



The Printer Working Group

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Working Draft

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

Status: Initial

Abstract: This specification defines an attribute for fine-grained fidelity, attributes and values to specify how Document data is processed, and status attributes and values to report 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-ippjobext11-20180926.docx>

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83 Contact information:

84 The Printer Working Group
85 c/o The IEEE Industry Standards and Technology Organization
86 445 Hoes Lane
87 Piscataway, NJ 08854
88 USA
89

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177 **1. Introduction**

178 This specification defines an attribute for fine-grained fidelity, attributes and values to specify
179 how Document data is processed, and status attributes and values to report issues
180 encountered during processing.

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 Standard for the Internet Printing Protocol (IPP): Job Extensions [PWG5100.7]
211 defines several attributes and values that have proven problematic from an interoperability
212 and privacy standpoint. This specification obsoletes these attributes and values.

216 **2. Terminology**

217 **2.1 Conformance Terminology**

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

223 **2.2 Printing Terminology**

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

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

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

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

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

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

236 **2.3 Protocol Role Terminology**

237 This document also defines the following protocol roles to specify unambiguous
238 conformance requirements:

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

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

244 **2.4 Other Terminology**

245 *Document Creation Operation*: operations that accept Document Content. Specifically:
246 Print-Job, Print-URI, Send-Document and Send-URI. Note: Print-Job and Print-URI are
247 both Job Creation and Document Creation operations.

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

250 *Job Attribute*: an Operation attribute or a Job Template attribute that applies to the Job
251 (object) as a whole. For example, "job-name" is an Operation attribute and "job-priority" is
252 a Job Template attribute.

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

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

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

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

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

269 **2.5 Acronyms and Organizations**

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

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

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

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

274 **3. Requirements**

275 **3.1 Rationale**

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

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

287 **3.2 Use Cases**

288 **3.2.1 Print a Plain Text File**

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

292 **3.2.2 Print a Document Using a Matching Size**

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

296 **3.2.3 Force a Document to Print on a Specific Media Size**

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

300 **3.2.4 Print a Presentation with Best Quality**

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

303 **3.2.5 Print Using a Specific Output Device**

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

307 **3.2.6 Monitor Whether Jobs are Printed Correctly**

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

311 **3.3 Exceptions**

312 **3.3.1 Too Many Jobs on a Printer**

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

315 **3.3.2 Too Many Documents in a Job**

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

318 **3.4 Out of Scope**

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

- 320 1. Definition of new file formats; and
- 321 2. Definition of new protocol bindings.

322 **3.5 Design Requirements**

323 The design requirements for this specification are:

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

334

335 **4. New Attributes**

336 **4.1 Operation Attributes**

337 **4.1.1 job-mandatory-attributes (1setOf keyword)**

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

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

352 **4.2 Document and Job Status Attributes**

353 **4.2.1 errors-count (integer(0:MAX))**

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

358 **4.2.2 print-content-optimize-actual (1setOf type2 keyword)**

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

361 **4.2.3 warnings-count (integer(0:MAX))**

362 This attribute reports the number of warnings encountered processing the Job as a whole.
363 A warning is where no information is lost but the appearance of the printed output MAY not
364 be as expected.

365 **4.3 Document and Job Template Attributes**

367 **4.3.1 output-device (name(127))**

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

371 **4.3.2 print-content-optimize (type2 keyword)**

372 This attribute specifies the type of optimization and/or processing to perform on the
373 Document data and refines the value specified by the “print-quality” attribute [ST92].
374 Keyword values include:

375 'graphics': Optimize for graphic clarity of graphs and line drawings.

376 'photo': Optimize for photographic clarity.

377 'text': Optimize for text clarity.

378 'text-and-graphics': Optimize for both text and graphic clarity.

379 **4.4 Printer Description Attributes**

382 **4.4.1 document-charset-default (charset)**

383 This attribute specifies the default charset that the Printer will assume for charset-ambiguous
384 Document formats when the Client omits the “document-charset” operation attribute
385 [PWG5100.5]. Printers that support the "document-charset" operation attribute MUST
386 support this attribute.

387 **4.4.2 document-charset-supported (1setOf charset)**

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

392 **4.4.3 document-natural-language-default (naturalLanguage)**

393 This attribute specifies the default natural language that the Printer will assume for
394 Document data when the Client omits the “document-natural-language” operation attribute
395 [STD92]. Printers that support the "document-natural-language" attribute MUST support
396 this.

397 **4.4.4 document-natural-language-supported (1setOf naturalLanguage)**

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

400 **4.4.5 output-device-supported (1setOf name(127))**

401 This attribute lists the supported "output-device" values. Printers MUST support this attribute
402 if the "output-device" Job Template attribute (section 4.3.1) is supported.

403 **4.4.6 print-content-optimize-default (type2 keyword)**

404 This attribute specifies the default "print-content-optimize" (section 4.3.2) value. Printers that
405 support the "print-content-optimize" attribute MUST support this attribute.

406 **4.4.7 print-content-optimize-supported(1setOf type2 keyword)**

407 This attribute lists the supported "print-content-optimize" (section 4.3.2) values. Printers that
408 support the "print-content-optimize" attribute MUST support this attribute.

409 **5. New Values for Existing Attributes**

410 **5.1 job-state-reasons (1setOf type2 keyword)**

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

414 'digital-signature-did-not-verify': One or more documents in the Job contains a
415 digital signature type that is supported (see section 1.1), but the signature did not
416 verify when the Printer attempted to verify the signature.

417 'errors-detected' : If the Printer supports this value, the Printer MUST add this value
418 to "job-state-reasons" when the Printer generates the first error message. That is, a
419 single occurrence of this value is present in the "job-state-reasons" Job Description
420 attribute if the Printer has generated one or more errors. An error indicates loss of
421 information, such as a page not imaged. See also the 'warnings-detected' value.

422 'warnings-detected' : If the Printer supports this value, the Printer MUST add this
423 value to "job-state-reasons" when the Printer generates the first warning message.
424 That is, a single occurrence of this value is present in the "job-state-reasons" Job
425 Description attribute if the Printer has generated one or more warnings. A warning
426 indicates something did not go as expected, but there was no loss of information.
427 For example, a font substitution. See also the 'errors-detected' value.

428 **5.2 media (type2 keyword | name(MAX))**

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

431 'choice_iso_a4_210x297mm_na_letter_8.5x11in': The Client has explicitly allowed
432 a choice of media for the Job. The Printer MUST choose physical media of size
433 na_letter_8.5x11in (215.9 x 279.4 mm) or iso_a4_210x297mm and MUST NOT
434 choose physical media of any other size. The Printer MAY scale the Document data
435 to fit, but any scaling MUST be isomorphic scaling and without image content loss.

436 **6. New Status Codes**

437 This section defines additional status code values.

438 **6.1 server-error-too-many-jobs (0x050B)**

439 The Client has attempted to create a Job using any of the Job Creation operations which
440 would exceed the capacity of the Printer. The Client MAY try the unmodified request again
441 at some later point in time with an expectation that the capacity condition may have changed.

442 **6.2 server-error-too-many-documents (0x050C)**

443 The Client has attempted to create a Document using any of the Document Creation
444 operations which would exceed the capacity of the Printer for this Job. The Client MAY try
445 the unmodified request again at some later point in time with an expectation that the capacity
446 condition may have changed.

449 **7. Obsolete Attributes**

450 **7.1 Obsolete Operation Attributes**

451 The following operation attributes from Standard for the Internet Printing Protocol (IPP): Job
452 Extensions [PWG5100.7] are now obsolete:

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

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

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

460 7.2 Obsolete Job Status Attributes

461 The following Job Status attributes from Standard for the Internet Printing Protocol (IPP):
462 Job Extensions [PWG5100.7] are now obsolete:

463 "compression-supplied" (type2 keyword): Data compression is used over the HTTP
464 transport during the submission of Document data and auditing of Printer bandwidth
465 usage requires additional information such as the size of the IPP request and
466 attached compressed document data.

467 "document-charset-supplied" (charset): The "document-charset" attribute is only
468 used for the internal processing of the Document data.

469 "document-digital-signature-supplied" (type2 keyword): The corresponding Job
470 Template attribute is obsolete.

471 "document-format-details-supplied" (1setOf collection): The corresponding Job
472 Template attribute is obsolete.

473 "document-format-supplied" (mimeMediaType): This attribute has been superseded
474 by the "document-format" Document Status attribute [PWG5100.5].

475 "document-format-version-supplied" (text(127)): The corresponding Job Template
476 attribute is obsolete.

477 "document-message-supplied" (text(MAX)): This attribute has been superseded by
478 the "document-message" Document Status attribute [PWG5100.5].

479 "document-name-supplied" (name(MAX)) : This attribute has been superseded by
480 the "document-name" Document Status attribute [PWG5100.5].

481 "document-natural-language-supplied" (naturalLanguage): This attribute has been
482 superseded by the "document-natural-language" Document Status attribute
483 [PWG5100.5].

484 "ipp-attribute-fidelity" (boolean): This attribute is only used at time of Job creation.
485 The "xxx-actual" Job Status attributes provide a receipt of attributes and values that
486 were used when processing a Job and thus provide the necessary auditing
487 information.

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

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

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

- 494 "job-finishings-actual" (1setOf type2 enum): This attribute has poor interoperability
495 with the "finishings" Job Template attribute [STD92].
- 496 "job-finishings-col-actual" (1setOf collection): This attribute has poor interoperability
497 with the "finishings-col" Job Template attribute [PWG5100.3].
- 498 "job-mandatory-attributes" (1setOf keyword): This attribute is only used at time of
499 Job creation. The "xxx-actual" Job Status attributes provide a receipt of attributes
500 and values that were used when processing a Job and thus provide the necessary
501 auditing information.
- 502 "output-device-actual" (1setOf name(127)): This attribute provides the same
503 functionality as the "output-device-assigned" attribute [STD92].

504 **7.3 Obsolete Job Template Attributes**

505 The following Job Templates attributes from Standard for the Internet Printing Protocol (IPP):
506 Job Extensions [PWG5100.7] are now obsolete:

- 507 "job-copies" (integer(1:MAX)): This attribute has poor interoperability with the
508 "copies" Job Template attribute [STD92].
- 509 "job-cover-back" (collection): This attribute has poor interoperability with the "cover-
510 back" Job Template attribute [PWG5100.3].
- 511 "job-cover-front" (collection): This attribute has poor interoperability with the "cover-
512 front" Job Template attribute [PWG5100.3].
- 513 "job-finishings" (1setOf type2 enum): This attribute has poor interoperability with the
514 "finishings" Job Template attribute [STD92].
- 515 "job-finishings-col" (1setOf collection): This attribute has poor interoperability with
516 the "finishings-col" Job Template attribute [PWG5100.3].

517 **7.4 Obsolete Printer Description Attributes**

518 The following Printer Description attributes from Standard for the Internet Printing Protocol
519 (IPP): Job Extensions [PWG5100.7] are now obsolete:

- 520 "document-digital-signature-default" (type2 keyword):
- 521 "document-digital-signature-supported" (1setOf type2 keyword):
- 522 "document-format-details-default" (collection):
- 523 "document-format-details-supported" (1setOf keyword):

- 524 "document-format-version-default" (text(127)):
- 525 "document-format-version-supported" (1setOf text(127)):
- 526 "job-copies-default" (integer(1:MAX)): This attribute has poor interoperability with
527 the "copies" Job Template attribute [STD92].
- 528 "job-copies-supported" (rangeOfInteger(1:MAX)): This attribute has poor
529 interoperability with the "copies" Job Template attribute [STD92].
- 530 "job-cover-back-default" (collection): This attribute has poor interoperability with the
531 "cover-back" Job Template attribute [PWG5100.3].
- 532 "job-cover-back-supported" (1setOf keyword): This attribute has poor
533 interoperability with the "cover-back" Job Template attribute [PWG5100.3].
- 534 "job-cover-front-default" (collection): This attribute has poor interoperability with the
535 "cover-front" Job Template attribute [PWG5100.3].
- 536 "job-cover-front-supported" (1setOf keyword): This attribute has poor interoperability
537 with the "cover-front" Job Template attribute [PWG5100.3].
- 538 "job-finishings-default" (1setOf type2 enum): This attribute has poor interoperability
539 with the "finishings" Job Template attribute [STD92].
- 540 "job-finishings-ready" (1setOf type2 enum): This attribute has poor interoperability
541 with the "finishings" Job Template attribute [STD92].
- 542 "job-finishings-supported" (1setOf type2 enum): This attribute has poor
543 interoperability with the "finishings" Job Template attribute [STD92].
- 544 "job-finishings-col-default" (1setOf collection): This attribute has poor interoperability
545 with the "finishings-col" Job Template attribute [PWG5100.3].
- 546 "job-finishings-col-ready" (1setOf collection): This attribute has poor interoperability
547 with the "finishings-col" Job Template attribute [PWG5100.3].
- 548 "job-finishings-col-supported" (1setOf keyword): This attribute has poor
549 interoperability with the "finishings-col" Job Template attribute [PWG5100.3].

550 **8. Obsolete Values**

551 **8.1 Obsolete "job-state-reasons" Values**

552 The following keyword values from Standard for the Internet Printing Protocol (IPP): Job
553 Extensions [PWG5100.7] are now obsolete:

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

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

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

559 **9.1 Create-Job, Print-Job, Print-URI, Validate-Job: job-mandatory-** 560 **attributes**

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

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

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

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

573 **9.2 Create-Job, Print-Job, Print-URI: server-error-too-many-jobs Status** 574 **Code**

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

577 **9.3 Print-Job, Print-URI, Send-Document, Send-URI: server-error-too-** 578 **many-documents Status Code**

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

582 **10. Conformance Requirements**

583 **10.1 Printer Conformance Requirements**

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

- 585 1. The Job Status attributes defined in section 4.2 that correspond to any
586 supported Job Template attributes defined in section 4.3;
- 587 2. The Document Status attributes defined in section 4.2 that correspond to any
588 supported Document Template attributes defined in section 4.3;
- 589 3. The Printer Description attributes defined in section 4.4 that correspond to any
590 supported Document/Job Template attributes defined in section 4.3;
- 591 4. The additional values defined in section 5;
- 592 5. The internationalization considerations defined in section 11; and
- 593 6. The security considerations defined in section 12.

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

596 **10.2 Client Conformance Requirements**

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

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

600 **11. Internationalization Considerations**

601 For interoperability and basic support for multiple languages, conforming implementations
602 MUST support:

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

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

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

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

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

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

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

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

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

622 Unicode Collation Algorithm [UTS10] – sorting

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

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

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

627 Unicode Character Property Model [UTR23] – character properties

628 Unicode Conformance Model [UTR33] – Unicode conformance basis

629 **12. Security Considerations**

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

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

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

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

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

638 **13. IANA Considerations**639 **13.1 Attribute Registrations**

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

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

643 The registry entries will contain the following information:

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

686	job-cover-front-actual(obsolete) (collection)	[PWG5100.7]
687	job-finishings-actual(obsolete) (1setOf type2 enum)	[PWG5100.7]
688	job-finishings-col-actual(obsolete) (1setOf collection)	[PWG5100.7]
689	job-mandatory-attributes(obsolete) (1setOf keyword)	[PWG5100.7]
690	output-device-actual(obsolete) (1setOf name(127))	[PWG5100.7]
691	print-content-optimize-actual (1setOf type2 keyword)	[PWG5100.7]
692	warnings-count (integer(0:MAX))	[PWG5100.7]
693		
694	Job Template attributes:	Reference
695	-----	-----
696	job-copies(obsolete) (integer(1:MAX))	[PWG5100.7]
697	job-cover-back(obsolete) (collection)	[PWG5100.7]
698	job-cover-front(obsolete) (collection)	[PWG5100.7]
699	job-finishings(obsolete) (1setOf type2 enum)	[PWG5100.7]
700	job-finishings-col(obsolete) (1setOf collection)	[PWG5100.7]
701	output-device (name(127))	[PWG5100.7]
702	print-content-optimize (type2 keyword)	[PWG5100.7]
703		
704	Operation attributes:	Reference
705	-----	-----
706	document-digital-signature(obsolete) (type2 keyword)	[PWG5100.7]
707	document-format-details(obsolete) (1setOf collection)	[PWG5100.7]
708	document-format-version(obsolete) (text(127))	[PWG5100.7]
709	job-mandatory-attributes (1setOf keyword)	[PWG5100.7]
710		
711	Printer Description attributes:	Reference
712	-----	-----
713	document-charset-default (charset)	[PWG5100.7]
714	document-charset-supported (1setOf charset)	[PWG5100.7]
715	document-digital-signature-default(obsolete) (type2 keyword)	[PWG5100.7]
716		[PWG5100.7]
717	document-digital-signature-supported(obsolete) (1setOf type2 keyword)	[PWG5100.7]
718		[PWG5100.7]
719	document-format-details-default(obsolete) (collection)	[PWG5100.7]
720	document-format-details-supported(obsolete) (1setOf keyword)	[PWG5100.7]
721		[PWG5100.7]
722	document-format-version-default(obsolete) (text(127))	[PWG5100.7]
723	document-format-version-supported(obsolete) (1setOf text(127))	[PWG5100.7]
724		[PWG5100.7]
725	document-natural-language-default (naturalLanguage)	[PWG5100.7]
726	document-natural-language-supported (1setOf naturalLanguage)	[PWG5100.7]
727		[PWG5100.7]
728	job-copies-default(obsolete) (integer(1:MAX))	[PWG5100.7]
729	job-copies-supported(obsolete) (rangeOfInteger(1:MAX))	[PWG5100.7]
730	job-cover-back-default(obsolete) (collection)	[PWG5100.7]
731	job-cover-back-supported(obsolete) (1setOf keyword)	[PWG5100.7]
732	job-cover-front-default(obsolete) (collection)	[PWG5100.7]
733	job-cover-front-supported(obsolete) (1setOf keyword)	[PWG5100.7]
734	job-finishings-col-default(obsolete) (1setOf collection)	[PWG5100.7]
735	job-finishings-col-ready(obsolete) (1setOf collection)	[PWG5100.7]
736	job-finishings-col-supported(obsolete) (1setOf keyword)	[PWG5100.7]
737	job-finishings-default(obsolete) (1setOf type2 enum)	[PWG5100.7]
738	job-finishings-ready(obsolete) (1setOf type2 enum)	[PWG5100.7]
739	job-finishings-supported(obsolete) (1setOf type2 enum)	[PWG5100.7]
740	output-device-supported (1setOf name(127))	[PWG5100.7]
741	print-content-optimize-default (type2 keyword)	[PWG5100.7]

742 print-content-optimize-supported (1setOf type2 keyword) [PWG5100.7]

743 **13.2 Attribute Value Registrations**

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

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

747 The registry entries will contain the following information:

748 Attributes (attribute syntax)	Reference
749 Keyword Attribute Value	-----
750 -----	-----
751 job-state-reasons (1setOf type2 keyword)	[RFC8011]
752 digital-signature-did-not-verify	[PWG5100.7]
753 digital-signature-type-not-supported (obsolete)	[PWG5100.7]
754 errors-detected	[PWG5100.7]
755 job-digital-signature-wait (obsolete)	[PWG5100.7]
756 warnings-detected	[PWG5100.7]
757	
758 media (type2 keyword name(MAX))	[RFC8011]
759 choice_iso_a4_210x297mm_na_letter_8.5x11in	[PWG5100.7]
760	
761 print-content-optimize (type2 keyword)	[PWG5100.7]
762 graphics	[PWG5100.7]
763 photo	[PWG5100.7]
764 text	[PWG5100.7]
765 text-and-graphics	[PWG5100.7]
766 print-content-optimize-actual (1setOf type2 keyword)	[PWG5100.7]
767 <Any "print-content-optimize" value>	[PWG5100.7]
768 print-content-optimize-default (type2 keyword)	[PWG5100.7]
769 <Any "print-content-optimize" value>	[PWG5100.7]
770 print-content-optimize-supported (1setOf type2 keyword)	[PWG5100.7]
771 <Any "print-content-optimize" value>	[PWG5100.7]
772	

773 13.3 Operation Registrations

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

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

777 The registry entries will contain the following information:

778	Operation Name	Reference
779	-----	-----
780	Create-Job (Extension)	[PWG5100.7]
781	Print-Job (Extension)	[PWG5100.7]
782	Print-URI (Extension)	[PWG5100.7]
783	Send-Document (Extension)	[PWG5100.7]
784	Send-URI (Extension)	[PWG5100.7]
785	Validate-Job (Extension)	[PWG5100.7]

786 13.4 Status Code Registrations

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

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

790 The registry entries will contain the following information:

791	Value	Status Code Name	Reference
792	-----	-----	-----
793	0x0500:0x05FF	- Server Error:	
794	0x050B	server-error-too-many-jobs	[PWG5100.7]
795	0x050C	server-error-too-many-documents	[PWG5100.7]
796			

797 **14. Overview of Changes**

798 **14.1 IPP Job Extensions v1.1**

799 The following changes were made to PWG 5100.7-2003: Standard for the Internet Printing
800 Protocol (IPP): Job Extensions [PWG5100.7]:

- 801 • A rationale section was added, including use cases, exceptions, and requirements;
- 802 • References now point to the current versions of dependent documents and
803 specifications at the time of publication;
- 804 • Read-only attributes are now defined and registered as status attributes;
- 805 • The "document-charset" operation attribute and corresponding operation semantics
806 are now defined in PWG 5100.5: IPP Document Object v1.1;
- 807 • The "document-digital-signature" operation attribute and corresponding Document
808 Status, Job Status, and Printer Description attributes have been made obsolete;
- 809 • The "document-format-details" operation attribute and corresponding Document
810 Status, Job Status, and Printer Description attributes have been made obsolete;
- 811 • The "document-format-version" operation attribute and corresponding Document
812 Status, Job Status, and Printer Description attributes have been made obsolete;
- 813 • The "job-copies" Job Template attribute and corresponding Job Status and Printer
814 Description attributes have been made obsolete;
- 815 • The "job-cover-back" Job Template attribute and corresponding Job Status and
816 Printer Description attributes have been made obsolete;
- 817 • The "job-cover-front" Job Template attribute and corresponding Job Status and
818 Printer Description attributes have been made obsolete;
- 819 • The "job-finishings" Job Template attribute and corresponding Job Status and Printer
820 Description attributes have been made obsolete;
- 821 • The "job-finishings-col" Job Template attribute and corresponding Job Status and
822 Printer Description attributes have been made obsolete; and
- 823 • The 'digital-signature-type-not-supported' and 'job-digital-signature-wait' values for
824 the "job-state-reasons" attribute have been made obsolete.

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876 **16. Author's Address**

877 Primary author:

878 Michael Sweet
879 Apple Inc.
880 One Apple Park Way
881 MS 111-HOMC
882 Cupertino CA 95014
883 USA

884 Send comments to the PWG IPP Mailing List:

885 ipp@pwg.org (subscribers only)

886 To subscribe, see the PWG web page:

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

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

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

893 Tom Hastings (author of v1.0)

894 Peter Zehler (author of v1.0)

895

896 **17. Change History**

897 **17.1 September 26, 2018**

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

905 **17.2 September 25, 2018**

906 Initial revision.