



The Printer Working Group

July 24, 2019  
Working Draft

## IPP Job and Printer Extensions Set 3 v1.1 (JPS3)

Status: Interim

Abstract: Printing on new operating systems, distributed computing systems, and mobile devices emphasizes the challenges of generating document data, discovering available Printers, and communicating that document data to a Printer. This specification adds additional attributes and operations to IPP to better support generic, vendor-neutral implementations of printing in these environments.

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

<https://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

This specification is available electronically at:

<https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippjobprinterext3v11-20190724.docx>  
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## 286 **1. Introduction**

287 Printing on new operating systems, distributed computing systems, and mobile devices  
288 emphasizes the challenges of generating document data, discovering available Printers, and  
289 communicating that document data to a Printer. This specification adds additional attributes  
290 and operations to IPP/1.1 [STD92] and IPP/2.0, IPP/2.1 and IPP/2.2 [PWG5100.12] to better  
291 support generic, vendor-neutral implementations of printing in these environments.

292 This specification extends the IPP Model and Semantics [STD92] by defining:

- 293 1. A general method for limits and filtering for objects and attributes;
- 294 2. Constraint handling mechanisms for clients and printers;
- 295 3. ICC-based color management, and
- 296 4. Localization of attribute names and values.

297

## 298 **2. Terminology**

### 299 **2.1 Conformance Terminology**

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

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

### 308 **2.2 Printing Terminology**

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

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

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

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

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

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

### 321 **2.3 Protocol Role Terminology**

322 The following protocol roles are defined to specify unambiguous conformance requirements:

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

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

## 328 **2.4 Other Terminology**

329 *Black Point Compensation*; the mapping of the darkest color in a source Color Space to the  
330 darkest color in a destination Color Space, generally to improve the reproduction of dark  
331 colors and shadows.

332 *Color Space*; the interpretation of color in a document, for example “RGB”, “Grayscale”,  
333 “CMYK”, and so forth.

334 *Coloring*; filtering or otherwise limiting the return of information such as limiting reported  
335 values to those supported for a given file format or hiding private information from  
336 unauthorized users.

337 *Content*; document data such as photos, web pages, email messages, reports and  
338 presentations, and books or other longer documents.

339 *Gamut*; the range of colors that can be reproduced by a Printer or Color Space.

340 *Image Box*; the "content area" within a digital document.

341 *Input-Document*; the entire sequence of bytes transmitted as the Document Content in the  
342 Print-Job and Send-Document operations or referenced by the "document-uri" operation  
343 attribute in the Print-URI and Send-URI operations. This sequence of bytes consists of one  
344 or more Input-Pages.

345 *Input-Page*; a sequence of bytes that describe how to mark a single Output-Page. IPP 1.1  
346 [STD92] uses the term “print-stream-pages” to refer to both Input-Pages and Output-Pages.  
347 There is a one to one relationship between Input-Pages and Output-Pages and they are in  
348 the same order. Both Input-Pages and Output-Pages are numbered sequentially starting  
349 from 1 at the beginning of each Input-Document or Output-Document, respectively. When  
350 the first Input-Page of an Input-Document coincides with the first Output-Page of an Output-  
351 Document, the numbering of Input-Pages and Output-Pages coincides; otherwise it doesn't.

352 *i<sup>th</sup>*; referring to a specific 1setOf value - the first value, the second value, and so forth.

353 *Kerberos Printing*; authenticated printing based on SPNEGO-based Kerberos and NTLM  
354 HTTP Authentication in Microsoft Windows [RFC4559], Transport Layer Security/1.2  
355 [RFC5246], and Upgrading to TLS Within HTTP/1.1 [RFC2817].

356 *Output-Document*; a set of one or more Sheets which either are permanently bound into a  
357 single unit, e.g., with a staple, or are intended to be treated by an end-user as a single unit,  
358 e.g., for a loose-leaf binder. If an Output-Document is bound, it is uniformly bound; if it is not  
359 bound, no subset of sheets within it are bound. The Output-Pages that comprise an Output-  
360 Document may come from, all the Input-Pages of an Input-Document, a proper subset of the  
361 Input-Pages of the Input-Document, or all the Input-Pages of several Input-Documents. An  
362 Output-Document is *not* a set of sheets that are bound temporarily for shipping, e.g., with  
363 banding.

364 *Output-Page*; the set of all markings that the author intended to be placed on one side of a  
365 Sheet, including, but not limited to, text, drawings, images, footers and headers.

366 *Paid Imaging Services*; Printing, facsimile, and scanning performed for a fee. The means of  
367 collecting payment is outside the scope of this specification.

368 *Secure Transport*; encryption of the HTTP connection using Transport Layer Security  
369 [RFC5246]. The security session may be negotiated at the initiation of the connection  
370 ("HTTPS") or by Upgrading to TLS Within HTTP/1.1 [RFC2817].

371 *Sheet*, the unit of media that a printer puts marks on. It is the most basic unit of output from  
372 a printer. A printer may mark on one side or on both sides of a sheet.

## 373 **2.5 Acronyms and Organizations**

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

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

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

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

378

## 379 **3. Requirements**

### 380 **3.1 Rationale**

381 The Internet Printing Protocol Version 2.0 Second Edition [PWG5100.12] defines:

- 382 1. A collection of existing IPP specifications that form the basis for IPP/2.0
- 383 2. Standard job template attributes for document format, media size, print quality,  
384 and so forth
- 385 3. Specific interoperability requirements, such as HTTP/1.1 support with chunking  
386 and IPP collection attribute support
- 387 4. New version number and operation requirements for different classes of devices

388 Printing from mobile devices and to distributed print services involves several new use cases  
389 that are not addressed by existing IPP standards.

390 Therefore, this IPP Job and Printer Extensions Set 3 v1.1 specification should

- 391 1. Support identification of the Printer;
- 392 2. Support determination of the proximity of the Client to the Printer;
- 393 3. Support job ticket constraint resolution;
- 394 4. Support job ticket-based Printer capability queries;
- 395 5. Support controls for the color rendition of a document and for Client-managed  
396 color workflows;
- 397 6. Support Paid Imaging Services (specifically printing);
- 398 7. Support supply monitoring and control;
- 399 8. Support globally-unique identifiers for all objects;
- 400 9. Support Client localization of Printer attributes and values;
- 401 10. Encourage adoption of modern IPP-based printing infrastructures; and
- 402 11. Discourage the proliferation of vendor proprietary IPP operations and attributes  
403 that damage IPP interoperability by duplicating IETF or PWG IPP standard  
404 operations and attributes.

### 405 **3.2 Use Cases**

406 Provide use cases for the document in subsections using the casual use case format.

#### 407 **3.2.1 Select Printer Using Geo-Location**

408 The Client initiates a proximity detection of nearby Printers using Services and/or Discovery  
409 Protocols, hiding duplicate Printers that are reported by multiple Service and/or Discovery  
410 Protocols. The Client User Interface asks the User to select one of the nearby Printers.  
411 Finally, the User selects a nearby Printer.

412 Preconditions: Both the Client and Printer have access to out-of-band geo-location  
413 information to allow for proximity detection, and both support common Discovery Protocol(s).

414 Geo-location information can be obtained via manual configuration by the User, Operator,  
415 or Administrator, or through location sensing technologies such as the Global Positioning  
416 System or radio signal triangulation.

### 417 **3.2.2 Select Printer with Confirmation**

418 After selecting a Printer using any of several methods, the Client sends an identification  
419 request to the Printer to provide a visual and/or auditory alert on the Printer to allow the User  
420 to confirm that the correct Printer has been selected.

### 421 **3.2.3 Print Using Loaded Media**

422 User is viewing a photo and would like to print the photo on the largest borderless  
423 photographic media loaded on her Printer.

424 After the User initiates a print from the phone and selects a Printer, the Client automatically  
425 selects the largest borderless photographic media loaded on the Selected Printer and the  
426 highest print quality. The User selects additional processing intent for the Job and confirms  
427 the print action. The Client sends a print job request to the Printer with the Job Ticket and  
428 local photo. The Printer validates the Job Ticket and document data and then prints the  
429 photo.

430 Preconditions: Printer can report loaded media information such as size, type, coating, and  
431 weight. This may be detected automatically or manually entered by the User or Operation  
432 when loading the media.

### 433 **3.2.4 Print a Secure Form**

434 The treasurer of a small training company that is holding a meeting and seminar at a resort  
435 needs to print out 20 checks for training personnel. He uses an accounting program to enter  
436 the hours worked, bonuses, reimbursable expenses, and so forth and prints the checks on  
437 a printer provided by the resort using check blanks he brought to the meeting.

438 The User loads check blanks into the Printer and configured the loaded media as necessary  
439 at the Printer. After the User initiates a print from his accounting program, selects a Printer  
440 for printing, and selects checks to be printed, the Client User Interface displays a preview of  
441 the printed checks and the User confirms that checks amounts, payees and signature are  
442 correct. The Client automatically selects the check blank media. The User selects additional  
443 processing intent for the Job and confirms the print action. The Client sends a print job  
444 request to the Printer with the Job Ticket and document data containing the checks, correctly  
445 oriented for the check blank media. The User waits for the checks to be printed and removes  
446 any excess media from the Printer.

### 447 **3.2.5 Print with Special Formatting**

448 At a seminar located at a country resort, a factotum and general gofer has been asked to  
449 provide 80 sets of ten keywords/phrases, clearly printed on 2-inch by 1-inch paper slips for

450 use in a get acquainted exercise. Costs are to be minimized. Gofer has a laptop with a word  
451 processor program. Resort has a Wi-Fi network available to users and a networked MFD at  
452 the business center. Attendant at business center will charge for any printed sheets removed  
453 from premises.

454 After the User initiates a print from his word processor and selects a Printer, the User selects  
455 the processing intent for the Job and confirms the print action. The Client produces  
456 document data using the media information (size and margins) in the Job Ticket so that 2-  
457 inch by 1-inch slips are spread evenly over each page and sends a print job request to the  
458 Printer with the Job Ticket and document. The Printer validates the Job Ticket and document  
459 data and then prints the document.

### 460 **3.2.6 Print to a Service**

461 John is flying to New York for a presentation and doesn't want to carry the presentations.  
462 John arrives in New York and goes online from his mobile phone. He selects a local print  
463 provider after reviewing the provider web pages and submits his document for printing. He  
464 specifies that he needs 10 color copies, printed duplex and stapled on the left side. He also  
465 specifies the covers to be 80lb. stock, and the internal pages to be 24lb. stock. John arrives  
466 at the provider and picks up his presentations, paying with his corporate credit card using  
467 an out-of-band method such as making a telephone call and providing the job identification  
468 and credit card numbers.

### 469 **3.2.7 Print a Document with Page Subsets**

470 Jim has 20 insurance policies to print, each consisting of 4 pages that must be stapled  
471 together. Jim submits an 80-page report document for printing and specifies that he wants  
472 every 4 pages stapled together.

### 473 **3.2.8 Print on a Roll**

474 Mike has a series of photos to print on a roll of photo media. Mike submits a multi-document  
475 job for printing and specifies that the roll be cut between each document in the job.

### 476 **3.2.9 Job or Document Processing Failures**

477 While processing a job, the Printer reports job or document processing issues to the Client,  
478 which displays an error message as needed and asks the User or Operator to confirm the  
479 disposition of the Job. Processing failures include out-of-memory, missing resource, missing  
480 or incorrect password, and other conditions that prevent a particular Job or document from  
481 printing.

### 482 **3.2.10 Manual Duplex Printing**

483 Larry has a long whitepaper he would like to print 2-sided on an entry-level laser printer  
484 without an automatic duplexer accessory. Larry submits the document for printing and  
485 specifies 2-sided printing. The Client software queries the Printer to determine the page

486 stacking order and delivery order for both the input and output trays and then sends the even  
487 numbered pages in the correct order to the Printer. When those pages have been printed,  
488 the Client software instructs Larry to insert the pages back in the input tray in the correct  
489 orientation. Once the pages are loaded in the input tray, the Client software sends the odd  
490 numbered pages to the Printer.

### 491 **3.2.11 Continuous Printing**

492 A scientist wants to continuously print graphs of seismometer readings on a roll of paper  
493 loaded in a Printer with a roll cutter. The Client software collects data from the seismometers  
494 and sends one-inch print documents to the Printer at regular intervals. Every hour the Client  
495 Software instructs the Printer to trim the roll at the end of a document.

### 496 **3.2.12 Correlation of Multiple Printers**

497 An operator monitors and maintains multiple printers managed by several print servers. The  
498 Client software correlates Printers registered with a directory service or dynamic discovery  
499 protocol in order to provide a hierarchical display of the available servers, printers, jobs, and  
500 current state.

### 501 **3.2.13 Manufacturer-Deployed Print Quality Mode**

502 X Printers, a printer manufacturer, has developed a new technology that provides significant  
503 customer benefit above and beyond that of the existing print quality modes available. It is  
504 exposed to the user as a new "X Magic" print quality mode. The "X Magic" print quality mode  
505 depends on the printer having a print engine mechanism that implements the requisite  
506 imaging technology.

507 The new print quality mode does not fit well in the context of the existing print quality modes,  
508 and the vendor does not want to cause customer confusion by remapping the use of existing  
509 print quality modes on devices that support the technology, and not on those that do not.  
510 Doing so would also prevent product differentiation.

511 In this case, the existing basic print quality modes (Draft, Normal, High) are preserved and  
512 the new print quality mode is added as a custom mode. A tooltip explains to the user the  
513 value provided by the "X Magic" print quality mode. The client drivers are unaware of the  
514 mode's meaning. Since the custom PQ mode is defined on the device, the mode will only  
515 be shown when connected to a device supporting that mode.

### 516 **3.2.14 Administrator-Deployed Print Quality Mode**

517 A customer has agreed with its print service provider to pay for an additional print quality  
518 mode called "Eco-Draft", that is enabled through the service contract. This additional print  
519 quality mode will only be made available on select printers, facilitated by the print service  
520 provider's IT administration and deployment system.

521 This "Eco-Draft" print mode differs from the standard "Draft", "Normal" and "High" modes in  
522 that, when selected and indicated to the Printer, the Printer employs a unique combination  
523 of rendering selections to produce output generally comparable to "Draft" but with a  
524 significantly reduced ink or toner usage, and a corresponding reduction in per-page cost. In  
525 order to preserve the conventional definition and user perception of "Draft", the "Eco-Draft"  
526 is offered as a new print quality setting unique to this deployment. A unique name and quality  
527 value are important for two reasons: making it clear to end users they are using a different  
528 print quality, so they can make an informed choice; and for job accounting reasons so that  
529 the billing system can bill pages using this quality level differently than the other familiar  
530 quality levels.

531 The IT administrators have a print policy defined so that users from different departments or  
532 role families are given different print capabilities. Those in the Finance department will only  
533 be offered the "Eco-Draft" print quality option, while executives and those in the Marketing  
534 department will be offered "Eco-Draft" in addition to the standard "Draft", "Normal" and "High"  
535 options. The different quality levels factor into the billing cost the IT administrators and their  
536 print service providers have negotiated.

### 537 **3.2.15 Manufacturer-Deployed Color Transformation Preferences**

538 X Printers, a printer manufacturer, has produced printers for many years. Its customers have  
539 asked X Printers to provide a "color output mode" control with a "legacy color compatibility  
540 mode" choice. X Printers implements this feature in its newer printers that have more  
541 accurate color output, to cause them to produce output that appears as though it was printed  
542 on an older printer whose output exhibited a different particular set of color output  
543 characteristics. The customers want to be able to select this "color output preference" on a  
544 per-job and/or per-Client basis, because some users have a need for this, but only in certain  
545 applications, while others do not.

546 The customers have also asked for a "print preview" to show them what the color would look  
547 like before printing. The printers that implement this new "legacy color compatibility mode"  
548 also provide a special "soft proofing" ICC profile so that the client can present this accurately  
549 to the user.

### 550 **3.2.16 Administrator-Deployed Color Transformation Preference**

551 Fred is a print administrator at an architecture firm. He has been tasked with finding a way  
552 to provide a "blueprint output mode" to the architects in the office, that can be selected as  
553 an option in the print dialog. When this option is selected, the submitted job will be output as  
554 though it was printed from a blueprinting machine. To produce this, the document color depth  
555 is flattened to a 1-bit monochrome, and then transformed so that the white background is  
556 rendered in Prussian blue (Web color #003153 or sRGB 0,49,83), and the "black" lines are  
557 rendered in white. Fred provisions the printer with settings and resources to describe the  
558 desired color transformation to its users' systems using an administrative interface to add  
559 this feature.

560 Lisa works in the office, and her laptop discovers this “Blueprint” color transformation option  
561 when it interrogates the printer for its capabilities. Her client device presents the “Blueprint”  
562 color transformation option in the print dialog. Lisa positions her mouse pointer over the  
563 option and sees a “tool tip” (snippet of descriptive text) over the “Blueprint” option, that  
564 describes what that will do. Lisa likes what the tool tip describes for the “Blueprint” option  
565 and selects it. The print preview in the print dialog shows her what the output will look like.  
566 She likes it more, so she clicks “Print”, and the job is printed as per the preview. Lisa is  
567 happy, and thanks Fred.

### 568 **3.2.17 Print Quality Hints to Influence Printer Color Processing**

569 Juan is a graphic artist, and his team has a high-performance color printer. It has produced  
570 high quality output for all of the applications from which he and his team are printing. But  
571 then Juan encounters a problem. He is viewing a document in a particular application, prints  
572 the document, and realizes that the output is not meeting his needs. He is unable to find  
573 settings in the application that will allow it to produce satisfactory printed output without either  
574 changing the document in unacceptable ways or affecting other users of the printer. He looks  
575 in the print dialog and finds a set of "print quality hints", and through a process of trial-and-  
576 error, is able to produce output that meets his needs.

577 Knowing he will need these settings in the future, and also knowing that his computer  
578 supports IPP Presets, he saves these settings as a Preset for future quick access.

## 579 **3.3 Exceptions**

580 Provide exceptions for the use cases using the casual use case format.

## 581 **3.4 Out of Scope**

582 The following are considered out of scope for this specification:

- 583 1. Methods for geo-location and proximity detection for the Select Printer Using  
584 Geo-Location (section 3.2.1) use case
- 585 2. The actual method of payment for the Print to a Service (section 3.2.6) use case
- 586 3. Constraining choice of document formats suitable for the Print use cases
- 587 4. Discovery protocols used to locate Printers

## 588 **3.5 Design Requirements**

589 The design requirements for this specification are:

- 590 1. Follow the naming conventions defined in the IPP/1.1 Model and Semantics  
591 [STD92], including keyword value (lowercase) and hyphenation requirements;
- 592 2. Optimize compatibility with existing IETF and PWG IPP operations when making  
593 design decisions in defining new operations and attributes;

- 594 3. Define new device attributes that allow a Client to correlate multiple Printers to a  
595 single device or server supporting the Printers;  
596 4. Define new Printer identification attributes and an identification operation;  
597 5. Define new geo-location attributes;  
598 6. Define new attributes for Paid Imaging Services (specifically printing);  
599 7. Define new Printer discovery and selection attributes;  
600 8. Define new job ticket constraint resolution attributes;  
601 9. Define new secure printing, identification, and metadata attributes and values;  
602 10. Define new media capability attributes;  
603 11. Define new input and output tray attributes;  
604 12. Define new limit and filtering attributes;  
605 13. Define new subset printing attributes;  
606 14. Define new color printing attributes  
607 15. Define new ICC color management attributes;  
608 16. Define new roll-fed printing attributes and values;  
609 17. Define new supply level and status monitoring attributes;  
610 18. Define new localization attributes and a message catalog file format; and  
611 19. Define new globally-unique identifier attributes for all objects.

612 The design recommendations for this specification are:

- 613 1. Recommend the use of Printer-resident resources in order to support color  
614 proofing, identification, localization, and management.

## 615 4. Model

### 616 4.1 Limits

617 The IPP/1.1 Model and Semantics [STD92] defines support for limits in the Get-Jobs  
618 operation to allow a Client to efficiently collect a large list of Job objects in groups of N  
619 objects. Similarly, the IPP Event Notifications and Subscriptions [RFC3995] defines support  
620 for limits in the Get-Subscriptions operation but without support for selecting the first  
621 Subscription object to return.

622 This specification extends the notion of limits to include any operation that might return large  
623 lists of objects or attributes with large amounts of data such as "media-col-database" and  
624 defines new attributes to allow a Client to discover which operations support limits and  
625 specify which object or attribute value to return first using a "first-index" operation attribute.

626 The new "first-index" operation attribute is an integer value representing an attribute value  
627 index in a 1setOf attribute value. The notion of an attribute value index requires that a Printer  
628 use a consistent ordering of 1setOf values that can be limited, i.e., the order of "media-col-  
629 database" values must be defined by the printer and consistent between Get-Printer-  
630 Attribute requests.

631 The existing "limit" operation attribute is an integer value representing the maximum number  
632 of values to return to the Client. Combined with "first-index", it allows a Client to query a  
633 subset of the Printer's values.

634 Because existing conforming Printer implementations will return the successful-ok-ignored-  
635 or-substituted-attributes status code when they do not support the "first-index" or "limit"  
636 operation attributes for a given request, a Client may be safely written to ask for a subset of  
637 values but handle receiving the complete set of values.

638 Printers that support the "first-index" and "limit" operation attributes must provide the values  
639 or objects in a consistent order such that a Client may retrieve all of those objects or values  
640 using a sequence of requests with increasing values for "first-index".

## 641 **4.2 Filtering**

642 The Get-Printer-Attributes operation in the IPP/1.1 Model and Semantics [STD92] supports  
643 attribute "filtering" using the "document-format" operation attribute. This specification  
644 extends this filtering mechanism to include arbitrary Job Creation attributes such as "sides"  
645 so that Clients may determine which attribute values are supported for a particular type of  
646 Job.

647 Similarly, the IPP/1.1 Model and Semantics and IPP Event Notifications and Subscriptions  
648 [RFC3995] allow for attribute "filtering" based on the "requesting-user-name" or  
649 authenticated user for Job and Subscription operations.

## 650 **4.3 Constraints and "preferred-attributes"**

651 Printers can impose constraints between Job Creation attributes for practical (e.g., duplexing  
652 on transparency media), physical (e.g., label printing from a paper tray), and policy (e.g., no  
653 color printing for students) reasons. This specification defines two mechanisms on the Client  
654 and Printer that allow a Client to discover what those constraints are prior to creating a print  
655 job.

656 Client constraint resolution uses two new Printer attributes that list the constraints and a list  
657 of changes used by the printer for resolving them automatically. These attributes allow the  
658 Client user interface to present a simple choice to the user when a selection triggers a  
659 constraint: revert to the previous settings or make the following additional changes.

660 Printer constraint resolution uses the Validate-Document and Validate-Job operations.  
661 Clients submit a Validate-Document or Validate-Job request with Template attributes that  
662 will be used in the actual document or job creation request. If conflicts are present in the  
663 supplied Template attributes, the Printer returns a "preferred-attributes" collection attribute  
664 indicating which substitute values will be used to resolve those conflicts.

665 There is no Validate-Subscription operation because subscriptions always enforce attribute  
666 fidelity.

## 667 **4.4 ICC Color Management and Color Mode Previews**

668 This specification adds new Printer Description attributes to support a managed color  
669 workflow using ICC color profiles. Clients may specify output rendering intent for a Job or  
670 Document and can query and download ICC color profiles listed by the Printer for color  
671 proofing or Client-side color rendering, especially when the Printer does not support a  
672 desired output rendering intent. This specification also adds new Printer Description  
673 attributes that specify URIs to ICC profiles to allow a Client to present a preview of a color  
674 mode transformation.

## 675 **4.5 Localization**

676 This specification defines and registers an existing plain text message catalog file format  
677 (MIME media type "text/strings") used on macOS and NeXTSTEP that allows a Client to  
678 present localized strings for attribute names and their associated values. For example, a  
679 Printer might provide localizations for vendor media sizes and "printer-state-reasons"  
680 keywords. A Printer attribute allows the Client to discover the location of message catalogs  
681 for the language specified by the "attributes-natural-language" attribute in the Client request.  
682 Clients can also use the HTTP If-Modified-Since header to detect whether the referenced  
683 message catalog has been updated. The message catalogs can also include inline help  
684 content that is associated with a particular attribute or attribute keyword / enum value.

## 685 **4.6 Device Information**

686 IPP has long exposed device information that was necessary for printing. As IPP expands  
687 to cover all of the Multi-Function Device (MFD) services defined by the PWG Semantic  
688 Model working group, additional device information will be needed. In the context of existing  
689 IPP-based printing, these new attributes are most applicable to print server implementations  
690 such as CUPS and high duty cycle print systems that support multiple independent IPP  
691 Printers.

692 This specification defines two new device attributes for IPP: the device unique identifier as  
693 a UUID and a count of services provided by the device. The device unique identifier allows  
694 a Client to correlate multiple IPP-based services to a single device or server. The count of  
695 services tells the client whether a particular device or server provides more than one IPP-  
696 based service, regardless of the type of service offered.

697

## 698 **5. New Operations**

699 Provide detailed data model and semantic information starting in section 4. Definition of data  
700 elements/attributes and operations happen in later sections.

### 701 **5.1 Identify-Printer**

702 The RECOMMENDED Identify-Printer operation allows a Client to request the Printer to  
703 physically identify itself by flashing lights, making sounds, or displaying something on the  
704 control panel.

705 The Printer SHOULD require an authenticated user [STD92] to perform this operation or  
706 provide other safeguards to prevent abuse of this operation. When the operation is not  
707 allowed for a security reason, the IPP object MUST reject the operation and return: 'client-  
708 error-forbidden', 'client-error-not-authenticated', or 'client-error-not-authorized' as  
709 appropriate.

#### 710 **5.1.1 Identify-Printer Request**

711 The following groups of attributes are supplied as part of the Identify-Printer Request:

712 Group 1: Operation Attributes

713 Natural Language and Character Set:

714 The "attributes-charset" and "attributes-natural-language" attributes as  
715 described in [STD92]

716 Target:

717 The "printer-uri" (uri) operation attribute which is the target for this operation  
718 as described in [STD92]

719 Requesting User:

720 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by  
721 the Client as described in [STD92]. In addition, the "requesting-user-uri"  
722 (section 6.1.6) attribute SHOULD be supplied by the Client as well.

723 "message" (text(127)):

724 The Client OPTIONALLY supplies this attribute. The Printer object  
725 OPTIONALLY supports this attribute. It is a message to the user for purposes  
726 of identifying the Printer to the user.

727 "identify-actions" (1setOf type2 keyword) [section 6.1.4]:

728           The Client OPTIONALLY supplies this attribute. The Printer object MUST  
729           support this attribute. The value(s) specify how the Printer will identify itself to  
730           the Client.

### 731   **5.1.2 Identify-Printer Response**

732   The following attributes are part of the Identify-Printer Response:

733   Group 1: Operation Attributes

734       Status Message:

735           In addition to the REQUIRED status code returned in every response, the  
736           response OPTIONALLY includes a "status-message" (text(255)) and/or a  
737           "detailed-status-message" (text(MAX)) operation attribute as described in  
738           [STD92] and Appendix B.

739       Natural Language and Character Set:

740           The "attributes-charset" and "attributes-natural-language" attributes as  
741           described in [STD92].

742   Group 2: Unsupported Attributes

743       See [STD92] for details on returning Unsupported Attributes.

## 744   **5.2 Validate-Document**

745   The CONDITIONALLY REQUIRED Validate-Document operation allows a Client to verify  
746   operation and Document Template attributes to be used in a subsequent Send-Document  
747   or Send-URI request. This operation MUST be supported by Printers that conform to the IPP  
748   Document Object [PWG5100.5].

749   This operation is similar to the Validate-Job operation except that it validates attributes used  
750   for the Send-Document or Send-URI operations. Like Validate-Job, Validate-Document  
751   allocates no Printer resources (i.e., job objects) and does not allow a "document-password"  
752   or "document-uri" operation attribute.

753   Clients MUST NOT send the "document-password" operation attribute (section 6.1.2) in a  
754   Validate-Document request. Printers MUST reject a Validate-Document request containing  
755   a "document-password" operation attribute and return the client-error-bad-request status  
756   code.

### 757   **5.2.1 Validate-Document Request**

758   The following groups of attributes are supplied as part of the Validate-Document Request:

## 759 Group 1: Operation Attributes

760 Natural Language and Character Set:

761 The "attributes-charset" and "attributes-natural-language" attributes as  
762 described in [STD92].

763 Target:

764 The "printer-uri" (uri) operation attribute which is the target for this operation  
765 as described in [STD92].

766 Requesting User:

767 The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by  
768 the Client as described in [STD92]. In addition, the "requesting-user-uri"  
769 (section 6.1.6) attribute SHOULD be supplied by the Client as well.

770 "document-format" (mimeType)

771 "document-name" (name(MAX))

## 772 Group 2: Document Template Attributes

773 The client OPTIONALLY supplies a set of Document Template attributes and  
774 SHOULD omit Group 2 rather than sending an empty group. However, a Printer  
775 MUST be able to accept an empty group.776 **5.2.2 Validate-Document Response**

777 The following attributes are part of the Validate-Document Response:

## 778 Group 1: Operation Attributes

779 Status Message:

780 In addition to the REQUIRED status code returned in every response, the  
781 response OPTIONALLY includes a "status-message" (text(255)) and/or a  
782 "detailed-status-message" (text(MAX)) operation attribute as described in  
783 [STD92] 4.1.6 and Appendix B.

784 Natural Language and Character Set:

785 The "attributes-charset" and "attributes-natural-language" attributes as  
786 described in [STD92].

787 "preferred-attributes" (collection):

788 This attribute (defined in section 6.1.5) MAY be returned when conflicts are  
789 detected in the supplied Operation and Document Template attributes.

790 Group 2: Unsupported Attributes

791 See [STD92] for details on returning Unsupported Attributes.

## 792 6. New Attributes

793 Or new elements (Semantic Model) or properties (SNMP), etc.

### 794 6.1 Operation Attributes

#### 795 6.1.1 document-metadata (1setOf octetString(MAX))

796 The REQUIRED "document-metadata" operation attribute specifies one or more  
797 keyword/value pairs describing the document being supplied. Each element in the set  
798 consists of a keyword followed by "=" and a UTF-8 value string. Standard keywords are  
799 defined in The Dublin Core Metadata Element Set [RFC5013] and DCMI Metadata Terms  
800 [DCMITERMS]. Vendor or customer-defined keywords MUST use the prefix string "x-" to  
801 avoid future keyword name conflicts, for example "x-vendor-foo" or "x-customer-bar". The  
802 complete ABNF definition is provided in Figure 1.

803 Printers MUST copy this attribute to the corresponding Job Description (section 6.3.1) or  
804 Document Description (section 6.6.1) attribute of the same name when processing Print-  
805 Job, Print-URI, Send-Document, or Send-URI requests (section 7.6).

#### 806 Figure 1 - ABNF for "document-metadata" Values

```
807 document-metadata = dc-elements "=" *utf8-char /
808                   dc-terms  "=" *utf8-char /
809                   x-keyword "=" *utf8-char
810
811 dc-elements = "contributor" / "coverage" / "creator" /
812              "date" / "description" / "format" /
813              "identifier" / "language" / "publisher" /
814              "relation" / "rights" / "source" /
815              "subject" / "title" / "type"
816
817 dc-terms     = "abstract" / "accessRights" / "accrualMethod" /
818              "accrualPeriodicity" / "accrualPolicy" / "alternative" /
819              "audience" / "available" / "bibliographicCitation" /
820              "conformsTo" / "created" / "dateAccepted" /
821              "dateCopyrighted" / "dateSubmitted" / "educationLevel" /
822              "extent" / "hasFormat" / "hasPart" / "hasVersion" /
823              "instructionalMethod" / "isFormatOf" / "isPartOf" /
824              "isReferencedBy" / "isReplacedBy" / "isRequiredBy" /
825              "issued" / "isVersionOf" / "license" / "mediator" /
826              "medium" / "modified" / "provenance" / "references" /
827              "replaces" / "requires" / "rightsHolder" / "spatial" /
```

```

828         "tableOfContents" / "temporal" / "valid"
829
830     x-keyword = "x-" 1*(ALPHA / DIGIT / "." / "-" / "_")
831
832     utf8-char = %x20-7E /
833               %xC0-DF.80-BF /
834               %xE0-EF.80-BF.80-BF /
835               %xF0-F7.80-BF.80-BF.80-BF

```

### 836 6.1.2 document-password (octetString(1023))

837 The "document-password" operation attribute specifies an unencrypted passphrase, OAuth  
838 token, or other string to be used to access the document content provided with the Print-  
839 Job, Print-URI, Send-Document, or Send-URI operations (section 7.6). Typically, the  
840 "document-password" value is an alphanumeric passphrase used to "unlock" a protected  
841 PDF [ISO32000] or OpenXPS [ECMA388] document. The maximum length of the  
842 "document-password" value is specified by the "document-password-supported" (section  
843 6.8.1) Printer attribute.

844 While the "document-password" value is necessarily associated with the document content,  
845 this attribute is not part of the Job or Document object and MUST NOT be reported by the  
846 Printer as part of a Job or Document object's description or template attributes. The value  
847 supplied MUST be retained by the Printer as long as the corresponding Document is  
848 retained.

849 This attribute MUST be supported if the Printer also supports the "document-password-  
850 supported" (section 6.8.1) attribute.

851 Printers and Clients that support this attribute MUST support Secure Transport. Printers  
852 MUST negotiate a TLS session prior to accepting a request containing this attribute. Clients  
853 MUST negotiate a TLS session prior to sending a request containing this attribute.

### 854 6.1.3 first-index (integer(1:MAX))

855 The REQUIRED "first-index" operation attribute specifies the first object or element, starting  
856 at 1, to be returned in a response.

### 857 6.1.4 identify-actions (1setOf type2 keyword)

858 The "identify-actions" operation attribute specifies the action(s) that are taken to identify the  
859 printer in an Identify-Printer request as defined in section 5.1, "Identify-Printer Operation".  
860 The standard keyword values are listed in Table 1 - "identify-actions" Keyword Values.

861 This attribute MUST be supported if the Printer supports the Identify-Printer operation.

862 **Table 1 - "identify-actions" Keyword Values**

<b>Keyword</b>	<b>Description</b>
----------------	--------------------

display	Displays the default or Client-provided message on the printer control panel.
flash	Flashes lights or the display on the printer.
sound	Makes a sound.
speak	Speaks the default or Client-provided message.

863 The default value of this operation attribute is defined by the "identify-actions-default"  
864 (section 6.8.2) Printer attribute and the supported values are defined by the "identify-actions-  
865 supported (section 6.8.3) Printer attribute.

866 Note: This specification does not define a "print" action due to security and accounting  
867 issues.

### 868 **6.1.5 preferred-attributes (collection)**

869 The RECOMMENDED "preferred-attributes" attribute specifies the attributes and values that  
870 will be substituted in a job or document creation request and is returned by the Printer in the  
871 Validate-Document response as defined in section 5.2 and the Validate-Job response as  
872 defined in section 7.11. Each member attribute in the collection represents an operation,  
873 Document Template, or Job Template attribute in the Validate-Document or Validate-Job  
874 request with the corresponding replacement value(s).

### 875 **6.1.6 requesting-user-uri (uri)**

876 The REQUIRED "requesting-user-uri" operation attribute contains the URI of the end user  
877 that is submitting the request. The value is typically a UUID encoded as defined in A  
878 Universally Unique IDentifier (UUID) URN Namespace [RFC4122] or an email address  
879 encoded as defined in the "mailto:" URI scheme [RFC6068], although any valid URI may be  
880 supplied.

881 The intent of this attribute is to provide an unambiguous user identifier since the "requesting-  
882 user-name" operation attribute is often not unique, e.g., "John Doe". However, because both  
883 of the attributes can be supplied by the Client, the Printer object may modify the values  
884 supplied based on information obtained from an authentication service [STD92].

885 The "requesting-user-uri-supported" (section 6.8.30) Printer attribute specifies whether the  
886 "requesting-user-uri" operation attribute is supported.

## 887 **6.2 Job and Document Template Attributes**

### 888 **6.2.1 job-error-action (type2 keyword)**

889 The "job-error-action" Job Template attribute specifies the action a Printer takes when an  
890 error is encountered in a document during processing of the job. Standard keyword values  
891 are shown in Table 2.

892 Note: When a Printer stops processing a job, it MAY temporarily add the 'processing-to-stop-  
893 point' keyword to the "job-state-reasons" Job Description attribute. See [STD92] for more  
894 information.

895 **Table 2 - "job-error-action" Keyword Values**

<b>Keyword</b>	<b>Description</b>
abort-job	Stop processing the job and move it to the 'aborted' state. The 'aborted-by-system' keyword MUST be present in the "job-state-reasons" Job Description attribute.
cancel-job	Stop processing the job as if the Printer had accepted a Cancel-Job request [STD92] from the user. The 'job-canceled-by-user' keyword MUST be present in the "job-state-reasons" Job Description attribute.
continue-job	Continue processing the next document in the job or, if this is the last document in the job, move the job to the 'completed' state.
suspend-job	Stop processing the job and move it to the 'processing-stopped' state as if the Printer had accepted a Suspend-Current-Job request (section 4.3.1 [RFC3998]). The 'job-suspended-by-user' keyword MUST be present in the "job-state-reasons" Job Description attribute.

## 896 **6.2.2 pages-per-subset (1setOf integer(1:MAX))**

897 The OBSOLETE "pages-per-subset" Job Template attribute partitions one or more Input-  
898 Documents into contiguous subsets of Input-Pages. Each subset is defined to be an Output-  
899 Document and finishing options such as stapling are applied as if the Client had submitted  
900 the document as multiple jobs.

901 The value of the attribute is a set of one or more integers, where each integer specifies the  
902 number of Input-Pages in a subset, and the set is treated as a repeating sequence of  
903 integers. Thus, when the attribute contains a single integer, the integer specifies the number  
904 of Input-Pages in each subset, as a repeating sequence of the single integer. When the  
905 number of integers in this attribute exceeds 1, the first integer specifies the number of Input-  
906 Pages in the first subset, the second integer specifies the number of Input-Pages in the  
907 second subset and so on. If numbers in this attribute are exhausted before partitioning all of  
908 the Input-Pages, the Printer starts at the beginning of the sequence again and continues  
909 until all Input-Pages are partitioned.

910 If the job contains more than one Input-Document, the Input-Pages are treated as a single  
911 stream of Input-Pages which are partitioned into contiguous subsets with some subsets  
912 possibly belonging to more than one Input-Document. If the number of Input-Pages available  
913 for the last subset is less than the number specified by this attribute, the Printer MUST treat  
914 the last subset as an Output-Document.

915 If the “multiple-document-handling” attribute is present, the Printer MUST ignore the "pages-  
916 per-subset" attribute if the "multiple-document-handling" attribute has any value other than  
917 'separate-documents-collated-copies' or 'separate-documents-uncollated-copies' and  
918 MUST return the "pages-per-subset" attribute in the unsupported attributes group of a  
919 Create-Job, Print-Job, Print-URI, or Validate-Job response with the successful-ok-ignored-  
920 or-substituted-attributes status code.

921 Printers that support this attribute MUST also support the "pages-per-subset-supported"  
922 Printer attribute (section 6.8.10).

923 There is no “pages-per-subset-default” attribute because there is no mechanism for a Client  
924 to specify that there are no Input-Page subsets except to omit this attribute, which would  
925 cause the Printer to use the “pages-per-subset-default” attribute and create the default  
926 subsets.

### 927 **6.2.3 print-color-mode (type2 keyword)**

928 The REQUIRED "print-color-mode" Job and Document Template attribute specifies the color  
929 mode to use when printing a job. If supported, the Printer MUST print the job using the  
930 requested color mode. Standard keyword values are shown in Table 3.

931 Vendor-defined keywords SHOULD have the distinguishing prefix 'smiNNN-' [STD92] where  
932 NNN is an SMI Private Enterprise Number (PEN) [IANA-PEN]. Vendor-defined keywords  
933 SHOULD have either the '-monochrome' or '-color' suffixes to assist clients. For example, if  
934 the company Example Corp. had obtained the SMI PEN 32473, has a vendor-unique color  
935 mode "magic" that pertains to color, the Printer could specify the 'smi32473-magic-color'.  
936

937

**Table 3 - "print-color-mode" Keyword Values**

<b>Keyword</b>	<b>Description</b>	<b>Conformance</b>
auto	Automatic based on document	REQUIRED
auto-monochrome	Printer chooses monochrome or process-monochrome based on document	RECOMMENDED
bi-level	1-colorant (typically black) threshold output	OPTIONAL (note 1)
color	Full-color output	CONDITIONALLY REQUIRED (note 2)
highlight	1-colorant + black output	OPTIONAL
monochrome	1-colorant (typically black) shaded/grayscale output	REQUIRED
process-bi-level	Process (2 or more colorants) threshold output	OPTIONAL
process-monochrome	Process (2 or more colorants) shaded/grayscale output	OPTIONAL (note 3)

938 Notes:

939 1 - Optional because the actual appearance is implementation-specific.

940 2 - Required for color Printers.

941 3 - Optional because process black on laser printers can be problematic.

942 **6.2.4 print-rendering-intent (type2 keyword)**

943 The RECOMMENDED "print-rendering-intent" Job and Document Template attribute  
 944 specifies how out-of-gamut colors (or shades of gray) are mapped to device colors when  
 945 printing. Printers MUST support this attribute if they support the "printer-icc-profiles" attribute  
 946 (section 6.8.21). If supported, the Printer MUST print the job using the requested rendering  
 947 intent. Standard keyword values are shown in Table 4.

948 **Table 4 - "print-rendering-intent" Keyword Values**

<b>Keyword</b>	<b>Description</b>	<b>Conformance</b>
absolute	Clip out-of-gamut colors to preserve in-gamut accuracy without adjusting the white point.	OPTIONAL
auto	Automatically determine the rendering intent based on the document and job ticket.	REQUIRED
perceptual	Map out-of-gamut colors at the expense of in-gamut accuracy.	OPTIONAL
relative	Clip out-of-gamut colors to preserve in-gamut accuracy, adjusting the white point as necessary.	REQUIRED

relative-bpc	Clip out-of-gamut colors to preserve in-gamut accuracy, adjusting both the white and black points as necessary. (bpc = Black Point Compensation)	REQUIRED
saturation	Preserve saturated colors.	OPTIONAL

## 949 6.3 Job Description Attributes

### 950 6.3.1 document-metadata (1setOf octetString(MAX))

951 The CONDITIONALLY REQUIRED "document-metadata" Job attribute specifies one or  
 952 more keyword/value pairs describing the document being supplied. This attribute MUST be  
 953 supported when the IPP Document Object [PWG5100.5] is not supported. The format of  
 954 each element in the set is defined in section 6.1.1. The "document-metadata" Document  
 955 attribute is copied from the operation attribute of the same name as defined in section 7.6.

## 956 6.4 Job Status Attributes

### 957 6.4.1 job-originating-user-uri (uri)

958 The REQUIRED "job-originating-user-uri" READ-ONLY Job attribute contains the most  
 959 authenticated URI of the end user that submitted the job creation request as defined in  
 960 section 7.1.

### 961 6.4.2 job-pages (integer(0:MAX))

962 The "job-pages" READ-ONLY Job attribute contains the total number of input pages for the  
 963 documents in the Job. See section 11 for a description of the relationship of this attribute to  
 964 the "job-impressions" and "job-media-sheets" attributes.

965 This attribute MUST be supported if the "job-pages-completed" Job attribute (section 6.4.3)  
 966 is supported.

### 967 6.4.3 job-pages-completed (integer(0:MAX))

968 The "job-pages-completed" READ-ONLY Job attribute specifies the total number of input  
 969 pages of the documents in the Job that have been processed. See section 11 for a  
 970 description of the relationship of this attribute to the "job-impressions-completed" and "job-  
 971 media-sheets-completed" attributes.

972 This attribute MUST be supported if the "job-pages" Job attribute (section 6.4.2) is  
 973 supported.

#### 974 **6.4.4 job-pages-completed-current-copy (integer(0:MAX))**

975 The "job-pages-completed-current-copy" READ-ONLY Job attribute specifies the total  
976 number of input pages of the documents in the Job that have been processed for the current  
977 copy.

978 This attribute MUST be supported if the "job-pages" Job attribute (section 6.4.2) is  
979 supported.

#### 980 **6.4.5 job-uuid (uri(45))**

981 The REQUIRED "job-uuid" READ-ONLY Job attribute specifies a globally-unique identifier  
982 that MUST be a 45-octet "urn:uuid" URI [RFC4122]. The Printer generates the globally-  
983 unique identifier when it creates a new Job object in response to a job creation request.

984 The "job-uuid" attribute MUST NOT be used as a Job identifier in IPP job operations but  
985 MAY be used as a Job identifier for other protocol bindings and SHOULD be used for  
986 accounting and auditing of Jobs.

### 987 **6.5 Subscription Status Attributes**

#### 988 **6.5.1 notify-subscription-uuid (uri(45))**

989 The CONDITIONALLY REQUIRED "notify-subscription-uuid" READ-ONLY Subscription  
990 attribute specifies a globally-unique identifier that MUST be a 45-octet "urn:uuid" URI  
991 [RFC4122]. This attribute is REQUIRED if IPP: Event Notifications and Subscriptions  
992 [RFC3995] are supported.

993 The Printer generates the globally-unique identifier when it creates a new Subscription  
994 object in response to a subscription creation request, which can be included as part of a job  
995 creation request.

996 The "notify-subscription-uuid" attribute MUST NOT be used as a Subscription identifier in  
997 IPP subscription operations but MAY be used as a Subscription identifier for other protocol  
998 bindings and SHOULD be used for accounting and auditing of Subscriptions.

#### 999 **6.5.2 notify-subscriber-user-uri (uri)**

1000 The CONDITIONALLY REQUIRED "notify-subscriber-user-uri" READ-ONLY Subscription  
1001 attribute contains the most authenticated URI of the end user that submitted the subscription  
1002 creation request as defined in section 7.1. This attribute is REQUIRED if IPP: Event  
1003 Notifications and Subscriptions [RFC3995] are supported.

## 1004 **6.6 Document Description Attributes**

### 1005 **6.6.1 document-metadata (1setOf octetString(MAX))**

1006 The CONDITIONALLY REQUIRED "document-metadata" Document attribute specifies one  
1007 or more keyword/value pairs describing the document being supplied. This attribute MUST  
1008 be supported when the IPP Document Object [PWG5100.5] is supported. The format of each  
1009 element in the set is defined in section 6.1.1. The "document-metadata" Document attribute  
1010 is copied from the operation attribute of the same name as defined in section 7.6.

### 1011 **6.6.2 pages (integer(0:MAX))**

1012 The "pages" Document attribute contains the total number of input pages for the document.  
1013 See section 11 for a description of the relationship of this attribute to the "impressions" and  
1014 "media-sheets" attributes.

1015 This attribute MUST be supported if the "pages-completed" Document attribute (section  
1016 6.7.2) and the IPP Document Object [PWG5100.5] are supported.

## 1017 **6.7 Document Status Attributes**

### 1018 **6.7.1 document-uuid (uri(45))**

1019 The CONDITIONALLY REQUIRED "document-uuid" READ-ONLY Document attribute  
1020 specifies a globally-unique identifier that MUST be a 45-octet "urn:uuid" URI [RFC4122].  
1021 This attribute is REQUIRED if the IPP Document Object [PWG5100.5] is supported.

1022 The Printer generates the globally-unique identifier when it creates a new Document object  
1023 in response to a document creation operation, which can be part of a job creation request.

1024 The "document-uuid" attribute MUST NOT be used as a Document identifier in IPP  
1025 document operations but MAY be used as a Document identifier for other protocol bindings  
1026 and SHOULD be used for accounting and auditing of Documents.

### 1027 **6.7.2 pages-completed (integer(0:MAX))**

1028 The "pages-completed" READ-ONLY Document attribute specifies the total number of input  
1029 pages of the document that have been processed. See section 11 for a description of the  
1030 relationship of this attribute to the "impressions-completed" and "media-sheets-completed"  
1031 attributes.

1032 This attribute MUST be supported if the "pages" Document attribute (section 6.6.2) and the  
1033 IPP Document Object [PWG5100.5] are supported.

1034 **6.7.3 pages-completed-current-copy (integer(0:MAX))**

1035 The OBSOLETE "pages-completed-current-copy" READ-ONLY Document attribute  
1036 specifies the total number of input pages of the document that have been processed for the  
1037 current copy.

1038 This attribute MUST be supported if the "pages" Document attribute (section 6.6.2) and the  
1039 IPP Document Object [PWG5100.5] are supported.

1040 **6.8 Printer Description Attributes**

1041 **6.8.1 document-password-supported (integer(0:1023))**

1042 The "document-password-supported" Printer attribute specifies the maximum number of  
1043 octets for the "document-password" operation attribute (section 6.1.2).

1044 Printers that support the "document-password" attribute MUST also support this attribute  
1045 with a value of at least 255. The value 0 indicates that the attribute is not supported. The  
1046 values 1 through 254 are not allowed.

1047 **6.8.2 identify-actions-default (1setOf type2 keyword)**

1048 The default value(s) supplied by the Printer if the Client omits the "identify-actions" operation  
1049 attribute from the Identify-Printer request. This attribute MUST be supported if the Printer  
1050 supports the Identify-Printer operation defined in section 5.1.

1051 **6.8.3 identify-actions-supported (1setOf type2 keyword)**

1052 The list of supported values for the "identify-actions" operation attribute. This attribute MUST  
1053 be supported if the Printer supports the Identify-Printer operation defined in section 5.1.

1054 **6.8.4 ipp-features-supported (1setOf type2 keyword)**

1055 The REQUIRED "ipp-features-supported" Printer attribute lists the IPP extension features  
1056 that are supported by the Printer. Standard keyword values are listed in Table 5. The value  
1057 'none' MUST be reported if no extension features are supported and MUST NOT be reported  
1058 otherwise.

1059 **Table 5 - "ipp-features-supported" Keyword Values**

Keyword	Description
document-object	IPP Document Object [PWG5100.5]
job-save (OBSOLETE)	Job save from IPP Job and Printer Extensions - Set 2 [PWG5100.11]
none	No extension features are supported.
page-overrides	Page overrides from IPP Page Overrides [PWG5100.6]

proof-print	Proof print from IPP Job and Printer Extensions - Set 2 [PWG5100.11]
subscription-object	IPP Event Notifications and Subscriptions [RFC3995]

### 1060 6.8.5 job-constraints-supported (1setOf collection)

1061 The RECOMMENDED "job-constraints-supported" Printer attribute provides a set of  
 1062 collections that describe Job Template attributes that are not supported by the Printer,  
 1063 allowing a Client to pre-screen options selected by the user and resolve them prior to job  
 1064 submission or validation. This attribute is REQUIRED if the "job-resolvers-supported"  
 1065 attribute is supported.

1066 Each collection consists of a "resolver-name (name(MAX))" member attribute plus any Job  
 1067 Template attributes and their list of unsupported values. The "resolver-name" member  
 1068 attribute MUST refer to a collection in the "job-resolvers-supported" attribute described  
 1069 below that specifies a matching "resolver-name" value. Multiple constraint collections can  
 1070 refer to the same "job-resolvers-supported" collection. Constraints for the "media-col" Job  
 1071 Template attribute can be incomplete; that is, the "media-col" collection values can contain  
 1072 only those member attributes that contribute to the constraint.

1073 Figure 2 illustrates how a constraint for duplex printing on transparency media could be  
 1074 specified by the Printer.

#### 1075 Figure 2 - Verbose "job-constraints-supported" and "job-resolvers-supported" Example

```

1076     job-constraints-supported=
1077     {
1078         resolver-name="A"
1079         sides="two-sided-short-edge"
1080         media-col={
1081             media-type="transparency"
1082         }
1083     },
1084     {
1085         resolver-name="A"
1086         sides="two-sided-long-edge"
1087         media-col={
1088             media-type="transparency"
1089         }
1090     }
1091
1092     job-resolvers-supported=
1093     {
1094         resolver-name="A"
1095         sides="one-sided"
1096         media-col={
1097             media-type="stationery"
1098         }
1099     }

```

1100 To minimize the number of collections in "job-constraints-supported", multiple Job Template  
1101 attribute value alternatives can be specified in a single collection using a "1setOf syntax"  
1102 representation. Figure 3 illustrates a concise representation of the constraints described in  
1103 Figure 2.

1104 **Figure 3 - Concise "job-constraints-supported" and "job-resolvers-supported" Example**

```
1105     job-constraints-supported=  
1106     {  
1107         resolver-name="A"  
1108         sides="two-sided-long-edge", "two-sided-short-edge"  
1109         media-col={  
1110             media-type="transparency"  
1111         }  
1112     }  
1113  
1114     job-resolvers-supported=  
1115     {  
1116         resolver-name="A"  
1117         sides="one-sided"  
1118         media-col={  
1119             media-type="stationery"  
1120         }  
1121     }
```

1122 Both are syntactically correct, but the latter representation SHOULD be used, since it is more  
1123 concise and minimizes encoding size.

1124 **6.8.6 job-error-action-default (type2 keyword)**

1125 The default value supplied by the Printer if the Client omits the "job-error-action" Job  
1126 Template attribute.

1127 **6.8.7 job-error-action-supported (1setOf type2 keyword)**

1128 The list of supported "job-error-action" Job Template attribute values.

1129 **6.8.8 job-resolvers-supported (1setOf collection)**

1130 The RECOMMENDED "job-resolvers-supported" Printer attribute provides a set of  
1131 collections that describe Job Template attribute changes to make for constrained values,  
1132 allowing a Client to pre-screen options selected by the user and resolve them prior to job  
1133 submission or validation. This attribute is REQUIRED if the "job-constraints-supported"  
1134 attribute is supported.

1135 Each collection consists of a "resolver-name (name(MAX))" member attribute plus any Job  
1136 Template attributes and their alternate values. Clients MUST only change as many Job  
1137 Template attributes as are needed to resolve the constraint and MUST try each value in the  
1138 order they are provided in the collection. The resolver potentially changes all of the  
1139 constrained attributes in order to avoid constraint/resolver loops.

1140 Resolvers containing the "media-col" Job Template attribute may provide an incomplete  
 1141 value; that is, the "media-col" collection value can contain only those member attributes that  
 1142 need to be changed to resolve the constraint.

1143 The "resolver-name" member attribute value MUST be used by at least one collection in the  
 1144 "job-constraints-supported" attribute described above. Constraint resolvers MUST NOT  
 1145 create loops, such that the resolver for constraint "A" causes constraint "B", but the resolver  
 1146 for constraint "B" causes constraint "A".

1147 For example, a resolver for duplex printing on transparency media would be encoded as a  
 1148 collection containing "resolver-name", "sides", and "media-col" member attributes. The  
 1149 "sides" member attribute would have the value "one-sided" while the "media-col" member  
 1150 attribute would contain a "media-type" member attribute with the value "stationery".

### 1151 **6.8.9 multiple-operation-time-out-action (type2 keyword)**

1152 The "multiple-operation-time-out-action" Printer attribute defines the action that is taken  
 1153 when open jobs time out and is REQUIRED if the Printer supports the Create-Job operation.  
 1154 Table 6 lists the available actions.

1155 **Table 6 - "multiple-document-time-out-action" Keyword Values**

<b>Keyword</b>	<b>Description</b>
abort-job	The job is closed and moved to the 'aborted' state. The 'aborted-by-system' keyword MUST be present in the "job-state-reasons" Job Description attribute.
hold-job	The job is closed and moved to the 'pending-held' state. The 'job-hold-until-specified' keyword MUST be present in the "job-state-reasons" Job Description attribute and the "job-hold-until" Job Template attribute MUST be set to 'indefinite'.
process-job	The job is closed and moved to the 'pending' or 'processing' state.

### 1156 **6.8.10 pages-per-subset-supported (boolean)**

1157 The OBSOLETE "pages-per-subset-supported" Printer attribute specifies whether the  
 1158 "pages-per-subset" attribute (section 6.2) is supported. This attribute is REQUIRED when  
 1159 the Printer also supports the "pages-per-subset" attribute.

### 1160 **6.8.11 preferred-attributes-supported (boolean)**

1161 The RECOMMENDED "preferred-attributes-supported" Printer attribute specifies whether  
 1162 the "preferred-attributes" attribute (section 6.1.5) will be returned by the Validate-Document  
 1163 (section 5.2) or Validate-Job (section 7.11) operations.

**1164 6.8.12 print-color-mode-default (type2 keyword)**

1165 The default value supplied by the Printer if the Client omits the "print-color-mode" Job  
1166 Template attribute.

**1167 6.8.13 print-color-mode-supported (1setOf type2 keyword)**

1168 This attribute specifies the Printer's set of supported "print-color-mode" Job Template  
1169 attribute values.

1170 The Printer's message catalogs SHOULD provide localized user-presentable label strings  
1171 for all non-standard "print-color-mode" keywords. The Printer's message catalogs SHOULD  
1172 provide localized "tooltip" contextual help strings for all non-standard "print-color-mode"  
1173 keywords.

1174 If this attribute is supported and non-standard keywords are among the keywords listed by  
1175 this attribute, the Printer SHOULD support the "soft-proof-icc-profiles" attribute (section  
1176 6.8.31) and SHOULD provide an ICC profile for all supported keywords, to allow a Client to  
1177 present a soft proof preview for each supported print color mode. Figure 4 illustrates, in  
1178 "ipptoolfile" syntax, a Printer's implementation of "print-color-mode-supported" that specifies  
1179 two vendor-unique color modes, and Figure 5 describes the corresponding Message  
1180 Catalog entries supporting the attributes and values specified in Figure 4.

**1181 Figure 4 - "print-color-mode-supported" Vendor Extension Example**

```
1182 ATTR keyword print-color-mode-supported auto,color,monochrome,smi32473-magic-
1183 color,smi32473-blueprint
1184 ATTR uri printer-strings-uri https://myprinter.local.:631/strings/ipp-
1185 en.strings
1186 ATTR uri soft-proof-icc-profiles {
1187     MEMBER name smi32473-magic-color
1188     MEMBER uri https://myprinter.local.:631/proofing/magic-color.icc
1189 }, {
1190     MEMBER name smi32473-blueprint
1191     MEMBER uri https://myprinter.local.:631/proofing/blueprint.icc
1192 }
```

1193 Its message catalog at /strings/ipp-en.strings would include the following (for en-us):

**1194 Figure 5 - "print-color-mode" Vendor Extension Message Catalog Example**

```
1195 "print-color-mode" = "Print Color Mode";
1196 "print-color-mode.auto" = "Automatic";
1197 "print-color-mode.auto-monochrome" = "Auto Monochrome";
1198 "print-color-mode.bi-level" = "Text";
1199 "print-color-mode.color" = "Color";
1200 "print-color-mode.highlight" = "Highlight";
1201 "print-color-mode.monochrome" = "Monochrome";
1202 "print-color-mode.process-bi-level" = "Process Text";
1203 "print-color-mode.process-monochrome" = "Process Monochrome";
1204 "print-color-mode.smi32473-magic-color" = "Magic Color";
```

```

1205 "print-color-mode.smi32473-magic-color._tooltip" = "Makes the colors look
1206     magical";
1207 "print-color-mode.smi32473-blueprint" = "Blueprint";
1208 "print-color-mode.smi32473-blueprint._tooltip" = "Blue background with white
1209     foreground lines";

```

#### 1210 **6.8.14 print-quality-hints-supported (1setOf keyword)**

1211 This OPTIONAL “print-quality-hints-supported” attribute specifies the supported set of print  
 1212 quality related Job Template attributes that specify "rendering hints" to influence  
 1213 implementation details relating to print quality. A Client that supports this attribute can  
 1214 present a collection of "advanced print settings" controls to the user, without having to be  
 1215 aware of the semantics of their meaning or purpose. The specified attribute names could be  
 1216 vendor- or site-unique.

1217 The supporting Client might present these member attributes using the following UI control  
 1218 types:

1219 **Table 7: Attribute syntax and controls for "print-quality-hints-supported"**

Syntax	Control
boolean	Checkbox
integer	Text box
type2 keyword	Pop-up menu or list
name	Pop-up menu or list

1220 The attribute syntax for all Job Template attributes named in "print-quality-hints-supported"  
 1221 MUST use one of the following attribute syntaxes:

- 1222 • boolean
- 1223 • integer
- 1224 • type2 keyword
- 1225 • name

1226 A Client encountering an attribute with some other syntax type SHOULD ignore that  
 1227 attribute. The Printer MUST support "xxx-supported" and "xxx-default" Printer Description  
 1228 attributes for every attribute whose name is specified in "print-quality-hints-supported".

1229 Figure 6 illustrates how this attribute would be used, a printer could implement two vendor-  
 1230 unique print quality hint attributes "notpwg-clever-x" and "notpwg-magic-y", and specify  
 1231 those two as print quality hint attributes to supporting Clients.

**1232 Figure 6 - "print-quality-hints-supported" example**

```
1233 ATTR boolean notpwg-clever-x-supported true
1234 ATTR boolean notpwg-clever-x-default false
1235 ATTR keyword notpwg-magic-y-supported 'none','aguamenti','duro','episkey'
1236 ATTR keyword notpwg-magic-y-default 'episkey'
1237 ATTR keyword print-quality-hints-supported 'notpwg-clever-x','notpwg-magic-y'
```

1238 A Client could present a checkbox for "notpwg-clever-x" and a pop-up menu or list for  
1239 "notpwg-magic-y".

**1240 6.8.15 print-rendering-intent-default (type2 keyword)**

1241 The default value supplied by the Printer if the Client omits the "print-rendering-intent" Job  
1242 Template attribute.

**1243 6.8.16 print-rendering-intent-supported (1setOf type2 keyword)**

1244 The list of supported "print-rendering-intent" Job Template attribute values. If the "print-  
1245 rendering-intent" Job Template attribute is supported, then the values "relative" and  
1246 "relative-bpc" MUST be supported as well.

**1247 6.8.17 printer-charge-info (text(MAX))**

1248 The OPTIONAL "printer-charge-info" Printer attribute provides a human-readable  
1249 description of paid printing services for the Printer. Typically, this description will provide a  
1250 summary of cost information.

**1251 6.8.18 printer-charge-info-uri (uri)**

1252 The OPTIONAL "printer-charge-info-uri" Printer attribute provides a "http:" or "https:" URI  
1253 referring to a human-readable web page for paid printing services for the Printer. Typically,  
1254 this web page will provide cost information and allow the Client to obtain a "job-accounting-  
1255 id" value for subsequent print jobs.

**1256 6.8.19 printer-geo-location (uri | unknown)**

1257 The RECOMMENDED "printer-geo-location" Printer attribute identifies the location of the  
1258 associated device using the World Geodetic System 1984 [WGS84]. The means for  
1259 expressing the location information is a "geo:" URI scheme [RFC5870]. When the  
1260 information is unknown, Printers MUST return the "printer-geo-location" attribute using the  
1261 unknown out-of-band value. Printers that support this attribute MUST allow the user to set  
1262 the location manually.

**1263 6.8.20 printer-get-attributes-supported (1setOf keyword)**

1264 The REQUIRED "printer-get-attributes-supported" Printer attribute lists the operation and  
1265 Job Template attributes that contribute to the content returned by the Get-Printer-Attributes

1266 operation. The "document-format" value is REQUIRED for all Printers to conform to IPP/1.1  
1267 [STD92]. All other values are OPTIONAL.

### 1268 **6.8.21 printer-icc-profiles (1setOf collection)**

1269 The RECOMMENDED "printer-icc-profiles" Printer attribute lists one or more ICC profiles  
1270 that characterize the Printer or its rendering. Each collection value consists of "profile-name  
1271 (name(MAX))" and "profile-uri (uri)" member attributes plus any Job Template attributes (as  
1272 member attributes) that contribute to the selection of the profile.

1273 ICC profiles are generally used for Client-side color proofing and/or color management and  
1274 MAY be externally managed via IPP or other protocols.

#### 1275 **6.8.21.1 profile-name (name(MAX))**

1276 The REQUIRED "profile-name" member attribute provides a unique name for a given ICC  
1277 profile. A given "profile-name" value MAY appear in multiple collection values but MUST  
1278 always be paired with the same "profile-uri" value. That is, a "profile-name" of "Glossy Paper,  
1279 High Quality" might be listed multiple times but will always refer to the same "profile-uri", for  
1280 example "http://example.com/glossy-high.icc".

1281 The "profile-name" value SHOULD be localized by the Printer based on the value of the  
1282 "attributes-natural-language" operation attribute.

#### 1283 **6.8.21.2 profile-uri (uri)**

1284 The REQUIRED "profile-uri" member attribute references an ICC color profile as a "http:" or  
1285 "https:" URI. Standard vendor-supplied profiles SHOULD be Printer-resident so that Client  
1286 printing does not require access to external networks.

### 1287 **6.8.22 printer-icons (1setOf uri)**

1288 The REQUIRED "printer-icons" Printer attribute lists one or more Printer-resident images  
1289 using "http:" or "https:" URIs. The referenced images MUST be RGBA PNG [RFC2083]  
1290 format, have square dimensions of 48x48, 128x128, or 512x512 pixels, represent the  
1291 physical appearance of the Printer, and show the same perspective/view of the Printer. If  
1292 only one image is provided, it MUST have dimensions of 128x128 pixels. Images MUST be  
1293 listed from smallest to largest dimensions. Images MUST provide an alpha channel to mask  
1294 the background surrounding the printer.

### 1295 **6.8.23 printer-input-tray (1setOf octetString(MAX))**

1296 The RECOMMENDED "printer-input-tray" Printer attribute provides current input tray details  
1297 mapped from the SNMP prtInputTable defined in IETF Printer MIB v2 [RFC3805]. This  
1298 attribute MUST be supported if the "media-source" member attribute (section **Error! R**  
1299 **eference source not found.**) or "media-source-properties" member attribute (section **Error!**  
1300 **Reference source not found.**) are supported.

1301 If supported, this attribute MUST have the same cardinality (contain the same number of  
1302 values) as the "media-source-supported" attribute. The  $i^{\text{th}}$  value in the "printer-input-tray"  
1303 attribute corresponds to the  $i^{\text{th}}$  value in the "media-source-supported" attribute.  
1304

1305 **6.8.23.1 Keywords for printer-input-tray**

1306 Table 8 defines the IPP datatypes and keywords for encoding "printer-input-tray" from all of  
 1307 the machine-readable (non-localized) columnar objects in prtInputTable [RFC3805].

1308 **Table 8 - Keywords for "printer-input-tray"**

Printer MIB Object	IPP Data-type	IPP Keyword	PWG SM Keyword	Conformance
prtInput...				
Index (note 1)	Integer	index	Id	OPTIONAL
Type	String	type	InputTrayType	REQUIRED
DimUnit	String	dimunit	[.01 mm]	RECOMMENDED
MediaDimFeed-DirDeclared	Integer	mediafeed	InputTrayMedia-Size.XDimension	REQUIRED
MediaDimXFeed-DirDeclared	Integer	mediaxfeed	InputTrayMedia-Size.YDimension	REQUIRED
MediaDimFeed-DirChosen	---	---		---
MediaDimXFeed-DirChosen	---	---		---
CapacityUnit	String	unit	InputTray-CapacityUnit	RECOMMENDED
MaxCapacity	Integer	maxcapacity	InputTrayMax-Capacity	REQUIRED
CurrentLevel	Integer	level	InputTrayCurrent Level	REQUIRED
Status	Integer	status	SubunitStates	REQUIRED
MediaName (note 2)	String	medianame	InputTrayMedia-SizeName	RECOMMENDED
Name	String	name	InputTrayName	REQUIRED
VendorName	---	---	InputTrayVendor Name	---
Model	---	---	InputTrayModel	---
Version	---	---	InputTrayVersion	---
SerialNumber	---	---	InputTraySerial-Number	---
Security	---	---	InputTraySecurity	---
MediaWeight (note 3)	Integer	mediaweight	InputTrayMedia-WeightMetric	OPTIONAL
MediaType (note 2)	String	mediatype	InputTrayMedia-Type	RECOMMENDED
MediaColor (note 2)	String	mediacolor	InputTrayMedia-Color	RECOMMENDED
MediaFormParts	---	---	InputTrayMedia-FormParts	---
MediaLoadTimeout	---	---	InputTrayMedia-LoadTimeout	---

Printer MIB Object	IPP Data-type	IPP Keyword	PWG SM Keyword	Conformance
NextIndex	---	---	InputTrayNext-InputTrayId	---

1309

1310 Notes:

- 1311 1. prtInputIndex is OPTIONAL in "printer-input-tray", because correlation with the  
1312 original MIB order is considered unimportant.
- 1313 2. prtInputMediaName, prtInputMediaType, and prtInputMediaColor are  
1314 RECOMMENDED in "printer-input-tray", because they are important but often  
1315 unknown to the printer (while loaded media dimensions are usually known).
- 1316 3. prtInputMediaWeight is OPTIONAL in "printer-input-tray", because because  
1317 most Printers can't sense loaded media weight.
- 1318 4. Printer MIB objects without corresponding IPP keywords are *\*not\** mapped, per  
1319 DMTF CIM ranking activity in WIMS WG in 2006.

1320 **6.8.23.2 Encoding of printer-input-tray**

1321 Values of "printer-input-tray" MUST be encoded using a visible subset of the [US-ASCII]  
1322 charset. Control codes (0x00 to 0x1F and 0x7F) MUST NOT be used. The ABNF [STD68]  
1323 in Figure 7 defines the standard encoding in "printer-input-tray" for all the machine-readable  
1324 (non-localized) columnar objects in prtInputTable [RFC3805].

1325 **Figure 7 - ABNF for "printer-input-tray" Values**

```

1326 printer-input-tray = *input-required *[input-optional]
1327                   ; set of input elements encoded into one value
1328
1329 input-required    = input-req ";"
1330 input-req         = input-type /
1331                   input-media-feed /
1332                   input-media-xfeed /
1333                   input-max-capacity /
1334                   input-level /
1335                   input-status /
1336                   input-name
1337
1338 input-optional    = input-opt ";"
1339 input-opt         = input-index /
1340                   input-dim-unit /
1341                   input-unit /
1342                   input-media-name /
1343                   input-media-weight /
1344                   input-media-type /
1345                   input-media-color /
1346                   input-ext
1347

```

```
1348 input-type = "type" "=" 1*ALPHA
1349 ; enumerated value as an alpha string (e.g.,
1350 ; 'sheetFeedAutoRemovableTray') of prtInputType in [RFC3805] mapped
1351 ; indirectly from the *label* in PprtInputTypeTC in [IANAPRT]
1352
1353 input-media-feed = "mediafeed" "=" 1*[DIGIT / "-"]
1354 ; integer value as a numeric string mapped directly from
1355 ; prtInputMediaDimFeedDirDeclared in [RFC3805]
1356
1357 input-media-xfeed = "mediaxfeed" "=" 1*[DIGIT / "-"]
1358 ; integer value as a numeric string mapped directly from
1359 ; prtInputMediaDimXFeedDirDeclared in [RFC3805]
1360
1361 input-max-capacity = "maxcapacity" "=" 1*[DIGIT / "-"]
1362 ; integer value as a numeric string mapped directly from
1363 ; prtInputMaxCapacity in [RFC3805]
1364
1365 input-level = "level" "=" 1*[DIGIT / "-"]
1366 ; integer value as a numeric string mapped directly from
1367 ; prtInputCurrentLevel in [RFC3805]
1368
1369 input-status = "status" "=" 1*DIGIT
1370 ; integer value as a numeric string mapped directly from
1371 ; prtInputStatus in [RFC3805]
1372
1373 input-name = "name" "=" 1*ALPHA
1374 ; string value as an alpha string mapped directly from
1375 ; prtInputName in [RFC3805]
1376
1377 input-index = "index" "=" 1*DIGIT
1378 ; integer value as a numeric string mapped directly from
1379 ; prtInputIndex in [RFC3805]
1380
1381 input-dim-unit = "dimunit" "=" 1*ALPHA
1382 ; enumerated value as an alpha string (e.g., 'other') of
1383 ; prtInputDimUnit in [RFC3805] mapped indirectly from
1384 ; the *label* in PprtMediaUnitTC in [RFC3805]
1385
1386 input-unit = "unit" "=" 1*ALPHA
1387 ; enumerated value as an alpha string (e.g., 'other') of
1388 ; prtInputCapacityUnit in [RFC3805] mapped indirectly from
1389 ; the *label* in PprtCapacityUnitTC in [RFC3805]
1390
1391 input-media-name = "medianame" "=" 1*ALPHA
1392 ; string value as an alpha string mapped directly from
1393 ; prtInputMediaName in [RFC3805]
1394
1395 input-media-weight = "mediaweight" "=" 1*[DIGIT / "-"]
1396 ; integer value as a numeric string mapped directly from
1397 ; prtInputMediaWeight in [RFC3805]
1398
1399 input-media-type = "mediatype" "=" 1*ALPHA
1400 ; string value as an alpha string mapped directly from
1401 ; prtInputMediaType in [RFC3805]
1402
1403 input-media-color = "mediacolor" "=" 1*ALPHA
```

```
1404         ; string value as an alpha string mapped directly from
1405         ; prtInputMediaColor in [RFC3805]
1406
1407 input-ext          = input-extname "=" input-extvalue
1408 input-extname     = 1*[ALPHA / DIGIT / "-"]
1409 input-extvalue    = 1*[ALPHA / DIGIT / "-" / "." / ","]
1410         ; extension point for other MIB values not mapped
1411
```

### 1412 6.8.23.3 Examples of printer-input-tray

1413 The following example shows two rows of the machine-readable (non-localized) columnar  
1414 objects from prtInputTable encoded into corresponding values of "printer-input-tray".

1415 Note: Line breaks are shown below for readability of this example. Line breaks MUST NOT  
1416 be encoded into actual values of "printer-input-tray".

```
1417 printer-input-tray[1] =  
1418     type=sheetFeedAutoRemovableTray;  
1419     mediafeed=110000;mediaxfeed=85000;  
1420     maxcapacity=500;level=100;status=8;name=Tray1;  
1421     index=1;dimunit=tenThousandthsOfInches;unit=sheets;  
1422     medianame=na-letter;mediaweight=-2;  
1423     mediatype=stationery;mediacolor=blue;  
1424  
1425 printer-input-tray[2] =  
1426     type=sheetFeedAutoRemovableTray;  
1427     mediafeed=110000;mediaxfeed=85000;  
1428     maxcapacity=100;level=20;status=8;name=Tray2;  
1429     index=2;dimunit=tenThousandthsOfInches;unit=sheets;  
1430     medianame=na-letter;mediaweight=-2;  
1431     mediatype=photographic;mediacolor=white;
```

### 1432 6.8.24 printer-mandatory-job-attributes (1setOf keyword)

1433 The OPTIONAL "printer-mandatory-job-attributes" Printer attribute lists the minimum Job  
1434 Template and operation attributes that are required for a successful job creation operation.

### 1435 6.8.25 printer-organization (1setOf text(MAX))

1436 The REQUIRED "printer-organization" Printer attribute specifies the name of the  
1437 organization (e.g., company, university, social club, etc.) that is administratively associated  
1438 with this Printer.

1439 See section 5.4.1 'OrganizationName' in ITU-T [X.520] and the derived section 2.19 'o' in  
1440 IETF LDAP User Schema [RFC4519] for more information.

### 1441 6.8.26 printer-organizational-unit (1setOf text(MAX))

1442 The REQUIRED "printer-organizational-unit" Printer attribute specifies the name of the  
1443 organizational unit (e.g., 'Human Resources', 'Finance', etc.) that is functionally associated  
1444 with this Printer.

1445 See section 5.4.2 'OrganizationalUnitName' in ITU-T [X.520] and the derived section 2.20  
1446 'ou' in LDAP User Schema [RFC4519] for more information.

1447 **6.8.27 printer-output-tray (1setOf octetString(MAX))**

1448 The CONDITIONALLY REQUIRED "printer-output-tray" Printer attribute provides current  
 1449 output tray details mapped from the SNMP prtOutputTable defined in IETF Printer MIB v2  
 1450 [RFC3805]. This attribute MUST be supported if the "output-bin" attribute [PWG5100.2] is  
 1451 supported.

1452 If supported, this attribute MUST have the same cardinality (contain the same number of  
 1453 values) as the "output-bin-supported" attribute. The  $i^{\text{th}}$  value in the "printer-output-tray"  
 1454 attribute corresponds to the  $i^{\text{th}}$  value in the "output-bin-supported" attribute.

1455 **6.8.27.1 Keywords for printer-output-tray**

1456 Table 9 defines the IPP datatypes and keywords for encoding "printer-output-tray" from all  
 1457 of the machine-readable (non-localized) columnar objects in prtOutputTable [RFC3805].

1458 **Table 9 - Keywords for "printer-output-tray"**

Printer MIB Object	IPP Data-type	IPP Keyword	PWG SM Keyword	Conformance
prtOutput...				
Index (note 1)	Integer	index	Id	OPTIONAL
Type	String	type	OutputTrayType	REQUIRED
CapacityUnit	String	unit	OutputTrayCapacity-Unit	RECOMMENDED
MaxCapacity	Integer	maxcapacity	OutputTrayMax-Capacity	REQUIRED
RemainingCapacity	Integer	remaining	OutputTrayRemaining Capacity	REQUIRED
Status	Integer	status	SubunitStates	REQUIRED
Name	String	name	OutputTrayName	REQUIRED
VendorName	---	---	OutputTrayVendor-Name	---
Model	---	---	OutputTrayModel	---
Version	---	---	OutputTrayVersion	---
SerialNumber	---	---	OutputTraySerial-Number	---
Security	---	---	OutputTraySecurity	---
DimUnit (note 2)	---	---		---
MaxDimFeedDir (note 2)	---	---	OutputTrayMax-MediaSizeName	---
MaxDimXFeedDir (note 2)	---	---	OutputTrayMax-MediaSizeName	---
MinDimFeedDir (note 2)	---	---	OutputTrayMin-MediaSizeName	---
MinDimXFeedDir (note 2)	---	---	OutputTrayMin-MediaSizeName	---

Printer MIB Object	IPP Data-type	IPP Keyword	PWG SM Keyword	Conformance
StackingOrder (note 3)	String	stackingorder	OutputTrayStacking- Order	REQUIRED
PageDelivery- Orientation (note 3)	String	pagedelivery	OutputTrayPage- DeliveryOrientation	REQUIRED
Bursting	---	---	OutputTrayBursting	---
Decollating	---	---	OutputTrayDecollating	---
PageCollated	---	---	OutputTrayPageCollat ed	---
OffsetStacking (note 4)	String	offsetstacking	OutputTrayOffsetStac king	OPTIONAL

1459

1460

Notes:

- 1461 1. prtOutputIndex is OPTIONAL in "printer-output-tray", because correlation with  
1462 the original MIB order is considered unimportant.
- 1463 2. prtOutputDimUnit, prtOutputMaxDimFeedDir, prtOutputMaxDimXFeedDir,  
1464 prtOutputMinDimFeedDir, and prtOutputMinDimXFeedDir are \*not\* mapped,  
1465 because they were rated "C" (low priority) in the DMTF CIM ranking activity in  
1466 WIMS WG in 2006.
- 1467 3. prtOutputStackingOrder and prtOututPageDeliveryOrientation are REQUIRED in  
1468 "printer-output-tray" in order to enable a Client to provide media load instructions  
1469 for manual duplexing, envelope, and form printing.
- 1470 4. prtOutputOffsetStacking is OPTIONAL because it was rated "B" (medium  
1471 priority) in the DMTF CIM ranking activity in WIMS WG in 2006.
- 1472 5. Printer MIB objects without corresponding IPP keywords are \*not\* mapped, per  
1473 DMTF CIM ranking activity in WIMS WG in 2006.

### 1474 6.8.27.2 Encoding of printer-output-tray

1475 Values of "printer-output-tray" MUST be encoded using a visible subset of the [US-ASCII]  
1476 charset. Control codes (0x00 to 0x1F and 0x7F) MUST NOT be used. The ABNF [STD68]  
1477 in Figure 8 defines the standard encoding in "printer-output-tray" for all the machine-  
1478 readable (non-localized) columnar objects in prtOutputTable [RFC3805].

#### 1479 Figure 8 - ABNF for "printer-output-tray" Values

```

1480 printer-output-tray = *output-required *[output-optional]
1481 ; set of output elements encoded into one value
1482
1483 output-required    = output-req ";"
1484 output-req         = output-type /
1485                    output-max-capacity /
1486                    output-page-delivery /
1487                    output-remaining /
1488                    output-stacking-order /

```

```
1489             output-status /
1490             output-name
1491
1492 output-optional = output-opt ";"
1493
1494 output-opt      = output-index /
1495                 output-unit /
1496                 output-offset-stacking /
1497                 output-ext
1498
1499 output-type     = "type" "=" 1*ALPHA
1500                 ; enumerated value as an alpha string
1501                 ; (e.g., 'removableBin') of prtOutputType
1502                 ; in [RFC3805] mapped indirectly from
1503                 ; the *label* in PrtOutputTypeTC in [IANAPRT]
1504
1505 output-max-capacity = "maxcapacity" "=" 1*[DIGIT / "-"]
1506                 ; integer value as a numeric string mapped directly from
1507                 ; prtOutputMaxCapacity in [RFC3805]
1508
1509 output-remaining = "remaining" "=" 1*[DIGIT / "-"]
1510                 ; integer value as a numeric string mapped directly from
1511                 ; prtOutputRemainingCapacity in [RFC3805]
1512
1513 output-status   = "status" "=" 1*DIGIT
1514                 ; integer value as a numeric string mapped directly from
1515                 ; prtOutputStatus in [RFC3805]
1516
1517 output-name     = "name" "=" 1*ALPHA
1518                 ; string value as an alpha string mapped directly from
1519                 ; prtOutputName in [RFC3805]
1520
1521 output-index    = "index" "=" 1*DIGIT
1522                 ; integer value as a numeric string mapped directly from
1523                 ; prtOutputIndex in [RFC3805]
1524
1525 output-unit     = "unit" "=" 1*ALPHA
1526                 ; enumerated value as an alpha string (e.g., 'other') of
1527                 ; prtOutputCapacityUnit in [RFC3805] mapped indirectly from
1528                 ; the *label* in PrtCapacityUnitTC in [RFC3805]
1529
1530 output-stacking-order = "stackingorder" "=" 1*ALPHA
1531                 ; enumerated value as an alpha string (e.g., 'firstToLast') of
1532                 ; prtOutputStackingOrder in [RFC3805] mapped indirectly from
1533                 ; the *label* in PrtOutputStackingOrderTC in [RFC3805]
1534
1535 output-page-delivery = "pagedelivery" "=" 1*ALPHA
1536                 ; enumerated value as an alpha string (e.g., 'faceUp') of
1537                 ; prtOutputPageDeliveryOrientation in [RFC3805] mapped indirectly
1538                 ; from the *label* in PrtOutputPageDeliveryOrientationTC in
1539                 ; [RFC3805]
1540
1541 output-offset-stacking = "offsetstacking" "=" 1*ALPHA
1542                 ; enumerated value as an alpha string (e.g., 'notPresent') of
1543                 ; prtOutputOffsetStacking in [RFC3805] mapped indirectly from
1544                 ; the *label* in PresentOnOff in [RFC3805]
```

```

1545
1546     output-ext           = output-extname "=" output-extvalue
1547     output-extname      = 1*[ALPHA / DIGIT / "-"]
1548     output-extvalue     = 1*[ALPHA / DIGIT / "-" / "." / ","]
1549     ; extension point for other MIB values not mapped

```

### 1550 6.8.27.3 Examples of printer-output-tray

1551 The following example shows two rows of the machine-readable (non-localized) columnar  
1552 objects from prtOutputTable encoded into corresponding values of "printer-output-tray".

1553 Note: Line breaks are shown below for readability of this example. Line breaks MUST NOT  
1554 be encoded into actual values of "printer-output-tray".

```

1555     printer-output-tray[1] =
1556         type=removableBin;
1557         maxcapacity=500;remaining=-3;status=12;name=LeftOutputBin;
1558         index=1;unit=sheets;stackingorder=firstToLast;
1559         pagedelivery=faceDown;offsetstacking=notPresent;
1560
1561     printer-output-tray[2] =
1562         type=removableBin;
1563         maxcapacity=300;remaining=-3;status=0;name=RightOutputBin;
1564         index=2;unit=sheets;stackingorder=firstToLast;
1565         pagedelivery=faceDown;offsetstacking=notPresent;

```

### 1566 6.8.28 printer-strings-languages-supported (1setOf naturalLanguage)

1567 The RECOMMENDED "printer-strings-languages-supported" Printer attribute provides a list  
1568 of languages that are supported for the "printer-strings-uri" (section 6.8.29) Printer attribute.

1569 This attribute MUST be supported if the "printer-strings-uri" attribute is supported.

### 1570 6.8.29 printer-strings-uri (uri | no-value)

1571 The RECOMMENDED "printer-strings-uri" Printer attribute provides a "text/strings" message  
1572 catalog file using "http:" or "https:" URIs that SHOULD be Printer-resident so that Client  
1573 printing does not require access to external networks. Printers SHOULD provide  
1574 localizations for all supported Job Template attributes, keywords, and enums as well as  
1575 localizations for "document-state-reasons", "job-state-reasons", "notify-event", and "printer-  
1576 state-reasons" keywords so that a Client may present a consistent user interface to the User.

1577 If supported, the Printer MUST return a URI corresponding to the language specified by the  
1578 "attributes-natural-language" operation attribute or the no-value out-of-band value if the  
1579 Printer does not have a localization for the specified language but otherwise supports the  
1580 attribute.

1581 This attribute MUST be supported if the "printer-strings-languages-supported" (section  
1582 6.8.28) attribute is supported.

1583 The "text/strings" MIME media type is defined in section 10.1.

### 1584 **6.8.30 requesting-user-uri-supported (boolean)**

1585 The REQUIRED "requesting-user-uri-supported" Printer attribute specifies whether the  
1586 "requesting-user-uri" (section 6.1.6) operation, "job-originating-user-uri" (section 6.4.1) Job  
1587 Description, and "notify-subscriber-user-uri" (section 6.5.2) Subscription Description  
1588 attributes are supported. Printers MUST support this attribute with a value of 'true'.

### 1589 **6.8.31 soft-proof-icc-profiles (1setOf collection)**

1590 The "soft-proof-icc-profiles" Printer Description attribute specifies the set of ICC profiles the  
1591 Printer provides for soft proofing the color transformation the Printer will perform for the  
1592 corresponding "print-color-mode" keyword. This set is distinct from the "printer-icc-profiles"  
1593 attribute (section 6.8.21) because the ICC profiles are used for different purposes. These  
1594 profiles MUST be used ONLY for soft proofing and MUST NOT be used for color  
1595 management.

1596 Each collection value consists of "profile-name (name(MAX))" and "profile-uri (uri)" member  
1597 attributes plus any Job Template attributes (as member attributes) that contribute to the  
1598 selection of the profile.

#### 1599 **6.8.31.1 profile-name (name(MAX))**

1600 The REQUIRED "profile-name" member attribute provides a unique name for a given ICC  
1601 profile. A given "profile-name" value MAY appear in multiple collection values but MUST  
1602 always be paired with the same "profile-uri" value. That is, a "profile-name" of "Glossy Paper,  
1603 High Quality" might be listed multiple times but will always refer to the same "profile-uri", for  
1604 example "http://example.com/glossy-high.icc".

1605 The "profile-name" value SHOULD be localized by the Printer based on the value of the  
1606 "attributes-natural-language" operation attribute.

#### 1607 **6.8.31.2 profile-uri (uri)**

1608 The REQUIRED "profile-uri" member attribute references an ICC color profile as a "http:" or  
1609 "https:" URI. Standard vendor-supplied profiles SHOULD be Printer-resident so that Client  
1610 printing does not require access to external networks. Printer-resident profiles SHOULD be  
1611 made available on the same TCP port number used for IPP (default 631) to ensure resource  
1612 availability.

## 1613 **6.9 Printer Status Attributes**

### 1614 **6.9.1 device-service-count (integer(1:MAX))**

1615 The REQUIRED "device-service-count" READ-ONLY Printer attribute specifies the number  
1616 of Printer instances supported by the Imaging Device.

**1617 6.9.2 device-uuid (uri(45))**

1618 The REQUIRED "device-uuid" READ-ONLY Printer attribute specifies a globally-unique  
1619 identifier for the Imaging Device that MUST be a 45-octet "urn:uuid:" URI [RFC4122].

**1620 6.9.3 printer-config-change-date-time (dateTime)**

1621 The RECOMMENDED "printer-config-change-date-time" READ-ONLY Printer attribute  
1622 records the most recent time at which the 'printer-config-changed' Printer Event occurred  
1623 whether or not any Subscription objects were listening for this event. This attribute helps a  
1624 Client or operator to determine how recently any of the Printer description attributes has  
1625 been changed.

1626 This attribute MUST be READ-ONLY - the only way to change its value is to change a Printer  
1627 description attribute.

1628 If this attribute is supported, the Printer MUST populate this attribute with the value of its  
1629 "printer-current-time" attribute on power-up so that it always has a value. Whenever the  
1630 'printer-config-changed' Printer Event occurs, the Printer MUST update this attribute with the  
1631 value of the Printer's "printer-current-time" attribute.

**1632 6.9.4 printer-config-change-time (integer(1:MAX))**

1633 The RECOMMENDED "printer-config-change-time" READ-ONLY Printer attribute records  
1634 the most recent time at which the 'printer-config-changed' Printer Event occurred whether or  
1635 not any Subscription objects were listening for this event. This attribute helps a Client or  
1636 operator to determine how recently any of the Printer description attributes has been  
1637 changed.

1638 This attribute MUST be READ-ONLY - the only way to change its value is to change a Printer  
1639 description attribute.

1640 On power-up, the Printer MUST populate this attribute with the value of its "printer-up-time"  
1641 attribute so that it always has a value. Whenever the 'printer-config-changed' Printer Event  
1642 occurs, the Printer MUST update this attribute with the value of the Printer's "printer-up-time"  
1643 attribute.

**1644 6.9.5 printer-supply (1setOf octetString(MAX))**

1645 The RECOMMENDED "printer-supply" READ-ONLY Printer attribute provides current  
1646 supply details mapped from the SNMP prtMarkerSuppliesTable and prtMarkerColorantTable  
1647 defined in IETF Printer MIB v2 [RFC3805].

1648 This attribute MUST be supported if the "printer-supply-description" (section 5.5.22) Printer  
1649 attribute is supported. If supported, this attribute MUST have the same cardinality (contain  
1650 the same number of values) as the "printer-supply-description" attribute. The  $i^{\text{th}}$  value in the  
1651 "printer-supply" attribute corresponds to the  $i^{\text{th}}$  value in the "printer-supply-description"  
1652 attribute.

1653 **6.9.5.1 Keywords for printer-supply**

1654 Table 10 defines the IPP datatypes and keywords for encoding "printer-supply" from all of  
 1655 the machine-readable (non-localized) columnar objects in prtMarkerSuppliesTable and  
 1656 prtMarkerColorantTable [RFC3805]. A Printer MAY represent site-unique or vendor-unique  
 1657 information using extension keywords. The extension keyword syntax

1658 **Table 10 - Keywords for "printer-supply"**

SNMP Supply Object	IPP Data-type	IPP Keyword	Conformance
prtMarkerSuppliesType	String	type	REQUIRED
prtMarkerSuppliesMaxCapacity	Integer	maxcapacity	REQUIRED
prtMarkerSuppliesLevel	Integer	level	REQUIRED
prtMarkerColorantValue	String	colorantname	REQUIRED
prtMarkerSuppliesClass	String	class	RECOMMENDED
prtMarkerSuppliesSupplyUnit	String	unit	RECOMMENDED
prtMarkerColorantIndex	Integer	colorantindex	OPTIONAL
prtMarkerColorantRole	String	colorantrole	OPTIONAL
prtMarkerColorantTonality	Integer	coloranttonality	OPTIONAL
prtMarkerSuppliesIndex	Integer	index	OPTIONAL (note 1)
prtMarkerSuppliesMarkerIndex	Integer	markerindex	OPTIONAL (note 2)
prtMarkerSuppliesColorantIndex	Integer	n/a	n/a (note 3)

1659 Notes:

1660 1 - prtMarkerSuppliesIndex is OPTIONAL in "printer-supply" because correlation  
 1661 with the original MIB order is considered unimportant.

1662 2 - prtMarkerSuppliesMarkerIndex is OPTIONAL in "printer-supply" because most  
 1663 Printers don't have multiple markers.

1664 3 - prtMarkerSuppliesColorantIndex is omitted in "printer-supply" because it is  
 1665 redundant with prtMarkerColorantIndex for the rows that include colorant  
 1666 information.

1667 **6.9.5.2 Encoding of printer-supply**

1668 Values of "printer-supply" MUST be encoded using a visible subset of the [US-ASCII]  
 1669 charset. Control codes (0x00 to 0x1F and 0x7F) MUST NOT be used. The ABNF  
 1670 [STD68] in Figure 9 defines the standard encoding in "printer-supply" for all the machine-

1671 readable (non-localized) columnar objects in prtMarkerSuppliesTable and  
 1672 prtMarkerColorantTable [RFC3805].

1673 **Figure 9 - ABNF for "printer-supply" Values**

```

1674 printer-supply      = *supply-required *[supply-optional]
1675     ; set of supply elements encoded into one value
1676
1677 supply-required    = supply-req ";"
1678 supply-req         = supply-type /
1679     supply-max-capacity /
1680     supply-level /
1681     colorant-name
1682
1683 supply-optional    = supply-opt ";"
1684 supply-opt         = supply-index /
1685     marker-index /
1686     supply-class /
1687     supply-unit /
1688     colorant-index /
1689     colorant-role /
1690     colorant-tonality /
1691     supply-ext
1692
1693 supply-type        = "type" "=" 1*ALPHA
1694     ; enumerated value as an alpha string (e.g., 'toner') of
1695     ; prtMarkerSuppliesType in [RFC3805] mapped indirectly from
1696     ; the *label* in PprtMarkerSuppliesTypeTC in [IANAPRT]
1697
1698 supply-max-capacity = "maxcapacity" "=" 1*[DIGIT / "-"]
1699     ; integer value as a numeric string mapped directly from
1700     ; prtMarkerSuppliesMaxCapacity in [RFC3805]
1701
1702 supply-level       = "level" "=" 1*[DIGIT / "-"]
1703     ; integer value as a numeric string mapped directly from
1704     ; prtMarkerSuppliesLevel in [RFC3805]
1705
1706 colorant-name      = "colorantname" "=" 1*ALPHA
1707     ; string value as an alpha string mapped directly from
1708     ; prtMarkerColorantValue in [RFC3805]
1709
1710 supply-index       = "index" "=" 1*DIGIT
1711     ; integer value as a numeric string mapped directly from
1712     ; prtMarkerSuppliesIndex in [RFC3805]
1713
1714 marker-index       = "markerindex" "=" 1*DIGIT
1715     ; integer value as a numeric string mapped directly from
1716     ; prtMarkerSuppliesMarkerIndex in [RFC3805]
1717
1718 supply-class        = "class" "=" 1*ALPHA
1719     ; enumerated value as an alpha string (e.g., 'other') of
1720     ; prtMarkerSuppliesClass in [RFC3805] mapped indirectly from
1721     ; the *label* in PprtMarkerSuppliesClassTC in [RFC3805]
1722
1723 supply-unit        = "unit" "=" 1*ALPHA
  
```

```

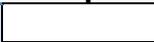
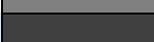
1724     ; enumerated value as an alpha string (e.g., 'other') of
1725     ; prtMarkerSuppliesSupplyUnit in [RFC3805] mapped indirectly from
1726     ; the *label* in PrtMarkerSuppliesSupplyUnitTC in [RFC3805]
1727
1728     colorant-index      = "colorantindex" "=" 1*DIGIT
1729     ; integer value as a numeric string mapped directly from
1730     ; prtMarkerColorantIndex in [RFC3805]
1731
1732     colorant-role       = "colorantrole" "=" 1*ALPHA
1733     ; enumerated value as an alpha string (e.g., 'other') of
1734     ; prtMarkerColorantRole in [RFC3805] mapped indirectly from
1735     ; the *label* in PrtMarkerColorantRoleTC in [RFC3805]
1736
1737     colorant-tonality   = "coloranttonality" "=" 1*DIGIT
1738     ; integer value as a numeric string mapped directly from
1739     ; prtMarkerColorantTonality in [RFC3805]
1740
1741     supply-ext          = supply-extname "=" supply-extvalue
1742     ; extension point for other MIB values not mapped
1743     ; or site-unique / vendor-unique additional info
1744
1745     supply-extname      = 1*[ALPHA / DIGIT / "-"]
1746     supply-extvalue     = 1*[ALPHA / DIGIT / "-" / "." / ","]

```

### 1747 6.9.5.3 Colorant Names in printer-supply

1748 Colorant names in "printer-supply" values not listed or referenced in the IETF Printer MIB v2  
 1749 MUST conform to the color names and extension formats defined in the PWG Media  
 1750 Standardized Names v2.0 [PWG5101.1], e.g., "light-cyan", "com.example-light-  
 1751 magenta\_ff7ffff", etc. This allows Clients to present supply level monitoring user interface  
 1752 with the appropriate colors. Table 11 lists the standard colorant names with their  
 1753 corresponding reference sRGBA values.

1754 **Table 11 - Standard Colorant Names for "printer-supply"**

Name	sRGBA Value	Sample
no-color	Undefined	
black	0x000000FF	
light-black	0x808080FF	
blue	0x0000FFFF	
cyan	0x00FFFFFF	
light-cyan	0xE0FFFFFF	
gold	0xFFD700FF	
gray	0x808080FF	
dark-gray	0x404040FF	
light-gray	0xD3D3D3FF	
green	0x008000FF	
magenta	0xFF00FFFF	
light-magenta	0xFF77FFFF	
multi-color	Undefined	

orange	0xFFA500FF	
red	0xFF0000FF	
silver	0xC0C0C0FF	
white	0xFFFFFFFF	
yellow	0xFFFF00FF	
dark-yellow	0xFFCC00FF	

#### 1755 6.9.5.4 Example of printer-supply

1756 Figure 10 shows the values of "printer-supply" in "ipptoolfile" syntax [IPPSAMPLE], encoding  
 1757 seven rows of the machine-readable (non-localized) columnar objects from  
 1758 prtMarkerSuppliesTable and prtMarkerColorantTable.

1759 Note: Line breaks are shown below for readability of this example. Line breaks MUST NOT  
 1760 be encoded into actual values of "printer-supply", as per section 6.9.5.2.

#### 1761 Figure 10 - Example values for "printer-supply" Printer Status attribute

```

1762 ATTR octetString printer-supply
1763
1764 "type=tonerCartridge;maxcapacity=100;level=56;unit:percent;
1765 colorantname=black;colorantindex=1;colorantrole=process;
1766 coloranttonality=128;class=supplyThatIsConsumed",
1767
1768 "type=tonerCartridge;maxcapacity=100;level=77;unit:percent;
1769 colorantname=cyan;colorantindex=2;colorantrole=process;
1770 coloranttonality=128;class=supplyThatIsConsumed",
1771
1772 "type=tonerCartridge;maxcapacity=100;level=19;unit:percent;
1773 colorantname=magenta;colorantindex=3;colorantrole=process;
1774 coloranttonality=128;class=supplyThatIsConsumed",
1775
1776 "type=tonerCartridge;maxcapacity=100;level=31;unit:percent;
1777 colorantname=yellow;colorantindex=4;colorantrole=process;
1778 coloranttonality=128;class=supplyThatIsConsumed",
1779
1780 "type=wasteToner;maxcapacity=100;level=67;unit:percent;
1781 colorantname=no-color;colorantindex=77;colorantrole=other;class=other",
1782
1783 "type=fuser;maxcapacity=100;level=89;unit:percent;
1784 colorantname=no-color;colorantindex=88;colorantrole=other;class:other",
1785
1786 "type=transferUnit;maxcapacity=100;level=84;unit:percent;
1787 colorantname=no-color;colorantindex=99;colorantrole=other;class:other"

```

#### 1788 6.9.6 printer-supply-description (1setOf text(MAX))

1789 The RECOMMENDED "printer-supply-description" READ-ONLY Printer attribute provides  
 1790 current supply descriptions mapped from the SNMP prtMarkerSuppliesDescription object in  
 1791 the prtMarkerSuppliesTable defined in IETF Printer MIB v2 [RFC3805].

1792 This attribute **MUST** be supported if the "printer-supply" (section 6.9.5) Printer attribute is  
 1793 supported. If supported, this attribute **MUST** have the same cardinality (contain the same  
 1794 number of values) as the "printer-supply" attribute. The  $i^{\text{th}}$  value in the "printer-supply-  
 1795 description" attribute corresponds to the  $i^{\text{th}}$  value in the "printer-supply" attribute.

### 1796 **6.9.6.1 Encoding of printer-supply-description**

1797 Values of the "printer-supply-description" attribute **MUST** be mapped from the corresponding  
 1798 human-readable (localized) values of prtMarkerSuppliesDescription, exactly as follows:

- 1799 1. Each value of prtMarkerSuppliesDescription **MUST** be converted from the charset  
 1800 [RFC3808] specified by prtGeneralCurrentLocalization and  
 1801 prtLocalizationCharacterSet into the charset specified by "charset-configured" and  
 1802 then copied into a text value of "printer-supply-description";
- 1803 2. Each value of "printer-supply-description" **MUST** be tagged with the natural  
 1804 language [RFC5646] specified by prtGeneralCurrentLocalization,  
 1805 prtLocalizationLanguage, and prtLocalizationCountry; and
- 1806 3. Each value of "printer-supply-description" **MUST** be in the same order as the  
 1807 corresponding value of "printer-supply" (i.e., strictly ascending order according to  
 1808 prtMarkerSuppliesIndex).

### 1809 **6.9.6.2 Example of printer-supply-description**

1810 Figure 11 describes in "ipptoolfile" syntax [IPPSAMPLE] the "printer-supply-description"  
 1811 values corresponding to the "printer-supply" values from Figure 10, encoding the Printer's  
 1812 prtMarkerSuppliesDescription values in its prtMarkerSuppliesTable.

1813 Note: Line breaks are shown below for readability of this example. Line breaks **MUST NOT**  
 1814 be encoded into actual values of "printer-supply", as per section 6.9.6.1.

#### 1815 **Figure 11 - Example of "printer-supply-description"**

```
1816 ATTR textWithoutLanguage printer-supply-description
1817     "Black Toner Cartridge S/N:16859422",
1818     "Cyan Toner Cartridge S/N:16852765",
1819     "Magenta Toner Cartridge S/N:16859681",
1820     "Yellow Toner Cartridge S/N:16859372",
1821     "Waste Toner Bin S/N:16816815",
1822     "Fuser Kit S/N:16820223",
1823     "Transfer Kit S/N:16821304"
```

### 1824 **6.9.7 printer-supply-info-uri (uri)**

1825 The **RECOMMENDED** "printer-supply-info-uri" Printer attribute provides a URI referring to a  
 1826 Printer-resident web page that provides controls for managing the Printer and its supplies,  
 1827 e.g., supply replacement, head alignment, self-test pages, and so forth. The web page **MAY**  
 1828 also provide supply part numbers, links for ordering supplies, and detailed instructions for  
 1829 replacing supplies.

1830 The URI MUST use the “http” or “https” scheme with the Printer as the destination host -  
1831 external URIs are not allowed.

### 1832 **6.9.8 printer-uuid (uri(45))**

1833 The REQUIRED "printer-uuid" READ-ONLY Printer attribute specifies a globally-unique  
1834 identifier for the Printer that MUST be a 45-octet "urn:uuid" URI [RFC4122].

1835 The "printer-uuid" attribute MUST NOT be used as a Printer identifier in IPP Printer  
1836 operations but MAY be used as a Printer identifier for other protocol bindings and SHOULD  
1837 be used for accounting and auditing of Printers.

## 1838 **7. Additional Semantics for Existing Operations**

### 1839 **7.1 All Operations: "requesting-user-uri"**

1840 If the Printer supports the "requesting-user-uri" (section 6.1.6) operation attribute, Clients  
1841 MAY supply it in a Create-Job, Create-Job-Subscription, Create-Printer-Subscription, Print-  
1842 Job, or Print-URI operation. The Printer object sets the "job-originating-user-uri" (section  
1843 6.4.1) or "notify-subscriber-user-uri" (section 6.5.2) attribute as needed to the most  
1844 authenticated URI that it can obtain from the authentication service over which the IPP  
1845 operation was received. Only if such an authenticated URI is not available, does the Printer  
1846 object use the value supplied by the Client in the "requesting-user-uri" operation of the  
1847 operation (see IPP/1.1 Model and Semantics [STD92] sections 5.4.2, 5.4.3 and 9).

### 1848 **7.2 Get-Printer-Attributes Operation: "first-index" and "limit"**

1849 Clients MAY provide and Printers MAY support job creation attributes beyond "document-  
1850 format" to color (filter) the response. The "printer-get-attributes-supported" Printer attribute  
1851 (section 5.5.15) specifies which job creation attributes are supported by the Get-Printer-  
1852 Attributes operation and MUST include "document-format".

1853 In addition, if a Printer supports the "media-col-database" Printer attribute ([PWG5100.11]),  
1854 the Client MAY provide and the Printer SHOULD support the "first-index" (section 6.1.3) and  
1855 "limit" ([STD92]) operation attributes to limit the number of "media-col-database" values that  
1856 are returned in the response.

### 1857 **7.3 Get-Subscriptions Operation: "first-index" and "limit"**

1858 If the Printer supports the Get-Subscriptions operation, Clients MAY provide and Printers  
1859 MUST support the "first-index" operation attribute (section 6.1.3) in conjunction with the  
1860 "limit" operation attribute ([STD92]) to select the first Subscription object that is returned in  
1861 the response.

**1862 7.4 Get-Jobs Operation: "first-index" and "limit"**

1863 Clients MAY provide and Printers MUST support the "first-index" operation attribute (section  
1864 6.1.3) in conjunction with the "limit" operation attribute ([STD92]) to select the first Job object  
1865 that is returned in the response.

**1866 7.5 Get-Documents Operation: "first-index" and "limit"**

1867 If the Printer supports the Get-Documents operation, Clients MAY provide and Printers  
1868 MUST support the "first-index" operation attribute (section 6.1.3) in conjunction with the  
1869 "limit" operation attribute ([STD92]) to select the first Document object that is returned in the  
1870 response.

**1871 7.6 Print-Job, Print-URI, Send-Document, and Send-URI Operations:  
1872 "document-metadata"**

1873 Clients MAY supply and Printers MUST support the "document-metadata" (section 6.1.1)  
1874 operation attribute in the Print-Job, Print-URI, Send-Document, or Send-URI operations.

1875 If the Printer conforms to the IPP Document Object [PWG5100.5], the Printer object MUST  
1876 copy the attribute value to the Document object, otherwise the Printer object MUST copy the  
1877 attribute value to the Job object.

**1878 7.7 Print-Job, Print-URI, Send-Document, and Send-URI Operations:  
1879 "document-password"**

1880 If the Printer supports the "document-password" (section 6.1.2) operation attribute, Clients  
1881 MAY supply it in a Print-Job, Print-URI, Send-Document, or Send-URI operation. The Printer  
1882 object MUST treat the attribute value as private and confidential, MUST retain the value as  
1883 long as the corresponding Job and Document are retained, MUST NOT persist the value  
1884 beyond the life of the Job or Document, MUST NOT return the value in the response to the  
1885 request, and MUST NOT set any Job or Document object attribute with the value of the  
1886 "document-password" attribute.

1887 If the Printer receives a request containing the "document-password" operation attribute  
1888 prior to negotiation of a TLS session, it MUST return the 'client-error-bad-request' status  
1889 code to the Client.

1890 If the Printer determines that the supplied "document-password" value is not correct, it MUST  
1891 return the 'client-error-document-password-error' (section 9.1) status code to the Client if a  
1892 response has not already been sent and add the 'document-password-error' keyword to the  
1893 "job-state-reasons" and, if supported, "document-state-reasons" attributes.

1894 If the Printer determines that the supplied "document-password" value is correct but the  
1895 Document does not allow printing, it MUST return the 'client-error-document-permission-

1896 error' status code to the Client if a response has not already been sent and add the  
1897 'document-permission-error' keyword to the "job-state-reasons" and, if supported,  
1898 "document-state-reasons" attributes.

## 1899 **7.8 Validate-Job Operation: "document-password"**

1900 Clients MUST NOT send the "document-password" operation attribute (section 6.1.2) in a  
1901 Validate-Job request. Printers MUST reject a Validate-Job request containing a "document-  
1902 password" operation attribute and return the client-error-bad-request status code.

## 1903 **7.9 Create-Job, Print-Job, and Print-URI Operations: "job-password" and** 1904 **"job-password-encryption"**

1905 Printers that support the "job-password" and "job-password-encryption" operation attributes  
1906 [PWG5100.11] MUST validate the values supplied and return the client-error-bad-request  
1907 status code if the values are invalid or not supported. Printers MUST NOT return the "job-  
1908 password" or "job-password-encryption" attributes in the Unsupported Attributes Group to  
1909 prevent the leaking of security information.

## 1910 **7.10 Validate-Job Operation: "job-password" and "job-password-** 1911 **encryption"**

1912 Clients MUST NOT send the "job-password" or "job-password-encryption" operation  
1913 attributes [PWG5100.11] in a Validate-Job request. Printers MUST reject a Validate-Job  
1914 request containing a "job-password" or "job-password-encryption" operation attribute and  
1915 return the client-error-bad-request status code.

## 1916 **7.11 Validate-Job Operation: "preferred-attributes"**

1917 Printers MAY support returning the values for specific Job Template attributes that would  
1918 actually be used (or that the Printer would prefer to use) based on the job creation attributes  
1919 included in the Validate-Job request. Each Job Template attribute is returned as a member  
1920 attribute in the "preferred-attributes" attribute in the Operation Attributes Group.

1921 Printers indicate their support for this functionality by listing the Job Template attributes that  
1922 may be returned in the "preferred-attributes-supported" Printer attribute (section 5.5.4).

## 1923 **8. Additional Values and Semantics for Existing Attributes**

### 1924 **8.1 document-state-reasons (1setOf type2 keyword) and job-state-** 1925 **reasons (1setOf type2 keyword)**

1926 Table 12 lists new "document-state-reasons" and "job-state-reasons" keyword values.

1927 **Table 12 - New "document-state-reasons" and "job-state-reasons" Keyword Values**

<b>Keyword</b>	<b>Description</b>
document-password-error	The Printer detected an incorrect document content password and was unable to unlock the document for printing. This value <b>MUST</b> be supported if the "document-password" (section 6.1.2) operation attribute is supported.
document-permission-error	The Printer was able to unlock the document but the document permissions do not allow for printing. This value <b>MUST</b> be supported if the "document-password" (section 6.1.2) operation attribute is supported.
document-security-error	The Printer detected security issues (virus, trojan horse, or other malicious software) embedded within the document. Whether the Printer aborts the job and moves the job to the 'aborted' job state or prints all documents that do not contain detected security issues and moves the job to the 'completed' job state and adds the 'completed-with-errors' value in the job's "job-state-reasons" attribute depends on implementation and/or site policy. This value <b>SHOULD</b> be supported.
document-unprintable-error	The Printer determined that the document was unprintable. This reason is intended to cover any issues of file size, format version, or complexity that would prevent the Printer from printing the document. Whether the Printer aborts the job and moves the job to the 'aborted' job state or prints all documents that do not contain detected security issues and moves the job to the 'completed' job state and adds the 'completed-with-errors' value in the job's "job-state-reasons" attribute depends on implementation and/or site policy. This value <b>SHOULD</b> be supported.

1928 **8.2 finishings (1setOf type2 enum)**

1929 Table 13 lists new enum values for the "finishings" Job Template attribute that **SHOULD** be  
 1930 supported by Printers with roll-fed media.

1931 **Table 13 - New "finishings" Enum Values**

<b>Value</b>	<b>Symbolic Name and Description</b>
--------------	--------------------------------------

'60'	'trim-after-pages': Trim output after each page.
'61'	'trim-after-documents': Trim output after each document.
'62'	'trim-after-copies': Trim output after each copy.
'63'	'trim-after-job': Trim output after job.

### 1932 8.3 orientation-requested (type2 enum)

1933 A new 'none' (7) value can be used with the "orientation-requested" Job Template attribute  
1934 to specify that the Printer should not perform any rotations for orientation.

### 1935 8.4 print-content-optimize (type2 keyword)

1936 A new 'auto' value can be used with the "print-content-optimize" Job Template attribute  
1937 [PWG5100.7] to specify that the Printer should automatically determine the best  
1938 optimizations to perform when printing the document.

### 1939 8.5 print-quality (type2 enum)

1940 The following new enum values for the "print-quality" attribute allow a Printer to specify  
1941 support for additional printer-specific print quality options that the Client can specify the  
1942 Printer use for a Job. A Printer that supports any of the enum labels defined here MUST  
1943 provide localized labels for each using the Localization Message Catalog available at the  
1944 URL specified by "printer-strings-uri" (section 6.8.29). The Message Catalog localized  
1945 strings provide the localization and the meaning of that enum for its own implementation. A  
1946 Printer SHOULD also provide a localized "tool tip" using the "\_tooltip" label extensions to the  
1947 Message Catalog (section 10.1) to provide some contextual help for the vendor-unique or  
1948 site-unique label string.

Enum Value	Enum Label	Description
3	draft	[STD92]
4	normal	[STD92]
5	high	[STD92]
10	custom-10	Lowest custom print quality level
11	custom-11	Custom print quality level lower than 'custom-2'
12	custom-12	Custom print quality level lower than 'draft'
16	custom-16	Custom print quality level higher than 'high'
17	custom-17	Custom print quality level higher than 'custom-16'

<b>18</b>	custom-18	Highest custom print quality level
<b>20</b>	custom-20	Non-linear custom print quality
<b>21</b>	custom-21	Non-linear custom print quality
<b>22</b>	custom-22	Non-linear custom print quality

1949 The string catalog entries for each of these might look like this:

```

1950 "print-quality.10" = "EcoWickedDrafty";
1951 "print-quality.12" = "EcoDrafty";
1952 "print-quality.3" = "Draft";
1953 "print-quality.4" = "Normal";
1954 "print-quality.5" = "High";
1955 "print-quality.16" = "Max";
1956 "print-quality.18" = "MegaMax";
1957 "print-quality.20" = "Non-linear Ennui";
1958 "print-quality.21" = "Non-linear Trepidation";
1959 "print-quality.22" = "Non-linear Happiness";
1960
1961 "print-quality.10._tooltip" = "Usable only for rough layout";
1962 "print-quality.12._tooltip" = "Lower quality with greatly reduced toner use";
1963 "print-quality.3._tooltip" = "Low quality with less toner use";
1964 "print-quality.4._tooltip" = "Average quality - best for everyday use";
1965 "print-quality.5._tooltip" = "Higher quality";
1966 "print-quality.16._tooltip" = "Maximum quality";
1967 "print-quality.18._tooltip" = "Super Maximum quality";
1968 "print-quality.20._tooltip" = "Produces output that makes you bored";
1969 "print-quality.21._tooltip" = "Produces output that makes you nervous ";
1970 "print-quality.22._tooltip" = "Produces output that makes you kinder";

```

## 1971 8.6 printer-state-reasons (1setOf type2 keyword)

1972 Table 14 lists new keyword values for the "printer-state-reasons" Printer attribute that MUST  
 1973 be supported by Printers that report the corresponding Printer MIB [RFC3805] supply types.

1974 **Table 14 - New "printer-state-reasons" Keyword Values**

<b>Keyword</b>	<b>Description</b>
cleaner-life-almost-over	A cleaning component corresponding to the Printer MIB prtMarkerSuppliesType values cleanerUnit(18) and fuserCleaningPad(19) is nearing the end of its service life.
cleaner-life-over	A cleaning component corresponding to the Printer MIB prtMarkerSuppliesType values cleanerUnit(18) and fuserCleaningPad(19) has reached the end of its service life.

## 1975 **8.7 uri-authentication-supported (1setOf type2 keyword)**

1976 The 'negotiate' keyword value MUST be used to indicate support for HTTP Negotiate  
1977 authentication based on SPNEGO-based Kerberos and NTLM HTTP Authentication  
1978 in Microsoft Windows [RFC4559].

## 1979 **9. Status Codes**

### 1980 **9.1 client-error-document-password-error (0x418)**

1981 The Client has attempted to submit a Document using the Print-Job, Print-URI, Send-  
1982 Document, or Send-URI operations with the wrong passphrase. The Client MAY try the  
1983 request again with a new passphrase.

### 1984 **9.2 client-error-document-permission-error (0x419)**

1985 The Client has attempted to submit a Document using the Print-Job, Print-URI, Send-  
1986 Document, or Send-URI operations that does not allow printing. The Client MUST NOT  
1987 retry the request using the same document.

### 1988 **9.3 client-error-document-security-error (0x41A)**

1989 The Printer has detected security issues (virus, trojan horse, or other malicious software)  
1990 embedded within the document and will not accept it for printing.

### 1991 **9.4 client-error-document-unprintable-error (0x41B)**

1992 The Printer has determined that the document is unprintable due to size, format version, or  
1993 complexity and will not accept it for printing.

## 1994 **10. Localization of Attributes and Values**

1995 The "printer-strings-uri" Printer attribute (section 6.8.29) provides the location of a language-  
1996 specific, printer-resident message catalog file that provides localizations for attribute names,  
1997 keyword values, and enum values.

### 1998 **10.1 Message Catalog File Format**

1999 This specification defines a new plain text message catalog format (MIME media type  
2000 "text/strings") based on the Apple "strings" file format to allow Printers to supply and Clients  
2001 to present localized strings for supported attributes values. A sample English localization for  
2002 registered IPP attributes, enum values, and keyword values is available on the PWG FTP

2003 server [PWG-CATALOG]. Boolean, dateTime, and integer values are not localizable using  
2004 this format, and name and text values are presumed to already be localized [STD92].

2005 Message catalog files consist of lines of UTF-8 encoded Unicode text following the general  
2006 "KEY = VALUE" form. The KEY and VALUE elements can be wrapped in double quotes.:

```
2007     "attribute-name" = "Localized Attribute Name Label";  
2008     "attribute-name.enum-value" = "Localized Enum Value Label";  
2009     "attribute-name.keyword-value" = "Localized Keyword Value Label";  
2010     /* Comment for/to localizers */
```

2011 Lines in a Message Catalog file can be terminated by a single line feed (%x0A) or a  
2012 combination of carriage return and line feed (%x0D.0A). All lines in a Message Catalog file  
2013 MUST use identical line terminators for consistency. Attribute names and values are limited  
2014 to the characters defined for the IPP keyword value syntax [STD92].

2015 Control characters (%x00-1F, %x7F), the double quote (%x22), and the backslash (%x5C)  
2016 MUST be escaped in localized strings using a subset of the C language syntax:

2017	\"	A double quote (%x22)
2018	\\	A backslash (%x5C)
2019	\n	A line feed (%x0A)
2020	\r	A carriage return (%x0D)
2021	\t	A horizontal tab (%x09)
2022	\###	An octet represented by 3 octal digits

2023 A more complete example is in section 10.3.

## 2024 10.2 Message Catalog Help Resources

2025 A Message Catalog MAY also contain two types of "help" content. The "\_tooltip" suffix can  
2026 be used to specify brief help content suitable for contextual presentation such as when a  
2027 mouse pointer is hovered over a label. The "\_helpurl" suffix can be used to specify a URL to  
2028 more detailed, rich and possibly lengthy help content that could be presented in a separate  
2029 "help" window. The general form is like so:

```
2030     "attribute-name._tooltip" = "Localized Attribute Name Tooltip Help String"  
2031     "attribute-name._helpurl" = "URL to localized attribute help content"  
2032  
2033     "attribute-name.enum-value._tooltip" = "Localized Enum Value Tooltip Help  
2034     String"  
2035     "attribute-name.enum-value._helpurl" = "URL to localized enum value help  
2036     content"  
2037
```

```

2038     "attribute-name.keyword-value._tooltip" = "Localized Keyword Value Tooltip
2039     Help String"
2040     "attribute-name.keyword-value._helpurl" = "URL to localized keyword value
2041     help content"

```

2042 A more complete example is in section 10.3.

### 2043 10.3 Message Catalog Example

2044 A Printer that specifies two collections in its "media-col-ready", one that specifies 'stationery'  
 2045 for its "media-type " value, and the other that specifies 'smi32473-eco-lite' for its "finishing-  
 2046 template" value, can implement among others the following attributes and values, using  
 2047 "ipptoolfile" syntax [IPPSAMPLE]:

```

2048     ATTR collection media-col-ready
2049     {
2050         MEMBER keyword media-type "stationery"
2051         MEMBER keyword media-source "tray-1"
2052         MEMBER collection media-size
2053         {
2054             # iso_a4_210x297mm
2055             MEMBER integer x-dimension 21000
2056             MEMBER integer y-dimension 29700
2057         }
2058         MEMBER integer media-top-margin 500
2059         MEMBER integer media-bottom-margin 500
2060         MEMBER integer media-left-margin 500
2061         MEMBER integer media-right-margin 500
2062     }, {
2063         MEMBER keyword media-type "smi32473-eco-lite"
2064         MEMBER keyword media-source "tray-2"
2065         MEMBER keyword media-color white
2066         MEMBER collection media-size
2067         {
2068             # na_letter_8.5x11in
2069             MEMBER integer x-dimension 21590
2070             MEMBER integer y-dimension 27940
2071         }
2072         MEMBER integer media-bottom-margin 500
2073         MEMBER integer media-left-margin 500
2074         MEMBER integer media-right-margin 500
2075         MEMBER integer media-top-margin 500
2076     }

```

2077 The Printer's Message Catalog corresponding to "attributes-natural-language" = 'en-us'  
 2078 might include the following:

```

2079     media-type = "Media Type";
2080     media-type.stationery = "Stationery";
2081     media-type.stationery._tooltip = "Conventional Stationery";
2082     media-type.stationery._helpurl = " //_help/media-types.html";
2083     media-type.smi32473-eco-lite = "PWG Eco Lite";
2084     media-type.smi32473-eco-lite._tooltip = "Lightweight paper that may tear";

```

2085 media-type.smi32473-eco-lite.\_helpurl = " //\_help/media-types.html#ecolite";

## 2086 10.4 Message Catalog ABNF

2087 Figure 12 provides the ABNF [STD68] for files conforming to the “text/strings” MIME media  
2088 type.

### 2089 Figure 12 - ABNF for the "text/strings" MIME Media Type

```

2090 CATALOG      = *(MESSAGE / COMMENT / *WSP CRLF / *WSP LF)
2091 MESSAGE     = *WSP DQUOTE %x61-7A *KEYWORD-CHAR DQUOTE
2092             *WSP "=" *WSP QUOTED-STRING *WSP ";" *WSP (CRLF / LF)
2093 COMMENT     = *WSP "/" * 1*CHAR "*" / *WSP (CRLF / LF)
2094 KEYWORD-CHAR = %x61-7A / DIGIT / "-" / "." / "_"
2095 QUOTED-STRING = DQUOTE 1*QUOTED-CHAR DQUOTE
2096 QUOTED-CHAR  = %x20-21 /
2097             %x23-5B /
2098             %x5C.22 / ; \ " = " (%x22)
2099             %x5C.5C / ; \ \ = \ (%x5C)
2100             %x5C.6E / ; \ n = lf (%x0A)
2101             %x5C.71 / ; \ r = cr (%x0D)
2102             %x5C.73 / ; \ t = ht (%x09)
2103             %x5C.30-33.30-37.30-37 / ; \ooo (octal)
2104             %x5D-7E /
2105             %xC0-DF.80-BF /
2106             %xE0-EF.80-BF.80-BF /
2107             %xF0-F7.80-BF.80-BF.80-BF
2108

```

## 2109 **11. Relationship of Impressions, Pages, and Sheets**

2110 The Internet Printing Protocol/1.1: Model and Semantics [STD92] defines attributes for the  
2111 impressions and media sheets in a job, the PWG Standardized Imaging System Counters  
2112 1.1 [PWG5106.1] clarifies the definitions of impressions and sheets, the Standard for the  
2113 Internet Printing Protocol: Page Overrides [PWG5100.6] defines input pages for page  
2114 overrides, and this specification defines new Job Description attributes to track the number  
2115 and progress of input pages within the documents of a Job.

2116 Because the various IPP and PWG standards have used slightly different definitions of  
2117 impressions, pages, and sheets, and because their interaction with various Job Template  
2118 attributes has not been documented, the Job Description attributes for impressions ("job-  
2119 impressions" and "job-impressions-completed") and sheets ("job-media-sheets" and "job-  
2120 media-sheets-completed") have not been implemented consistently between different  
2121 vendors' IPP Printers. Table 15 lists the Job Template attributes that affect reporting of  
2122 impressions and sheets. Only the "page-range" Job Template attribute affects the page  
2123 counts ("job-pages" and "job-pages-completed").

### 2124 **11.1 Examples for Impressions, Pages, and Sheets**

#### 2125 **11.1.1 Single Document Simplex Job Without Copies**

2126 A single-document simplex job has the same number of impressions, pages, and sheets.  
2127 Thus, a 10 page document will yield impression and sheet counts of 10 each.

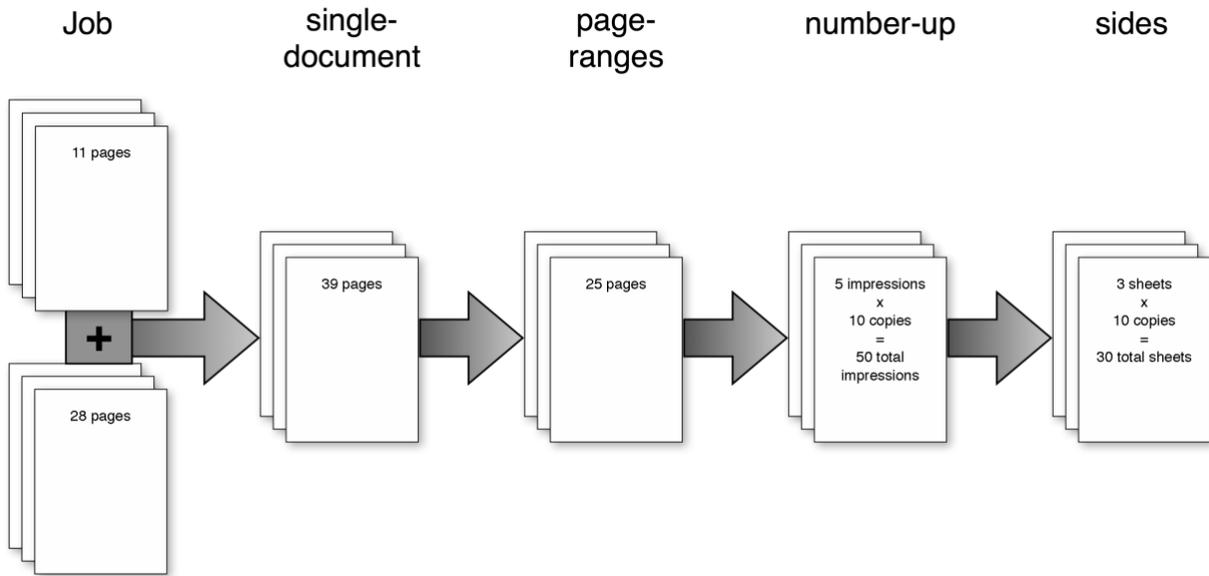
#### 2128 **11.1.2 Single Document Duplex Job Without Copies**

2129 A single-document duplex jobs ("sides" is "two-sided-long-edge" or "two-sided-short-edge")  
2130 has the same number of impressions and pages but half as many sheets. Thus, an 11 page  
2131 document will yield 11 impressions and 6 sheets - the last sheet will only have one  
2132 impression on it.

#### 2133 **11.1.3 Two Document Duplex Job With Copies, Number-Up, and Page-Ranges**

2134 A two-document duplex job with copies and number-up will have different page, impression,  
2135 and sheet counts. For example, a job containing documents of 11 and 28 pages, a "copies"  
2136 value of 10, a "multiple-document-handling" value of 'single-document', a "number-up" value  
2137 of 6, a "page-ranges" value of 1-25, and a "sides" value of 'two-sided-long-edge' would yield  
2138 a page count of 39 (11 + 28 pages from two documents), an impression count of 50 (25 6-  
2139 up pages produces 5 impressions per copy), and a sheet count of 30 (5 impressions are  
2140 printed on a total of 3 pages per copy). Figure 13 shows a graphical representation of this  
2141 example.  
2142

2143 **Figure 13 - Two Document Duplex Job With Copies, Number-Up, and Page-Ranges**



2144

2145

**Table 15 - Job Template Attributes That Affect Impressions and Sheets**

<b>Attribute</b>	<b>Description</b>
copies	Multiplier for impressions and sheets; also see job-copies, multiple-document-handling, and sheet-collate
cover-back	For 'print-none', adds one sheet per set
cover-front	For 'print-none', adds one sheet per set
insert-sheet	Adds N sheets for each copy and, potentially, each document in the Job
job-copies	Multiplier for impressions and sheets; also see copies, multiple-document-handling, and sheet-collate
job-error-sheet	May add one or more impressions and sheets to the Job
job-sheets	May add one or more impressions and sheets to the Job
multiple-document-handling	For the value 'single-document', duplex Jobs may have a reduced number of sheets per copy when the input documents produce an odd number of impressions; also see copies, imposition-template, job-copies, and number-up
number-up	Generally a divisor for impressions and sheets
overrides	Can override any Job Template attribute (except overrides)
page-ranges	Changes the number of input pages that are processed, thus changing the impressions and sheets accordingly
proof-print	Overrides the copies and job-copies values
separator-sheets	'slip-sheets': adds one impression and sheet between each set in a Job 'start-sheet' and 'end-sheet': adds one impression and sheet for each set in a Job 'both-sheets': adds two impressions and sheets for each set in a Job
sides	For 'two-sided-long-edge' and 'two-sided-short-edge', generally makes sheets half of the number of impressions; also see copies, job-copies, multiple-document-handling, and sheet-collate

2146 **12. Obsolete Attributes**

2147 Table 16 lists the attributes that are OBSOLETE.

2148

**Table 16 - Obsolete Attributes**

Attribute	Explanation
job-cover-back	
job-cover-front	
pages-completed-current-copy	RFC 3381 is obsolete
pages-per-subset	Redundant with "job-pages-per-set" [PWG5100.1]
sheet-collate	

2149 **13. Obsolete Values**

2150 Table 17 lists the attribute values that are OBSOLETE.

2151

**Table 17 - Obsolete Values**

Attribute	Value	Explanation
ipp-features-supported	'job-save'	The "Job Save and Reprint" will be obsoleted in the process of obsoleting PWG 5100.11

2152 **14. Conformance Requirements**2153 This section summarizes the Conformance Requirements detailed in the definitions in this  
2154 document for Clients and Printers.2155 **14.1 Conformance Requirements for this Specification**2156 In order for a Client and a Printer to claim conformance to this specification a Client MUST  
2157 be able to supply and a Printer MUST support the following:

- 2158 1. "document-metadata" (sections 6.1.1 and 6.3.1)
- 2159 2. "requesting-user-uri" (section 6.1.6)
- 2160 3. "job-originating-user-uri" (section 6.4.1)
- 2161 4. "print-color-mode" (section 6.2.3)
- 2162 5. "print-rendering-intent" (section 6.2.4)

- 2163 6. "job-uuid" (section 6.4.5)
- 2164 7. "ipp-features-supported" (section 6.8.4)
- 2165 8. The "printer-get-attributes-supported" (section 6.8.20) Printer Description
- 2166 attribute
- 2167 9. The "printer-icons" (section 6.8.22) Printer Description attribute
- 2168 10. "printer-organization" (section 6.8.25)
- 2169 11. "printer-organizational-unit" (section 6.8.26)
- 2170 12. The "printer-uuid" (section 6.9.8) Printer Status attribute

## 2171 **14.2 Conditional Conformance Requirements for Printer Objects**

2172 To claim conformance to this specification, Printers conforming to IPP Event Notifications  
2173 and Subscriptions [RFC3995] MUST support the following:

- 2174 1. The "first-index" (section 6.1.3) operation attribute
- 2175 2. The "notify-subscription-uuid" (section 6.5.1) Subscription Description attribute
- 2176 3. The "printer-config-change-time" (section 6.9.4) Printer Description attribute.

2177 To claim conformance to this specification, Printers conforming to the Standard for IPP  
2178 Document Object [PWG5100.5] MUST support the following:

- 2179 1. The Validate-Document (section 5.2) operation
- 2180 2. The "document-metadata" (section 6.6.1) Document Description attribute
- 2181 3. The "document-uuid" (section 6.7.1) Document Description attribute
- 2182 4. The "print-color-mode" (section 6.2.3) Document Template attribute
- 2183 5. The "print-rendering-intent" (section 6.2.4) Document Template attribute
- 2184

- 2185 To claim conformance for the OPTIONAL Identify-Printer operation (section 5.1), Printers  
2186 MUST support the following:
- 2187 1. The "identify-actions" (section 6.1.4) operation attribute
  - 2188 2. The "identify-actions-default" (section 6.8.1) Printer Description attribute
  - 2189 3. The "identify-actions-supported" (section 6.8.3) Printer Description attribute.
- 2190 To claim conformance for the OPTIONAL "printer-icc-profiles" (section 6.8.21) Printer  
2191 attribute, Printers MUST support:
- 2192 1. The "print-rendering-intent" (section 6.2.4) Job Template attribute, and
  - 2193 2. The "print-rendering-intent-default" (section 6.8.14) and "print-rendering-intent-  
2194 supported" (section 6.8.16) Printer Description attributes.
- 2195 To claim conformance for the REQUIRED "requesting-user-uri" (section 6.1.6) operation  
2196 attribute, Printers conforming to IPP Event Notifications and Subscriptions [RFC3995] MUST  
2197 support the "notify-subscriber-user-uri" (section 6.5.2) Subscription attribute, and vice-versa.
- 2198 To claim conformance for the OPTIONAL "pages-per-subset" (section 6.2) attribute, Printers  
2199 MUST support the "pages-per-subset-supported" Printer Description attribute, and vice-  
2200 versa.
- 2201 To claim conformance for the OPTIONAL "document-password" (section 6.1.2) operation  
2202 attribute, Printers MUST support the following:
- 2203 1. The "document-password-supported" (section 6.8.1) Printer Description attribute
  - 2204 2. The 'document-password-error' and 'document-permission-error' (section 8.1)  
2205 keywords for the "document-state-reasons" and "job-state-reasons" attributes
  - 2206 3. The 'client-error-document-password-error' (section 9.1) and 'client-error-  
2207 document-permission-error' (section 9.2) status codes.
  - 2208 4. Transport Layer Security 1.2 [RFC5246] or higher
  - 2209 5. Upgrading to TLS Within HTTP/1.1 [RFC2817].
  - 2210 6. Negotiation of a TLS session prior to accepting a request containing the  
2211 "document-password" operation attribute
- 2212 To claim conformance for the OPTIONAL job ticket preflighting using the Validate-Job  
2213 operation, Printers MUST support:
- 2214 1. The "preferred-attributes" (section 6.1.5) operation attribute, and
  - 2215 2. The "preferred-attributes-supported" (section 6.8.11) Printer Description  
2216 attribute.
- 2217 To claim conformance for the OPTIONAL "job-constraints-supported" (section 6.8.5) Printer  
2218 Description attribute, Printers MUST support the "job-resolvers-supported" (section 6.8.8)  
2219 Printer Description attribute, and vice-versa.

2220 To claim conformance for the OPTIONAL "printer-strings-uri" (section 6.8.29) Printer  
2221 Description attribute, Printers MUST supply the "printer-strings-languages-supported"  
2222 (section 6.8.28) Printer Description attribute, and vice-versa.

2223 To claim conformance for the OPTIONAL "printer-supply" (section 6.8.28) Printer  
2224 Description attribute, Printers MUST supply the "printer-supply-description" (section 6.9.6)  
2225 Printer Description attribute, and vice-versa.

2226 To claim conformance for the OPTIONAL Create-Job operation, Printers MUST support the  
2227 "multiple-operation-time-out-action" (section 6.8.9) Printer Description attribute.

2228 To claim conformance for the OPTIONAL Paid Imaging Services, Printers MUST support  
2229 the following:

- 2230 1. The "printer-charge-info" (section 6.8.11) Printer Description attribute
- 2231 2. The "printer-charge-info-uri" (section 6.8.10) Printer Description attribute
- 2232 3. The "printer-mandatory-job-attributes" (section 6.8.23) Printer Description  
2233 attribute

2234 To claim conformance for the OPTIONAL Kerberized Printing, Printers MUST support the  
2235 following:

- 2236 1. HTTP Negotiate authentication based on SPNEGO-based Kerberos and NTLM  
2237 HTTP Authentication in Microsoft Windows [RFC4559]
- 2238 2. The 'negotiate' value (section 8.7) in the "uri-authentication-supported" Printer  
2239 Description attribute

## 2240 **14.3 Conditional Conformance Requirements for Clients**

2241 To claim conformance for the OPTIONAL "document-password" (section 6.1.2) operation  
2242 attribute, Clients MUST support the following:

- 2243 1. Transport Layer Security 1.2 [RFC5246] or higher and Upgrading to TLS Within  
2244 HTTP/1.1 [RFC2817]
- 2245 2. Negotiation of a TLS session prior to sending a request containing the  
2246 "document-password" operation attribute

## 2247 **14.4 HTTP Recommendations**

2248 In order to support efficient retrieval of printer icons, ICC profiles, and localization files,  
2249 Clients SHOULD provide and Printers SHOULD support the If-Modified-Since request  
2250 header [RFC7232] to allow Clients to locally cache these resources to minimize network  
2251 bandwidth usage and provide a responsive user interface. HTTP caching semantics  
2252 [RFC7234], particularly with HTTP proxies [RFC7230] MUST be followed.

## 2253 15. Internationalization Considerations

2254 For interoperability and basic support for multiple languages, conforming implementations  
2255 MUST support:

- 2256 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)  
2257 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 2258 2. The Unicode Format for Network Interchange [RFC5198] which requires  
2259 transmission of well-formed UTF-8 strings and recommends transmission of  
2260 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

2261 Unicode NFC is defined as the result of performing Canonical Decomposition (into base  
2262 characters and combining marks) followed by Canonical Composition (into canonical  
2263 composed characters wherever Unicode has assigned them).

2264 WARNING – Performing normalization on UTF-8 strings received from Clients and  
2265 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client  
2266 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now  
2267 'hidden').

2268 Implementations of this specification SHOULD conform to the following standards on  
2269 processing of human-readable Unicode text strings, see:

2270 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

2271 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

2272 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

2273 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

2274 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

2275 Unicode Collation Algorithm [UTS10] – sorting

2276 Unicode Locale Data Markup Language [UTS35] – locale databases

2277 Implementations of this specification are advised to also review the following informational  
2278 documents on processing of human-readable Unicode text strings:

2279 Unicode Character Encoding Model [UTR17] – multi-layer character model

2280 Unicode Character Property Model [UTR23] – character properties

2281 Unicode Conformance Model [UTR33] – Unicode conformance basis

## 2282 **16. Security Considerations**

2283 The IPP extensions defined in this document require the same security considerations as  
2284 defined in the Internet Printing Protocol/1.1 [STD92].

2285 Implementations of this specification SHOULD conform to the following standard on  
2286 processing of human-readable Unicode text strings, see:

2287       Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

2288 Implementations of this specification are advised to also review the following informational  
2289 document on processing of human-readable Unicode text strings:

2290       Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

2291 The "document-password" (section 6.1.2) operation attribute MUST be treated as private  
2292 and confidential, MUST be retained for as long as the corresponding Job and Document are  
2293 retained, MUST NOT be persisted beyond the life of the Job or Document, and MUST NOT  
2294 be returned to Clients in any IPP response.

## 2295 **17. IANA Considerations**

### 2296 **17.1 MIME Media Type Registration**

2297 Name : Michael Sweet

2298 E-mail : msweet@apple.com

2299 MIME media type name : text

2300 MIME subtype name : Standards Tree – strings

2301 Required parameters : NONE

2302 Optional parameters : NONE

2303 Encoding considerations :

2304       UTF-8 encoded Unicode text.

2305 Security considerations :

2306       Localized strings may be arbitrarily large and could potentially cause a denial-of-  
2307 service.

2308       Localized strings may contain printf-style format characters that could cause a  
2309 program to display unintended information or crash.

2310 Interoperability considerations :

2311 NONE

2312 Published specification :

2313 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-5100.13.pdf)  
2314 5100.13.pdf

2315 Applications which use this media :

2316 All Cocoa, NeXTStep, and OpenStep applications

2317 CUPS

2318 IPP Everywhere

2319 Additional information :

2320 1. Magic number(s) :

2321 2. File extension(s) :

2322 strings

2323 3. Macintosh file type code :

2324 Person to contact for further information :

2325 1. Name : Michael Sweet

2326 2. E-mail : msweet@apple.com

2327 Intended usage : Common

2328 Used for providing localizations of English keywords and numeric values.

2329 Author/Change controller :

2330 The Printer Working Group

2331 c/o The IEEE Industry Standards and Technology Organization

2332 445 Hoes Lane

2333 Piscataway, NJ 08854

2334 USA

## 2335 17.2 Attribute Registrations

2336 The attributes defined in this specification will be published by IANA according to the  
2337 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

2338	<a href="http://www.iana.org/assignments/ipp-registrations">http://www.iana.org/assignments/ipp-registrations</a>	
2339	The registry entries will contain the following information:	
2340	Operation attributes:	Reference
2341	-----	-----
2342	document-metadata (1setOf octetString(MAX))	[PWG5100.13]
2343	document-password (octetString(1023))	[PWG5100.13]
2344	first-index (integer(1:MAX))	[PWG5100.13]
2345	identify-actions (1setOf type2 keyword)	[PWG5100.13]
2346	preferred-attributes (collection)	[PWG5100.13]
2347	<Any Template attribute>	[PWG5100.13]
2348	requesting-user-uri (uri)	[PWG5100.13]
2349		
2350	Job Template attributes:	Reference
2351	-----	-----
2352	job-error-action (type2 keyword)	[PWG5100.13]
2353	pages-per-subset (1setOf integer(1:MAX))	[PWG5100.13]
2354	print-color-mode (type2 keyword)	[PWG5100.13]
2355	print-rendering-intent (type2 keyword)	[PWG5100.13]
2356		
2357	Job Description attributes:	Reference
2358	-----	-----
2359	document-metadata (1setOf octetString(MAX))	[PWG5100.13]
2360	job-originating-user-uri (uri)	[PWG5100.13]
2361	job-pages (integer(0:MAX))	[PWG5100.13]
2362	job-pages-completed (integer(0:MAX))	[PWG5100.13]
2363	job-pages-completed-current-copy (integer(0:MAX))	[PWG5100.13]
2364	job-uuid (uri(45))	[PWG5100.13]
2365		
2366	Document Template attributes:	Reference
2367	-----	-----
2368	print-color-mode (type2 keyword)	[PWG5100.13]
2369	print-rendering-intent (type2 keyword)	[PWG5100.13]
2370		
2371	Document Description attributes:	Reference
2372	-----	-----
2373	document-metadata (1setOf octetString(MAX))	[PWG5100.13]
2374	document-uuid (uri(45))	[PWG5100.13]
2375	pages (integer(0:MAX))	[PWG5100.13]
2376	pages-completed (integer(0:MAX))	[PWG5100.13]
2377	pages-completed-current-copy (integer(0:MAX))	[PWG5100.13]
2378		
2379	Printer Description attributes:	Reference
2380	-----	-----
2381	device-service-count (integer(1:MAX))	[PWG5100.13]
2382	device-uuid (uri(45))	[PWG5100.13]
2383	document-password-supported (integer(0:1023))	[PWG5100.13]
2384	identify-actions-default (1setOf type2 keyword)	[PWG5100.13]
2385	identify-actions-supported (1setOf type2 keyword)	[PWG5100.13]
2386	ipp-features-supported (1setOf type2 keyword)	[PWG5100.13]
2387	job-constraints-supported (1setOf collection)	[PWG5100.13]
2388	job-error-action-default (type2 keyword)	[PWG5100.13]
2389	job-error-action-supported (1setOf type2 keyword)	[PWG5100.13]
2390	job-resolvers-supported (1setOf collection)	[PWG5100.13]
2391	multiple-operation-time-out-action (type2 keyword)	[PWG5100.13]

2392	pages-per-subset-supported (boolean)	[PWG5100.13]
2393	preferred-attributes-supported (boolean)	[PWG5100.13]
2394	print-color-mode-default (type2 keyword)	[PWG5100.13]
2395	print-color-mode-supported (1setOf type2 keyword)	[PWG5100.13]
2396	print-rendering-intent-default (type2 keyword)	[PWG5100.13]
2397	print-rendering-intent-supported (1setOf type2 keyword)	[PWG5100.13]
2398	printer-charge-info (text(MAX))	[PWG5100.13]
2399	printer-charge-info-uri (uri)	[PWG5100.13]
2400	printer-geo-location (uri)	[PWG5100.13]
2401	printer-get-attributes-supported (1setOf type2 keyword)	[PWG5100.13]
2402	printer-icc-profiles (1setOf collection)	[PWG5100.13]
2403	<Any Template attribute>	[PWG5100.13]
2404	profile-name (name(MAX))	[PWG5100.13]
2405	profile-url (uri)	[PWG5100.13]
2406	printer-icons (1setOf uri)	[PWG5100.13]
2407	printer-mandatory-job-attributes (1setOf type2 keyword)	[PWG5100.13]
2408	printer-organization (1setOf text(MAX))	[PWG5100.13]
2409	printer-organizational-unit (1setOf text(MAX))	[PWG5100.13]
2410	printer-supply (1setOf octetString(MAX))	[PWG5100.13]
2411	printer-supply-description (1setOf text(MAX))	[PWG5100.13]
2412	printer-supply-info-uri (uri)	[PWG5100.13]
2413	printer-uuid (uri(45))	[PWG5100.13]
2414	requesting-user-uri-supported (boolean)	[PWG5100.13]
2415		
2416	Subscription Description attributes:	Reference
2417	-----	-----
2418	notify-subscriber-user-uri (uri)	[PWG5100.13]
2419	notify-subscription-uuid (uri)	[PWG5100.13]
2420		

## 2421 17.3 Type2 keyword Registrations

2422 The keyword values defined in this specification will be published by IANA according to the  
2423 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

2424 <http://www.iana.org/assignments/ipp-registrations>

2425 The registry entries will contain the following information:

2426	Attributes (attribute syntax)	
2427	Keyword Attribute Value	Reference
2428	-----	-----
2429	document-state-reasons (1setOf type2 keyword)	[PWG5100.5]
2430	document-password-error	[PWG5100.13]
2431	document-permission-error	[PWG5100.13]
2432	document-security-error	[PWG5100.13]
2433	document-unprintable-error	[PWG5100.13]
2434		
2435	identify-actions (1setOf type2 keyword)	[PWG5100.13]
2436	display	[PWG5100.13]
2437	flash	[PWG5100.13]
2438	sound	[PWG5100.13]
2439	speak	[PWG5100.13]
2440	identify-actions-default (1setOf type2 keyword)	[PWG5100.13]

2441	<Any "identify-actions" keyword value>	[PWG5100.13]
2442	identify-actions-supported (1setOf type2 keyword)	[PWG5100.13]
2443	<Any "identify-actions" keyword value>	[PWG5100.13]
2444	ipp-features-supported (1setOf type2 keyword)	[PWG5100.13]
2445	document-object	[PWG5100.13]
2446	job-save	[PWG5100.13]
2447	none	[PWG5100.13]
2448	page-overrides	[PWG5100.13]
2449	proof-print	[PWG5100.13]
2450	subscription-object	[PWG5100.13]
2451		
2452	job-error-action (type2 keyword)	[PWG5100.13]
2453	abort-job	[PWG5100.13]
2454	cancel-job	[PWG5100.13]
2455	continue-job	[PWG5100.13]
2456	suspend-job	[PWG5100.13]
2457	job-error-action-default (type2 keyword)	[PWG5100.13]
2458	<Any "job-error-action" keyword value>	[PWG5100.13]
2459	job-error-action-supported (1setOf type2 keyword)	[PWG5100.13]
2460	<Any "job-error-action" keyword value>	[PWG5100.13]
2461		
2462	job-state-reasons (1setOf type2 keyword)	[RFC8011]
2463	document-password-error	[PWG5100.13]
2464	document-permission-error	[PWG5100.13]
2465	document-security-error	[PWG5100.13]
2466	document-unprintable-error	[PWG5100.13]
2467		
2468	multiple-operation-time-out-action (type2 keyword)	[PWG5100.13]
2469	abort-job	[PWG5100.13]
2470	hold-job	[PWG5100.13]
2471	process-job	[PWG5100.13]
2472		
2473	print-color-mode (type2 keyword)	[PWG5100.13]
2474	auto	[PWG5100.13]
2475	auto-monochrome	[PWG5100.13]
2476	bi-level	[PWG5100.13]
2477	color	[PWG5100.13]
2478	highlight	[PWG5100.13]
2479	monochrome	[PWG5100.13]
2480	process-bi-level	[PWG5100.13]
2481	process-monochrome	[PWG5100.13]
2482	print-color-mode-default (type2 keyword)	[PWG5100.13]
2483	<Any "print-color-mode" keyword value>	[PWG5100.13]
2484	print-color-mode-supported (1setOf type2 keyword)	[PWG5100.13]
2485	<Any "print-color-mode" keyword value>	[PWG5100.13]
2486		
2487	print-content-optimize (type2 keyword)	[PWG5100.7]
2488	auto	[PWG5100.13]
2489		
2490	print-rendering-intent (type2 keyword)	[PWG5100.13]
2491	absolute	[PWG5100.13]
2492	auto	[PWG5100.13]
2493	perceptual	[PWG5100.13]
2494	relative	[PWG5100.13]
2495	relative-bpc	[PWG5100.13]
2496	saturation	[PWG5100.13]

2497	print-rendering-intent-default (type2 keyword)	[PWG5100.13]
2498	<Any "print-rendering-intent" keyword value>	[PWG5100.13]
2499	print-rendering-intent-supported (1setOf type2 keyword)	[PWG5100.13]
2500	<Any "print-rendering-intent" keyword value>	[PWG5100.13]
2501		
2502	printer-get-attributes-supported (1setOf type2 keyword)	[PWG5100.13]
2503	<Any Job Template attribute>	
2504	<Any Operation attribute at the job level>	
2505		
2506	printer-mandatory-job-attributes (1setOf type2 keyword)	[PWG5100.13]
2507	<Any Job Template attribute>	
2508	<Any Operation attribute at the job level>	
2509		
2510	printer-state-reasons (1setOf type2 keyword)	[RFC8011]
2511	cleaner-life-almost-over	[PWG5100.13]
2512	cleaner-life-over	[PWG5100.13]
2513		
2514	uri-authentication-supported (1setOf type2 keyword)	[RFC8011]
2515	negotiate	[PWG5100.13]

## 2516 17.4 Type2 enum Registrations

2517 The enum values defined in this specification will be published by IANA according to the  
2518 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

2519 <http://www.iana.org/assignments/ipp-registrations>

2520 The registry entries will contain the following information:

2521	Attributes (attribute syntax)		
2522	Enum Value	Enum Symbolic Name	Reference
2523	-----	-----	-----
2524	finishings (1setOf type2 enum)		[RFC8011]
2525	60	trim-after-pages	[PWG5100.13]
2526	61	trim-after-documents	[PWG5100.13]
2527	62	trim-after-copies	[PWG5100.13]
2528	63	trim-after-job	[PWG5100.13]
2529			
2530	operations-supported (1setOf type2 enum)		[RFC8011]
2531	0x003C	Identify-Printer	[PWG5100.13]
2532	0x003D	Validate-Document	[PWG5100.13]
2533			
2534	orientation-requested (type2 enum)		[RFC8011]
2535	7	none	[PWG5100.13]

## 2536 17.5 Operation Registrations

2537 The operations defined in this specification will be published by IANA according to the  
2538 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

2539 <http://www.iana.org/assignments/ipp-registrations>

2540 The registry entries will contain the following information:

2541	Operation Name	Reference
2542	-----	-----
2543	Create-Job (extension)	[PWG5100.13]
2544	Create-Job-Subscription (extension)	[PWG5100.13]
2545	Create-Printer-Subscription (extension)	[PWG5100.13]
2546	Get-Documents (extension)	[PWG5100.13]
2547	Get-Jobs (extension)	[PWG5100.13]
2548	Get-Printer-Attributes (extension)	[PWG5100.13]
2549	Get-Subscriptions (extension)	[PWG5100.13]
2550	Identify-Printer	[PWG5100.13]
2551	Print-Job (extension)	[PWG5100.13]
2552	Print-URI (extension)	[PWG5100.13]
2553	Send-Document (extension)	[PWG5100.13]
2554	Send-URI (extension)	[PWG5100.13]
2555	Validate-Document	[PWG5100.13]
2556	Validate-Job (extension)	[PWG5100.13]

## 2557 17.6 Status Code Registrations

2558 The status codes defined in this specification will be published by IANA according to the  
2559 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

2560 <http://www.iana.org/assignments/ipp-registrations>

2561 The registry entries will contain the following information:

2562	Value	Status Code Name	Reference
2563	-----	-----	-----
2564	0x0400:0x04FF	- Client Error:	
2565	0x0418	client-error-document-password-error	[PWG5100.13]
2566	0x0419	client-error-document-permission-error	[PWG5100.13]
2567	0x041A	client-error-document-security-error	[PWG5100.13]
2568	0x041B	client-error-document-unprintable-error	[PWG5100.13]

## 2569 18. Overview of Changes

### 2570 18.1 IPP Job and Printer Extensions Set 3 v.1.1

2571 The following changes were made to the previous version of this specification  
2572 [PWG5100.13-2012]:

- 2573 • Resolved all errata from PWG errata tracking site  
2574 (<https://www.pwg.org/dynamo/issues.php?L+P-1+S-2+I0+E0+Z13+Q>)
- 2575 • Added message catalog syntax extensions and semantics for "\_tooltip" and "\_helpurl"  
2576 (content from the latest draft of HELPME)

- 2577 • Added "soft-proof-icc-profiles" and "print-quality-hints-supported" (content from the  
2578 latest draft of PQI)
- 2579 • Added extensions to "print-color-mode" and "print-quality" (content from the latest  
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## 2769 **21. Change History**

### 2770 **21.1 July 24, 2019**

2771 Copied in definitions for "soft-proof-icc-profiles" and "print-quality-hints-supported" and  
2772 extensions for "print-color-mode" and "print-quality" (from the latest draft of PQI). Also  
2773 resolved the following feedback from Mike Sweet's email to the IPP WG reflector:

- 2774 • Drop "-5100.13" from the filename (that's just for published documents)
- 2775 • Global: remove section references for all of the STD92 stuff (which would have been  
2776 RFC2911 sections - they don't match up)
- 2777 • Global: fix "reference not found" issues (section 5.6.7 at least)
- 2778 • I think much of the 1.x content should be moved to a new section 4 model, with the  
2779 new operations starting in section 5 (in keeping with our current template)
- 2780 • pages-per-subset should be deprecated, per our prior discussions on the subject  
2781 (finishings 2.1 has the job-pages-per- set attribute)

- 2782 • Might as well add the "auto-monochrome" value for print-color-mode as  
2783 RECOMMENDED.
- 2784 • Section 5.3 attributes that are READ-ONLY should be moved to a new Job Status  
2785 Attributes section.
- 2786 • Section 5.4 should be "Subscription Status Attributes"
- 2787 • Section 5.5 attributes that are READ-ONLY should be moved to a new Document  
2788 Status Attributes section.
- 2789 • Section 5.5.3 (pages) attribute is READ-WRITE (Document Description), per prior  
2790 registry correction
- 2791 • Section 5.5.5 (pages-completed-current-copy) should be obsoleted since RFC 3381  
2792 has been obsoleted
- 2793 • Section 5.6 attributes that are READ-ONLY should be moved to a new Printer Status  
2794 Attributes section.
- 2795 • Section 5.6.7, table 5: obsolete "job-save" since that spec is getting obsoleted, move  
2796 "proof-print" to the new EPX spec? - Section 5.6.8: The examples seem to have a  
2797 mix of quote styles, maybe "1setOf syntax" instead of "1setOf <type-def-  
2798 template-attribute>"
- 2799 • Global: Remove all of the media-xxx attributes since those are part of Job Extensions  
2800 v2.0
- 2801 • Section 5.6.17, table 6: fix title ("multiple-operation-time-out-action")
- 2802 • Section 5.6.18: Obsolete
- 2803 • Section 5.6.29 (printer-get-attributes-supported): Drop 'type2'
- 2804 • Section 5.6.33 (printer-mandatory-job-attributes): Drop 'type2'
- 2805 • Section 5.6.39.4 example should probably be expanded to include yellow and black  
2806 (to be realistic), along with a wasteToner or wastelnk entry?
- 2807 • Section 5.6.40.2 sync up with printer-supply example changes
- 2808 • Section 6.10: Remove (all media-col stuff is in JOBEXT 2.0)
- 2809 • Section 7.2: Remove? I think these are now defined in Finishings 2.1?
- 2810 • Sections 7.6 and 7.7: Remove (all media-col stuff is in JOBEXT 2.0)

- 2811 • Section 9.1: Example on lines 1878 to 1881 uses left/right quotes instead of straight  
2812 quotes
- 2813 • Section 10: Might want to wordsmith this now that STD92 has clarified things? Line  
2814 1985 also has a typo ("page-range" instead of "page-ranges").
- 2815 • Table 15: Remove (obsolete) job-cover-back and job-cover-front attributes, change  
2816 "pages-ranges" to "page-ranges", remove (obsolete) sheet-collate,
- 2817 • Section 11.2: "printer-config-change-time" (not printer-description-change-time),  
2818 remove media-xxx references.
- 2819 • Global: Update RFC2616 references to the corresponding new RFC723x RFCs...
- 2820 • Section 16: Drop "using Address style", you should be listed as primary author,  
2821 move/update others as appropriate
- 2822 References to PWG 5100.11 were left largely unchanged because it and related  
2823 documents are in a state of flux.
- 2824 **21.2 July 10, 2019**
- 2825 Initial revision for v1.1.
- 2826 • Copied all content from previous JPS3 MS Word document into latest template
- 2827 • Resolved all errata from PWG errata tracking site  
2828 (<https://www.pwg.org/dynamo/issues.php?L+P-1+S-2+I0+E0+Z13+Q>)
- 2829 • Copied in message catalog syntax extensions and semantics for "\_tooltip" and  
2830 "\_helpurl" from the latest draft of HELPME
- 2831 • Copied in extensions for "print-color-mode", "print-quality", from the latest draft of PQI