



The Printer Working Group

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Working Draft

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**IPP Job Extensions v1.1  
(JOBEXT)**

Status: Interim

Abstract: This specification defines IPP attributes and values for fine-grained fidelity, Document processing, and status reporting for issues encountered during processing.

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-ippjobext11-20181023.docx>  
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77 multiple independent and interoperable implementations. Printer manufacturers and  
78 vendors of printer related software benefit from the interoperability provided by voluntary  
79 conformance to these standards.

80 For additional information regarding the Printer Working Group visit:

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## 176 **1. Introduction**

177 This specification defines IPP attributes and values for fine-grained fidelity, Document  
178 processing, and status reporting for issues encountered during processing.

179 This specification obsoletes portions of the previous version of this specification  
180 [PWG5100.7-2003]. A list of changes can be found in section 14.

### 181 **1.1 Document Natural Language and Character Set**

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

### 189 **1.2 Attribute Fidelity**

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

### 194 **1.3 Rendering Optimizations**

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

### 200 **1.4 Printing on a Specific Output Device**

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

### 204 **1.5 Results of Job/Document Processing**

205 The Internet Printing Protocol/1.1 [STD92] defines some Job Status attributes and values  
206 but none of them provide information about processing issues that do not prevent a Job or

207 Document from being printed. This specification defines attributes and values for discovering  
208 those processing issues.

## 209 **1.6 Obsolete Attributes and Values**

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

## 213 **2. Terminology**

### 214 **2.1 Conformance Terminology**

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

### 220 **2.2 Printing Terminology**

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

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

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

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

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

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

### 233 **2.3 Protocol Role Terminology**

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

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

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

## 241 **2.4 Other Terminology**

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

245 *Finished Document*: the result that the Printer produces on Sheets after the operations of  
246 printing, folding, cutting, finishing, etc. are completed.

247 *Job Attribute*: an Operation attribute or a Job Template attribute that applies to the Job  
248 (object) as a whole. For example, “job-name” is an Operation attribute and “job-priority” is  
249 a Job Template attribute.

250 *Job Creation Operation*: operations that create Job objects, specifically: Print-Job, Print-URI,  
251 and Create-Job as defined in [rfc2911].

252 *Operation Attribute*: an attribute supplied by a client in the Operation Attribute group of a  
253 request in order to affect the behavior of the operation or an attribute returned by the Printer  
254 in the Operation Attributes group in an operation response in order to report the results of  
255 the operation. For some Operation attributes, the Printer copies the values supplied by the  
256 client to corresponding Job Description attributes.

257 *Page*: The term "Page" used throughout this document is a synonym for PDL page.

258 *PDL Page*: A "PDL Page" is a page according to the definition of pages in the language used  
259 to express the document data. Note: If the PDL contains multiple original source pages  
260 that have been placed on a single page by the client application, then the PDL page count  
261 is one. On the other hand, if the client requests that multiple PDL Pages are placed on a  
262 single side of media, by supplying “number-up” with a value greater than 1, then the PDL  
263 page count will be more than one. [rfc2911] uses the term “print stream page” for PDL Page.

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

## 266 **2.5 Acronyms and Organizations**

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

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



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

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

## 271 **3. Requirements**

### 272 **3.1 Rationale**

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

- 277 1. Define attributes and values that specify the Document character set and  
278 rendering optimizations;
- 279 2. Define an attribute for doing selective fidelity enforcement;
- 280 3. Define a media size for automatically printing Documents on the correct size;  
281 and
- 282 4. Define attributes and values that allow a Client to discover the results of  
283 Document processing.

### 284 **3.2 Use Cases**

#### 285 **3.2.1 Print a Plain Text File**

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

#### 289 **3.2.2 Print a Document Using a Matching Size**

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

#### 293 **3.2.3 Force a Document to Print on a Specific Media Size**

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

#### 297 **3.2.4 Print a Presentation with Best Quality**

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

### 300 **3.2.5 Print Using a Specific Output Device**

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

### 304 **3.2.6 Monitor Whether Jobs are Printed Correctly**

305 Mary is the administrator for the office printers and wants to know whether users are having  
306 difficulty printing their documents. She uses Client software to query the history of jobs on  
307 each printer, including any errors or warnings that were encountered during processing.

## 308 **3.3 Exceptions**

### 309 **3.3.1 Too Many Jobs on a Printer**

310 Jane has several documents to print for a meeting. While submitting the documents for  
311 printing from her Client software, the printer responds that there are too many queued jobs.

### 312 **3.3.2 Too Many Documents in a Job**

313 Bob is submitting multiple documents in a single job. While submitting the documents from  
314 his Client software, the printer responds that there are too many documents in the job.

## 315 **3.4 Out of Scope**

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

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

## 319 **3.5 Design Requirements**

320 The design requirements for this specification are:

- 321 1. Define attributes for supported languages and character sets in Document data;
- 322 2. Define attributes and values to describe the kind of processing optimizations that  
323 should be performed on Document data;
- 324 3. Define an attribute to specify fidelity requirements;
- 325 4. Define attributes to select an Output Device for printing;
- 326 5. Define attributes and values to report processing errors and warnings; and
- 327 6. Define sections to register all attributes, values, and operations with IANA.

328

## 329 **4. New Attributes**

### 330 **4.1 Operation Attributes**

#### 331 **4.1.1 job-mandatory-attributes (1setOf keyword)**

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

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

### 343 **4.2 Document and Job Status Attributes**

#### 344 **4.2.1 errors-count (integer(0:MAX))**

345 This attribute reports the number of errors encountered processing the Job as a whole. An  
346 error is reported when some portion of the printed output is not present, such as a glyph  
347 encountered which isn't in a Printer's font or an image in a page was in a format that the  
348 Printer didn't support, though the Printer did support the overall Document format.

#### 349 **4.2.2 print-content-optimize-actual (1setOf type2 keyword)**

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

#### 352 **4.2.3 warnings-count (integer(0:MAX))**

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

### 356 **4.3 Document and Job Template Attributes**

#### 357 **4.3.1 output-device (name(127))**

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

### 361 **4.3.2 print-content-optimize (type2 keyword)**

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

364 'graphics': Graphs and line drawings.

365 'photo': Photographs.

366 'text': Text.

367 'text-and-graphics': Text and graphics.

## 368 **4.4 Printer Description Attributes**

### 369 **4.4.1 document-charset-default (charset)**

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

### 374 **4.4.2 document-charset-supported (1setOf charset)**

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

### 378 **4.4.3 document-natural-language-default (naturalLanguage)**

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

### 383 **4.4.4 document-natural-language-supported (1setOf naturalLanguage)**

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

### 386 **4.4.5 job-mandatory-attributes-supported (boolean)**

387 This attribute specifies whether the "job-mandatory-attributes" operation attribute (section  
388 4.1.1) is supported. Printers that support the "job-mandatory-attributes" operation attribute  
389 SHOULD support this attribute.

#### 390 **4.4.6 output-device-supported (1setOf name(127))**

391 This attribute lists the supported “output-device” values. Printers MUST support this attribute  
392 if the "output-device" Job Template attribute (section 4.3.1) is supported.

#### 393 **4.4.7 print-content-optimize-default (type2 keyword)**

394 This attribute specifies the default “print-content-optimize” (section 4.3.2) value. Printers that  
395 support the "print-content-optimize" attribute MUST support this attribute.

#### 396 **4.4.8 print-content-optimize-supported (1setOf type2 keyword)**

397 This attribute lists the supported “print-content-optimize” (section 4.3.2) values. Printers that  
398 support the "print-content-optimize" attribute MUST support this attribute.

## 399 **5. New Values for Existing Attributes**

### 400 **5.1 job-state-reasons (1setOf type2 keyword)**

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

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

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

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

### 409 **5.2 media (type2 keyword | name(MAX))**

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

412       'choice\_iso\_a4\_210x297mm\_na\_letter\_8.5x11in': Print using US Letter or ISO A4  
413       media (whichever is available).

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

416

## 417 **6. New Status Codes**

418 This section defines additional status code values.

### 419 **6.1 server-error-too-many-jobs (0x050B)**

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

### 422 **6.2 server-error-too-many-documents (0x050C)**

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

## 426 **7. Obsolete Attributes**

### 427 **7.1 Obsolete Operation Attributes**

428 The following operation attributes from the previous version of this specification  
429 [PWG5100.7-2003] are now obsolete:

430 "document-digital-signature" (type2 keyword): This attribute only identifies the type  
431 of signature that is present in the Document data, but that information can be  
432 determined by examining the Document data.

433 "document-format-details" (1setOf collection): The member attributes and values  
434 cause serious interoperability and privacy issues.

435 "document-format-version" (text(127)): Free form text values cause serious  
436 interoperability issues when used as identifiers for processing data.

### 437 **7.2 Obsolete Job Status Attributes**

438 The following Job Status attributes from the previous version of this specification  
439 [PWG5100.7-2003] are now obsolete:

440 "compression-supplied" (type2 keyword): Data compression is used over the HTTP  
441 transport during the submission of Document data. Auditing of Printer bandwidth  
442 usage requires additional information such as the size of the IPP request and  
443 attached compressed document data.

444 "document-charset-supplied" (charset): This attribute has been superseded by the  
445 "document-charset" Document Status attribute.

- 446 "document-digital-signature-supplied" (type2 keyword): The corresponding Job  
447 Template attribute is obsolete.
- 448 "document-format-details-supplied" (1setOf collection): The corresponding Job  
449 Template attribute is obsolete.
- 450 "document-format-supplied" (mimeMediaType): This attribute has been superseded  
451 by the "document-format" Document Status attribute [PWG5100.5].
- 452 "document-format-version-supplied" (text(127)): The corresponding Job Template  
453 attribute is obsolete.
- 454 "document-message-supplied" (text(MAX)): This attribute has been superseded by  
455 the "document-message" Document Status attribute [PWG5100.5].
- 456 "document-name-supplied" (name(MAX)) : This attribute has been superseded by  
457 the "document-name" Document Status attribute [PWG5100.5].
- 458 "document-natural-language-supplied" (naturalLanguage): This attribute has been  
459 superseded by the "document-natural-language" Document Status attribute  
460 [PWG5100.5].
- 461 "ipp-attribute-fidelity" (boolean): This attribute is only used at time of Job creation.  
462 The "xxx-actual" Job Status attributes provide a receipt of attributes and values that  
463 were used when processing a Job and thus provide the necessary auditing  
464 information.
- 465 "job-copies-actual" (integer(1:MAX)): The corresponding Job Template attribute is  
466 obsolete.
- 467 "job-cover-back-actual" (collection): The corresponding Job Template attribute is  
468 obsolete.
- 469 "job-cover-front-actual" (collection): The corresponding Job Template attribute is  
470 obsolete.
- 471 "job-finishings-actual" (1setOf type2 enum): The corresponding Job Template  
472 attribute is obsolete.
- 473 "job-finishings-col-actual" (1setOf collection): The corresponding Job Template  
474 attribute is obsolete.
- 475 "job-mandatory-attributes" (1setOf keyword): This attribute is only used at time of  
476 Job creation. The "xxx-actual" Job Status attributes provide a receipt of attributes  
477 and values that were used when processing a Job and thus provide the necessary  
478 auditing information.

479 "output-device-actual" (1setOf name(127)): This attribute is redundant with the  
480 "output-device-assigned" attribute [STD92].

### 481 **7.3 Obsolete Job Template Attributes**

482 The following Job Templates attributes from the previous version of this specification  
483 [PWG5100.7-2003] are now obsolete:

484 "job-copies" (integer(1:MAX)): This attribute has poor interoperability with the  
485 "copies" Job Template attribute [STD92].

486 "job-cover-back" (collection): This attribute has poor interoperability with the "cover-  
487 back" Job Template attribute [PWG5100.3].

488 "job-cover-front" (collection): This attribute has poor interoperability with the "cover-  
489 front" Job Template attribute [PWG5100.3].

490 "job-finishings" (1setOf type2 enum): This attribute has poor interoperability with the  
491 "finishings" Job Template attribute [STD92].

492 "job-finishings-col" (1setOf collection): This attribute has poor interoperability with  
493 the "finishings-col" Job Template attribute [PWG5100.3].

### 494 **7.4 Obsolete Printer Description Attributes**

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

497 "document-digital-signature-default" (type2 keyword): The corresponding Job  
498 Template attribute is obsolete.

499 "document-digital-signature-supported" (1setOf type2 keyword): The corresponding  
500 Job Template attribute is obsolete.

501 "document-format-details-default" (collection): The corresponding operation attribute  
502 is obsolete.

503 "document-format-details-supported" (1setOf keyword): The corresponding  
504 operation attribute is obsolete.

505 "document-format-version-default" (text(127)): The corresponding operation  
506 attribute is obsolete.

507 "document-format-version-supported" (1setOf text(127)): The corresponding  
508 operation attribute is obsolete.



- 509 "job-copies-default" (integer(1:MAX)): The corresponding Job Template attribute is  
510 obsolete.
- 511 "job-copies-supported" (rangeOfInteger(1:MAX)): The corresponding Job Template  
512 attribute is obsolete.
- 513 "job-cover-back-default" (collection): The corresponding Job Template attribute is  
514 obsolete.
- 515 "job-cover-back-supported" (1setOf keyword): The corresponding Job Template  
516 attribute is obsolete.
- 517 "job-cover-front-default" (collection): The corresponding Job Template attribute is  
518 obsolete.
- 519 "job-cover-front-supported" (1setOf keyword): The corresponding Job Template  
520 attribute is obsolete.
- 521 "job-finishings-default" (1setOf type2 enum): The corresponding Job Template  
522 attribute is obsolete.
- 523 "job-finishings-ready" (1setOf type2 enum): The corresponding Job Template  
524 attribute is obsolete.
- 525 "job-finishings-supported" (1setOf type2 enum): The corresponding Job Template  
526 attribute is obsolete.
- 527 "job-finishings-col-default" (1setOf collection): The corresponding Job Template  
528 attribute is obsolete.
- 529 "job-finishings-col-ready" (1setOf collection): The corresponding Job Template  
530 attribute is obsolete.
- 531 "job-finishings-col-supported" (1setOf keyword): The corresponding Job Template  
532 attribute is obsolete.

## 533 **8. Obsolete Values**

### 534 **8.1 Obsolete "job-state-reasons" Values**

535 The following keyword values from the previous version of this specification [PWG5100.7-  
536 2003] are now obsolete:

- 537 'digital-signature-type-not-supported': This value is obsolete because the  
538 corresponding "document-digital-signature" Job Template attribute is obsolete.

539 'job-digital-signature-wait': This value is obsolete because the corresponding  
540 "document-digital-signature" Job Template attribute is obsolete.

## 541 **9. Additional Semantics for Existing Operations**

### 542 **9.1 Create-Job, Print-Job, Print-URI, Validate-Job: job-mandatory- 543 attributes**

544 This specification extends the Create-Job, Print-Job, Print-URI, and Validate-Job operations  
545 to support the "job-mandatory-attributes" operation attribute (section 4.1.1) in the request  
546 sent by the Client, which specifies a list of Job Template attributes that MUST be supported  
547 by the Printer for the request to be accepted.

548 If the "job-mandatory-attributes" operation attribute is supported, the Client MAY supply and  
549 the Printer MUST accept the "job-mandatory-attributes" operation attribute in any Job  
550 Creation or Validate-Job request.

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

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

### 556 **9.2 Create-Job, Print-Job, Print-URI: server-error-too-many-jobs Status 557 Code**

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

### 560 **9.3 Print-Job, Print-URI, Send-Document, Send-URI: server-error-too- 561 many-documents Status Code**

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

## 565 **10. Conformance Requirements**

### 566 **10.1 Printer Conformance Requirements**

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

- 568 1. The Job Status attributes defined in section 4.2 that correspond to any  
569 supported Job Template attributes defined in section 4.3;  
570 2. The Document Status attributes defined in section 4.2 that correspond to any  
571 supported Document Template attributes defined in section 4.3;  
572 3. The Printer Description attributes defined in section 4.4 that correspond to any  
573 supported Document/Job Template attributes defined in section 4.3;  
574 4. The additional values defined in section 5;  
575 5. The internationalization considerations defined in section 11; and  
576 6. The security considerations defined in section 12.

577 Printers that support the "job-mandatory-attributes" operation attribute (section 4.1.1) MUST  
578 also support the additional semantics defined in section 9.1.

## 579 **10.2 Client Conformance Requirements**

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

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

## 583 **11. Internationalization Considerations**

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

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

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

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

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

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

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

- 602 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]
- 603 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences
- 604 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization
- 605 Unicode Collation Algorithm [UTS10] – sorting
- 606 Unicode Locale Data Markup Language [UTS35] – locale databases

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

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

## 612 **12. Security Considerations**

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

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

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

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

- 620 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

## 621 **13. IANA Considerations**

### 622 **13.1 Attribute Registrations**

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

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

626 The registry entries will contain the following information:

627 Document Status attributes:	Reference
628 -----	-----

629	compression-supplied(obsolete) (type2 keyword)	[PWG5100.7]
630	document-charset-supplied(obsolete) (charset)	[PWG5100.7]
631	document-digital-signature-supplied(obsolete) (type2 keyword)	
632		[PWG5100.7]
633	document-format-details-supplied(obsolete) (1setOf collection)	
634		[PWG5100.7]
635	document-format-supplied(obsolete) (mimeType)	[PWG5100.7]
636	document-format-version-supplied(obsolete) (text(127))	[PWG5100.7]
637	document-message-supplied(obsolete) (text(MAX))	[PWG5100.7]
638	document-name-supplied(obsolete) (name(MAX))	[PWG5100.7]
639	document-natural-language-supplied(obsolete) (naturalLanguage)	
640		[PWG5100.7]
641	errors-count (integer(0:MAX))	[PWG5100.7]
642	output-device-actual(obsolete) (1setOf name(127))	[PWG5100.7]
643	print-content-optimize-actual (1setOf type2 keyword)	[PWG5100.7]
644	warnings-count (integer(0:MAX))	[PWG5100.7]
645		
646	Document Template attributes:	Reference
647	-----	-----
648	output-device (name(127))	[PWG5100.7]
649	print-content-optimize (type2 keyword)	[PWG5100.7]
650		
651	Job Status attributes:	Reference
652	-----	-----
653	compression-supplied(obsolete) (type2 keyword)	[PWG5100.7]
654	document-charset-supplied(obsolete) (charset)	[PWG5100.7]
655	document-digital-signature-supplied(obsolete) (type2 keyword)	
656		[PWG5100.7]
657	document-format-details-supplied(obsolete) (1setOf collection)	
658		[PWG5100.7]
659	document-format-supplied(obsolete) (mimeType)	[PWG5100.7]
660	document-format-version-supplied(obsolete) (text(127))	[PWG5100.7]
661	document-message-supplied(obsolete) (text(MAX))	[PWG5100.7]
662	document-name-supplied(obsolete) (name(MAX))	[PWG5100.7]
663	document-natural-language-supplied(obsolete) (naturalLanguage)	
664		[PWG5100.7]
665	errors-count (integer(0:MAX))	[PWG5100.7]
666	ipp-attribute-fidelity(obsolete) (boolean)	[PWG5100.7]
667	job-copies-actual(obsolete) (integer(1:MAX))	[PWG5100.7]
668	job-cover-back-actual(obsolete) (collection)	[PWG5100.7]
669	job-cover-front-actual(obsolete) (collection)	[PWG5100.7]
670	job-finishings-actual(obsolete) (1setOf type2 enum)	[PWG5100.7]
671	job-finishings-col-actual(obsolete) (1setOf collection)	[PWG5100.7]
672	job-mandatory-attributes(obsolete) (1setOf keyword)	[PWG5100.7]
673	output-device-actual(obsolete) (1setOf name(127))	[PWG5100.7]
674	print-content-optimize-actual (1setOf type2 keyword)	[PWG5100.7]
675	warnings-count (integer(0:MAX))	[PWG5100.7]
676		
677	Job Template attributes:	Reference
678	-----	-----
679	job-copies (obsolete) (integer(1:MAX))	[PWG5100.7]
680	job-cover-back (obsolete) (collection)	[PWG5100.7]
681	job-cover-front (obsolete) (collection)	[PWG5100.7]
682	job-finishings (obsolete) (1setOf type2 enum)	[PWG5100.7]
683	job-finishings-col (obsolete) (1setOf collection)	[PWG5100.7]
684	output-device (name(127))	[PWG5100.7]

685	print-content-optimize (type2 keyword)	[PWG5100.7]
686		
687	Operation attributes:	Reference
688	-----	-----
689	document-digital-signature(obsolete) (type2 keyword)	[PWG5100.7]
690	document-format-details(obsolete) (1setOf collection)	[PWG5100.7]
691	document-format-version(obsolete) (text(127))	[PWG5100.7]
692	job-mandatory-attributes (1setOf keyword)	[PWG5100.7]
693		
694	Printer Description attributes:	Reference
695	-----	-----
696	document-charset-default (charset)	[PWG5100.7]
697	document-charset-supported (1setOf charset)	[PWG5100.7]
698	document-digital-signature-default(obsolete) (type2 keyword)	[PWG5100.7]
699		[PWG5100.7]
700	document-digital-signature-supported(obsolete) (1setOf type2 keyword)	[PWG5100.7]
701		[PWG5100.7]
702	document-format-details-default(obsolete) (collection)	[PWG5100.7]
703	document-format-details-supported(obsolete) (1setOf keyword)	[PWG5100.7]
704		[PWG5100.7]
705	document-format-version-default(obsolete) (text(127))	[PWG5100.7]
706	document-format-version-supported(obsolete) (1setOf text(127))	[PWG5100.7]
707		[PWG5100.7]
708	document-natural-language-default (naturalLanguage)	[PWG5100.7]
709	document-natural-language-supported (1setOf naturalLanguage)	[PWG5100.7]
710		[PWG5100.7]
711	job-copies-default(obsolete) (integer(1:MAX))	[PWG5100.7]
712	job-copies-supported(obsolete) (rangeOfInteger(1:MAX))	[PWG5100.7]
713	job-cover-back-default(obsolete) (collection)	[PWG5100.7]
714	job-cover-back-supported(obsolete) (1setOf keyword)	[PWG5100.7]
715	job-cover-front-default(obsolete) (collection)	[PWG5100.7]
716	job-cover-front-supported(obsolete) (1setOf keyword)	[PWG5100.7]
717	job-finishings-col-default(obsolete) (1setOf collection)	[PWG5100.7]
718	job-finishings-col-ready(obsolete) (1setOf collection)	[PWG5100.7]
719	job-finishings-col-supported(obsolete) (1setOf keyword)	[PWG5100.7]
720	job-finishings-default(obsolete) (1setOf type2 enum)	[PWG5100.7]
721	job-finishings-ready(obsolete) (1setOf type2 enum)	[PWG5100.7]
722	job-finishings-supported(obsolete) (1setOf type2 enum)	[PWG5100.7]
723	output-device-supported (1setOf name(127))	[PWG5100.7]
724	print-content-optimize-default (type2 keyword)	[PWG5100.7]
725	print-content-optimize-supported (1setOf type2 keyword)	[PWG5100.7]

## 726 13.2 Attribute Value Registrations

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

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

730 The registry entries will contain the following information:

731	Attributes (attribute syntax)	
732	Keyword Attribute Value	Reference
733	-----	-----

---

734	job-state-reasons (1setOf type2 keyword)	[RFC8011]
735	digital-signature-did-not-verify	[PWG5100.7]
736	digital-signature-type-not-supported (obsolete)	[PWG5100.7]
737	errors-detected	[PWG5100.7]
738	job-digital-signature-wait (obsolete)	[PWG5100.7]
739	warnings-detected	[PWG5100.7]
740		
741	media (type2 keyword   name(MAX))	[RFC8011]
742	choice_iso_a4_210x297mm_na_letter_8.5x11in	[PWG5100.7]
743		
744	print-content-optimize (type2 keyword)	[PWG5100.7]
745	graphics	[PWG5100.7]
746	photo	[PWG5100.7]
747	text	[PWG5100.7]
748	text-and-graphics	[PWG5100.7]
749	print-content-optimize-actual (1setOf type2 keyword)	[PWG5100.7]
750	<Any "print-content-optimize" value>	[PWG5100.7]
751	print-content-optimize-default (type2 keyword)	[PWG5100.7]
752	<Any "print-content-optimize" value>	[PWG5100.7]
753	print-content-optimize-supported (1setOf type2 keyword)	[PWG5100.7]
754	<Any "print-content-optimize" value>	[PWG5100.7]
755		

### 756 13.3 Operation Registrations

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

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

760 The registry entries will contain the following information:

761	Operation Name	Reference
762	-----	-----
763	Create-Job (Extension)	[PWG5100.7]
764	Print-Job (Extension)	[PWG5100.7]
765	Print-URI (Extension)	[PWG5100.7]
766	Send-Document (Extension)	[PWG5100.7]
767	Send-URI (Extension)	[PWG5100.7]
768	Validate-Job (Extension)	[PWG5100.7]

### 769 13.4 Status Code Registrations

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

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

773 The registry entries will contain the following information:

774	Value	Status Code Name	Reference
775	-----	-----	-----
776	0x0500:0x05FF	- Server Error:	
777	0x050B	server-error-too-many-jobs	[PWG5100.7]
778	0x050C	server-error-too-many-documents	[PWG5100.7]
779			



## 780 **14. Overview of Changes**

### 781 **14.1 IPP Job Extensions v1.1**

782 The following changes were made to the previous version of this specification [PWG5100.7-  
783 2003]:

- 784 • A rationale section was added, including use cases, exceptions, and requirements;
- 785 • References now point to the current versions of dependent documents and  
786 specifications at the time of publication;
- 787 • Read-only attributes are now defined and registered as status attributes;
- 788 • A RECOMMENDED "job-mandatory-attributes-supported" Printer Description  
789 attribute has been added;
- 790 • The "document-charset" operation attribute and corresponding operation semantics  
791 are now defined in PWG 5100.5: IPP Document Object v1.1;
- 792 • The "document-digital-signature" operation attribute and corresponding Document  
793 Status, Job Status, and Printer Description attributes have been made obsolete;
- 794 • The "document-format-details" operation attribute and corresponding Document  
795 Status, Job Status, and Printer Description attributes have been made obsolete;
- 796 • The "document-format-version" operation attribute and corresponding Document  
797 Status, Job Status, and Printer Description attributes have been made obsolete;
- 798 • The "job-copies" Job Template attribute and corresponding Job Status and Printer  
799 Description attributes have been made obsolete;
- 800 • The "job-cover-back" Job Template attribute and corresponding Job Status and  
801 Printer Description attributes have been made obsolete;
- 802 • The "job-cover-front" Job Template attribute and corresponding Job Status and  
803 Printer Description attributes have been made obsolete;
- 804 • The "job-finishings" Job Template attribute and corresponding Job Status and Printer  
805 Description attributes have been made obsolete;
- 806 • The "job-finishings-col" Job Template attribute and corresponding Job Status and  
807 Printer Description attributes have been made obsolete; and
- 808 • The 'digital-signature-type-not-supported' and 'job-digital-signature-wait' values for  
809 the "job-state-reasons" attribute have been made obsolete.

## 810 15. References

### 811 15.1 Normative References

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875 To subscribe, see the PWG web page:

876 <http://www.pwg.org/>

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

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881 significantly to the development of this document:

882 Tom Hastings (author of v1.0)

883 Peter Zehler (author of v1.0)

884

## 885 **17. Change History**

### 886 **17.1 October 23, 2018**

- 887 • Status: Interim
- 888 • Updated references to the first version of 5100.7 to include year and exclude the full  
889 name.
- 890 • Abstract and intro: Clarified that this specification is defining attributes and values.
- 891 • Editorial changes
- 892 • Added reference to the MSN2 spec.

### 893 **17.2 September 26, 2018**

- 894 • Brought back the job-mandatory-attributes operation attribute, which is still needed.
- 895 • Added a rationale, use case, and design requirement for selective fidelity/job-  
896 mandatory-attributes.
- 897 • Added Additional Semantics and Operation Registrations sections for using job-  
898 mandatory-attributes with job creation/validation operations.
- 899 • Added Additional Semantics and Operation Registrations sections for returning the  
900 too-many-jobs/documents status codes.

### 901 **17.3 September 25, 2018**

902 Initial revision.