



The Printer Working Group

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IPP Everywhere™ v1.1

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Abstract: This specification defines an IPP profile that supports network printing without vendor-specific driver software, including the transport, various discovery protocols, and standard document formats.

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This document is available electronically at:

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85 vendors of printer related software benefit from the interoperability provided by voluntary
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87 For additional information regarding the Printer Working Group visit:

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Table of Contents

96		
97	1. Introduction	8
98	2. Terminology	8
99	2.1 Printing Terminology.....	8
100	2.2 Protocol Role Terminology	9
101	2.3 Other Terminology.....	9
102	2.4 Acronyms and Organizations	10
103	3. Requirements.....	11
104	3.1 Rationale	11
105	3.2 Use Cases	12
106	3.2.1 Select Printer	12
107	3.2.2 Print.....	14
108	3.2.3 Exceptions	17
109	3.3 Out of Scope.....	19
110	3.4 Design Requirements	19
111	4. Discovery Protocols	20
112	4.1 Printer Description Attributes Used in Discovery.....	20
113	4.2 DNS Service Discovery (DNS-SD).....	20
114	4.2.1 Service (SRV) Instance Name	20
115	4.2.2 Geo-Location (LOC).....	20
116	4.2.3 Text (TXT).....	21
117	4.3 LDAP and SLP Discovery.....	26
118	5. Protocol Binding.....	27
119	5.1 HTTP Features	27
120	5.1.1 Host.....	27
121	5.1.2 If-Modified-Since, Last-Modified, and 304 Not Modified	27
122	5.1.3 Cache-Control	27
123	5.2 IPP Operations	28
124	5.3 IPP Printer Description Attributes	28
125	5.3.1 media-col-database (1setOf collection)	31
126	5.3.2 media-col-ready (1setOf collection)	32
127	5.3.3 media-ready (1setOf (type3 keyword name(MAX))	32
128	5.3.4 media-size-supported (1setOf collection)	33
129	5.3.5 media-supported (1setOf (type3 keyword name(MAX))	33
130	5.3.6 pdl-override-supported (type2 keyword)	34
131	5.4 IPP Printer Status Attributes.....	34
132	5.4.1 printer-uri-supported (1setOf uri)	35
133	5.5 IPP Operation Attributes.....	36
134	5.6 IPP Job Description Attributes.....	37
135	5.7 IPP Job Status Attributes.....	37
136	5.7.1 job-id (integer).....	37
137	5.7.2 job-uri (uri).....	38
138	5.8 IPP Job Template Attributes.....	38
139	6. Document Formats.....	40
140	6.1 Supporting Long-Edge Feed Media with PWG Raster Format Documents	40

141 7. Additional Values for Existing Attributes 43

142 7.1 ipp-features-supported (1setOf type2 keyword) 43

143 8. Additional Semantics for Existing Value Tags..... 43

144 8.1 nameWithLanguage and nameWithoutLanguage 43

145 8.2 naturalLanguage..... 43

146 8.3 textWithLanguage and textWithoutLanguage..... 43

147 8.4 uri..... 43

148 9. Conformance Requirements 44

149 9.1 Conformance Requirements for Clients 44

150 9.2 Conformance Requirements for Printers 44

151 9.3 Conditional Conformance Requirements for Printers 45

152 10. Internationalization Considerations 46

153 11. Security Considerations 47

154 12. IANA Considerations..... 47

155 12.1 Attribute Value Registrations 47

156 13. Safe String Truncation 47

157 13.1 Plain Text Strings 48

158 13.2 URIs..... 48

159 13.3 MIME Media Types..... 48

160 13.4 Delimited Lists 48

161 14. Overview of Changes 49

162 14.1 IPP Everywhere™ v1.1 49

163 15. References 50

164 15.1 Normative References 50

165 15.2 Informative References 55

166 16. Authors' Addresses 56

167 17. Change History 57

168 17.1 January 28, 2019..... 57

169 17.2 September 26, 2018..... 57

170 17.3 August 24, 2018 57

171 17.4 July 4, 2018 58

172 17.5 June 6, 2018..... 58

173 17.6 April 17, 2018 58

174 17.7 April 16, 2018 58

175 17.8 April 3, 2018 59

176 17.9 February 9, 2018 59

List of Figures

177

178

179

180

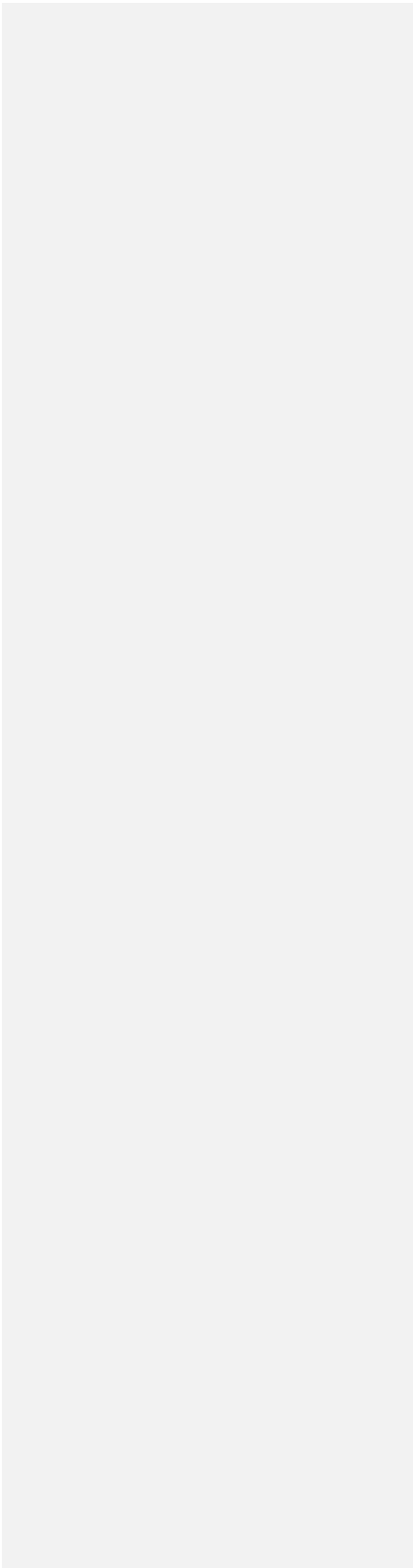
181 Figure 2 - PWG Raster Bitmaps with Portrait Feed Orientation..... 41

182 Figure 3 - PWG Raster Bitmaps with Landscape Feed Orientation 41

183 Figure 4 - PWG Raster Bitmaps with Reverse Landscape Feed Orientation 42

184 Figure 5 - PWG Raster Bitmaps with Reverse Portrait Feed Orientation 42

185



List of Tables

187
188
189 Table 1 - Attributes in Discovery Protocols 21
190 Table 2 - Priority of DNS TXT Key/Value Pairs..... 22
191 Table 3 - DNS TXT Record Keys 23
192 Table 4 - IPP Everywhere™ Operations 28
193 Table 5 - Required IPP Everywhere™ Printer Description Attributes 28
194 Table 6 - RECOMMENDED IPP Everywhere™ Printer Description Attributes..... 31
195 Table 7 - IPP Everywhere™ Printer Status Attributes..... 34
196 Table 8 - REQUIRED IPP Everywhere™ Operation Attributes..... 36
197 Table 9 - RECOMMENDED IPP Everywhere™ Operation Attributes..... 36
198 Table 10 - IPP Everywhere™ Required Job Description Attributes 37
199 Table 11 - IPP Everywhere™ Required Job Status Attributes 37
200 Table 12 - REQUIRED IPP Everywhere™ Job Template Attributes..... 38
201 Table 13 - RECOMMENDED IPP Everywhere™ Job Template Attributes..... 39

202

203

204

205

206 1. Introduction

207 Mobile devices do not follow the traditional use models for printing services. For mobile
208 devices, discovery of available printers and their capabilities is both more difficult than for
209 traditional desktop systems and more important because of dynamically changing network
210 attachment points.

211 Printer vendors and software vendors have defined and deployed many different document
212 formats (page description languages) and also dialects of those document formats,
213 increasing the traditional desktop system need for model-specific printer drivers. While there
214 are millions of model-specific printer drivers available for traditional desktop systems, this
215 printer driver model is clearly not practical for mobile devices.

216 IPP Everywhere™ allows Clients, particularly mobile Internet devices, to easily support
217 printing using IPP but without the use of vendor-specific drivers through the adoption of
218 standard document formats, discovery protocols, and schemas.

219 2. Terminology

220 2.1 Printing Terminology

221 Normative definitions and semantics of printing terms are imported from IETF Printer MIB
222 v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1
223 [STD92].

224 *Device*: A Logical or Physical Device associated with one or more Printers [STD92].

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

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

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

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

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

235 **2.2 Protocol Role Terminology**

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

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

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

243 **2.3 Other Terminology**

244 *Direct Imaging*: Printing, facsimile, and scanning performed by direct communication from
245 the Client to an Imaging Device or local print server.

246 *Directory Service*: A Service providing query and enumeration of information using names
247 or other identifiers.

248 *Discovery*: Finding Printers by querying or browsing local network segments or Enumeration
249 of Directory or Name Services.

250 *Enumeration*: Listing Printers that are registered with a Directory or other Service.

251 *Indirect Imaging*: Printing, facsimile, and scanning performed by communication from the
252 Client and/or Imaging Device to an intermediary service in a different administrative domain,
253 for example when the Client communicates with a third-party print service or when an
254 Imaging Device communicates with a Cloud service.

255 *Network Accessible Device*: A Device that can be directly accessed by a Client.

256 *Network Accessible/Accessibility*: Refers to the ability of one device to communicate directly
257 with another, for example a Client is able to connect to a Device, query for supported
258 attributes, submit Job creation requests, and so forth.

259 *Operator*: A person or automata that typically oversees the Printer. The Operator is allowed
260 to query and manage the Printer, Jobs and Documents based on site policy.

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

263 *Secure Print*: A print job using the "document-password", "job-password", and/or "job-
264 password-encryption" operation attributes to provide document and/or physical security.
265 See [PWG5100.11] and [PWG5100.13].

266 *Service*: Software providing access to physical, logical, or virtual resources and (typically)
267 processing of queued Jobs.

268 *User*: A person or automata using a Client to communicate with a Printer.

269 **2.4 Acronyms and Organizations**

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

271 *IEEE*: Institute of Electrical and Electronics Engineers, <http://www.ieee.org/>

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

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

274 *NFC*: Near Field Communications, <http://www.nfc-forum.org/>

275 *OASIS*: Organization for the Advancement of Structured Information Standards,
276 <http://www.oasis-open.org/>

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

278

279 3. Requirements

280 3.1 Rationale

281 Given the following existing specifications and the need for a standard method of Direct
282 Imaging without traditional vendor-specific driver software, this specification should:

- 283 1. Use existing protocols and schema to support discovery, identification, and
284 auto-configuration of Imaging Devices,
- 285 2. Use existing IPP specifications to support job submission to and monitoring of
286 Imaging Devices,
- 287 3. Encourage support for printing through standard document formats, and
- 288 4. Discourage the further proliferation of vendor-specific page description
289 languages, formats, discovery protocols, interfaces, and transports

290 The Internet Printing Protocol/1.1 [STD92] defines the core Internet Printing Protocol.

291 IPP Version 2.0, 2.1, and 2.2 [PWG5100.12] defines:

- 292 1. A collection of existing IPP specifications that form the basis for IPP/2.0
- 293 2. Standard job template attributes
- 294 3. Specific interoperability requirements, such as HTTP/1.1 support with chunking
295 and IPP collection attribute support
- 296 4. New version number and operation requirements for different classes of
297 Imaging Devices

298 The IPP URL Scheme [RFC3510] defines the 'ipp' URI scheme and the IPP over HTTPS
299 Transport Binding and 'ipps' URI Scheme [RFC7472] defines the 'ipps' URI scheme used
300 for IPP.

301 The IPP: Job and Printer Extensions - Set 3 [PWG5100.13] define new attributes and
302 operations required for mobile printing and printing with generic drivers.

303 [The IPP Transaction-Based Printing Extensions \[PWG5100.16\] define attributes required
304 for Paid Imaging Services.](#)

305 [The IPP Job Password Repertoire \[REPertoire\] defines attributes that articulate the
306 repertoire of allowable password strings.](#)

307 [The IPP Presets \[PRESETS\] define attributes for predefined sets of Job Template values.](#)

308 [The IPP Privacy Attributes v1.0 \[PRIVACY\] define attributes for specifying the privacy
309 policies of Jobs and Printers.](#)

310 The PWG Raster Format [PWG5102.4] defines a minimal file format for transmission of
311 multi-page color and grayscale bitmap images

312 The Document management -- Portable document format -- Part 1: PDF 1.7 [ISO32000]
313 defines:

- 314 1. A rich file format for transmission of multi-page color and grayscale vector and
315 bitmap images
- 316 2. Standard page attributes to support page size, orientation, and duplex
317 functionality

318 The JPEG File Interchange Format Version 1.02 [JFIF] defines a compact file format for
319 transmission of photographic images

320 The Bonjour Printing Specification version 1.2 [BONJOUR] defines:

- 321 1. Multicast DNS for use on link-local networks [RFC6762]
- 322 2. Discovery of Printers using Domain Name System (DNS) service (SRV) lookups
323 [RFC6763]
- 324 3. Automatic address assignment for both IPv4 [RFC3927] and IPv6
- 325 4. DNS text (TXT) record keys to support auto-configuration, capabilities,
326 identification, and protocol selection

327 The Lightweight Directory Access Protocol (LDAP): Schema for Printer Services [RFC7612]
328 defines a schema for Printer registrations and discovery via LDAP [RFC4510] and Service
329 Location Protocol (SLP) [RFC2608] services.

330 **3.2 Use Cases**

331 **3.2.1 Select Printer**

332 Printer selection is part of most Print use cases - Jane selects a Printer, implicitly or
333 explicitly, and the remainder of the use case applies to the selected Printer. A Printer can
334 be a Logical Printer (Service) or a Physical Printer (section 2.1). Selection use cases can
335 often be combined, for example Selection Using a Directory Service (section 3.2.1.4) with
336 Selection Using Properties (section 3.2.1.9).

337 In order to simplify the selection use cases, common exceptions are listed as separate use
338 cases in section 3.2.3.

339 Precondition: For all of the following use cases, the Printer is Network Accessible to be
340 selected, either directly or through an intermediate Service.

341 **3.2.1.1 Select the Last Used Printer**

342 The Client User Interface provides the last used Printer as a selection. Jane then confirms
343 the selection of the last used Printer.

344 The last used Printer may be automatically selected by the Client User Interface and may
345 be affected by the current network topology or geo-location, for example the last used
346 Printer may be tracked on a per-network (e.g., default router or other criteria), per-location
347 (e.g., geo-location), or per-Service (e.g., current local server) basis.

348 **3.2.1.2 Select Printer Using Name or Address**

349 The Client User Interface asks Jane for a name or address for the Printer. She then provides
350 a Printer name or address through the Client User Interface. Finally, the Client User
351 Interface queries the Printer for valid Service Uniform Resource Identifiers (URIs).

352 The Printer name can be a DNS Service Discovery (DNS-SD) Service name, a fully-
353 qualified domain name, or other unique identifying name. The Printer address can be a
354 numeric IP address or other unique identifying number.

355 **3.2.1.3 Select Printer Using URI**

356 The Client User Interface asks Jane for a Service URI for the Printer. She then provides a
357 URI through the Client User Interface or cancels selection.

358 For example, Jane could supply an IPP URI: "ipp://example.com/port1" as reported by the
359 Printer's network configuration page.

360 **3.2.1.4 Select Printer Using a Directory Service**

361 The Client obtains a list of Printers on behalf of Jane from the Directory Service and
362 validates that each Printer supports one or more Client-supported Service protocols. The
363 Client User Interface then asks Jane to select one of the supported Printers. Finally, she
364 selects a Printer.

365 Preconditions: One or more Printers are listed in a Directory Service and that Directory
366 Service is Network Accessible to the Client.

367 **3.2.1.5 Select Printer Using a Cloud Service**

368 The Client obtains a list of Printers on behalf of Jane from the Cloud Service(s). The Client
369 User Interface then asks Jane to select one of the Printers. Finally, she selects a Printer.

370 Preconditions: The Client and one or more Printers are registered with a Cloud Service, and
371 that Cloud Service is Network Accessible to both the Client and Printers. The Client and
372 Printers may be registered with multiple Cloud Services, and both may maintain multiple
373 identities for a particular Cloud Service.

374 **3.2.1.6 Select Printer Using a Discovery Protocol**

375 The Client initiates Discovery on behalf of Jane and maintains a dynamic list of Network
376 Accessible Printers during selection. The Client User Interface asks Jane to select one of

377 the Network Accessible Printers, updating those Printers as they come and go. Finally, she
378 selects a Printer and the Client terminates Discovery.

379 Preconditions: The Printer is Network Accessible to the Client and supports a common
380 Discovery Protocol.

381 **3.2.1.7 Select Printer Using Geo-Location**

382 The Client initiates Enumeration of Printers within a geographic area using Services and/or
383 Discovery Protocols, hiding duplicate Printers that are reported by multiple Service and/or
384 Discovery Protocols. The Client User Interface asks Jane to select one of the Printers.
385 Finally, she selects a Printer.

386 Preconditions: Both the Client and Printer have access to geo-location information to allow
387 for Enumeration within a geographic area, and both support common Discovery Protocol(s).

388 **3.2.1.8 Select Printer Using Out of Band Method**

389 Jane asks the Client User Interface to identify the Printer using a built-in camera, Near-Field
390 Communications (NFC) chip, or other sensing technology. The Client initiates identification
391 to obtain a Service URI and descriptive information. The Client User Interface then asks
392 Jane to confirm the selection of the identified Printer. Finally, she confirms the selection.

393 Precondition: The Printer and Client support a common identifying technology such as NFC,
394 Quick Response Codes (QR Codes), or bar codes.

395 **3.2.1.9 Select Printer Using Properties**

396 Jane selects a Printer using properties such as Service, capability, or description properties
397 of the Printer. Service properties include the application (printing) protocol, security, or
398 restrictions such as the maximum number of pages allowed in a job. Capability properties
399 include values such as media, duplex, finishing, color support, and so forth, Description
400 properties include values such as location, speed, color support, and job size. The
401 properties may be provided by a combination of user input, policy, and/or software heuristic.

402 Jane asks the Client User Interface to select using properties. The Client obtains a list of
403 Printers for Jane that meet the given properties provided by the Client software, policy,
404 and/or user and validates that each Printer supports one or more Client-supported Service
405 protocols. The Client User Interface then asks Jane to select one of the supported Printers.
406 Finally, she selects a Printer.

407 **3.2.2 Print**

408 Each of the use cases in this section begin by initiating a print action, selecting a Printer
409 (section 3.2.1), querying the Printer status, capabilities, and status information, and
410 displaying of any status information important to the User. Each use case generally ends
411 with Jane collecting the printout from the Printer.

412 Preconditions: For all of the following use cases, the Printer must be Network Accessible to
413 the Client in order to be selected, either directly or through an intermediate Service. Also,
414 the document to be printed must be Network Accessible to the Printer and in a format
415 suitable for the Printer or converted by the Client or Service into a suitable format.

416 **3.2.2.1 Print a Document**

417 Jane has a Client connected to the Wi-Fi network in her business and has a document to
418 print prior to a meeting that is stored on her phone.

419 After Jane initiates a print action and selects a Printer, she specifies the processing intent
420 for the Job and confirms the print action. The Client sends a print job request to the Printer
421 with the Job Ticket and attached document data. The Printer validates the Job Ticket and
422 document data and then prints the document.

423 **3.2.2.2 Print a Document by Reference**

424 Jane has a Client connected to the Wi-Fi network in her business and is viewing a document
425 on a server that she would like to print.

426 After Jane initiates a print action and selects a Printer, she specifies the processing intent
427 for the Job and confirms the print action. The Client sends a print job request to the Printer
428 with the Job Ticket and document URI. The Printer validates the Job Ticket and document
429 URI and then prints the document.

430 **3.2.2.3 Print Using Loaded Media**

431 Jane is viewing a photo and would like to print the photo on the largest borderless
432 photographic media loaded on her Printer.

433 After Jane initiates a print action from the phone and selects a Printer, the Client photo
434 application automatically selects the largest borderless photographic media loaded on the
435 Selected Printer and the highest print quality. Jane selects additional processing intent for
436 the Job and confirms the print action. The Client sends a print job request to the Printer with
437 the Job Ticket and local photo. The Printer validates the Job Ticket and document data and
438 then prints the photo.

439 Preconditions: Printer can report loaded media information such as size, orientation, type,
440 coating, and weight. This may be detected automatically or manually entered by the User
441 or Operator when loading the media.

442 **3.2.2.4 Print a Secure Form**

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

447 The treasurer loads check blanks into the Printer and configured the loaded media as
448 necessary at the Printer. After he initiates a print action from the accounting program,
449 selects a Printer for printing, and selects checks to be printed, the Client User Interface
450 displays a preview of the printed checks and he confirms that the checks are correctly
451 paginated and oriented and the amounts, payees and signature are correct. The Client
452 automatically selects the check blank media. The treasurer selects additional processing
453 intent for the Job and confirms the print action. The Client sends a print job request to the
454 Printer with the Job Ticket and document data containing the check information, correctly
455 oriented for the check blank media. He waits for the checks to be printed and removes any
456 excess media from the Printer.

457 Preconditions: Printer can report loaded media information such as size, orientation, type,
458 coating, and weight. This may be detected automatically or manually entered by the User
459 or Operator when loading the media.

460 **3.2.2.5 Print with Special Formatting**

461 At a seminar located at a country resort, an assistant has been asked to provide 80 sets of
462 ten keywords/phrases, clearly printed on 2-inch by 1-inch paper slips for use in a get
463 acquainted exercise. Costs are to be minimized. The assistant has a laptop with a word
464 processor program. The resort has a Wi-Fi network available to Users and a networked
465 MFD at the business center. The attendant at the business center will charge for any printed
466 sheets removed from the premises.

467 After the assistant initiates a print action from the word processor and selects a Printer, he
468 selects the processing intent for the Job and confirms the print action. The word processor
469 produces document data using the media information (size and margins) in the Job Ticket
470 so that 2-inch by 1-inch slips are spread evenly over each page and sends a print job
471 request to the Printer with the Job Ticket and document. The Printer validates the Job Ticket
472 and document data and then prints the document.

473 **3.2.2.6 Print and Select at Printer**

474 One or more Printers are associated with a Service that allows Users to release and print
475 Jobs at any associated Printer. Each User may release a job at a given Printer by providing
476 a Personal Identification Number (PIN) and/or other unique identification/authorization
477 information such as a username and password or IDentification (ID) card.

478 After initiating a print action and selecting a Service, Jane specifies the processing intent
479 and PIN for the Job and confirms the print action. The Client sends a print job request to
480 the Service with the Job Ticket and local document. The Service validates the Job Ticket
481 and document data and then holds the document until released by Jane at the Printer.

482 Precondition: The Client and Printer support a common authorization or identification
483 system. The capability of associated Printers are the same or the User selects a best-effort
484 job processing intent.

485 3.2.2.7 Print to a Service

486 John is flying to New York for a presentation and doesn't want to carry the presentations.
487 John arrives in New York and goes online from his mobile phone. After initiating a print
488 action, he selects a local print provider, reviewing the provider web pages as needed. He
489 then specifies the processing intent as 10 color copies, printed duplex and stapled on the
490 left side, with the covers on 80lb. stock and the internal pages on 24lb. stock. After
491 confirming the print action, John goes to the provider and picks up his presentations, paying
492 with his corporate credit card.

493 3.2.2.8 Print to a Recipient

494 The recipient may release a job at a given Printer by providing a PIN and/or other unique
495 identification/authorization information such as a username and password or ID card.

496 After initiating a print action and selecting a Printer, Jane specifies the processing intent,
497 specifies John as the recipient, and confirms the print action. The Client sends a print job
498 request to the Printer with the Job Ticket and local document. The Printer validates the Job
499 Ticket and document data and then holds the document until released by John. Finally,
500 John collects the printout from the Printer.

501 3.2.2.9 Print with a Proof Copy

502 After initiating a print action and selecting a Printer, John specifies the processing intent,
503 requests a proof print, and confirms the print action. The Client sends a print job request to
504 the Printer with the Job Ticket and local document. The Printer validates the Job Ticket and
505 document data and then prints a proof copy of the document. John collects the proof printout
506 from the Printer and verifies correct output. John then initiates a full print of the document
507 from the Client or Printer to produce part or all of the final output.

508 3.2.3 Exceptions**509 3.2.3.1 Print Action Canceled**

510 Jane cancels the print action UI. The Client then discontinues any active printer selection,
511 print job submission, or other operations and cancels any incomplete print job submission
512 as needed.

513 3.2.3.2 Select Printer Canceled

514 John cancels selection of a Printer. The Client then discontinues any active discovery,
515 Enumeration, or query operations as needed.

516 3.2.3.3 Printer No Longer Network Accessible after Selection

517 After selecting a Network Accessible Printer, the Client, selected Printer, or network suffers
518 a failure preventing the Client from communicating with the Printer. Typically this will display
519 an error message on the Client and cancel the print request.

520 3.2.3.4 Not Authorized

521 After confirming the print request, the Printer responds that the User is not authorized to
522 print the Job document(s). The reason for the authorization failure may involve general
523 access to the Printer, Job document(s), or disallowed Job Ticket values, for example a User
524 may not be allowed to print in color.

525 Precondition: The Printer has access to a file, database, or Service that provides
526 authorization information.

527 3.2.3.5 Needs Authentication

528 After confirming the print request or selecting the Printer, the User is asked to authenticate
529 with the Printer in order to gain access.

530 Precondition: The Printer has access to a file, database, or Service that provide
531 authentication and authorization information.

532 3.2.3.6 Not Accepting Jobs

533 After confirming the print request, the Client discovers that the Printer is no longer accepting
534 jobs, displays an error message, and cancels the print request.

535 3.2.3.7 Job Ticket or Document Format Not Supported

536 After confirming the print request, the Printer rejects the request because the job ticket or
537 document format is not supported. The Client displays an error message and cancels the
538 print request.

539 3.2.3.8 Job or Document Processing Failures

540 While processing a job, the Printer reports job or document processing issues to the Client,
541 which displays an error message as needed and asks the User or Operator to confirm the
542 disposition of the Job. Processing failures include out-of-memory, missing resources, and
543 other conditions that prevent a particular Job or document from printing.

544 3.2.3.9 Printer Fault

545 While processing a Job, the Printer reports faults to the Client, which displays an error
546 message as needed and asks the User or Operator to confirm the disposition of the Job.
547 Printer faults include "out of paper" and other conditions that stop the processing of Jobs.

548 **3.2.3.10 Printer Warning**

549 While processing a Job, the Printer reports warnings to the Client, which provides a warning
550 message as needed. Printer warnings include "low toner" and other advisory conditions that
551 do not stop the processing of Jobs and do not require immediate attention.

552 **3.3 Out of Scope**

553 The following elements of the use cases are considered out of scope for this specification:

- 554 1. The actual method of geo-location and geographic area detection for the Select
555 Printer Using Geo-Location (section 3.2.1.7) use case
556 2. The actual method of payment for the Print to a Service (section 3.2.2.7) use
557 case
558 3. Constraining choice of document formats suitable for the Print use cases
559 4. Definition of new discovery protocols used to find Network Accessible Printers
560 (however, extension of existing protocols is still in scope)

561 **3.4 Design Requirements**

562 The IPP Everywhere™ design should:

- 563 1. Define conformance profiles that reference the IPP/2.0 versions [PWG5100.12];
564 2. Follow the naming conventions defined in the Internet Printing Protocol/1.1
565 [STD92], including keyword value case (lower) and hyphenation requirements;
566 3. Define conformance requirements for both Printers and Clients; and
567 4. Support printing with vendor-neutral Client software from any Client to any
568 Printer using a variety of discovery protocols, IPP for the transport, and
569 standard document formats.

570

571 **4. Discovery Protocols**

572 Printers representing Physical Devices MUST and Printers representing Logical Devices
573 (i.e. print servers) SHOULD support DNS-SD based Discovery. Printers MAY support other
574 Discovery protocols such as LDAP and SLP.

575 Clients MUST support DNS-SD. Clients MAY support other Discovery protocols such as
576 LDAP and SLP.

577 **4.1 Printer Description Attributes Used in Discovery**

578 Table 1 lists the Printer Description attributes that would normally be used for Discovery or
579 filtering of discovered Printers based on one or more specified Printer attribute values.

580 **4.2 DNS Service Discovery (DNS-SD)**

581 DNS Service Discovery (DNS-SD) [RFC6762] uses service (SRV) records and traditional
582 unicast and multicast DNS (mDNS) [RFC6763] queries. This discovery protocol is
583 collectively defined in the Bonjour Printing Specification version 1.2.1 [BONJOUR] and
584 extended in this specification.

585 Printers that support DNS-SD MUST support mDNS and MAY support dynamic DNS
586 updates via Dynamic Updates in the Domain Name System (DNS UPDATE) [RFC2136]
587 and other mechanisms.

588 **4.2.1 Service (SRV) Instance Name**

589 Printers MUST NOT use a service instance name containing a unique identifier by default.
590 A unique identifier MAY be added to the instance if there is a name collision.

591 Printers that support DNS-SD MUST advertise the "_ipp._tcp" (generic IPP) and
592 "_print._sub._ipp._tcp" (IPP Everywhere™) services over mDNS.

593 Printers that support DNS-SD and the "ipps" URI scheme [RFC7472] MUST advertise the
594 "_ipps._tcp" (generic IPPS) and "_print._sub._ipps._tcp" (IPP Everywhere™ Secure)
595 services over mDNS.

596 The domain portion of the service instance name MUST BE "local." for mDNS.

597 **4.2.2 Geo-Location (LOC)**

598 Printers MUST publish LOC records [RFC1876] over mDNS to provide the physical location
599 of the Printer. Printers MUST allow the User to configure the geo-location manually. If the
600 accuracy of the geo-location is unknown, a value of 9×10^9 meters (0x99) MUST be used.
601

602

Table 1 - Attributes in Discovery Protocols

IPP Attribute	DNS-SD TXT Key	LDAP/SLP Attribute
color-supported	Color	printer-color-supported
copies-supported	Copies	printer-copies-supported
device-service-count	(note 2)	printer-device-service-count (note 1)
device-uuid	DUUID	printer-device-uuid (note 1)
document-formats-supported	pdl	printer-document-format-supported
finishings-supported	Bind, Punch, Sort, Staple	printer-finishings-supported
ipp-features-supported	(subtype)	printer-ipp-features-supported
media-supported	PaperCustom, PaperMax	printer-media-supported
multiple-document-handling	Collate	-
pages-per-minute	(note 2)	printer-pages-per-minute
pages-per-minute-color	(note 2)	printer-pages-per-minute-color
printer-charge-info	(note 2)	printer-charge-info (note 1)
printer-charge-info-uri	chargeuri	printer-charge-info-uri (note 1)
printer-device-id	usb_CMD, usb_MDL, usb_MFG	printer-device-id (note 1)
printer-geo-location	(LOC record)	printer-geo-location (note 1)
printer-info	(instance)	printer-info
printer-location	note	printer-location
printer-make-and-model	ty	printer-make-and-model
printer-more-info	adminurl	printer-more-info
printer-name	(instance)	printer-name
printer-organization	(note 2)	O
printer-organizational-unit	(note 2)	OU
printer-uri-supported	(service + host + port) rp	printer-uri, printer-xri-supported
printer-uuid	UUID	printer-uuid (note 1)
sides-supported	Duplex	printer-sides-supported
uri-authentication-supported	air	printer-xri-supported
uri-security-supported	TLS	printer-xri-supported

603 Note 1: Extension attribute to RFC 7612.

604 Note 2: Available via subsequent IPP Get-Printer-Attributes request.

605 **4.2.3 Text (TXT)**

606 Printers MUST publish a text (TXT) record that provides service information over mDNS.
607 Printers that support dynamic DNS updates MUST publish separate TXT records for each
608 domain that is updated. The following subsections define new key/value pairs in addition
609 to those required by the Bonjour Printing Specification [BONJOUR].

610 Table 3 lists all of the key/value pairs that are defined with the corresponding default values.
 611 Printers SHOULD omit key/value pairs when the value matches the default value for the
 612 corresponding key to limit the size of the TXT record.

613 The combined length of a TXT key/value pair ("key=value") cannot exceed 255 octets. This
 614 limit is sometimes smaller than the limit imposed by the corresponding IPP attribute.

615 For example, the IPP "printer-more-info" attribute has a maximum length of 1023 octets,
 616 however the corresponding "adminurl" key cannot represent a value longer than 246 octets
 617 (255 - 9 octets for "adminurl="). Printers MUST truncate long strings as described in section
 618 13.

619 The combined length of all TXT key/value pairs provided by the Printer SHOULD BE 400
 620 octets or less for unicast DNS and MUST NOT exceed 1300 octets for multicast DNS.

621 Printers MUST provide the "rp" TXT key/value pair within the first 400 octets of the TXT
 622 record. Table 2 shows the priority of TXT key/value pairs.

623 **Table 2 - Priority of DNS TXT Key/Value Pairs**

Most Important Access Keys	Identification Keys	Capability Keys	Least Important Keys
rp	UUID	Color	Product
txtvers	DUUID	Duplex	usb_MFG
priority	ty	Copies	usb_MDL
qtotal		Collate	usb_CMD
note		PaperMax	pdl
air		PaperCustom	
TLS		Bind	
adminurl		Punch	
		Sort	
		Staple	

624 Clients MUST ignore incomplete key/value pairs at the end of a truncated TXT record.
 625

626

Table 3 - DNS TXT Record Keys

Key	Description	Default Value
adminurl	The Printer-resident configuration page URL as reported by the "printer-more-info" Printer Description attribute.	" (empty string)
air	The type of authentication information that is required for the Printer. See section 4.2.3.1.	'none'
Bind	'T' if the Printer can bind output, 'F' otherwise.	'U' (note 1)
Collate	'T' if the Printer can collate copies, 'F' otherwise.	'U' (note 1)
Color	'T' if the Printer supports color printing, 'F' otherwise.	'U' (note 1)
Copies	'T' if the Printer can make copies on its own, 'F' otherwise.	'U' (note 1)
Duplex	'T' if the Printer supports duplex printing, 'F' otherwise	'U' (note 1)
DUUID	The UUID of the Device without the "urn:uuid:" prefix as reported by the "device-uuid" Printer Description attribute. See section 4.2.3.6.	" (empty string)
note	The location of the Printer as reported by the "printer-location" Printer Description attribute.	" (empty string)
PaperCustom	'T' if the Printer supports custom media sizes, 'F' otherwise.	'U' (note 1)
PaperMax	The maximum media size supported by the Printer: '<legal-A4', 'legal-A4', 'isoC-A2', '>isoC-A2'.	'legal-A4'
pdl	A comma-delimited list of supported MIME media types. See section 4.2.3.2.	" (empty string)
priority	The priority for the service from 0 to 99, where 0 is the highest priority and 99 is the lowest priority.	'50'
Punch	'T' if the Printer can punch output, 'F' otherwise.	'U' (note 1)
qtotal	The number of queues for this Printer. MUST have the value '1'. See section 4.2.3.3	'1'
rp	The remote print queue name, which is the resource path portion of the Printer URI without the leading slash.	" (empty string)
Sort	'T' if the Printer can sort output, 'F' otherwise.	'U' (note 1)
Staple	'T' if the Printer can staple output, 'F' otherwise.	'U' (note 1)
TLS	The maximum TLS version supported or 'none' if no version of TLS is supported. See section 4.2.3.4.	'none'
txtvers	The major version of the Bonjour Printing Specification. MUST have the value '1'.	'1'
ty	The make and model of the Printer as reported by the "printer-make-and-model" Printer Description attribute.	" (empty string)
UUID	The UUID of the Printer without the 'urn:uuid:' prefix as reported by the "printer-uuid" Printer Description attribute. See section 4.2.3.5.	" (empty string)

627 Note 1: The value 'U' means "undefined".

628 **4.2.3.1 air**

629 The "air" key defines the type of authentication information that is required for imaging. The
 630 name "air" comes from the CUPS "auth-info-required" Printer Description attribute

631 [CUPSIPP] that extends the "uri-authentication-supported" Printer Description attribute
632 [STD92]. The following values are supported:

633 'certificate'; Authentication using Secure Sockets Layer (SSL) and Transport Layer
634 Security (TLS) certificates. This is equivalent to the 'certificate' value for the "uri-
635 authentication-supported" Printer Description attribute.

636 'negotiate'; Kerberized authentication is required [RFC4559]. This is equivalent to the
637 'negotiate' value [PWG5100.13] for the "uri-authentication-supported" Printer
638 Description attribute.

639 'none'; No authentication is required. This is equivalent to the 'none' value for the
640 "uri-authentication-supported" Printer Description attribute.

641 'oauth'; OAuth 2.0 authentication [RFC6749] is required using the Bearer method
642 [RFC6750]. This is equivalent to the 'oauth' value [PWG5100.18] for the "uri-
643 authentication-supported" Printer Description attribute.

644 'username,password'; Username + password authentication is required. This is
645 equivalent to the 'basic' or 'digest' values for the "uri-authentication-supported"
646 Printer Description attribute.

647 The default value for the "air" key is 'none'.

648 **4.2.3.2 pdl**

649 The REQUIRED "pdl" (Page Description Language) key lists the supported MIME media
650 types. Because the total length of a key/value pair is 255 octets, the "pdl" value is typically
651 a subset of the values reported by the "document-format-supported" Printer Description
652 attribute. Printers SHOULD populate the "pdl" key with a comma-delimited list of the
653 REQUIRED and preferred Multipurpose Internet Mail Extensions (MIME) media types and
654 MUST NOT list the 'application/octet-stream' MIME media type.

655 **4.2.3.3 qtotal**

656 The "qtotal" key defines the number of services supported by the Printer with this service
657 instance name. While the Bonjour Printing Specification [BONJOUR] does allow Printers to
658 advertise multiple services with the same name using multiple TXT records, historically this
659 functionality has caused interoperability and stability issues for Printers and Clients that
660 support multiple network interfaces, e.g., Wi-Fi and Ethernet. Therefore, Printers MUST
661 NOT advertise multiple services using the same name and MUST always use the default
662 value (1) for the "qtotal" key and advertise the default (print) service in the TXT record.
663 Printers with multiple print service endpoints MAY advertise multiple uniquely named
664 services, each providing a single TXT record for their corresponding information.

665 4.2.3.4 TLS

666 The "TLS" key defines the highest version of TLS that is supported for encrypted
667 communications with the Printer. The following values are currently defined:

668 'none'; No encryption is supported. This is equivalent to the value 'none' for the "uri-
669 security-supported" Printer Description attribute.

670 '1.0'; TLS 1.0 [RFC2246] encryption is supported. This is equivalent to the value 'tls'
671 for the "uri-security-supported" Printer Description attribute.

672 '1.1'; TLS 1.1 [RFC4346] encryption is supported. This is equivalent to the value 'tls'
673 for the "uri-security-supported" Printer Description attribute.

674 '1.2'; TLS 1.2 [RFC5246] encryption is supported. This is equivalent to the value 'tls'
675 for the "uri-security-supported" Printer Description attribute.

676 '1.3'; TLS 1.3 [RFC-TLS1.3] encryption is supported. This is equivalent to the value
677 'tls' for the "uri-security-supported" Printer Description attribute.

678 The default value of the "TLS" key is 'none'. Version numbers correspond to the currently
679 defined TLS protocol versions as defined by the IETF and are not limited to the version
680 numbers shown above. Printers that support IPPS MUST report the TLS key.

681 4.2.3.5 UUID

682 The REQUIRED "UUID" key provides the value of the "printer-uuid" Printer Description
683 attribute [RFC4122] [PWG 5100.13] without the leading "urn:uuid:". For example, if a Printer
684 reports a "printer-uuid" value of:

685 urn:uuid:12345678-9ABC-DEF0-1234-56789ABCDEF0

686 The "UUID" key will have a value of:

687 12345678-9ABC-DEF0-1234-56789ABCDEF0

688 Note: The "printer-uuid" value is used instead of "device-uuid" because DNS-SD identifies
689 services and not devices.

690 4.2.3.6 DUUID

691 The "DUUID" key provides the value of the "device-uuid" Printer Description attribute
692 [RFC4122] [PWG 5100.13] without the leading "urn:uuid:". For example, if a Printer reports
693 a "device-uuid" value of:

694 urn:uuid:12345678-9ABC-DEF0-1234-56789ABCDEF0

695 The "DUUID" key will have a value of:

696 12345678-9ABC-DEF0-1234-56789ABCDEF0

697 **4.3 LDAP and SLP Discovery**

698 LDAP and SLP discovery use the schema defined in Lightweight Directory Access Protocol
699 (LDAP): Schema for Printer Services [RFC4511] [RFC4515] [RFC7612].

700 Both LDAP and SLP impose hard limits on the lengths of string values, typically 127 or 255
701 octets depending on the attribute. These limits are sometimes smaller than the limits
702 imposed by the corresponding IPP attributes.

703 For example, the IPP "printer-device-id" attribute has a maximum length of 1023 octets,
704 however the corresponding LDAP "printer-device-id" attribute has a maximum length of 255
705 octets. Printers MUST truncate long strings as defined in section 13.
706

707 **5. Protocol Binding**

708 Printers and Clients MUST support IPP/2.0, IPP/2.1, and/or IPP/2.2 [PWG5100.12] and the
709 IPP Job and Printer Extensions - Set 3 [PWG5100.13].

710 While this specification defines an IPP binding, the same set of Semantic Elements can be
711 applied to any protocol that conforms to the PWG Semantic Model.

712 **5.1 HTTP Features**

713 In addition to the IPP over HTTP conformance requirements defined in section 7.3 of IPP
714 Version 2.0, 2.1, and 2.2 [PWG5100.12], Printers MUST support the following HTTP
715 headers and status codes defined in HTTP/1.1 - Message Syntax and Routing [RFC7230],
716 HTTP/1.1 - Semantics and Content [RFC7231], HTTP/1.1 - Conditional Requests
717 [RFC7232], and HTTP/1.1 - Caching [RFC7234].

718 Clients and Printers MUST support IPP over HTTP [RFC3510] and SHOULD support IPP
719 over HTTPS [RFC7472] with the most recent version of TLS [RFC8446].

720 **5.1.1 Host**

721 Printers MUST validate the Host request header and SHOULD use the Host value in
722 generated URIs, including any port number.

723 **5.1.2 If-Modified-Since, Last-Modified, and 304 Not Modified**

724 Printers MUST support the If-Modified-Since request header (section 3.3 [RFC7232]), the
725 corresponding response status ("304 Not Modified", section 4.1 [RFC7232]), and the Last-
726 Modified response header (section 2.2 [RFC7232]).

727 The If-Modified-Since request header allows a Client to efficiently determine whether a
728 particular resource file (icon, ICC profile, localization file, etc.) has been updated since the
729 last time the Client requested it.

730 **5.1.3 Cache-Control**

731 Printers and Clients MUST conform to the caching semantics defined in [RFC7234].
732 Typically, most resource files provided by a Printer in a GET response will be cacheable but
733 IPP responses in a POST response are not. Therefore, Printers MAY provide a Cache-
734 Control header in GET responses with an appropriate "max-age" value and MUST provide
735 a Cache-Control header in IPP POST responses with the value "no-cache".
736

737 **5.2 IPP Operations**

738 Table 4 lists the REQUIRED operations for an IPP Everywhere™ Printer. Additionally,
739 Clients and Printers SHOULD support the Get-User-Printer-Attributes [GUPA] operation for
740 per-User print policies.

741 Note: The Create-Job and Send-Document operations are required in order to support
742 reliable Job management (e.g., cancellation) during Print Job submission, but Printers are
743 not required to support multiple Document Jobs.

744 **Table 4 - IPP Everywhere™ Operations**

Code	Operation Name	Reference
0x0002	Print-Job	RFC 8011
0x0004	Validate-Job	RFC 8011
0x0005	Create-Job	RFC 8011
0x0006	Send-Document	RFC 8011
0x0008	Cancel-Job	RFC 8011
0x0009	Get-Job-Attributes	RFC 8011
0x000A	Get-Jobs	RFC 8011
0x000B	Get-Printer-Attributes	RFC 8011
0x0039	Cancel-My-Jobs	PWG 5100.11
0x003B	Close-Job	PWG 5100.11
0x003C	Identify-Printer (note 1)	PWG 5100.13

745 Note 1: RECOMMENDED for Logical Devices, REQUIRED otherwise.

746 **5.3 IPP Printer Description Attributes**

747 Table 5 lists the Printer Description attributes for an IPP Everywhere™ Printer. All attributes
748 in the table are REQUIRED unless otherwise specified.

749 **Table 5 - Required IPP Everywhere™ Printer Description Attributes**

Attribute	Reference
charset-configured	RFC 8011
charset-supported	RFC 8011
color-supported	RFC 8011
compression-supported	RFC 8011
copies-default (note 2)	RFC 8011
copies-supported (note 2)	RFC 8011
document-format-default	RFC 8011
document-format-supported	RFC 8011
document-password-supported (note 2)	PWG 5100.13
feed-orientation-default (note 5)	PWG 5100.11
feed-orientation-supported (note 5)	PWG 5100.11
finishings-col-database (notes 3 and 7)	PWG 5100.1
finishings-col-default (notes 3 and 7)	PWG 5100.1
finishings-col-ready (notes 3 and 7)	PWG 5100.1
finishings-col-supported (notes 3 and 7)	PWG 5100.1
finishings-default (note 3)	RFC 8011

Attribute	Reference
finishings-ready (notes 3 and 7)	RFC 8011
finishings-supported (note 3)	RFC 8011
generated-natural-language-supported	RFC 8011
identify-actions-default	PWG 5100.13
identify-actions-supported	PWG 5100.13
ipp-features-supported	PWG 5100.13
ipp-versions-supported	RFC 8011
job-account-id-default (note 1)	PWG 5100.3
job-account-id-supported (note 1)	PWG 5100.3
job-accounting-user-id-default (note 1)	PWG 5100.3
job-accounting-user-id-supported (note 1)	PWG 5100.3
job-constraints-supported	PWG 5100.13
job-creation-attributes-supported	PWG 5100.11
job-ids-supported	PWG 5100.11
job-password-supported (note 4)	PWG 5100.11
job-password-encryption-supported (note 4)	PWG 5100.11
job-resolvers-supported	PWG 5100.13
media-bottom-margin-supported	PWG 5100.13
media-col-database	PWG 5100.11
media-col-database.media-source-properties (note 5)	PWG 5100.13
media-col-default	PWG 5100.3
media-col-ready	PWG 5100.3
media-col-ready.media-source-properties (note 5)	PWG 5100.13
media-col-supported	PWG 5100.3
media-default	RFC 8011
media-left-margin-supported	PWG 5100.13
media-ready	RFC 8011
media-right-margin-supported	PWG 5100.13
media-size-supported	PWG 5100.3
media-source-supported	PWG 5100.13
media-supported	RFC 8011
media-top-margin-supported	PWG 5100.13
media-type-supported	PWG 5100.3
multiple-document-jobs-supported	RFC 8011
multiple-operation-timeout	RFC 8011
multiple-operation-timeout-action	PWG 5100.13
natural-language-configured	RFC 8011
operations-supported	RFC 8011
orientation-requested-default	RFC 8011
orientation-requested-supported	RFC 8011
output-bin-default	PWG 5100.2
output-bin-supported	PWG 5100.2
overrides-supported (note 2)	PWG 5100.6
page-ranges-supported (note 2)	RFC 8011
preferred-attributes-supported	PWG 5100.13
print-color-mode-default	PWG 5100.13
print-color-mode-supported	PWG 5100.13
print-content-optimize-default	PWG 5100.7
print-content-optimize-supported	PWG 5100.7
print-rendering-intent-default (note 8)	PWG 5100.13
print-rendering-intent-supported (note 8)	PWG 5100.13
print-quality-default	RFC 8011
print-quality-supported	RFC 8011

Attribute	Reference
printer-current-time (note 7)	RFC 8011
printer-geo-location	PWG 5100.13
printer-get-attributes-supported	PWG 5100.13
printer-icc-profiles (notes 6 and 8)	PWG 5100.13
printer-icons (note 6)	PWG 5100.13
printer-info	RFC 8011
printer-location	RFC 8011
printer-make-and-model	RFC 8011
printer-mandatory-job-attributes (note 1)	PWG 5100.13
printer-name	RFC 8011
printer-organization	PWG 5100.13
printer-organizational-unit	PWG 5100.13
printer-resolution-default	RFC 8011
printer-resolution-supported	RFC 8011
pwg-raster-document-resolution-supported	PWG 5102.4
pwg-raster-document-sheet-back	PWG 5102.4
pwg-raster-document-type-supported	PWG 5102.4
sides-default	RFC 8011
sides-supported	RFC 8011
uri-security-supported	RFC 8011
uri-authentication-supported	RFC 8011
which-jobs-supported	PWG 5100.11

750
751 Note 1: CONDITIONALLY REQUIRED for Printers that implement Paid Imaging
752 services.
753 Note 2: REQUIRED for the "application/pdf" and "image/jpeg" MIME media types.
754 Note 3: CONDITIONALLY REQUIRED for Printers with finishers.
755 Note 4: CONDITIONALLY REQUIRED for Printers that support the Print to a
756 Recipient (section 3.2.2.8) use case.
757 Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed
758 media.
759 Note 6: URIs MUST be absolute, SHOULD use the Host value (including port
760 number) from the HTTP Host header (section 5.1.1), and MUST NOT use link-local
761 addresses (section 8.4).
762 Note 7: RECOMMENDED due to its omission from IPP Everywhere™ 1.0, however
763 it is needed for the underlying functionality.
764 Note 8: CONDITIONALLY REQUIRED for Printers that support ICC-based color
765 management.
766

767

Table 6 - RECOMMENDED IPP Everywhere™ Printer Description Attributes

Attribute	Reference
job-account-type-default	PWG 5100.16
job-account-type-supported	PWG 5100.16
job-authorization-uri-supported	PWG 5100.16
job-password-repertoire-configured	REPertoire
job-password-repertoire-supported	REPertoire
job-presets-supported	PRESETS
job-privacy-attributes	PRIVACY
job-privacy-scope	PRIVACY
jpeg-features-supported	PWG 5100.16
jpeg-k-octets-supported	PWG 5100.16
jpeg-x-dimension-supported	PWG 5100.16
jpeg-y-dimension-supported	PWG 5100.16
pdf-k-octets-supported	PWG 5100.16
pdf-versions-supported	PWG 5100.16
print-scaling-default	PWG 5100.16
print-scaling-supported	PWG 5100.16
printer-dns-sd-name	PWG 5100.16
printer-privacy-policy-uri	PRIVACY

768 5.3.1 media-col-database (1setOf collection)

769 The REQUIRED "media-col-database" Printer attribute lists the supported combinations of
 770 "media-col" member attributes for a Printer. In addition to the requirements set forth in IPP:
 771 Job and Printer Extensions - Set 2 [PWG5100.11], this specification defines how a Printer
 772 advertises custom and roll-fed media capabilities in the "media-col-database" attribute.

773 Custom media sizes are described using rangeOfInteger values for the "x-dimension" and
 774 "y-dimension" member attributes of the "media-size" member attribute. Dimensions are
 775 provided for sheets in portrait orientation, that is the "x-dimension" ranges refer to the short
 776 axis and the "y-dimension" ranges refer to the long axis of the sheet. For example, a Printer
 777 supporting sheet media from 50x50mm to 330.2x482.6mm from the by-pass tray could
 778 report:

```
779     media-col-database=..., {
780         media-size={
781             x-dimension=5000-33020
782             y-dimension=5000-48260 }
783         media-source='by-pass-tray' },...
```

784 Similarly, roll media sizes are also described using rangeOfInteger values, however the "x-
 785 dimension" value refers to the cross-feed (width) dimension and the "y-dimension" value
 786 refers to the feed (length) dimension. The supported ranges provide the capabilities of the
 787 Printer and not of any loaded media which is reported separately in the "media-col-ready"
 788 and "media-ready" attributes. For example, a Printer supporting rolls 8 to 60 inches wide
 789 and 6 inches to 300 feet long would report:

```
790     media-col-database=..., {
791         media-size={
```


829 the name "roll_current_36x0in". As for custom sizes, the size name MUST include the
830 source name if more than one roll is loaded, for example "roll_current.roll-1_36x0in".

831 **5.3.4 media-size-supported (1setOf collection)**

832 The REQUIRED "media-size-supported" Printer attribute lists the supported media sizes for
833 a Printer. In addition to the requirements set forth in [PWG5100.3], this specification defines
834 how a Printer advertises custom and roll-fed media in the "media-size" attribute.

835 Custom media sizes are described using rangeOfInteger values for the "x-dimension" and
836 "y-dimension" member attributes. Dimensions are provided for sheets in portrait orientation,
837 that is the "x-dimension" ranges refer to the short axis and the "y-dimension" ranges refer
838 to the long axis of the sheet. For example, a Printer supporting sheet media from 50x50mm
839 to 330.2x482.6mm from the by-pass tray would report:

```
840     media-size-supported=..., {  
841         x-dimension=5000-33020  
842         y-dimension=5000-48260 }, ...
```

843 Similarly, roll media sizes are also described using rangeOfInteger values, however the "x-
844 dimension" value refers to the cross-feed (width) dimension and the "y-dimension" value
845 refers to the feed (length) dimension. The supported ranges provide the capabilities of the
846 Printer and not of any loaded media which is reported separately in the "media-col-ready"
847 and "media-ready" attributes. For example, a Printer supporting rolls 8 to 60 inches wide
848 and 6 inches to 300 feet long would report:

```
849     media-size-supported=..., {  
850         x-dimension=20320-152400  
851         y-dimension=1524-9144000 }, ...
```

852 **5.3.5 media-supported (1setOf (type3 keyword | name(MAX)))**

853 The REQUIRED "media-supported" Printer attribute lists the supported media sizes for a
854 Printer. In addition to the requirements set forth in the Internet Printing Protocol/1.1 [STD92],
855 this specification defines how a Printer advertises custom and roll-fed media in the "media-
856 supported" attribute.

857 Custom media sizes are described using two self-describing media names. The
858 "custom_min_WIDTHxHEIGHTunits" value provides the minimum custom media
859 dimensions and the "custom_max_WIDTHxHEIGHTunits" value provides the maximum
860 custom media dimensions. The size name MUST include the source name if different
861 dimensions are supported by each source. Dimensions are provided for sheets in portrait
862 orientation, that is the "WIDTH" values refer to the short axis and the "HEIGHT" values refer
863 to the long axis of the sheet. For example, a Printer supporting sheet media from 50x50mm
864 to 330.2x482.6mm from the by-pass tray could report:

```
865     media-supported=..., custom_max.by-pass-tray_330.2x482.6mm,  
866     custom_min.by-pass-tray_50x50mm, ...
```

867 Similarly, roll media sizes are described using the "roll_min_WIDTHxHEIGHTunits" and
 868 "roll_max_WIDTHxHEIGHTunits" names. The "WIDTH" values refer to the supported roll
 869 widths while the "HEIGHT" values refer to the supported roll lengths. The size name MUST
 870 include the source name if the Printer supports multiple source with different roll limits.

871 For example, a Printer supporting a single roll 8 to 60 inches wide and 6 inches to 300 feet
 872 long would report:

873 `media-supported=...,roll_max_60x3600in,roll_min_8x6in,...`

874 A Printer supporting two rolls, one 8 to 60 inches wide and 6 inches to 300 feet long and
 875 the other 8 to 36 inches wide and 6 inches to 150 feet long would report:

876 `media-size-supported=...,roll_max.roll-1_60x3600in,roll_min.roll-1_8x6in,`
 877 `roll_max.roll-2_36x1800in,roll_min.roll-2_8x6in,...`

878 5.3.6 pdl-override-supported (type2 keyword)

879 The REQUIRED "pdl-override-supported" Printer attribute informs the Client whether Job
 880 Ticket information embedded in the Document data for a Job is overridden by Job Template
 881 attributes.

882 When reporting capabilities for the 'application/pdf', 'image/jpeg', or 'image/pwg-raster'
 883 MIME media types, Printers MUST report either 'attempted' [STD92] or 'guaranteed'
 884 [PWG5100.11] for the "pdl-override-supported" Printer attribute.

885 5.4 IPP Printer Status Attributes

886 Table 5 lists the Printer Status attributes for an IPP Everywhere™ Printer. All attributes in
 887 the table are REQUIRED unless otherwise specified.

888 **Table 7 - IPP Everywhere™ Printer Status Attributes**

Attribute	Reference
pages-per-minute	RFC 8011
pages-per-minute-color	RFC 8011
printer-alert	PWG 5100.9
printer-alert-description	PWG 5100.9
printer-config-change-date-time	PWG 5100.13
printer-config-change-time	PWG 5100.13
printer-is-accepting-jobs	RFC 8011
printer-more-info (note 1)	RFC 8011
printer-state	RFC 8011
printer-state-change-date-time	RFC 3995
printer-state-change-time	RFC 3995
printer-state-message	RFC 8011
printer-state-reasons	RFC 8011
printer-strings-languages-supported (note 2)	PWG 5100.13
printer-strings-uri (notes 1 and 2)	PWG 5100.13

Attribute	Reference
printer-supply	PWG 5100.13
printer-supply-description	PWG 5100.13
printer-supply-info-uri (note 1)	PWG 5100.13
printer-up-time	RFC 8011
printer-uri-supported (note 1)	RFC 8011
printer-uuid	PWG 5100.13
pwg-raster-document-resolution-supported	PWG 5102.4
pwg-raster-document-sheet-back	PWG 5102.4
pwg-raster-document-type-supported	PWG 5102.4
queued-job-count	RFC 8011

889
890 Note 1: URIs MUST be absolute, SHOULD use the Host value (including port
891 number) from the HTTP Host header (section 5.1.1), and MUST NOT use link-local
892 addresses (section 8.4).
893 Note 2: RECOMMENDED due to its omission from IPP Everywhere™ 1.0, however
894 it is needed for the underlying functionality.

895 **5.4.1 printer-uri-supported (1setOf uri)**

896 The REQUIRED "printer-uri-supported" Printer attribute provides 'ipp' and 'ipps' URIs that
897 can be used to access the Printer. Printers SHOULD advertise URIs with a resource path
898 of the form "/ipp/print" or "/ipp/print/queuename".

899 **5.5 IPP Operation Attributes**

900 Table 8 lists the REQUIRED operation attributes for an IPP Everywhere™ Printer.

901 **Table 8 - REQUIRED IPP Everywhere™ Operation Attributes**

Deleted: Required

Attribute	Reference
compression	RFC 8011
document-format	RFC 8011
document-name	RFC 8011, PWG 5100.5
document-password (note 1)	PWG 5100.13
first-index	PWG 5100.13
first-job-id	RFC 8011
identify-actions	PWG 5100.13
ipp-attribute-fidelity	RFC 8011
job-ids	PWG 5100.11
job-mandatory-attributes (note 3)	PWG 5100.7
job-name	RFC 8011
job-password (note 2)	PWG 5100.11
job-password-encryption (note 2)	PWG 5100.11
last-document	RFC 8011
limit	RFC 8011
requesting-user-name	RFC 8011
requesting-user-uri	PWG 5100.13
which-jobs	RFC 8011, PWG 5100.11

902 Note 1: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"
 903 MIME media type.

904 Note 2: CONDITIONALLY REQUIRED for Printers that support the Print to a
 905 Recipient (section 3.2.2.8) use case.

906 Note 3: CONDITIONALLY REQUIRED for Printers that implement Paid Imaging
 907 services.
 908

909 **Table 9 - RECOMMENDED IPP Everywhere™ Operation Attributes**

Attribute	Reference
job-authorization-uri	PWG 5100.16
job-impressions-estimated	PWG 5100.16

910

912 **5.6 IPP Job Description Attributes**

913 Table 10 lists the REQUIRED Job Description attributes for an IPP Everywhere™ Printer.

914 **Table 10 - IPP Everywhere™ Required Job Description Attributes**

Attribute	Reference
job-name	RFC 8011

Deleted: Source

915 **5.7 IPP Job Status Attributes**

916 Table 10 lists the REQUIRED Job Status attributes for an IPP Everywhere™ Printer.

917 **Table 11 - IPP Everywhere™ Required Job Status Attributes**

Attribute	Reference
date-time-at-completed	RFC 8011
date-time-at-creation	RFC 8011
date-time-at-processing	RFC 8011
job-id	RFC 8011
job-impressions	RFC 8011
job-impressions-completed	RFC 8011
job-originating-user-name	RFC 8011
job-printer-up-time	RFC 8011
job-printer-uri (note 1)	RFC 8011
job-state	RFC 8011
job-state-message	RFC 8011
job-state-reasons	RFC 8011
job-uri (note 1)	RFC 8011
job-uuid	PWG 5100.13
time-at-completed	RFC 8011
time-at-creation	RFC 8011
time-at-processing	RFC 8011

Deleted: Source

918 Note 1: URIs MUST be absolute, SHOULD use the Host value from HTTP header
919 (section 5.1.1), and MUST NOT use link-local addresses (section 8.4).
920

921 **5.7.1 job-id (integer)**

922 The REQUIRED "job-id" Job Description attribute contains the ID of the Job. In order to
923 support reliable job submission and management, Printers MUST NOT reuse "job-id"
924 values since the last power cycle of the Printer and SHOULD NOT reuse "job-id" values
925 for the life of the Printer as described in section 3.1.2.3.9 of the Internet Printing
926 Protocol/1.1: Implementer's Guide [RFC3196].

929 **5.7.2 job-uri (uri)**

930 The REQUIRED "job-uri" Job Description attribute contains the absolute URI of the Job. In
 931 order to support reliable job submission and management, Printers MUST NOT reuse
 932 "job-uri" values since the Printer was last powered up and SHOULD NOT reuse "job-uri"
 933 values for the life of the Printer as described in section 3.1.2.3.9 of the Internet Printing
 934 Protocol/1.1: Implementer's Guide [RFC3196]. In addition, the "job-uri" value SHOULD be
 935 derived from the "job-id" value as described in the IPP URL Scheme [RFC3510].

936 **5.8 IPP Job Template Attributes**

937 Table 12 lists the Job Template attributes for an IPP Everywhere™ Printer. All attributes in
 938 the table are REQUIRED unless otherwise specified.

939 **Table 12 - REQUIRED IPP Everywhere™ Job Template Attributes**

Attribute	Reference
copies (note 2)	RFC 8011
feed-orientation (note 5)	PWG 5100.11
finishings (note 4)	RFC 8011
finishings-col (note 4)	PWG 5100.1
finishings-col.finishing-template (note 4)	PWG 5100.1
job-account-id (note 1)	PWG 5100.3
job-accounting-user-id (note 1)	PWG 5100.3
media	RFC 8011
media-col	PWG 5100.3
media-col.media-bottom-margin	PWG 5100.13
media-col.media-left-margin	PWG 5100.13
media-col.media-right-margin	PWG 5100.13
media-col.media-size	PWG 5100.3
media-col.media-source	PWG 5100.13
media-col.media-top-margin	PWG 5100.13
media-col.media-type	PWG 5100.3
multiple-document-handling (note 3)	RFC 8011
orientation-requested	RFC 8011
output-bin	PWG 5100.2
overrides (note 3)	PWG 5100.6
overrides.document-numbers (note 6)	PWG 5100.6
page-ranges (note 3)	RFC 8011
print-color-mode	PWG 5100.13
print-content-optimize	PWG 5100.7
print-rendering-intent (note 7)	PWG 5100.13
print-quality	RFC 8011
printer-resolution	RFC 8011
sides	RFC 8011

Deleted: s
 Deleted: 5 and 7

940

- 943 Note 1: CONDITIONALLY REQUIRED for Printers that implement paid imaging
- 944 services.
- 945 Note 2: [CONDITIONALLY](#) REQUIRED for the "application/pdf" and "image/jpeg"
- 946 MIME media types.
- 947 Note 3: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"
- 948 MIME media type.
- 949 Note 4: CONDITIONALLY REQUIRED for Printers with finishers.
- 950 Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed
- 951 media.
- 952 Note 6: CONDITIONALLY REQUIRED for Printers that support multiple-Document
- 953 Jobs.
- 954 Note 7: CONDITIONALLY REQUIRED for Printers that support ICC-based color
- 955 management.

956 [Table 13 - RECOMMENDED IPP Everywhere™ Job Template Attributes](#)

Attribute	Reference
job-account-type	PWG 5100.16
print-scaling	PWG 5100.16

957

958 **6. Document Formats**

959 Printers MUST support documents conforming to the PWG Raster Format [PWG5102.4]
960 ("image/pwg-raster"). Color Printers MUST and monochrome Printers SHOULD support
961 documents conforming to the JPEG File Information Format Version 1.02 [JFIF]
962 ("image/jpeg"), specifically the metadata and JPEG subset defined in the Standard of the
963 Camera & Imaging Products Association, CIPA DC-008-Translation-2016, Exchangeable
964 image file format for digital still cameras: Exif Version 2.31 [EXIF].

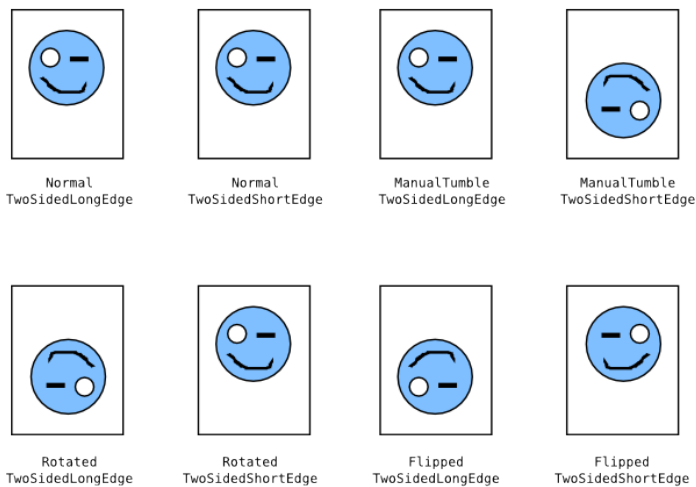
965 IPP/2.1 and IPP/2.2 Printers MUST and IPP/2.0 Printers SHOULD support documents
966 conforming to Document management — Portable document format — Part 1: PDF 1.7
967 [ISO32000] ("application/pdf"). IPP/2.0, IPP/2.1, and IPP/2.2 Printers are defined in
968 [PWG5100.12].

969 **6.1 Supporting Long-Edge Feed Media with PWG Raster Format** 970 **Documents**

971 Printers that support long-edge feed media MUST support the "feed-orientation" Job
972 Template attribute and corresponding "feed-orientation-default" and "feed-orientation-
973 supported" Printer attributes. In addition, Printers that support long-edge feed media MUST
974 report the "media-source-properties" member attribute in the "media-col-database" and
975 "media-col-ready" Printer attributes.

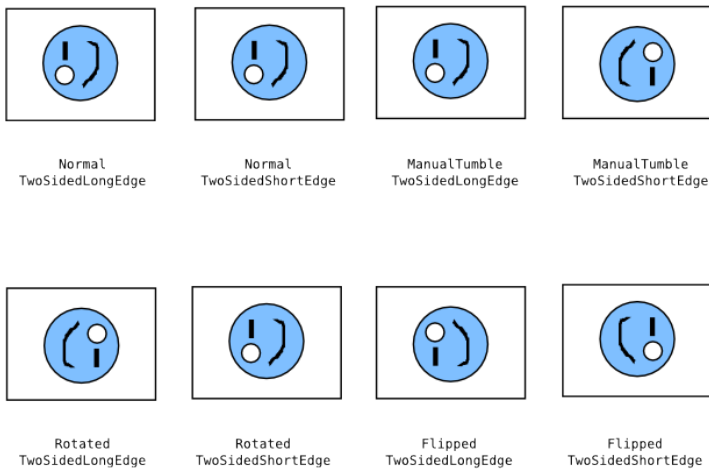
976 When submitting a PWG Raster document in a job or document creation request, Clients
977 MUST additionally query the Printer for the "feed-orientation-supported", "media-col-
978 database", and/or "media-col-ready" Printer attributes in order to provide a document in the
979 correct orientation and dimensions for the Printer.

980 Figures 2 through 5 show how raster data must be formatted for each feed orientation.



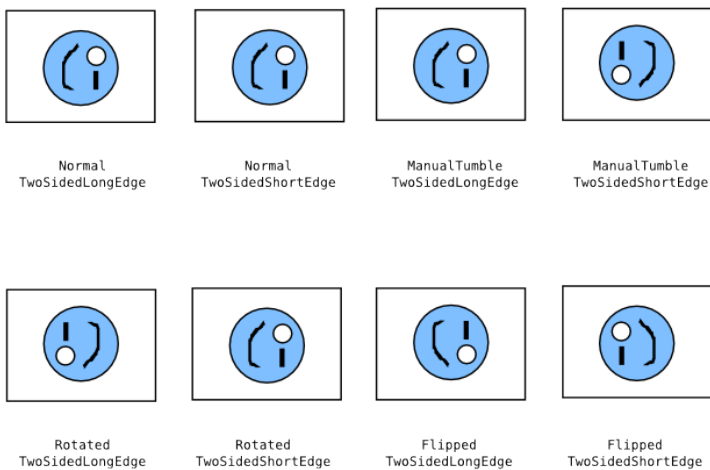
981
982
983

Figure 1 - PWG Raster Bitmaps with Portrait Feed Orientation



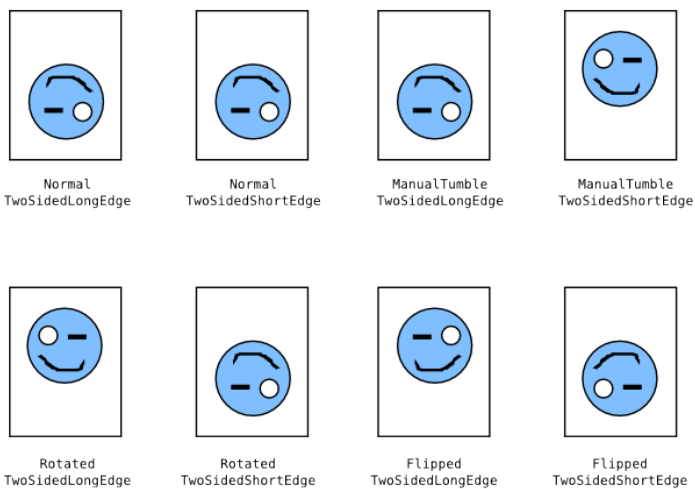
984
985

Figure 2 - PWG Raster Bitmaps with Landscape Feed Orientation



986
987
988

Figure 3 - PWG Raster Bitmaps with Reverse Landscape Feed Orientation



989
990

Figure 4 - PWG Raster Bitmaps with Reverse Portrait Feed Orientation

991 **7. Additional Values for Existing Attributes**

992 **7.1 ipp-features-supported (1setOf type2 keyword)**

993 This specification defines the REQUIRED keyword 'ipp-everywhere' for the "ipp-features-
994 supported" Printer attribute.

995 **8. Additional Semantics for Existing Value Tags**

996 This specification amends the definition of the nameWithLanguage,
997 nameWithoutLanguage, naturalLanguage, textWithLanguage, textWithoutLanguage, and
998 URI value tags defined in the Internet Printing Protocol/1.1 [STD92] with additional
999 restrictions to improve interoperability.

1000 **8.1 nameWithLanguage and nameWithoutLanguage**

1001 Name values MUST NOT contain characters in the "C0 Control Character Set" or the DEL
1002 character as defined in Unicode Format for Network Interchange [RFC5198]. Printers MUST
1003 transcode and filter values from MIBs and other sources to conform to the added
1004 restrictions.

1005 **8.2 naturalLanguage**

1006 NaturalLanguage values MUST conform to and be compared as defined in Tags for
1007 Identifying Languages [BCP47]. The shortest language tag MUST be used, e.g., "en"
1008 instead of "eng" for English. Printers SHOULD also support legacy language tags such as:

1009 'no'; replaced by 'nb' (Norwegian Bokmål),

1010 'zh-cn'; replaced by 'zh-hans' (Simplified Chinese), and

1011 'zh-tw'; replaced by 'zh-hant' (Traditional Chinese)

1012 **8.3 textWithLanguage and textWithoutLanguage**

1013 Text values MUST NOT contain the DEL character or characters in the "C0 Control
1014 Character Set" other than CR, LF, and HT [RFC5198]. Printers MUST transcode and filter
1015 values from MIBs and other sources to conform to the added restrictions.

1016 **8.4 uri**

1017 URI values MUST be in absolute form, i.e., "ipp://hostname.local/ipp/print" is acceptable but
1018 "//ipp/print" is not. URI values MUST NOT contain link-local addresses in the host field.

1019 Printers MUST NOT generate URI values with link-local addresses and SHOULD NOT
1020 generate URI values with IP addresses obtained via Dynamic Host Control Protocol (DHCP)
1021 [RFC2131] or other auto-configuration protocols. Printers SHOULD use the HTTP Host:
1022 header value when generating URIs for use in Client responses.

1023 9. Conformance Requirements

1024 This section summarizes the Conformance Requirements detailed in the definitions in this
1025 document for Clients and Printers.

1026 9.1 Conformance Requirements for Clients

1027 In order for a Client to claim conformance to this specification a Client MUST support the
1028 following:

- 1029 1. DNS Service Discovery as defined in section 4.2
- 1030 2. IPP/2.0 as defined in section 5
- 1031 3. The REQUIRED operations listed in Table 4
- 1032 4. The REQUIRED Printer Description attributes listed in Table 5
- 1033 5. The REQUIRED operation attributes listed in Table 8
- 1034 6. The REQUIRED Job Template attributes listed in Table 12
- 1035 7. The REQUIRED Job Description attributes listed in Table 10
- 1036 8. The REQUIRED document formats listed in section 5.8
- 1037 9. The "feed-orientation-supported" Printer attribute and "media-source-properties"
1038 member attribute of the "media-col-database" and "media-col-ready" Printer
1039 attributes as reported by the Printer and defined in section 6.1
- 1040 10. The internationalization considerations as defined in section 10
- 1041 11. The security considerations as defined in section 0

1042 9.2 Conformance Requirements for Printers

1043 In order for a Printer to claim conformance to this specification a Printer MUST support the
1044 following:

- 1045 1. DNS Service Discovery as defined in section 4.2
- 1046 2. IPP/2.0 as defined in section 5
- 1047 3. The REQUIRED operations listed in Table 4
- 1048 4. The REQUIRED Printer Description attributes listed in Table 5
- 1049 5. The REQUIRED operation attributes listed in Table 8
- 1050 6. The REQUIRED Job Template attributes listed in Table 12
- 1051 7. The REQUIRED Job Description attributes listed in Table 10
- 1052 8. The REQUIRED document formats listed in section 5.8
- 1053 9. The 'ipp-everywhere' value for the "ipp-features-supported" Printer Description
1054 attribute as defined in section 7.1

- 1055 10. The additional semantics for attribute values as defined in section 8
1056 11. The internationalization considerations as defined in section 10
1057 12. The security considerations as defined in section 0
1058 13. The safe string truncation rules as defined in section 13

1059 9.3 Conditional Conformance Requirements for Printers

1060 Printers that support the "image/jpeg" [JFIF] MIME media type MUST support:

- 1061 1. The "copies-default", and "copies-supported" Printer Description attributes as
1062 defined in section 5.3.
1063 2. The "copies" Job Template attribute as defined in section 5.8.

1064 Printers that support the "application/pdf" [ISO32000] MIME media type MUST support:

- 1065 1. The "copies-default", "copies-supported", "document-password-supported", and
1066 "page-ranges-supported" Printer Description attributes as defined in section 5.3,
1067 2. The "document-password" Operation attribute as defined in section 5.4, and
1068 3. The "copies", "multiple-document-handling", "overrides", and "page-ranges" Job
1069 Template attributes as defined in section 5.8.

1070 Printers that support the Print to a Recipient use case (section 3.2.2.8) MUST support:

- 1071 1. The "job-password-supported" and "job-password-encryption-supported" Printer
1072 Description attributes as defined in section 5.3, and
1073 2. The "job-password" and "job-password-encryption" Operation attributes as
1074 defined in section 5.4.

1075 Printers that provide Paid Print services MUST support:

- 1076 1. The "job-account-id-default", "job-account-id-supported", "job-accounting-user-
1077 id-default", "job-accounting-user-id-supported", "job-mandatory-attributes-
1078 default", "job-mandatory-attributes-supported", and "printer-mandatory-job-
1079 attributes" Printer Description attributes as defined in section 5.3,
1080 2. The "job-mandatory-attributes" operation attribute as defined in section 5.4, and
1081 3. The "job-account-id" and "job-accounting-user-id" Job Template attributes as
1082 defined in section 5.8.

1083 Printers that support long-edge feed media MUST support:

- 1084 1. The "feed-orientation-default" and "feed-orientation-supported" Printer
1085 Description attributes as defined in section 5.3.
1086 2. The "media-source-properties" member attribute of the "media-col-database"
1087 and "media-col-ready" Printer Description attributes as defined in section 5.3.
1088 3. The "feed-orientation" Job Template attribute as defined in section 5.8.

1089 Printers that support ICC-based color management MUST support:

- 1090 4. The "print-rendering-intent-default", "print-rendering-intent-supported", and
- 1091 "printer-icc-profiles" Printer Description attributes as defined in section 5.3.
- 1092 5. The "print-render-intent" Job Template attribute as defined in section 5.8.

1093 **10. Internationalization Considerations**

1094 For interoperability and basic support for multiple languages, conforming implementations
1095 MUST support:

- 1096 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
- 1097 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 1098 2. The Unicode Format for Network Interchange [RFC5198] which requires
- 1099 transmission of well-formed UTF-8 strings and recommends transmission of
- 1100 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

1101 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
1102 characters and combining marks) followed by Canonical Composition (into canonical
1103 composed characters wherever Unicode has assigned them).

1104 **WARNING** – Performing normalization on UTF-8 strings received from Clients and
1105 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client
1106 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
1107 'hidden').

1108 Implementations of this specification SHOULD conform to the following standards on
1109 processing of human-readable Unicode text strings, see:

1110 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

1111 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

1112 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

1113 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

1114 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

1115 Unicode Collation Algorithm [UTS10] – sorting

1116 Unicode Locale Data Markup Language [UTS35] – locale databases

1117 Implementations of this specification are advised to also review the following informational
1118 documents on processing of human-readable Unicode text strings:

1119 Unicode Character Encoding Model [UTR17] – multi-layer character model

1120 Unicode Character Property Model [UTR23] – character properties

1121 Unicode Conformance Model [UTR33] – Unicode conformance basis

1122 **11. Security Considerations**

1123 The IPP extensions defined in this document require the same security considerations as
1124 defined in the Internet Printing Protocol/1.1 [STD92]. In addition, Printers MUST validate
1125 the HTTP Host request header in order to protect against DNS rebinding attacks.

1126 Implementations of this specification SHOULD conform to the following standard on
1127 processing of human-readable Unicode text strings, see:

1128 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

1129 Implementations of this specification are advised to also review the following
1130 informational document on processing of human-readable Unicode text strings:

1131 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

1132 **12. IANA Considerations**

1133 **12.1 Attribute Value Registrations**

1134 The keyword attribute values defined in this document will be published by IANA according
1135 to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

1136 <http://www.iana.org/assignments/ipp-registrations>

1137 The registry entries will contain the following information:

1138	Attributes (attribute syntax)	
1139	Keyword Attribute Value	Reference
1140	-----	-----
1141	ipp-features-supported (1setOf type2 keyword)	[PWG5100.13]
1142	ipp-everywhere	[PWG5100.14]

1143 **13. Safe String Truncation**

1144 Strings can be truncated or omitted when transferred over alternate protocols. Printers
1145 MUST truncate long strings at logical boundaries. The following subsections describe how
1146 this truncation is performed for different kinds of strings.

1147 **13.1 Plain Text Strings**

1148 Plain text strings MUST be truncated at the end of a valid character sequence. For example,
1149 strings using the UTF-8 transformation format of ISO 10646 [STD0063] [ISO10646-1]
1150 SHOULD be represented using the Unicode Format for Network Interchange [RFC5198]
1151 and MUST be truncated at the end of a valid UTF-8 sequence.

1152 For example, the 9 octet UTF-8 sequence 0x48.65.CA.81.6C.6C.6F.C2.81 (Héllöj) would
1153 be shortened to fit within 6 octets by composing the é (0x65.CA.81 becomes 0xC3.A9) and
1154 removing the trailing UTF-8 sequence 0xC2.81 (j), resulting in the 6 octet UTF-8 sequence
1155 0x48.C3.A9.6C.6C.6F (Héllö).

1156 **13.2 URIs**

1157 URIs MUST be truncated so that the URI remains valid and accepted by the Printer. For
1158 example, the 46 octet URI "ipp://printer.example.com/ipp/really-long-name" might be
1159 shortened to fit within 32 octets by removing the last path name component, resulting in the
1160 29 octet URI "ipp://printer.example.com/ipp". Similarly, the 52 octet URI
1161 "ipp://printer.example.com/ipp?query-string" might be shortened to fit within 32 octets by
1162 removing the query string.

1163 As recommended by the Uniform Resource Identifier (URI): Generic Syntax [STD66],
1164 Printers SHOULD omit the port number from the URI when it has the default value, e.g., 80
1165 for "http", 443 for "https", and 631 for "ipp" and "ipps" URIs.

1166 **13.3 MIME Media Types**

1167 MIME media type strings MUST be truncated at the end of the media subtype, removing
1168 any parameters that are included with the media type. If the resulting string still exceeds the
1169 maximum length it MUST be discarded. For example, the 24 octet MIME media type
1170 "text/plain;charset=utf-8" would be shortened to fit within 16 octets by removing the trailing
1171 parameter, resulting in the 10 octet MIME media type "text/plain".

1172 **13.4 Delimited Lists**

1173 Delimited Lists combine one or more string types listed in the previous sections, separated
1174 by a delimiting character such as a comma or semicolon. Delimited lists MUST first be
1175 shortened by removal of unnecessary path components (URIs) and parameters (MIME
1176 media types) and second truncated at a delimiting character. For example, the 40 octet list
1177 of MIME media types "text/plain;charset=utf-8,application/pdf" would be shortened to fit
1178 within 32 octets by removing the MIME media type parameter, resulting in the 26 octet list
1179 "text/plain,application/pdf". The same list would be shortened to fit within 16 octets by also
1180 removing the last MIME media type, resulting in the 10 octet list "text/plain".

1181 14. Overview of Changes

1182 14.1 IPP Everywhere™ v1.1

1183 The following changes were made to PWG 5100.14-2013: IPP Everywhere [PWG5100.14-
1184 [2013](#)]:

- 1185 • References now point to the current versions of dependent documents and
1186 specifications at the time of publication;
- 1187 • Requirements for WS-Discovery have been removed due to a lack of
1188 implementations, which effectively made WS-Discovery support OPTIONAL;
- 1189 • References to OpenXPS and SSDP have been removed;
- 1190 • The "printer-device-id" Printer Description attribute and associated DNS-SD TXT
1191 record keys are no longer required;
- 1192 • DNS-SD is now RECOMMENDED for Printers representing Logical Devices (print
1193 servers);
- 1194 • ICC attributes are now CONDITIONALLY REQUIRED for printers that support ICC-
1195 based color management;
- 1196 • JPEG support is now CONDITIONALLY REQUIRED for color printers;
- 1197 • The "compression-supplied", "document-format-supplied", "document-format-
1198 version", "document-format-version-supplied", "document-name-supplied" attributes
1199 are no longer required;
- 1200 • IPP Finishings 2.1 and the "finishings-col" Job Template attribute are now
1201 RECOMMENDED;
- 1202 • The "printer-strings-languages-supported" and "printer-strings-uri" Printer Status
1203 attributes are now RECOMMENDED to support localization; and
- 1204 • Printer Status and Job Status attributes are now listed in a separate section to match
1205 STD 92 and the IANA IPP registry.
1206

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1417 ipp@pwg.org (subscribers only)

1418 To subscribe, see the PWG web page:

1419 <http://www.pwg.org/>

1420 Implementers of this specification document are encouraged to join the IPP Mailing List in
1421 order to participate in any discussions of clarification issues and review of registration
1422 proposals for additional attributes and values.

1423 The editors would like to especially thank the following individuals who also contributed
1424 significantly to the development of this document:

1425 Andrew Mitchell
1426 Jerry Thrasher - Lexmark
1427 Peter Zehler - Xerox
1428

1429 **17. Change History**

1430 **[17.1 January 28, 2019](#)**

- 1431 [• Status: Stable](#)
- 1432 [• Updated reference to v1.0 to use -2013 suffix.](#)
- 1433 [• Sections 3.1 and 15.1: Added references to 5100.16 and registration documents](#)
- 1434 [• Section 5.3: Added recommended attributes table](#)
- 1435 [• Section 5.5: Added recommended attributes table](#)
- 1436 [• Sections 5.6 and 5.7: Tables used "Source" heading instead of "Reference"](#)
- 1437 [• Section 5.8: Table 10 had wrong note for finishings-col, added finishings-](#)
- 1438 [col.finishing-template, made note 2 conditionally required, added recommended](#)
- 1439 [attributes table](#)

1440 **17.2 September 26, 2018**

- 1441 • Removed the "compression-supplied", "document-format-supplied", "document-
- 1442 format-version", "document-format-version-supplied", and "document-name-
- 1443 supplied" attributes from the required attribute lists since the corresponding attributes
- 1444 are being obsoleted in PWG 5100.7.

1445 **17.3 August 24, 2018**

- 1446 • The current version of the Bonjour Printing Specification is 1.2.1.
- 1447 • Section 4: DNS-SD is now required for physical devices and recommended for
- 1448 logical devices (print servers)
- 1449 • Section 5.1: Clarified that the use of the Host header value includes the port number.
- 1450 • Section 5.3: Moved printer-more-info to 5.4 Printer Status attributes
- 1451 • Section 5.4: Added RECOMMENDED printer-strings-languages-supported and
- 1452 printer-strings-uri attributes from JPS3
- 1453 • Section 6: Still recommend JPEG for monochrome printers
- 1454 • Section 8.4: Clarified that we mean IP addresses from DHCP

- 1455 • Section 9.3: Fixed section 5.3 references
- 1456 • Section 10: Dropped UTR20 (now maintained by the W3C, but why do we care about
1457 XML here?)
- 1458 • Section 12.1: Fixed STD 92 reference
- 1459 • Section 14.1: Updated the change list
- 1460 • Section 15.1: Fixed up STD 92 reference, added references to PWG 5100.18 (IPP
1461 INFRA) and RFCs 6749 and 6750 (OAuth 2.0), updated all Unicode references,
1462 dropped UTR20 (which is now maintained by the W3C)

1463 **17.4 July 4, 2018**

- 1464 • Status: Prototype
- 1465 • RFC 8011 is now STD 92
- 1466 • Updated Unicode to 11.0.0.

1467 **17.5 June 6, 2018**

- 1468 • Section 5.7: Fixed cross-reference to Table 10.
- 1469 • Section 14.1: Cleaned up WS-Discovery bullet.
- 1470 • Section 15.2: Updated Bonjour Printing specification reference.

1471 **17.6 April 17, 2018**

- 1472 • Removed all references to 1284 device IDs and associated information.

1473 **17.7 April 16, 2018**

- 1474 • Made sure IPP Everywhere™ consistently has trademark symbol.
- 1475 • Section 1: Drop examples of mobile devices.
- 1476 • Section 4.2.3.4: TLS key required for IPPS.
- 1477 • Section 5.1: Fix typos.

- 1478 • Section 5.2: Made Identify-Printer operation recommended for logical devices,
1479 required otherwise.
- 1480 • Sections 5.3 and 5.8: Made print-rendering-intent and printer-icc-profiles
1481 conditionally required for printers that support ICC-based color management.
- 1482 • Section 5.3.6: Clarify pdl-override-supported values and usage.
- 1483 • Section 5.7: Deleted stray "note 7"
- 1484 • Section 9.3: Added ICC attributes here.
- 1485 • Section 14: Reworded for present tense, clarified why WS-Discovery has been
1486 removed, removed reason for removing OpenXPS and SSDP.

1487 17.8 April 3, 2018

- 1488 • Make JPEG support conditionally required for color printers.

1489 17.9 February 9, 2018

- 1490 • Initial v1.1 draft
- 1491 • Updated template
- 1492 • Updated abstract (can't call it a standard in the abstract)
- 1493 • Updated spec references to current versions
- 1494 • Dropped all mention of UPNP, SSDP, WS-Discovery, and OpenXPS (never
1495 implemented)
- 1496 • Added a new "Overview of Changes" chapter that documents the high-level changes
1497 since the original IPP Everywhere specification
- 1498 • Now recommend support for the Get-User-Printer-Attributes operation
- 1499 • Now recommend support for the "finishings-col" attributes (PWG 5100.1)
- 1500 • Now recommend support for TLS 1.3
- 1501 • Now recommend using a resource path of /ipp/print or /ipp/print/name in Printer URIs
- 1502 • Issue 11: printer-current-time is now listed as an IPP Everywhere attribute, although
1503 only RECOMMENDED since it was missing in the 1.0 spec. (all of the date-time

- 1504 attributes were previously required, so printer-current-time would have implicitly been
1505 required)
- 1506 • Issue 12: The reference to PWG 5100.12 has been corrected
 - 1507 • Issue 13: The reference to the EXIF specification has been updated.
 - 1508 • Issue 13: The reference to PWG 5101.1 has been updated.
 - 1509 • Issue 14: Clarified the pdl-override-supported requirements ('attempted' or
1510 'guaranteed')
 - 1511 • Issue 15: Clarified that relative URIs ("//ipp/print") are not allowed in IPP.
 - 1512 • Issue 26: "job-preferred-attributes-supported" should have been "preferred-
1513 attributes-supported"
 - 1514 • Issue 31: Incorrect references to PWG 5101.2 have been changed to PWG 5101.1
1515 (MSN)
 - 1516 • Issue 33: The notes concerning IPP/2.x conformance changes were confusing and
1517 have been removed
 - 1518 • Issue 34: Table 6: overrides-supported now correctly references "note 2"
1519 (conditionally required).
 - 1520 • Issue 35: overrides-supported.document-numbers is now **CONDITIONALLY**
1521 **REQUIRED**
 - 1522 • Fixed attribute examples to use PAPI encoding
 - 1523 • Fixed notes concerning "copies" to indicate that support is required for JPEG and
1524 PDF documents
 - 1525 • Separated Printer Status attributes from Printer Description
 - 1526 • Separated Job Status attributes from Job Description