



The Printer Working Group

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Working Draft

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IPP Enterprise Printer Extensions v2.0 (EPX)

Status: Interim

Abstract: This specification defines extensions to IPP/1.1 [STD92] to support the IPP Job Proof Print Feature, Job Storage Feature and Job Protection Feature, to better enable authenticated release workflows that are used in institutional IT environments such as corporate businesses, governments or universities.

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220 **1. Introduction**

221 This specification defines extensions to IPP/1.1 [STD92] to support the IPP Proof Job
222 Feature, Job Storage Feature and Job Protection Feature, to better enable authenticated
223 release workflows that are used in institutional IT environments such as corporate
224 businesses or universities.

225 The Proof Print, Job Save and Secure Print features defined in "Internet Printing Protocol
226 (IPP): Job and Printer Extensions – Set 2 (JPS2)" [PWG5100.11] were not interoperable
227 with one another, and were not defined in such a way that they could interoperate in practice.
228 The Proof Print and Job Save features are deprecated, to be replaced by Job Proof Print
229 Feature and Job Storage Feature. The Secure Print feature has been refactored and
230 extended to become the Job Protection Feature, which can interoperate with the Job Proof
231 Print Feature and Job Storage Feature to enable more complex print workflow solutions to
232 be created.

233 **2. Terminology**

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

235 **2.1 Conformance Terminology**

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

241 **2.2 Printing Terminology**

242 Normative definitions and semantics of printing terms are imported from IETF Printer MIB
243 v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1: Model
244 and Semantics [STD92].

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

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

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

252 *Output Device*: a single Logical or Physical Device

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

255 **2.3 Protocol Role Terminology**

256 This document also defines the following protocol roles in order to specify unambiguous
257 conformance requirements:

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

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

263 **2.4 Job State Terminology**

264 This document defines features that influence the trajectory of a Job through the various Job
265 states. The states defined for "job-state" [STD92] and the transitions between these states
266 are illustrated in Figure 1. **THIS SUB-SECTION SHOULD BE REMOVED BEFORE FINAL**
267 **PUBLICATION.**

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

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

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

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

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

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

281 *'processing'*: One or more of the following: (1) the Job is using, or is attempting to use, one
282 or more purely software processes that are analyzing, creating, or interpreting a PDL, etc.;
283 (2) the Job is using, or is attempting to use, one or more hardware devices that are
284 interpreting a PDL; making marks on a medium; and/or performing finishing, such as
285 stapling, etc.; (3) the Printer has made the Job ready for printing, but the Output Device is

286 not yet printing it, either because the Job hasn't reached the Output Device or because the
287 Job is queued in the Output Device or some other spooler, waiting for the Output Device to
288 print it.

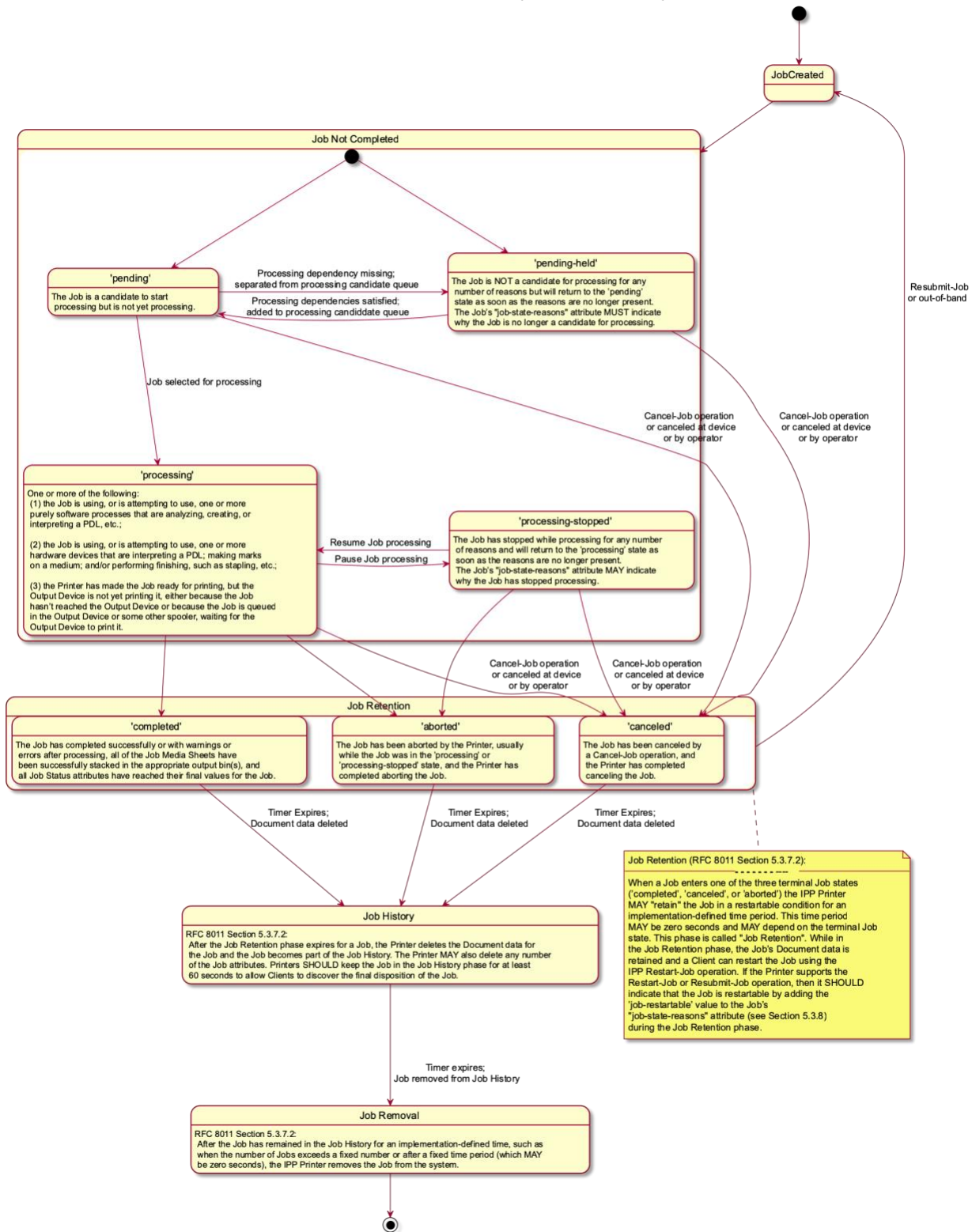
289 *'processing-stopped'*: The Job has stopped while processing for any number of reasons and
290 will return to the 'processing' state as soon as the reasons are no longer present.

291 *'canceled'*: The Job has been canceled by a User-initiated action such as a Cancel-Job
292 operation or some non-IPP method, the Printer has completed canceling the Job, and all
293 Job Status attributes have reached their final values for the Job.

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

297 *'completed'*: The Job has completed successfully or with warnings or errors after processing,
298 all of the Job Media Sheets have been successfully stacked in the appropriate output bin(s),
299 and all Job Status attributes have reached their final values for the Job.

IPP Job States and State Transitions (RFC 8011 Section 5.3.7)



300

301

Figure 1 - IPP Job States and Transitions

302 **2.5 Other Terminology**

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

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

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

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

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

319 *Password Protected Job:* The Job that has a password permanently attached to it that must
320 be provided to the Printer to authorize its printing. If the Job is duplicated, either via an IPP
321 Reprocess-Job or Resubmit-Job operation, or out of band of IPP via control panel-initiated
322 reprinting or some other method, the password is included in the new Job to require
323 authorization for the new Job.

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

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

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

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

335 *Retained Job:* A Job that the Printer retains in the so-called Job Retention Phase (see
336 [STD92] section 5.3.7.2 Partitioning of Job States) in the Job's terminal state ('completed',
337 'aborted', or 'canceled') after processing it, for an implementation-defined period (including

338 zero seconds). An exact copy of a Retained Job can be created using a Reprocess-Job
339 operation. A modifiable copy of a Retained Job can be created using a Resubmit-Job
340 operation.

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

342 *Stored Job*: A Retained Job that has reached the 'completed' state and that has identifying
343 characteristics marking it as a Stored Job instead of simply as a previously processed Job.
344 The Documents in a Stored Job are maintained in their originally submitted state and format.
345 The Printer retains a Stored Job indefinitely, unless otherwise configured, so that it can be
346 listed and selected for reprinting at some time in the future.

347 **2.6 Acronyms and Organizations**

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

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

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

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

352 **3. Requirements**

353 **3.1 Rationale for IPP Enterprise Printer Extensions v2.0**

354 IETF and PWG IPP printing standards define an abstract model of a Print Service (i.e., ISO
355 DPA Logical Printer) and a Print Device (i.e., ISO DPA Physical Printer) in section 3.1 of
356 IETF IPP/1.1 [STD92]. Some IPP Printers already support proofing, saving, and reprinting
357 of large Print Jobs via vendor proprietary operations and attributes.

358 Therefore, this IPP Enterprise Printer Extensions v2.0 specification should:

- 359 1. Support Proof Jobs using IPP Job Creation operations;
- 360 2. Support Stored Jobs using IPP Job Creation operations;
- 361 3. Support creating new Jobs from stored or proofed Jobs, with possibly different
362 processing instructions;
- 363 4. Support Password Protected Jobs using IPP Job Creation operations;
- 364 5. Support interoperability between Proof Jobs, Stored Jobs and Password
365 Protected Jobs such that a single Job can be any combination of the 3 including
366 all 3 (e.g. a "Password Protected Stored Proof Job").

367 **3.2 Use Cases**

368 **3.2.1 Job Protection Via a Job Password**

369 Frank works in a sales office that is large enough for him to have privacy concerns, but not
370 so large that the printers are integrated into the IT infrastructure in a sophisticated manner.
371 He is editing a sensitive business report that contains financial data. He wants to make sure
372 that, if he prints it to the office's workgroup printer, he can be confident only people with the
373 original password can pick it up or re-print it. Frank sees that the workgroup printer supports
374 Password Protected Jobs, so he specifies a "Job Password" when he prints it. The
375 workgroup printer delays printing the Job until someone first provides the matching
376 password. Frank goes to the workgroup printer, observes that his Password Protected Job
377 is listed on the control panel, selects it, and enters the job's password at the prompt. The
378 printer prints the Password Protected Job, and Frank can relax knowing the printed Job was
379 safe from others' view.

380 **3.2.2 Job Protection Via User Authentication**

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

390 **3.2.3 Job Storage**

391 Vincent is an administrative assistant for a school. The school provides its teachers with
392 paper forms for documenting their class assignments and attendance. Vincent makes these
393 forms available on the school's web site and also on the school's workgroup printer as a
394 Stored Job accessible by any accounts in the Faculty user group. He sends an email to the
395 school faculty letting them know that the Stored Job is available for reprinting.

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

401 **3.2.4 Proof Print**

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

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

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

414 Alice searches for layout and visual content errors, while Bob looks for typos and missing
415 words. Charlie commits their fixes to the database, regenerates the source documents, and
416 does another cycle of proof print.

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

420 **3.3 Exceptions**

421 **3.3.1 Unauthorized Access Job Protection Using a Job Password**

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

428 **3.4 Out of Scope**

429 The following are considered out of scope for this document:

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

432 **3.5 Design Requirements**

433 This IPP Enterprise Printer Extensions v2.0 design should:

- 434 (1) Follow the naming conventions defined in IETF IPP/1.1 [STD92], including
435 keyword value (lowercase) and hyphenation requirements;
- 436 (2) Optimize compatibility with existing IETF and PWG IPP operations when
437 making design decisions in defining new operations and attributes;

- 438 (3) Define new attributes in support of the Job Protection Feature;
- 439 (4) Define new attributes in support of the Job Storage feature;
- 440 (5) Define new attributes in support of the Job Proof Print Feature;
- 441 (6) Define additional attributes .
- 442

443 **4. Semantics Common to More Than One Attribute**

444 **4.1 Overview**

445 **4.2 Authenticated Release Feature**

446 The Authenticated Release Feature enables a Client to provide authentication credentials
447 at Job Creation Time, and request that the Job be held by the Printer until matching
448 credentials are provided at the Printer to authorize the Job's release.

449 This feature provides functionality similar to the Job Protection Feature (section 4.4). It differs
450 mainly in the nature of the credential used to release the Job; whereas the Job Protection
451 Feature uses a "job password", this feature uses user credentials to release the Job to
452 processing. The Client uses this feature by specifying "job-hold-until" = 'owner-authorized'.

453 **4.3 Job Storage Feature**

454 The Job Storage Feature enables a Client to "store" a Job and its Documents in their
455 originally submitted and unprocessed form to make it available for reprinting at a later time.
456 A Stored Job's discoverability will depend on its access settings; it might be discoverable to
457 all users, to only the originating user, or to users that are part of a particular group. A Client
458 requests a Job be treated as a Stored Job by supplying the "job-storage" Job Template
459 attribute (section 6.5) when submitting the Job Creation operation.

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

464 **4.3.1 Creating Stored Jobs**

465 A Job becomes a Stored Job when the "job-storage" Job Template attribute is specified in
466 the Job Creation operation, and that Job has reached the 'completed' state.

467 **4.3.2 Identifying and Listing Stored Jobs**

468 A Job is a Stored Job if its "job-state-reasons" Job Status attribute includes one of the
469 keywords for the Job Storage Feature defined in section . A Client can get a listing of Stored
470 Jobs by specifying either the 'stored-public' or 'stored-owner' keyword for the "which-jobs"
471 attribute (section 10.1) in a Get-Jobs operation request [STD92].

472 **4.3.3 Reprinting Stored Jobs**

473 There are two methods defined to reprint a copy of the Saved Job: using the Resubmit-Job
474 operation [PWG5100.7]; and by direct interaction with the Printer's control panel. The
475 Reprocess-Job operation [RFC3998] has been deprecated.

476 **4.3.3.1 Reprinting Stored Jobs using the Resubmit-Job operation**

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

483 **4.3.3.2 Reprinting Stored Jobs using the Printer Control Panel**

484 Stored Jobs can be reprinted using the Printer's control panel (control console). The details
485 of the user experience and presentation are beyond the scope of this document, but ought
486 to reflect the semantics of the Job Storage feature defined in this IPP Enterprise Printer
487 Extensions v2.0 specification.

488 **4.4 Job Protection Feature**

489 The Job Protection Feature enables a User to protect a Job with a password that is required
490 for authorizing printing or reprinting the Job. A Client requests a Job be treated as a
491 Password Protected Job by supplying the “job-password”, “job-password-action” and “job-
492 password-encryption” Job Template attributes (sections 5.1, 5.2, and 5.3) when submitting
493 the Job Creation operation.

494 The password is permanently attached to the Job and persists with the Job until it enters the
495 Job History phase [STD92]. If the Job is copied, as in the case of reprinting a Stored Job,
496 the password is preserved in the new copy. This feature can be combined with the Job
497 Storage Feature and/or the Job Proof Print Feature.

498 **4.5 Job Proof Print Feature**

499 The Job Proof Print Feature enables a User to print a Proof Job and to save it as part of job
500 processing in such a way that users can submit a request to print a copy of the Proof Job at
501 a later time. A Client requests a Printer to print and save a Proof Job by supplying the “proof-
502 print” Job Template attribute (section 6.6) when submitting the job. In this case, the Printer
503 retains the Proof Job indefinitely in the so-called Job Retention Phase (see [STD92] section
504 5.3.7.2 Partitioning of Job States) in the job's terminal state (‘completed’, ‘aborted’, or
505 ‘canceled’) after processing it, rather than aging the job out after an implementation-defined
506 period. In other words, a Proof Job is just a Retained Job that the Printer is retaining
507 indefinitely. A Client can then request the Printer to reprint a copy of the Proof Job using the
508 Resubmit-Job operation [PWG5100.7]. See section 12.5 Conformance Requirements for the
509 REQUIRED “proof-print” Job Template attribute for additional conformance requirements for
510 Clients and Printers.

511 **5. New Operation Attributes for Existing Operations**

512 This section defines additional Operation attributes for existing IPP operations.

513 **5.1 job-password (octetString(255)) for Job Creation operations**

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

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

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

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

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

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

541 **5.2 job-password-action (type2 keyword)**

542 The "job-password-action" operation attribute specifies how a Job is processed when the
543 "job-password" operation attribute (section 5.1) is included in a Job Creation request. If the
544 Client supplies the "job-password" attribute but does not supply the "job-password-action"
545 attribute, the Client and the Printer MUST assume the value is 'hold-job', to preserve
546 backward compatibility with the earlier definition of "job-password" [PWG5100.11]. The

547 value specified by this operation attribute **MUST** be one of the values specified by the
548 Printer's "job-password-action-supported" attribute (section 8.3).

549 Standard keyword values include:

- 550 • 'hold-job': The Job is placed in the 'pending-held' state and is released when the "job-
551 password" value is entered at the Printer's console. The Job **MUST NOT** be retained
552 once it has reached its terminal state ('completed', aborted' or 'canceled'). This is the
553 semantic originally specified for the "job-password" operation attribute (section 5.1).
- 554 • 'process-and-retain': The Job is placed in the 'pending' state and it scheduled for
555 processing without waiting for the User to enter the "job-password" value at the
556 Printer's console.
- 557 • 'retain-only': The Job is placed in the 'completed' state as soon as all Documents are
558 received by the Printer. The Printer will require a matching password for all reprints.

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

561 **5.3 job-password-encryption (type2 keyword) for Job Creation** 562 **operations**

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

569 **6. Job Template Attributes**

570 Job Template attributes describe job processing behavior and conform to a set of rules. See
571 [STD92] for the complete text of the rules that apply to each Job Template attribute called
572 "xxx".

573 **6.1 job-cancel-after (integer(1:MAX))**

574 This Job Template attribute specifies the maximum number of seconds that are allowed for
575 processing a Job. The cancel timer does not begin until the Job enters the 'processing' state.
576 If the Job is canceled because of this timer, the Printer **MUST** add the 'job-canceled-after-
577 timeout' keyword to the "job-state-reasons" Job Status attribute (section 10.3).

578 **6.2 job-pause-after (integer(1:MAX))**

579 This Job Template attribute specifies after how many pages the Printer should pause
580 processing a Job.

581 **6.3 job-phone-number (uri)**

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

586 **6.4 job-recipient-name (name(MAX))**

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

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

596 **6.5 job-storage (collection)**

597 The "job-storage" Job Template attribute is a collection whose members specify how a
598 Printer processes a Job to become a Stored Job. See section 4.2 for a full description of the
599 Job Storage Feature.

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

602 **6.5.1 job-storage-access (type2 keyword)**

603 The "job-storage-access" member attribute specifies the access restrictions on the Stored
604 Job. The value MUST be one of the keywords specified by the Printer's "job-storage-access-
605 supported" Printer Description attribute (section 8.14). The "job-storage-access" member
606 attribute MUST be preserved by the Job as a member of the "job-storage" Job Status
607 attribute (section 7.1).

608 6.5.2 job-storage-disposition (type2 keyword)

609 The "job-storage-disposition" member attribute specifies how the Job is to be handled by the
 610 Printer during the 'processing' state. The value MUST be one of the values specified by the
 611 Printer's "job-storage-disposition-supported" Printer Description attribute (section 8.16).

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

614 6.5.3 job-storage-group (name(MAX))

615 This member attribute specifies the group, if any, in which the Stored Job is listed. The value
 616 specified by the "job-storage-access" attribute (section 6.5.1) coordinates with the value of
 617 this attribute. If the "job-storage-access" attribute is 'group', then the value of this attribute
 618 MUST be one of the values specified by the Printer's "job-storage-group-supported" Printer
 619 Description attribute (section 8.17).

620 6.6 proof-print (collection)

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

632 A Client MUST be able to supply and a Printer MUST support this attribute in order to claim
 633 support of this IPP Enterprise Printer Extensions v2.0 Specification, respectively. See
 634 section 12.5 Conformance Requirements for the REQUIRED "proof-print" Job Template
 635 attribute for additional conformance requirements for Clients and Printers.

636 This attribute MAY be used with the "job-password" attribute for a Password Protected Job
 637 that is also a Proof Job. A Printer indicates its support for this by listing "job-password" and
 638 "job-password-encryption" in its "proof-print-supported" Printer Description attribute (section
 639 8.19).

640 Table 1 lists the member attributes of the "proof-print" collection attribute.

641 **Table 1 - "proof-print" member attributes**

Member Attribute Name	Request	Printer Support
-----------------------	---------	-----------------

proof-print-copies	MUST	MUST
media	MUST be one or the other, but NOT both	MUST
media-col		MAY

642 **6.6.1 proof-print-copies (integer (0:MAX))**

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

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

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

651 **6.6.2 media (type2 keyword | name(MAX)) or media-col (collection)**

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

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

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

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

675 **7. Job Status Attributes**

676 **7.1 job-storage (collection)**

677 The "job-storage" Job Status attribute labels the Job as a Stored Job and specifies the
678 storage handling requirements the Printer MUST follow. All the members of this Job Storage
679 attribute are the same as those specified for the "job-storage" Job Template attribute (section
680 6.5).

681 **8. Printer Description Attributes**

682 **8.1 job-cancel-after-default (integer(1:MAX) | no-value)**

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

685 **8.2 job-cancel-after-supported (rangeOfInteger(1:MAX))**

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

688 **8.3 job-password-action-supported (type2 keyword)**

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

692 Standard password action keyword values include:

- 693 • 'hold-job': The Job is placed in the 'pending-held' state and is released when the "job-
694 password" value is entered at the Printer's console. The Job MUST NOT be retained
695 once it has reached its terminal state ('completed', aborted' or 'canceled'). This is the
696 semantic originally specified for the "job-password" operation attribute (section 5.1).
- 697 • 'process-and-retain': The Job is placed in the 'pending' state and it scheduled for
698 processing without waiting for the User to enter the "job-password" value at the
699 Printer's console.
- 700 • 'retain-only': The Job is placed in the 'completed' state as soon as all Documents are
701 received by the Printer. The Printer will require a matching password for all reprints.

702 Once in a terminating state, the Job is retained according to the current value of its "job-
703 retain-until" and/or "job-retain-until-time" attributes.

704 **8.4 job-password-encryption-supported (1setOf (type2 keyword |**
 705 **name(MAX)))**

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

708 If the "job-password" operation attribute is supported, then this attribute MUST be supported.
 709 Standard keyword values are in Table 2. The 'md2', 'md4', 'md5', and 'sha' keywords have
 710 been DEPRECATED. Others may be deprecated in the future as the state of the art of
 711 cryptography evolves.

712 **Table 2 - Standard keywords for "job-password-encryption-supported"**

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

'sha2-512_224'	The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 224 bits.
'sha2-512_256'	The encryption method uses the Secure Hash Algorithm 2 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 256 bits.
'sha3-224'	The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 224 bits.
'sha3-256'	The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 256 bits.
'sha3-384'	The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 384 bits.
'sha3-512'	The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 512 bits.
'sha3-512_224'	The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 224 bits.
'sha3-512_256'	The encryption method uses the Secure Hash Algorithm 3 defined by the National Institute of Standards and Technology, with an output size of 512 bits, truncated to 256 bits.
'shake-128'	The encryption method uses the SHAKE128 method defined by the National Institute of Standards and Technology, with an output size of 128 bits.
'shake-256'	The encryption method uses the SHAKE256 method defined by the National Institute of Standards and Technology, with an output size of 256 bits.

713 [1] - Deprecated

714 **8.5 job-password-length-supported (rangeOfInteger (0:255))**

715 The 4.1 "job-password-length-supported" Printer Description attribute specifies the minimum
716 and maximum supported length of the unencrypted password, measured in characters. The

717 character set encoding is specified by the "job-password-repertoire-configured" attribute
 718 (Section XX). The Printer is configured to accept an empty password if the range's minimum
 719 value is 0 (zero).

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

723 **8.6 job-password-repertoire-supported (1setOf (type2 keyword))**

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

726 The keywords are named according to a 'REGISTRY_ENCODING_RANGE' naming
 727 structure convention. Table 3 lists the standard keywords. Vendor repertoire keywords,
 728 prefixed with "vendor_" to indicate a vendor-specific registry, may also be used. Vendor
 729 repertoire keywords SHOULD be registered with the PWG to achieve interoperability. As
 730 an example, a vendor may choose to register the 'vendor_us-ascii_lowercase' keyword to
 731 specify a repertoire limited to using only lowercase characters from the US ASCII encoding.

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

733 **Table 3 - job-password-repertoire-supported keyword definitions**

<i>Keyword</i>	<i>Description</i>
<i>'iana_us-ascii_digits'</i>	Value must consist of only ASCII digits (0x30-0x39)
<i>'iana_us-ascii_letters'</i>	Value must consist of only US ASCII letters (0x41-0x5A, 0x61-0x7A)
<i>'iana_us-ascii_complex'</i>	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)
<i>'iana_us-ascii_any'</i>	Value must consist of US ASCII printable characters (0x20-0x7e)
<i>'iana_utf-8_digits'</i>	Value must consist of only UTF-8 numerical digits
<i>'iana_utf-8_letters'</i>	Value must consist of UTF-8 letters
<i>'iana_utf-8_any'</i>	Value must consist of UTF-8 printable characters

734 **8.7 job-password-repertoire-configured (type2 keyword)**

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

740 **8.8 job-password-supported (integer(0:255))**

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

748 **8.9 job-pause-after-supported (1setOf type2 keyword)**

749 This attribute lists the

750 **8.10 job-phone-number-default (uri)**

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

753 **8.11 job-phone-number-supported (boolean)**

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

755 **8.12 job-recipient-name-default (name(MAX))**

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

758 **8.13 job-recipient-name-supported (boolean)**

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

760 **8.14 job-storage-supported (1setOf keyword)**

761 This attribute indicates whether the Printer supports the Job Storage feature, and what
762 members are supported by the Printer.

763 The Printer indicates support for Stored Jobs that are also Protected Jobs by including both
 764 "job-password" and "job-password-encryption" in the set of keywords. If the Printer lists
 765 these two attribute name keywords, it MUST accept "job-password" and "job-password-
 766 encryption" with "job-storage". If "job-password" and "job-password-encryption" are both
 767 specified for the Job, the Job MUST NOT return these attributes in a Get-Job-Attributes
 768 request. The Printer MUST preserve the "job-password" and "job-password-encryption" Job
 769 Status attributes in all copies of the original Job to maintain Job Protection.

770 **8.15 job-storage-access-supported (1setOf type2 keyword)**

771 This attribute specifies the Job Storage access modes supported by the Printer. Standard
 772 keywords for the "job-storage-access" attribute are listed in Table 4.

773 **Table 4 - Standard keywords for "job-storage-access-supported"**

<i>Keyword</i>	<i>Meaning</i>
"group"	Visible to only the group to which the submitting most authenticated user is a member
"owner"	Visible to only the submitting most authenticated user
"public"	Visible to all users (may still be password protected)

774

775 **8.16 job-storage-disposition-supported (1setOf type2 keyword)**

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

778 **Table 5 - Standard keywords for "job-storage-disposition-supported"**

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

779 **8.17 job-storage-group-supported (1setOf name(MAX))**

780 This attribute specifies the user groups to which a Stored Job could be made visible when it
781 is stored, using the "job-storage-group" member (section 6.5.3) of the "job-storage" attribute
782 (section 6.5). The value of this attribute will list different values if returned in an authenticated
783 Get-Printer-Attributes or Get-User-Printer-Attributes response.

784 **8.18 proof-print-default (collection)**

785 This attribute specifies the default value of "proof-print" the Printer will use when the Client
786 doesn't specify the "proof-print" Job Template attribute in a Job Creation request. A Printer
787 MUST support the same member attributes for this default collection as it supports for the
788 corresponding "proof-print" Job Template attribute.

789 **8.19 proof-print-supported (1setOf keyword)**

790 This attribute lists the member attributes of "proof-print" that the Printer supports.

791 The Printer indicates support for Proof Print Jobs that are also Protected Jobs by including
792 both "job-password" and "job-password-encryption" in the set of keywords. If the Printer lists
793 these two attribute name keywords, it MUST accept "job-password" and "job-password-
794 encryption" with "proof-print". If "job-password" and "job-password-encryption" are both
795 specified for the Job, the Job MUST NOT return these attributes in a Get-Job-Attributes
796 request. The Printer MUST preserve the "job-password" and "job-password-encryption" Job
797 Status attributes in all copies of the original Job to maintain Job Protection.

798 **8.20 proof-print-copies-supported (rangeOfInteger(0:MAX))**

799 This attribute specifies the range of values the Printer supports for the "proof-print-copies"
800 member attribute of the "proof-print" Job Template attribute (section 6.6.1).

801 **9. Additional Semantics for Existing Operations**

802 **9.1 Create-Job, Print-Job, and Print-URI Operations: "job-password" and** 803 **"job-password-encryption"**

804 A Printer that supports the "job-password" operation attribute (section 5.1) and "job-
805 password-encryption" operation attribute (section 5.3) MUST validate the values supplied
806 and return the 'client-error-bad-request' status code if the values are invalid or not supported.
807 A Printer MUST NOT return the "job-password" or "job-password-encryption" attributes in
808 the Unsupported Attributes Group to prevent the leaking of security information.

809 **9.2 Validate-Job Operation: "job-password" and "job-password-**
810 **encryption"**

811 A Client MUST NOT send the "job-password" operation attribute (section 5.1) or "job-
812 password-encryption" operation attribute (section 5.3) in a Validate-Job request. Printers
813 MUST reject a Validate-Job request containing either a "job-password" or "job-password-
814 encryption" operation attribute and return the 'client-error-bad-request' status code.

815 **10. Additional Values and Semantics for Existing IPP Attributes**

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

818 **10.1 ipp-features-supported (1setOf type2 keyword)**

819 This IPP Enterprise Printer Extensions v2.0 specification defines the 'authenticated-release',
820 'job-protection', 'job-storage' and 'proof-print' keywords for the "ipp-features-supported"
821 Printer Description attribute [PWG5100.13] to let the Printer to indicate its support for one or
822 more of the major features defined in this specification.

823 **10.2 job-hold-until (type2 keyword | name(MAX))**

824 This IPP Enterprise Printer Extensions v2.0 specification defines additional keyword values
825 for the "job-hold-until" Job Template attribute [STD92] to support workflow features specified
826 elsewhere in this document. Table 6 lists the new values and their uses.

827 **Table 6 - Additional Keywords for "job-hold-until"**

Keyword	Description
'owner-authorized'	Hold the Job until the Owner has authorized it to be released. A supporting Printer MAY challenge the Client for authentication credentials. A supporting Client MUST expect an authentication challenge from the Printer.
'button-press'	Hold the Job until a button press on the Output Device's control panel authorizes it to be released to processing.

828 **10.3 job-state-reasons (1setOf type2 keyword) Job Description attribute**

829 This section adds additional keywords to the "job-cancel-after" attribute (section 6.1) in
830 support of the Job Storage Feature (section 4.2), the Job Protection Feature (section 4.4)
831 and the Job Proof Print Feature (section 4.5).

832 Many of the existing "job-state-reasons" attribute values can apply to a 'save-only' Job as
 833 well as a Job submitted for printing. If the value of the "job-storage-disposition" attribute is
 834 store-only', the "job-state-reasons" attribute MAY be set with existing values such as 'job-
 835 incoming', 'resources-are-not-ready' (such as a font), 'job-interpreting', and 'job-queued'.
 836 Likewise, errors that occur on a Stored Job MAY have existing "job-state-reasons" attribute
 837 values such as 'job-data-insufficient', 'document-access-error', 'submission-interrupted', 'job-
 838 canceled-by-user', 'aborted-by-system', etc.

839 There are also new four new "job-state-reasons" keyword values REQUIRED that support a
 840 Stored Job: 'job-storing', 'job-stored-successfully', 'job-stored-with-warnings', and 'job-
 841 stored-with-errors'. The existing 'job-completed-successfully', 'job-completed-with-warnings',
 842 and 'job-completed-with-errors' values are also clarified in the list above for implementations
 843 that support the "job-save-disposition" Job Template attribute, in such a way that these
 844 values remain compatible with Printers and Clients that do not support job saving. Table 7
 845 defines the meanings of these 4 new "job-state-reasons" keywords.

846 **Table 7 - Additional Keywords for "job-state-reasons"**

Keyword	Description
'job-canceled-after-timeout'	The Job was canceled because the timer with a duration specified by the "job-cancel-after" attribute (section 7.4) to the "job-state-reasons" Job Status attribute.
'job-awaiting-password'	The Job is in the 'pending-held' state awaiting a password to be entered to allow it to be released to processing.
'job-awaiting-proof-release'	The Job is in the 'processing-stopped' state following the printing of the first copy, awaiting a signal of approval to allow the remaining copies to be produced.
'job-password-timeout'	The Job is in the 'aborted' state being retained and stored by the Printer, ready to be duplicated to produce a new reprint Job.
'job-stored-successfully'	The job was successfully saved. The Printer MUST also supply 'job-completed-successfully', except when "job-storage-disposition" = 'store-only'. If the "job-storage" Job Template attribute is supported, this value MUST be supported.
'job-stored-with-errors'	The job did not save successfully (whether or not it was printed successfully, printed with warnings, printed with errors, or not printed). The Printer MUST ensure that none of the saved job is accessible, if it was unable to successfully save all of the job. If the "job-storage" Job Template attribute is supported, this value MUST be supported.

'job-stored-with-warnings' The job was saved with warnings. If the "job-storage" Job Template attribute is supported, this value MUST be supported.

'job-storing' The Printer is transmitting the job to the save location. This is similar to the 'job-printing' value. If the "job-storage" Job Template attribute is supported, this value MUST be supported.

847 Table 8 enumerates the possible combinations of print and save success, warning, and error
 848 conditions. Note that two values occur only when there are print warnings/errors and a save
 849 error.

850 **Table 8 - Values of "job-state-reasons" attribute for various job conditions**

	Not storing	Store was successful	Store was unsuccessful
Not printing	<not possible>	'job-completed-successfully'	'job-stored-with-errors'
Print successful	'job-completed-successfully'	'job-completed-successfully'	'job-stored-with-errors'
Print warnings	'job-completed-with-warnings'	'job-completed-with-warnings'	'job-completed-with-warnings', 'job-stored-with-errors'
Print errors	'job-completed-with-errors'	'job-completed-with-errors'	'job-completed-with-errors', 'job-stored-with-errors'
Print warnings and errors	'job-completed-with-errors'	'job-completed-with-errors'	'job-completed-with-errors', 'job-stored-with-errors'

851 **10.4 which-jobs (type2 keyword) and which-jobs-supported (1setOf**
 852 **type2 keyword)**

853 This IPP Enterprise Printer Extensions v2.0 specification defines additional keyword values
 854 for the IPP "which-jobs" operation attribute of the Get-Jobs operation [STD92] and the
 855 "which-jobs-supported" Printer Description attribute [PWG5100.7] to support filtering for
 856 Proof Jobs and Stored Jobs. Table 9 lists the new values and their uses.

857 **Table 9 - Additional Keywords for "which-jobs" and "which-jobs-supported"**

Keyword	Description
----------------	--------------------

'proof-print'	Proof Jobs, i.e., Jobs that have been submitted using the "proof-print" Job Template attribute and which are in the 'completed', 'canceled', or 'aborted' state. If the "proof-print" Job Template attribute is supported, this value MUST be supported.
'stored-public'	Public Stored Jobs, i.e., Jobs that have been stored using the "job-storage " Job Template attribute where the "job-storage-access" member attribute specifies 'public', and which are in the 'completed' state. If the "job-storage" Job Template attribute is supported, this value MUST be supported.
'stored-owner'	Private Stored Jobs, i.e., Jobs that have been stored using the "job-storage " Job Template attribute where the "job-storage-access" member attribute specifies 'owner', and which have reached the 'completed' state. If the "job-storage" Job Template attribute is supported, this value MUST be supported.

858 A Client that specifies the 'stored-owner' keyword for "which-jobs" MUST be prepared to
 859 handle an authentication challenge from the Printer.

860 11. Obsolete Attributes and Values

861 11.1 Obsolete Attributes

862 Table 10 lists the attributes that are OBSOLETE.

863 **Table 10 - Obsolete Attributes**

Attribute	Explanation
job-save-disposition	The Job Save and Reprint Feature [PWG5100.11] has been deprecated
pages-per-subset	Redundant with "job-pages-per-set" [PWG5100.1]
sheet-collate	

864 11.2 Obsolete Values

865 Table 11 lists the values that are OBSOLETE.

866 **Table 11 - Obsolete Values**

Attribute	Value	Explanation
-----------	-------	-------------

job-state-reasons	'job-saved-successfully'	The Job Save and Reprint Feature [PWG5100.11] has been deprecated
job-state-reasons	'job-saved-with-errors'	The Job Save and Reprint Feature [PWG5100.11] has been deprecated
job-state-reasons	'job-saved-with-warnings'	The Job Save and Reprint Feature [PWG5100.11] has been deprecated
job-state-reasons	'job-saving'	The Job Save and Reprint Feature [PWG5100.11] has been deprecated
which-jobs	'saved'	The Job Save and Reprint Feature [PWG5100.11] has been deprecated

867 12. Conformance Requirements

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

870 12.1 Authenticated Release Feature

871 12.1.1 Printer Conformance Requirements

872 In order for a Printer to claim conformance with the Authenticated Release Feature defined
873 in this specification, a Printer MUST support:

- 874 1. The "job-hold-until" attribute defined in [STD92];
- 875 2. The required operations defined in section **Error! Reference source not f**
876 **ound.;**
- 877 3. The additional semantics defined in section **Error! Reference source not f**
878 **ound.;**
- 879 4. The additional values defined in section **Error! Reference source not found.;**
- 880 5. The status codes defined in section **Error! Reference source not found.;**
- 881 6. The internationalization considerations defined in section **Error! Reference s**
882 **ource not found.;** and
- 883 7. The security considerations defined in section **Error! Reference source not f**
884 **ound..**

885 12.1.2 Client Conformance Requirements

886 In order for a Client to claim conformance with the Authenticated Release Feature defined
887 in this specification, a Client MUST support:

- 888 1. The required attributes and values defined in section **Error! Reference source n**
889 **ot found.**;
- 890 2. The required operations defined in section **Error! Reference source not f**
891 **ound.**;
- 892 3. The additional semantics defined in section **Error! Reference source not f**
893 **ound.**;
- 894 4. The additional values defined in section **Error! Reference source not found.**;
- 895 5. The status codes defined in section **Error! Reference source not found.**;
- 896 6. The internationalization considerations defined in section **Error! Reference s**
897 **ource not found.**; and
- 898 7. The security considerations defined in section **Error! Reference source not f**
899 **ound.**.

900 12.2 Job Protection Feature

901 12.2.1 Printer Conformance Requirements

902 In order for a Printer to claim conformance with the Job Protection Feature defined in this
903 specification, a Printer MUST support:

- 904 1. The required attributes and values defined in section **Error! Reference source n**
905 **ot found.**;
- 906 2. The required operations defined in section **Error! Reference source not f**
907 **ound.**;
- 908 3. The additional semantics defined in section **Error! Reference source not f**
909 **ound.**;
- 910 4. The additional values defined in section **Error! Reference source not found.**;
- 911 5. The status codes defined in section **Error! Reference source not found.**;
- 912 6. The internationalization considerations defined in section **Error! Reference s**
913 **ource not found.**; and
- 914 7. The security considerations defined in section **Error! Reference source not f**
915 **ound.**.

916 12.2.2 Client Conformance Requirements

917 In order for a Client to claim conformance with the Job Protection Feature defined in this
918 specification, a Client MUST support:

- 919 1. The required attributes and values defined in section **Error! Reference source n**
920 **ot found.**;
- 921 2. The required operations defined in section **Error! Reference source not f**
922 **ound.**;

- 923 3. The additional semantics defined in section **Error! Reference source not f**
924 **ound.;**
925 4. The additional values defined in section **Error! Reference source not found.;**
926 5. The status codes defined in section **Error! Reference source not found.;**
927 6. The internationalization considerations defined in section **Error! Reference s**
928 **ource not found.;** and
929 7. The security considerations defined in section **Error! Reference source not f**
930 **ound..**

931 **12.3 Job Storage Feature**

932 **12.3.1 Printer Conformance Requirements**

933 In order for a Printer to claim conformance with the Job Storage Feature defined in this
934 specification, a Printer MUST support:

- 935 1. The required attributes and values defined in section **Error! Reference source n**
936 **ot found.;**
937 2. The required operations defined in section **Error! Reference source not f**
938 **ound.;**
939 3. The additional semantics defined in section **Error! Reference source not f**
940 **ound.;**
941 4. The additional values defined in section **Error! Reference source not found.;**
942 5. The status codes defined in section **Error! Reference source not found.;**
943 6. The internationalization considerations defined in section **Error! Reference s**
944 **ource not found.;** and
945 7. The security considerations defined in section **Error! Reference source not f**
946 **ound..**

947 **12.3.2 Client Conformance Requirements**

948 In order for a Client to claim conformance with the Job Storage Feature defined in this
949 specification, a Client MUST support:

- 950 1. The required attributes and values defined in section **Error! Reference source n**
951 **ot found.;**
952 2. The required operations defined in section **Error! Reference source not f**
953 **ound.;**
954 3. The additional semantics defined in section **Error! Reference source not f**
955 **ound.;**
956 4. The additional values defined in section **Error! Reference source not found.;**
957 5. The status codes defined in section **Error! Reference source not found.;**
958 6. The internationalization considerations defined in section **Error! Reference s**
959 **ource not found.;** and
960 7. The security considerations defined in section **Error! Reference source not f**
961 **ound..**

962 **13. Internationalization Considerations**

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

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

- 969 • Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical
- 970 • Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping
- 971 • Unicode Normalization Forms [UAX15] – especially NFC for [RFC 5198]
- 972 • Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences
- 973 • Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization
- 974 • Unicode Collation Algorithm [UTS10] – sorting
- 975 • Unicode Locale Data Markup Language [UTS35] – locale databases

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

- 978 • Unicode Character Encoding Model [UTR17] – multi-layer character model
- 979 • Unicode in XML and other Markup Languages [UTR20] – XML usage
- 980 • Unicode Character Property Model [UTR23] – character properties
- 981 • Unicode Conformance Model [UTR33] – Unicode conformance basis

982 **14. Security Considerations**

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

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

988 15. IANA Considerations

989 15.1 IPP Attribute and Keyword Value Registrations

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

992 The registry entries will contain the following information:

993	Job Template attributes:	Reference
994	-----	-----
995	job-cancel-after (integer(1:MAX))	[IPPEPX]
996	job-phone-number (uri)	[IPPEPX]
997	job-recipient-name (name(MAX))	[IPPEPX]
998	job-storage (collection)	[IPPEPX]
999	job-storage-access (type2 keyword)	[IPPEPX]
1000	job-storage-disposition (type2 keyword)	[IPPEPX]
1001	job-storage-group (name(MAX))	[IPPEPX]
1002	proof-print (collection)	[IPPEPX]
1003	media (type2 keyword name(MAX))	[IPPEPX]
1004	media-col (collection)	[IPPEPX]
1005	proof-print-copies (integer (0:MAX))	[IPPEPX]
1006		
1007		
1008	Operation attributes:	Reference
1009	-----	-----
1010	job-password (octetString(255))	[IPPEPX]
1011	job-password-action (type2 keyword)	[IPPEPX]
1012	job-password-encryption (type2 keyword name(MAX))	[IPPEPX]
1013		
1014		
1015	Job Status attributes:	Reference
1016	-----	-----
1017	job-storage (collection)	[IPPEPX]
1018		
1019		
1020	Printer Description attributes:	Reference
1021	-----	-----
1022	job-cancel-after-default (integer(1:MAX))	[IPPEPX]
1023	job-password-action-supported (1setOf (type2 keyword))	[IPPEPX]
1024	job-password-encryption-supported (1setOf (type2 keyword name(MAX)))	[IPPEPX]
1025	job-password-repertoire-configured (1setOf (type2 keyword name(MAX)))	[IPPEPX]
1026	job-password-repertoire-supported (1setOf (type2 keyword name(MAX)))	[IPPEPX]
1027	job-password-supported (integer(0:255))	[IPPEPX]
1028	job-phone-number-default (uri)	[IPPEPX]
1029	job-phone-number-supported (boolean)	[IPPEPX]
1030	job-print-password-supported (octetString(256))	[IPPEPX]
1031	job-print-password-encryption-supported (type2 keyword)	[IPPEPX]
1032	job-print-password-repertoire-supported (type2 keyword)	[IPPEPX]
1033	job-recipient-name-default (name(MAX))	[IPPEPX]
1034	job-recipient-name-supported (boolean)	[IPPEPX]
1035	job-storage-access-supported (1setOf type2 keyword)	[IPPEPX]
1036	job-storage-disposition-supported (1setOf type2 keyword)	[IPPEPX]
1037	job-storage-group-supported (1setOf type2 keyword)	[IPPEPX]
1038	job-storage-supported (1setOf type2 keyword)	[IPPEPX]
1039	printer-detailed-status-messages (1setOf text(MAX))	[IPPEPX]
1040	proof-print-default (collection)	[IPPEPX]
1041	proof-print-supported (1setOf type2 keyword)	[IPPEPX]
1042	proof-print-copies-supported (rangeOfInteger(0:MAX))	[IPPEPX]

1043 proof-print-password-supported (1setOf type2 keyword) [IPPEPX]

1044 15.2 Attribute Value Registrations

1045 The attributes defined in this specification will be published by IANA according to the
1046 procedures in IPP/1.1 Model and Semantics [STD92] section 7.1 in the following file:

1047 <http://www.iana.org/assignments/ipp-registrations>

1048 The registry entries will contain the following information:

1049	Attribute (attribute syntax)	Reference
1050	Keyword Attribute Value	
1051	-----	-----
1052	ipp-features-supported (1setOf (type2 keyword))	[PWG5100.13]
1053	authenticated-release	[IPPEPX]
1054	job-protection	[IPPEPX]
1055	job-storage	[IPPEPX]
1056	proof-print	[IPPEPX]
1057		
1058	job-hold-until (type2 keyword)	[RFC8011]
1059	job-hold-until-supported (1setOf (type2 keyword))	[RFC8011]
1060	owner-authorized	[IPPEPX]
1061	button-press	[IPPEPX]
1062		
1063	job-password-action (type2 keyword)	[IPPEPX]
1064	job-password-action-supported (1setOf (type2 keyword))	[IPPEPX]
1065	hold-job	[IPPEPX]
1066	process-and-retain	[IPPEPX]
1067	retain-only	[IPPEPX]
1068		
1069	job-password-encryption (type2 keyword name(MAX))	[IPPEPX]
1070	job-password-encryption-supported (1setOf (type2 keyword name(MAX)))	[IPPEPX]
1071	md2	[IPPEPX]
1072	md4	[IPPEPX]
1073	md5	[IPPEPX]
1074	none	[IPPEPX]
1075	sha	[IPPEPX]
1076	sha2-224	[IPPEPX]
1077	sha2-256	[IPPEPX]
1078	sha2-384	[IPPEPX]
1079	sha2-512	[IPPEPX]
1080	sha2-512_224	[IPPEPX]
1081	sha2-512_256	[IPPEPX]
1082	sha3-224	[IPPEPX]
1083	sha3-256	[IPPEPX]
1084	sha3-384	[IPPEPX]
1085	sha3-512	[IPPEPX]
1086	sha3-512_224	[IPPEPX]
1087	sha3-512_256	[IPPEPX]
1088	shake-256	[IPPEPX]
1089	shake-512	[IPPEPX]
1090		
1091	job-storage-access-supported (1setOf type2 keyword)	[IPPEPX]
1092	save-disposition	[IPPEPX]
1093	save-info	[IPPEPX]
1094		
1095	job-storage-disposition-supported (1setOf type2 keyword)	[IPPEPX]
1096	save-disposition	[IPPEPX]

1097	save-info	[IPPEPX]
1098		
1099	job-storage-group-supported (1setOf type2 keyword)	[IPPEPX]
1100	save-disposition	[IPPEPX]
1101	save-info	[IPPEPX]
1102		
1103	job-storage-supported (1setOf type2 keyword)	[IPPEPX]
1104	save-disposition	[IPPEPX]
1105	save-info	[IPPEPX]
1106		
1107	job-state-reasons (type2 keyword)	[RFC8011]
1108	job-delay-output-until-specified	[IPPEPX]
1109	job-password-wait	[IPPEPX]
1110	job-printed-successfully	[IPPEPX]
1111	job-printed-with-errors	[IPPEPX]
1112	job-printed-with-warnings	[IPPEPX]
1113	job-resuming	[IPPEPX]
1114	job-retain-until-specified	[IPPEPX]
1115	job-saved-successfully	[IPPEPX]
1116	job-saved-with-errors	[IPPEPX]
1117	job-saved-with-warnings	[IPPEPX]
1118	job-saving	[IPPEPX]
1119	job-spooling	[IPPEPX]
1120	job-streaming	[IPPEPX]
1121	job-suspended-by-operator	[IPPEPX]
1122	job-suspended-by-system	[IPPEPX]
1123	job-suspended-by-user	[IPPEPX]
1124	job-suspending	[IPPEPX]
1125		
1126	job-storage-supported (type2 keyword)	[IPPEPX]
1127	job-storage-access	[IPPEPX]
1128	job-storage-disposition	[IPPEPX]
1129	job-storage-group	[IPPEPX]
1130		
1131	proof-print-supported (1setOf type2 keyword)	[IPPEPX]
1132	media	[IPPEPX]
1133	media-col	[IPPEPX]
1134	proof-print-copies	[IPPEPX]
1135		
1136	which-jobs (type2 keyword)	[RFC8011]
1137	proof-print	[IPPEPX]
1138	stored	[IPPEPX]

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1266 To subscribe, see the PWG IPP workgroup web page:

1267 <https://www.pwg.org/ipp/>

1268 Implementers of this specification document are encouraged to join the IPP Mailing List in
1269 order to participate in any discussions of clarification issues and review of registration
1270 proposals for additional attributes and values.

1271 The editors would like to especially thank the following individuals who also contributed
1272 significantly to the development of this document:

1273	Ira McDonald	High North, Inc.
1274	Chris Rizzo	Xerox

1275 **18. Change History**

1276 **18.1 October 10, 2019**

1277 Updated as per brief review from 2019-09-26 and from other sources:

- 1278 • Moved "Additional Semantics for Existing Operations" subsections relating to "job-
1279 password" from JPS3v2 to new section 9 / 9.1 / 9.2
- 1280 • Updated IANA Considerations section with many editorial fixes
- 1281 • Expanded the "Authorized Release Feature" feature description

1282 18.2 September 11, 2019

1283 Added definition of the 'enterprise' keyword for "ipp-features-supported" as per agenda for
1284 2019-09-12 IPP WG meeting and added reference to PWG 5100.13. Also made all URLs in
1285 references use the "https" scheme.

1286 18.3 September 3, 2019

1287 Updated as per feedback from the July 18 IPP Workgroup teleconference review and other
1288 feedback:

- 1289 • Added version number ("v2.0") to title and name
- 1290 • Updated abstract and other references to use new feature names
- 1291 • Restored IPP Proof Print from 5100.11 and "rebranded" it as the Job Proof Print
1292 Feature in this document. Abandoned the proposed new Proof Print feature from HP.
- 1293 • Removed the " | name(MAX)" from the syntax definition for job-password-encryption,
1294 since site-defined localized strings in that context would seem to be unlikely and of
1295 limited value
- 1296 • Added "job-pause-after" and then questioned whether we ought to be adding it
- 1297 • Added a MAY statement allowing "job-password" to be used with "proof-print", with
1298 corresponding conditional requirements, so that the Job Proof Print Feature and Job
1299 Protection Feature can be used with a single Job to make a Protected Proof Print
1300 Job.
- 1301 • Added "proof-print-password-supported" and "proof-print-copies-supported"
- 1302 • Various questions still to be resolved are in comments

1303 18.4 June 14, 2019

1304 Updated to resolve issues identified in the April 2019 PWG F2F and to align with IPP Job
1305 Extensions v2.0.

1306 18.5 March 27, 2019

1307 Initial revision based on an abandoned update to JPS2v2 and discussions on the IPP WG
1308 reflector.