keyword) [IPPEPX]

job-storage (collection) [IPPEPX]

job-storage-access (type2 keyword) [IPPEPX]

job-storage-disposition (type2 keyword) [IPPEPX]

job-storage-group (name(MAX) [IPPEPX]

Job Template attributes: Reference ---------------------------------------- ------------

job-cancel-after (integer(1:MAX)) [IPPEPX]

job-phone-number (uri) [IPPEPX]

job-recipient-name (name(MAX)) [IPPEPX]

proof-copies (integer(1:MAX)) [IPPEPX]

proof-print (collection) [IPPEPX]

proof-print-copies (integer (0:MAX)) [IPPEPX]

media (type2 keyword | name(MAX)) [IPPEPX]

media-col (collection) [IPPEPX]

Job Status attributes: Reference

---------------------------------------- ------------

job-release-action (type2 keyword) [IPPEPX]

job-storage (collection) [IPPEPX]

<Any "job-storage" member attribute> [IPPEPX]

parent-job-id (integer(1:MAX)) [IPPEPX]

parent-job-uuid (uri(45)) [IPPEPX]

Printer Description attributes: Reference

---------------------------------------- ------------

job-cancel-after-default (integer(1:MAX)) [IPPEPX]

job-password-encryption-supported (1setOf type2 keyword) [IPPEPX]

job-password-length-supported (rangeOfInteger(0:255)) [IPPEPX]

job-password-repertoire-configured (1setOf (type2 keyword | name(MAX))) [IPPEPX]

job-password-repertoire-supported (1setOf (type2 keyword | name(MAX))) [IPPEPX]

job-password-supported (integer(0:255)) [IPPEPX]

job-phone-number-default (uri) [IPPEPX]

job-phone-number-supported (boolean) [IPPEPX]

job-recipient-name-default (name(MAX)) [IPPEPX]

job-recipient-name-supported (boolean) [IPPEPX]

job-release-action-default (type2 keyword) [IPPEPX]

job-release-action-supported (1setOf type2 keyword) [IPPEPX]

job-storage-access-supported (1setOf type2 keyword) [IPPEPX]

job-storage-disposition-supported (1setOf type2 keyword) [IPPEPX]

job-storage-group-supported (1setOf name(MAX)) [IPPEPX]

job-storage-supported (1setOf keyword) [IPPEPX]

printer-detailed-status-messages (1setOf text(MAX)) [IPPEPX]

proof-print-copies-supported (rangeOfInteger(0:MAX)) [IPPEPX]

proof-print-default (collection) [IPPEPX]

proof-print-supported (1setOf type2 keyword) [IPPEPX]

* 1. Type2 keyword Registrations

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

<https://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Attribute (attribute syntax)

Keyword Attribute Value Reference

------------------------------- -------------

ipp-features-supported (1setOf type2 keyword) [PWG5100.13]

job-release [IPPEPX]

job-storage [IPPEPX]

print-policy [IPPEPX]

proof-and-suspend [IPPEPX]

proof-print [IPPEPX]

job-release-action (type2 keyword) [IPPEPX]

job-release-action-supported (1setOf type2 keyword) [IPPEPX]

none [IPPEPX]

button-press [IPPEPX]

job-password [IPPEPX]

owner-authorized [IPPEPX]

job-password-encryption (type2 keyword | name(MAX)) [IPPEPX]

job-password-encryption-supported (1setOf type2 keyword) [IPPEPX]

md2 (deprecated) [IPPEPX]

md4 (deprecated) [IPPEPX]

md5 (deprecated) [IPPEPX]

none [IPPEPX]

sha (deprecated) [IPPEPX]

sha2-224 [IPPEPX]

sha2-256 [IPPEPX]

sha2-384 [IPPEPX]

sha2-512 [IPPEPX]

sha2-512\_224 [IPPEPX]

sha2-512\_256 [IPPEPX]

sha3-224 [IPPEPX]

sha3-256 [IPPEPX]

sha3-384 [IPPEPX]

sha3-512 [IPPEPX]

sha3-512\_224 [IPPEPX]

sha3-512\_256 [IPPEPX]

shake-256 [IPPEPX]

shake-512 [IPPEPX]

job-storage-access-supported (1setOf type2 keyword) [IPPEPX]

group [IPPEPX]

owner [IPPEPX]

public [IPPEPX]

job-storage-disposition-supported (1setOf type2 keyword) [IPPEPX]

none [IPPEPX]

print-and-store [IPPEPX]

store-only [IPPEPX]

job-storage-supported (1setOf type2 keyword) [IPPEPX]

job-storage-access [IPPEPX]

job-storage-disposition [IPPEPX]

job-storage-group [IPPEPX]

job-state-reasons (type2 keyword) [STD92]

conflicting-attributes [IPPEPX]

job-canceled-after-timeout [IPPEPX]

job-held-for-authorization [IPPEPX]

job-held-for-button-press [IPPEPX]

job-held-for-release [IPPEPX]

job-password-wait [IPPEPX]

job-printed-successfully [IPPEPX]

job-printed-with-errors [IPPEPX]

job-printed-with-warnings [IPPEPX]

job-resuming [IPPEPX]

job-release-wait [IPPEPX]

job-stored [IPPEPX]

job-storing [IPPEPX]

job-suspended-by-operator [IPPEPX]

job-suspended-by-system [IPPEPX]

job-suspended-by-user [IPPEPX]

job-suspended-for-approval [IPPEPX]

job-suspending [IPPEPX]

unsupported-attributes-or-values [IPPEPX]

job-storage-supported (type2 keyword) [IPPEPX]

job-storage-access [IPPEPX]

job-storage-disposition [IPPEPX]

job-storage-group [IPPEPX]

proof-print-supported (1setOf type2 keyword) [IPPEPX]

proof-print-copies [IPPEPX]

media [IPPEPX]

media-col [IPPEPX]

which-jobs (type2 keyword) [STD92]

proof-print [IPPEPX]

proof-and-suspend [IPPEPX]

stored-group [IPPEPX]

stored-owner [IPPEPX]

stored-public [IPPEPX]

* 1. Type2 enum Registrations

The enum 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:

<https://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Attributes (attribute syntax)

Enum Value Enum Symbolic Name Reference

---------- ------------------ ---------

operations-supported (1setOf type2 enum) [STD92]

0x0066 Get-User-Printer-Attributes [IPPEPX]

* 1. 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:

<https://www.iana.org/assignments/ipp-registrations>

The registry entries will contain the following information:

Operation Name Reference

-------------- ---------

Create-Job (Extension) [IPPEPX]

Get-Jobs (Extension) [IPPEPX]

Get-User-Printer-Attributes [IPPEPX]

Print-Job (Extension) [IPPEPX]

Print-URI (Extension) [IPPEPX]

Reprocess-Job (Extension) [IPPEPX]

Resubmit-Job (Extension) [IPPEPX]

Validate-Job (Extension) [IPPEPX]

1. Overview of Changes
   1. IPP Enterprise Printing Extensions v2.0

The Proof Print, Job Save and Secure Print features defined in "Internet Printing Protocol (IPP): Job and Printer Extensions – Set 2 (JPS2)" [PWG5100.11-2010] were not defined in such a way that they could interoperate in practice. To resolve these shortcomings:

* The Job Save and Reprint feature is OBSOLETE, replaced by the new Job Storage feature (section ‎4.2), which provides more clearly defined semantics;
* The Job Proof and Suspend feature is defined to provide a simpler proof printing solution more congruent with vendor proof printing implementations already in the marketplace for many years;
* The Job Proof Print feature is DEPRECATED;
* The Secure Print feature has been refactored and extended to become the Job Release feature (section ‎4.1), which is defined to interoperate with the Job Storage feature and the Job Proof and Suspend feature (section ‎4.4.1) to better support complex enterprise print workflow solutions.

Other changes were also made to the previous version of this specification:

* The Job Print Policy feature (section ‎4.3) was added by adopting the Get-User-Printer-Attributes operation registered in 2017.
* Defined keywords for "ipp-features-supported" for the conceptual Job Release, Job Storage, Job Print Policy, Job Proof and Suspend and Job Proof Print features defined in this specification;
* Deprecated the "name(MAX)" syntax from the original definition of the "job-password-encryption" Job Template attribute, since the "type2 keyword" syntax allows for site-local or vendor-unique hashing algorithms (which were never observed to have been used in practice);
* A Client can now include the "job-password" and "job-password-encryption" attributes in a Validate-Job request. This was disallowed in the previous version of this specification [PWG5100.11-2010];
* "proof-print-default" is DEPRECATED and strongly discouraged because its semantics were not clearly defined, and its value was and remains unclear; and
* Many attributes and keywords were moved to "IPP Job Extensions v2.0" [PWG5100.7] because they don't specifically apply to the new "enterprise printing" focus of this specification.

These extensive changes required this to be a new major version.

1. References
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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.

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Ira McDonald High North, Inc.

Chris Rizzo Xerox

1. Change History
   1. October 29, 2020

Resolved all review feedback from IPP WG review documented in ippv2-concall-minutes-20200924.pdf and ippv2-concall-minutes-20201001.pdf:

* Broke Figure 1 and Figure 2 (sequence diagrams for 3.2.7 and 3.2.8 that pertain to Get-User-Printer-Attributes) each into two, so there are now 4 figures in section 3.2.
* Added references to definitions leveraged from STD92
* Added clarifying text to section 7.1
* Included Reprocess-Job in section 7.4 and 7.5
* Changed the old syntax definition of "job-password-encryption" from DEPRECATED to OBSOLETE
* Added a description of "job-state-reasons" and "which-jobs" to section 4.1
* Changed some of the new keywords for "job-state-reasons"
  + 'job-await-proof-approval' -> 'job-suspended-for-approval'
  + 'job-release-wait' -> 'job-held-for-release'
  + Simplified the "job-state-reasons" for Job Storage
* Normalized the terms used in attribute definitions: use "indicates" for boolean / integer / rangeOfInteger syntaxes, "lists" for 1setOf syntax, "provides" for xxx-default attributes
* Changed passive voice to active voice
* A few other minor changes and many editorial changes
  1. August 26, 2020

Updated as per minutes from the review at the PWG August 2020 F2F meeting:

* Changed wording at the start of each subsection of section 4 describing a conceptual feature, because the wording in the previous draft was inappropriate given the PWG model and its actors capable of activity;
* Restored the definition of "job-password" and removed the added Job Status definitions of "job-password" and "job-password-encryption" because the internal Printer / Job values are not to be defined as "hidden Job Status attributes";
* Changed all uses of the word "deprecated" to "DEPRECATED" other than those uses in the IANA Considerations section;
* Fixed the IANA Considerations to reflect the state of the rest of the document; and
* Restructured and updated the definition of "proof-copies".

Revision versions of this draft will be compared against the June 30, 2020 revision since the August 15, 2020 revision wasn't completely reviewed.

* 1. August 15, 2020

Updated as per minutes from the IPP WG meetings on July 16 and July 30:

* Renamed and simplified the "proof-and-hold" collection to become "proof-copies" (integer(1:MAX));
* Refactored sections 4.4 and 4.5 to now be sub-sections of a new 4.4 "Proof Printing". Also renamed "Proof and Hold" to be "Job Proof and Suspend" and restored "Job Proof Print" as the feature name from the original 5100.11-2010.
* Removed the "Feature Interoperability" sub-section of section 4 and instead distributed the points to other relevant areas of the document;
* Updated language for "parent-job-id" and "parent-job-uuid" as per minutes. Also added a new subsection in section 7 to state that a Printer implementing the Resubmit-Job operation is required to add these attributes to the new copy of the Job;
* Moved the tables listing the standard keywords to the section defining the Job Template attribute or operation attribute, not the Printer Description attribute ("xxx-supported") and added a note in the new PWG document style policy draft;
* Added definitions for Control Console and End User and simplified the definition of Password Release Job;
* Clarified and expanded the definition of the Job Release feature;
* Extensively rewrote the definition of the Job Storage feature;
* Added minor clarifications to the Get-User-Printer-Attributes operation definition;
* Moved the portions of the "job-password" and "job-password-encryption" definitions concerning printer processing to new Job Status attribute definitions, since that is really where such discussion belongs;
* Clarified the definition of the "job-cancel-after" attribute;
* Fixed the table formatting for the "job-password-encryption-supported" keyword listing;
* Updated keywords for "ipp-features-supported" to specify keywords for all conceptual features defined in this draft;
* Updated Conformance Requirements and IANA Considerations; and
* Fixed many instances of passive voice and other issues once the grammar checker had additional checking criteria enabled.
  1. June 30, 2020

Updated as per the minutes from the IPP WG meeting on June 18, 2020:

* Defined the new "Proof and Hold" feature to replace the existing "Proof Print" feature, which doesn't seem to have been implemented anywhere in the wild.
* Editorial changes cited in the minutes
  1. June 8, 2020

Updated to resolve issues identified during the PWG May 2020 F2F and later discussions:

* Refactored to define a new "job-release-action" instead of extending "job-hold-until", which has not previously been an attribute that persists across copies.
* Added a new “Feature Interoperability” section to section 4 describing how the features interoperate.
* Updated the definitions of “job-storage” and “proof-print” and related attributes to more clearly specify how the features interoperate with one another and “job-release-action”.
* Added several new attributes needed for job accounting:
  + parent-job-id
  + parent-job-uuid
  1. May 4, 2020

Updated to add in the 'conflicting-attributes', 'job-release-wait', and 'unsupported-attributes-or-values' keywords for the "job-state-reasons" Job Status attribute moved from "IPP Transaction-Based Printing Extensions (2016)" that was overlooked in the April 28, 2020 draft.

* 1. April 28, 2020

Updated as per review from 2019-09-26 and 2019-10-24 IPP WG teleconferences, the November 2019 F2F, and from other sources:

* Moved "Additional Semantics for Existing Operations" subsections relating to "job-password" from JPS3v2 to new section 9 / 9.1 / 9.2
* Updated IANA Considerations section with many editorial fixes
* Expanded the model feature descriptions in section 4 to tie together the disparate elements defined in other parts of the specification.
* Expanded the "Job Release" feature description substantially, and as a result added section 7.3 'Get-Jobs: "job-storage-group"' to provide a Client with a way to filter on a specific group
* Removed "job-password-action" and instead defined more clear semantics about when a new Job is to be placed in the 'pending-held' state and when it should proceed to the 'pending' or 'processing' state, depending on context.
* Added query semantics enabling a Client to discover whether the Printer supports Job Release with Job Storage and/or Proof Print, resolving a shortcoming of 5100.11-2010.
* Updated Obsolete Attributes and Obsolete Values with complete list
* Updated "job-state-reasons", conformance requirements, and IANA Considerations to hopefully correctly list all the definitions from sections 5-9.
  1. October 10, 2019

Updated as per brief review from 2019-09-26 and from other sources:

* Moved "Additional Semantics for Existing Operations" subsections relating to "job-password" from JPS3v2 to new section 9 / 9.1 / 9.2
* Updated IANA Considerations section with many editorial fixes
* Expanded the "Authorized Release Feature" feature description
  1. September 11, 2019

Added definition of the 'enterprise' keyword for "ipp-features-supported" as per agenda for 2019-09-12 IPP WG meeting and added reference to PWG 5100.13. Also made all URLs in references use the "https" scheme.

* 1. September 3, 2019

Updated as per feedback from the July 18 IPP Workgroup teleconference review and other feedback:

* Added version number ("v2.0") to title and name
* Updated abstract and other references to use new feature names
* Restored IPP Proof Print from 5100.11 and "rebranded" it as the Proof Print feature in this document. Abandoned the proposed new Proof Print feature from HP.
* Removed the " | name(MAX)" from the syntax definition for job-password-encryption, since site-defined localized strings in that context would seem to be unlikely and of limited value
* Added "job-pause-after" and then questioned whether we ought to be adding it
* Added a MAY statement allowing "job-password" to be used with "proof-print", with corresponding conditional requirements, so that the Proof Print feature and Job Release feature can be used with a single Job to make a Protected Proof Job.
* Added "proof-print-password-supported" and "proof-print-copies-supported"
* Various questions still to be resolved are in comments
  1. June 14, 2019

Updated to resolve issues identified in the April 2019 PWG F2F and to align with IPP Job Extensions v2.0.

* 1. March 27, 2019

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