



The Printer Working Group

August 24, 2018
Working Draft

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

IPP Everywhere™ v1.1

Status: Prototype

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.

This document 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 document is available electronically at:

<https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeve11-20180824.docx>

<https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeve11-20180824.pdf>

24 Copyright © 2011-2018 The Printer Working Group. All rights reserved.

25 This document may be copied and furnished to others, and derivative works that comment
26 on, or otherwise explain it or assist in its implementation may be prepared, copied, published
27 and distributed, in whole or in part, without restriction of any kind, provided that the above
28 copyright notice, this paragraph and the title of the Document as referenced below are
29 included on all such copies and derivative works. However, this document itself may not
30 be modified in any way, such as by removing the copyright notice or references to the IEEE-
31 ISTO and the Printer Working Group, a program of the IEEE-ISTO.

32 Title: *IPP Everywhere™ v1.1*

33 The IEEE-ISTO and the Printer Working Group DISCLAIM ANY AND ALL WARRANTIES,
34 WHETHER EXPRESS OR IMPLIED INCLUDING (WITHOUT LIMITATION) ANY IMPLIED
35 WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

36 The Printer Working Group, a program of the IEEE-ISTO, reserves the right to make
37 changes to the document without further notice. The document may be updated, replaced
38 or made obsolete by other documents at any time.

39 The IEEE-ISTO takes no position regarding the validity or scope of any intellectual property
40 or other rights that might be claimed to pertain to the implementation or use of the
41 technology described in this document or the extent to which any license under such rights
42 might or might not be available; neither does it represent that it has made any effort to
43 identify any such rights.

44 The IEEE-ISTO invites any interested party to bring to its attention any copyrights, patents,
45 or patent applications, or other proprietary rights which may cover technology that may be
46 required to implement the contents of this document. The IEEE-ISTO and its programs shall
47 not be responsible for identifying patents for which a license may be required by a document
48 and/or IEEE-ISTO Industry Group Standard or for conducting inquiries into the legal validity
49 or scope of those patents that are brought to its attention. Inquiries may be submitted to the
50 IEEE-ISTO by e-mail at: ieee-isto@ieee.org.

51 The Printer Working Group acknowledges that the IEEE-ISTO (acting itself or through its
52 designees) is, and shall at all times be the sole entity that may authorize the use of
53 certification marks, trademarks, or other special designations to indicate compliance with
54 these materials.

55 Use of this document is wholly voluntary. The existence of this document does not imply
56 that there are no other ways to produce, test, measure, purchase, market, or provide other
57 goods and services related to its scope.

58

59 About the IEEE-ISTO

60 The IEEE-ISTO is a not-for-profit corporation offering industry groups an innovative and
61 flexible operational forum and support services. The IEEE-ISTO provides a forum not only
62 to develop standards, but also to facilitate activities that support the implementation and
63 acceptance of standards in the marketplace. The organization is affiliated with the IEEE
64 (<http://www.ieee.org/>) and the IEEE Standards Association (<http://standards.ieee.org/>).

65 For additional information regarding the IEEE-ISTO and its industry programs visit:

66 <http://www.ieee-isto.org>

67 About the IEEE-ISTO PWG

68 The Printer Working Group (or PWG) is a Program of the IEEE Industry Standards and
69 Technology Organization (ISTO) with member organizations including printer
70 manufacturers, print server developers, operating system providers, network operating
71 system providers, network connectivity vendors, and print management application
72 developers. The PWG is chartered to make printers and the applications and operating
73 systems supporting them work together better. All references to the PWG in this document
74 implicitly mean “The Printer Working Group, a Program of the IEEE ISTO.”

75 To meet this objective, the PWG documents the results of their work as open standards that
76 define print related protocols, interfaces, procedures, and conventions. A PWG standard is
77 a stable, well understood, and technically competent specification that is widely used with
78 multiple independent and interoperable implementations. Printer manufacturers and
79 vendors of printer related software benefit from the interoperability provided by voluntary
80 conformance to these standards.

81 For additional information regarding the Printer Working Group visit:

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

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

	Table of Contents	
90		
91	1. Introduction.....	7
92	2. Terminology.....	7
93	2.1 Printing Terminology.....	7
94	2.2 Protocol Role Terminology.....	8
95	2.3 Other Terminology.....	8
96	2.4 Acronyms and Organizations.....	9
97	3. Requirements.....	10
98	3.1 Rationale.....	10
99	3.2 Use Cases.....	11
100	3.2.1 Select Printer.....	11
101	3.2.2 Print.....	13
102	3.2.3 Exceptions.....	16
103	3.3 Out of Scope.....	17
104	3.4 Design Requirements.....	18
105	4. Discovery Protocols.....	19
106	4.1 Printer Description Attributes Used in Discovery.....	19
107	4.2 DNS Service Discovery (DNS-SD).....	19
108	4.2.1 Service (SRV) Instance Name.....	19
109	4.2.2 Geo-Location (LOC).....	19
110	4.2.3 Text (TXT).....	20
111	4.3 LDAP and SLP Discovery.....	25
112	5. Protocol Binding.....	26
113	5.1 HTTP Features.....	26
114	5.1.1 Host.....	26
115	5.1.2 If-Modified-Since, Last-Modified, and 304 Not Modified.....	26
116	5.1.3 Cache-Control.....	26
117	5.2 IPP Operations.....	27
118	5.3 IPP Printer Description Attributes.....	27
119	5.3.1 media-col-database (1setOf collection).....	29
120	5.3.2 media-col-ready (1setOf collection).....	30
121	5.3.3 media-ready (1setOf (type3 keyword name(MAX))).....	31
122	5.3.4 media-size-supported (1setOf collection).....	31
123	5.3.5 media-supported (1setOf (type3 keyword name(MAX))).....	32
124	5.3.6 pdl-override-supported (type2 keyword).....	32
125	5.4 IPP Printer Status Attributes.....	33
126	5.4.1 printer-uri-supported (1setOf uri).....	33
127	5.5 IPP Operation Attributes.....	34
128	5.6 IPP Job Description Attributes.....	35
129	5.7 IPP Job Status Attributes.....	35
130	5.7.1 job-id (integer).....	35
131	5.7.2 job-uri (uri).....	36
132	5.8 IPP Job Template Attributes.....	36
133	6. Document Formats.....	37
134	6.1 Supporting Long-Edge Feed Media with PWG Raster Format Documents.....	37

135 7. Additional Values for Existing Attributes 40
 136 7.1 ipp-features-supported (1setOf type2 keyword)..... 40
 137 8. Additional Semantics for Existing Value Tags 41
 138 8.1 nameWithLanguage and nameWithoutLanguage..... 41
 139 8.2 naturalLanguage..... 41
 140 8.3 textWithLanguage and textWithoutLanguage 41
 141 8.4 uri..... 41
 142 9. Conformance Requirements..... 42
 143 9.1 Conformance Requirements for Clients..... 42
 144 9.2 Conformance Requirements for Printers..... 42
 145 9.3 Conditional Conformance Requirements for Printers..... 43
 146 10. Internationalization Considerations 44
 147 11. Security Considerations..... 45
 148 12. IANA Considerations 46
 149 12.1 Attribute Value Registrations 46
 150 13. Safe String Truncation..... 46
 151 13.1 Plain Text Strings..... 46
 152 13.2 URIs..... 46
 153 13.3 MIME Media Types..... 47
 154 13.4 Delimited Lists 47
 155 14. Overview of Changes 48
 156 14.1 IPP Everywhere™ v1.1..... 48
 157 15. References..... 49
 158 15.1 Normative References..... 49
 159 15.2 Informative References..... 54
 160 16. Authors' Addresses 55
 161 17. Change History..... 56
 162 17.1 August 24, 2018..... 56
 163 17.2 July 4, 2018 56
 164 17.3 June 6, 2018 56
 165 17.4 April 17, 2018..... 57
 166 17.5 April 16, 2018..... 57
 167 17.6 April 3, 2018..... 57
 168 17.7 February 9, 2018 57

List of Figures

173 Figure 1 - PWG Raster Bitmaps with Portrait Feed Orientation..... 38
 174 Figure 2 - PWG Raster Bitmaps with Landscape Feed Orientation..... 38
 175 Figure 3 - PWG Raster Bitmaps with Reverse Landscape Feed Orientation 39
 176 Figure 4 - PWG Raster Bitmaps with Reverse Portrait Feed Orientation 39

List of Tables

179
180
181 Table 1 - Attributes in Discovery Protocols..... 20
182 Table 2 - Priority of DNS TXT Key/Value Pairs 21
183 Table 3 - DNS TXT Record Keys 22
184 Table 4 - IPP Everywhere™ Operations 27
185 Table 5 - IPP Everywhere™ Printer Description Attributes 27
186 Table 6 - IPP Everywhere™ Printer Status Attributes 33
187 Table 7 - IPP Everywhere™ Required Operation Attributes..... 34
188 Table 8 - IPP Everywhere™ Required Job Description Attributes..... 35
189 Table 9 - IPP Everywhere™ Required Job Status Attributes 35
190 Table 10 - IPP Everywhere™ Job Template Attributes 36

191

192

193

194

195 **1. Introduction**

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

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

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

208 **2. Terminology**

209 **2.1 Printing Terminology**

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

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

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

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

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

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

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

224 **2.2 Protocol Role Terminology**

225 This document also defines the following protocol roles to specify unambiguous
226 conformance requirements:

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

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

232 **2.3 Other Terminology**

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

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

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

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

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

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

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

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

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

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

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

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

258 **2.4 Acronyms and Organizations**

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

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

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

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

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

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

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

267

268 **3. Requirements**

269 **3.1 Rationale**

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

- 272 1. Use existing protocols and schema to support discovery, identification, and
273 auto-configuration of Imaging Devices,
- 274 2. Use existing IPP specifications to support job submission to and monitoring of
275 Imaging Devices,
- 276 3. Encourage support for printing through standard document formats, and
- 277 4. Discourage the further proliferation of vendor-specific page description
278 languages, formats, discovery protocols, interfaces, and transports

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

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

- 281 1. A collection of existing IPP specifications that form the basis for IPP/2.0
- 282 2. Standard job template attributes
- 283 3. Specific interoperability requirements, such as HTTP/1.1 support with chunking
284 and IPP collection attribute support
- 285 4. New version number and operation requirements for different classes of
286 Imaging Devices

287 The IPP URL Scheme [RFC3510] defines the 'ipp' URI scheme and the IPP over HTTPS
288 Transport Binding and 'ipps' URI Scheme [RFC7472] defines the 'ipps' URI scheme used
289 for IPP.

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

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

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

- 296 1. A rich file format for transmission of multi-page color and grayscale vector and
297 bitmap images
- 298 2. Standard page attributes to support page size, orientation, and duplex
299 functionality

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

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

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

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

312 **3.2 Use Cases**

313 **3.2.1 Select Printer**

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

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

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

323 **3.2.1.1 Select the Last Used Printer**

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

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

330 **3.2.1.2 Select Printer Using Name or Address**

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

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

337 **3.2.1.3 Select Printer Using URI**

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

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

342 **3.2.1.4 Select Printer Using a Directory Service**

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

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

349 **3.2.1.5 Select Printer Using a Cloud Service**

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

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

356 **3.2.1.6 Select Printer Using a Discovery Protocol**

357 The Client initiates Discovery on behalf of Jane and maintains a dynamic list of Network
358 Accessible Printers during selection. The Client User Interface asks Jane to select one of
359 the Network Accessible Printers, updating those Printers as they come and go. Finally, she
360 selects a Printer and the Client terminates Discovery.

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

363 **3.2.1.7 Select Printer Using Geo-Location**

364 The Client initiates Enumeration of Printers within a geographic area using Services and/or
365 Discovery Protocols, hiding duplicate Printers that are reported by multiple Service and/or

366 Discovery Protocols. The Client User Interface asks Jane to select one of the Printers.
367 Finally, she selects a Printer.

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

370 **3.2.1.8 Select Printer Using Out of Band Method**

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

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

377 **3.2.1.9 Select Printer Using Properties**

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

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

389 **3.2.2 Print**

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

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

398 **3.2.2.1 Print a Document**

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

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

405 **3.2.2.2 Print a Document by Reference**

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

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

412 **3.2.2.3 Print Using Loaded Media**

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

415 After Jane initiates a print action from the phone and selects a Printer, the Client photo
416 application automatically selects the largest borderless photographic media loaded on the
417 Selected Printer and the highest print quality. Jane selects additional processing intent for
418 the Job and confirms the print action. The Client sends a print job request to the Printer with
419 the Job Ticket and local photo. The Printer validates the Job Ticket and document data and
420 then prints the photo.

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

424 **3.2.2.4 Print a Secure Form**

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

429 The treasurer loads check blanks into the Printer and configured the loaded media as
430 necessary at the Printer. After he initiates a print action from the accounting program,
431 selects a Printer for printing, and selects checks to be printed, the Client User Interface
432 displays a preview of the printed checks and he confirms that the checks are correctly
433 paginated and oriented and the amounts, payees and signature are correct. The Client
434 automatically selects the check blank media. The treasurer selects additional processing
435 intent for the Job and confirms the print action. The Client sends a print job request to the
436 Printer with the Job Ticket and document data containing the check information, correctly

437 oriented for the check blank media. He waits for the checks to be printed and removes any
438 excess media from the Printer.

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 **3.2.2.5 Print with Special Formatting**

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

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

455 **3.2.2.6 Print and Select at Printer**

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

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

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

467 **3.2.2.7 Print to a Service**

468 John is flying to New York for a presentation and doesn't want to carry the presentations.
469 John arrives in New York and goes online from his mobile phone. After initiating a print
470 action, he selects a local print provider, reviewing the provider web pages as needed. He
471 then specifies the processing intent as 10 color copies, printed duplex and stapled on the
472 left side, with the covers on 80lb. stock and the internal pages on 24lb. stock. After

473 confirming the print action, John goes to the provider and picks up his presentations, paying
474 with his corporate credit card.

475 **3.2.2.8 Print to a Recipient**

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

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

483 **3.2.2.9 Print with a Proof Copy**

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

490 **3.2.3 Exceptions**

491 **3.2.3.1 Print Action Canceled**

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

495 **3.2.3.2 Select Printer Canceled**

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

498 **3.2.3.3 Printer No Longer Network Accessible after Selection**

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

502 **3.2.3.4 Not Authorized**

503 After confirming the print request, the Printer responds that the User is not authorized to
504 print the Job document(s). The reason for the authorization failure may involve general

505 access to the Printer, Job document(s), or disallowed Job Ticket values, for example a User
506 may not be allowed to print in color.

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

509 **3.2.3.5 Needs Authentication**

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

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

514 **3.2.3.6 Not Accepting Jobs**

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

517 **3.2.3.7 Job Ticket or Document Format Not Supported**

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

521 **3.2.3.8 Job or Document Processing Failures**

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

526 **3.2.3.9 Printer Fault**

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

530 **3.2.3.10 Printer Warning**

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

534 **3.3 Out of Scope**

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

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

543 **3.4 Design Requirements**

544 The IPP Everywhere™ design should:

- 545 1. Define conformance profiles that reference the IPP/2.0 versions [PWG5100.12];
546 2. Follow the naming conventions defined in the Internet Printing Protocol/1.1
547 [STD92], including keyword value case (lower) and hyphenation requirements;
548 3. Define conformance requirements for both Printers and Clients; and
549 4. Support printing with vendor-neutral Client software from any Client to any
550 Printer using a variety of discovery protocols, IPP for the transport, and
551 standard document formats.
552

553 **4. Discovery Protocols**

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

557 Clients **MUST** support DNS-SD. Clients **MAY** support other Discovery protocols such as
558 LDAP and SLP.

559 **4.1 Printer Description Attributes Used in Discovery**

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

562 **4.2 DNS Service Discovery (DNS-SD)**

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

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

570 **4.2.1 Service (SRV) Instance Name**

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

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

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

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

579 **4.2.2 Geo-Location (LOC)**

580 Printers **MUST** publish LOC records [RFC1876] over mDNS to provide the physical location
581 of the Printer. Printers **MUST** allow the User to configure the geo-location manually. If the
582 accuracy of the geo-location is unknown, a value of 9×10^9 meters (0x99) **MUST** be used.
583

584

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	pdf	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

585 Note 1: Extension attribute to RFC 7612.

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

587 **4.2.3 Text (TXT)**

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

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

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

597 For example, the IPP "printer-more-info" attribute has a maximum length of 1023 octets,
 598 however the corresponding "adminurl" key cannot represent a value longer than 246 octets
 599 (255 - 9 octets for "adminurl="). Printers MUST truncate long strings as described in section
 600 13.

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

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

605 **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	pdf
air		PaperCustom	
TLS		Bind	
adminurl		Punch	
		Sort	
		Staple	

606 Clients MUST ignore incomplete key/value pairs at the end of a truncated TXT record.
 607

608

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)

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

610 **4.2.3.1 air**

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

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

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

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

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

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

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

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

630 4.2.3.2 pdl

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

637 4.2.3.3 qtotal

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

647 **4.2.3.4 TLS**

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

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

652 '1.0'; TLS 1.0 [RFC2246] encryption is supported. This is equivalent to the value 'tls'
653 for the "uri-security-supported" Printer Description attribute.

654 '1.1'; TLS 1.1 [RFC4346] encryption is supported. This is equivalent to the value 'tls'
655 for the "uri-security-supported" Printer Description attribute.

656 '1.2'; TLS 1.2 [RFC5246] encryption is supported. This is equivalent to the value 'tls'
657 for the "uri-security-supported" Printer Description attribute.

658 '1.3'; TLS 1.3 [RFC-TLS1.3] encryption is supported. This is equivalent to the value
659 'tls' for the "uri-security-supported" Printer Description attribute.

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

663 **4.2.3.5 UUID**

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

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

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

669 12345678-9ABC-DEF0-1234-56789ABCDEF0

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

672 **4.2.3.6 DUUID**

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

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

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

678 12345678-9ABC-DEF0-1234-56789ABCDEF0

679 **4.3 LDAP and SLP Discovery**

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

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

685 For example, the IPP "printer-device-id" attribute has a maximum length of 1023 octets,
686 however the corresponding LDAP "printer-device-id" attribute has a maximum length of 255
687 octets. Printers **MUST** truncate long strings as defined in section 13.
688

689 **5. Protocol Binding**

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

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

694 **5.1 HTTP Features**

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

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

702 **5.1.1 Host**

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

705 **5.1.2 If-Modified-Since, Last-Modified, and 304 Not Modified**

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

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

712 **5.1.3 Cache-Control**

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

718

719 5.2 IPP Operations

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

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

726 **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

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

728 5.3 IPP Printer Description Attributes

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

731 **Table 5 - 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

732

733

Note 1: CONDITIONALLY REQUIRED for Printers that implement Paid Imaging services.

734

Note 2: REQUIRED for the "application/pdf" and "image/jpeg" MIME media types.

735

736

Note 3: CONDITIONALLY REQUIRED for Printers with finishers.

737

738

Note 4: CONDITIONALLY REQUIRED for Printers that support the Print to a

739

Recipient (section 3.2.2.8) use case.

740

741

Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed media.

742

743

Note 6: URIs MUST be absolute, SHOULD use the Host value (including port number) from the HTTP Host header (section 5.1.1), and MUST NOT use link-local addresses (section 8.4).

744

745

Note 7: RECOMMENDED due to its omission from IPP Everywhere™ 1.0, however it is needed for the underlying functionality.

746

747

Note 8: CONDITIONALLY REQUIRED for Printers that support ICC-based color management.

748

5.3.1 media-col-database (1setOf collection)

749

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

750

751

752

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

```
759     media-col-database=..., {  
760         media-size={  
761             x-dimension=5000-33020  
762             y-dimension=5000-48260 }  
763         media-source='by-pass-tray' },...
```

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

```
770     media-col-database=..., {  
771         media-size={  
772             x-dimension=20320-152400  
773             y-dimension=1524-9144000 },...
```

774 5.3.2 media-col-ready (1setOf collection)

775 The REQUIRED "media-col-ready" Printer attribute lists the loaded media combinations of
776 "media-col" member attributes for a Printer. In addition to the requirements set forth in IPP:
777 Production Printing Attributes - Set 1 [PWG5100.3], this specification defines how a Printer
778 advertises manually-fed and roll-fed media in the "media-col-ready" attribute.

779 Manual feed media sizes MUST NOT be reported in the "media-col-ready" attribute. By
780 definition the 'manual-feed' media source requires the Printer to ask the User/Operator to
781 load the requested media, thus the media can never be "ready" for use. However, many
782 Printers offer a multi-purpose tray that serves as both a manual feed source and an ad-hoc
783 paper tray. Printers that provide such a multi-purpose tray MUST advertise media loaded in
784 the tray using a different media source such as 'by-pass-tray'.

785 Roll media sizes are described using an integer value for the "x-dimension" and a
786 rangeOfInteger value for the "y-dimension" member attributes of the "media-size" member
787 attribute. The "x-dimension" value refers to the width of the loaded roll, the lower bound of
788 the "y-dimension" value refers to the minimum length allowed, and the upper bound of the
789 "y-dimension" value refers to the remaining length of the loaded roll or, if the remainder is
790 not known, the maximum length allowed.

791 **5.3.3 media-ready (1setOf (type3 keyword | name(MAX)))**

792 The REQUIRED "media-ready" Printer attribute lists the loaded media for a Printer. In
793 addition to the requirements set forth in the Internet Printing Protocol/1.1 [STD92], this
794 specification defines how a Printer advertises custom, manually-fed, and roll-fed media in
795 the "media-ready" attribute.

796 Manual feed media sizes MUST NOT be reported in the "media-ready" attribute. By
797 definition the 'manual-feed' media source requires the Printer to ask the User/Operator to
798 load the requested media, thus the media can never be "ready" for use. However, many
799 Printers offer a multi-purpose tray that serves as both a manual feed source and an ad-hoc
800 paper tray. Printers that provide such a multi-purpose tray MUST advertise media loaded in
801 the tray.

802 Custom media sizes are described using the "custom" self-describing media size names
803 defined in section 5 of the PWG Media Standardized Names [PWG5101.1] specification.
804 For example, a custom media size of 4x8 inches might be listed with the name
805 "custom_current_4x8in". The size name MUST include the source name if more than one
806 custom size is loaded, for example "custom_current.tray-1_4x8in".

807 Similarly, roll media sized are described using "roll" self-describing media size names with
808 the width of the loaded roll and a length of 0. For example, a 36 inch roll might be listed with
809 the name "roll_current_36x0in". As for custom sizes, the size name MUST include the
810 source name if more than one roll is loaded, for example "roll_current.roll-1_36x0in".

811 **5.3.4 media-size-supported (1setOf collection)**

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

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

```
820     media-size-supported=..., {  
821         x-dimension=5000-33020  
822         y-dimension=5000-48260 },...
```

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

```
829     media-size-supported=..., {  
830         x-dimension=20320-152400  
831         y-dimension=1524-9144000 },...
```

832 5.3.5 media-supported (1setOf (type3 keyword | name(MAX)))

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

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

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

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

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

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

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

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

858 5.3.6 pdl-override-supported (type2 keyword)

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

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

865 **5.4 IPP Printer Status Attributes**

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

868 **Table 6 - 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
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

869
870 Note 1: URIs MUST be absolute, SHOULD use the Host value (including port
871 number) from the HTTP Host header (section 5.1.1), and MUST NOT use link-local
872 addresses (section 8.4).
873 Note 2: RECOMMENDED due to its omission from IPP Everywhere™ 1.0, however
874 it is needed for the underlying functionality.

875 **5.4.1 printer-uri-supported (1setOf uri)**

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

879 **5.5 IPP Operation Attributes**

880 Table 7 lists the REQUIRED operation attributes for an IPP Everywhere™ Printer.

881 **Table 7 - IPP Everywhere™ Required Operation Attributes**

Attribute	Reference
compression	RFC 8011
document-format	RFC 8011
document-format-version	PWG 5100.7
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

882
883 Note 1: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"
884 MIME media type.
885 Note 2: CONDITIONALLY REQUIRED for Printers that support the Print to a
886 Recipient (section 3.2.2.8) use case.
887 Note 3: CONDITIONALLY REQUIRED for Printers that implement Paid Imaging
888 services.
889

890 5.6 IPP Job Description Attributes

891 Table 8 lists the REQUIRED Job Description attributes for an IPP Everywhere™ Printer.

892 **Table 8 - IPP Everywhere™ Required Job Description Attributes**

Attribute	Source
job-name	RFC 8011

893 5.7 IPP Job Status Attributes

894 Table 8 lists the REQUIRED Job Status attributes for an IPP Everywhere™ Printer.

895 **Table 9 - IPP Everywhere™ Required Job Status Attributes**

Attribute	Source
compression-supplied	PWG 5100.7
date-time-at-completed	RFC 8011
date-time-at-creation	RFC 8011
date-time-at-processing	RFC 8011
document-format-supplied	PWG 5100.7
document-format-version-supplied	PWG 5100.7
document-name-supplied	PWG 5100.7
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

896
 897 Note 1: URIs MUST be absolute, SHOULD use the Host value from HTTP header
 898 (section 5.1.1), and MUST NOT use link-local addresses (section 8.4).

899 5.7.1 job-id (integer)

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

905 5.7.2 job-uri (uri)

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

912 5.8 IPP Job Template Attributes

913 Table 10 lists the Job Template attributes for an IPP Everywhere™ Printer. All attributes in
 914 the table are REQUIRED unless otherwise specified.

915 **Table 10 - 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 (notes 5 and 7)	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

916
 917 Note 1: CONDITIONALLY REQUIRED for Printers that implement paid imaging
 918 services.

919 Note 2: REQUIRED for the "application/pdf" and "image/jpeg" MIME media types.
920 Note 3: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"
921 MIME media type.
922 Note 4: CONDITIONALLY REQUIRED for Printers with finishers.
923 Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed
924 media.
925 Note 6: CONDITIONALLY REQUIRED for Printers that support multiple-Document
926 Jobs.
927 Note 7: CONDITIONALLY REQUIRED for Printers that support ICC-based color
928 management.

929 **6. Document Formats**

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

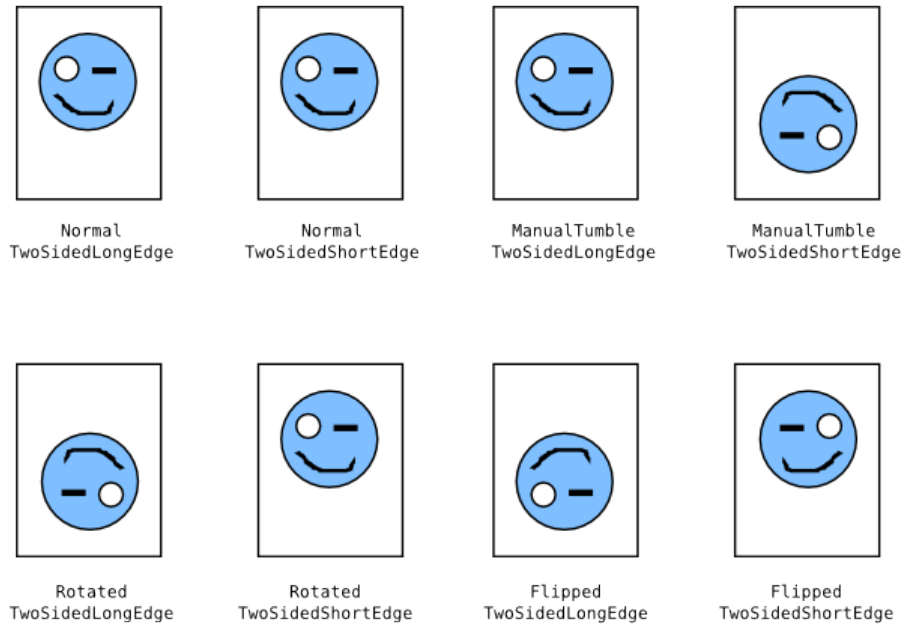
936 IPP/2.1 and IPP/2.2 Printers MUST and IPP/2.0 Printers SHOULD support documents
937 conforming to Document management — Portable document format — Part 1: PDF 1.7
938 [ISO32000] ("application/pdf"). IPP/2.0, IPP/2.1, and IPP/2.2 Printers are defined in
939 [PWG5100.12].

940 **6.1 Supporting Long-Edge Feed Media with PWG Raster Format** 941 **Documents**

942 Printers that support long-edge feed media MUST support the "feed-orientation" Job
943 Template attribute and corresponding "feed-orientation-default" and "feed-orientation-
944 supported" Printer attributes. In addition, Printers that support long-edge feed media MUST
945 report the "media-source-properties" member attribute in the "media-col-database" and
946 "media-col-ready" Printer attributes.

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

951 Figures 2 through 5 show how raster data must be formatted for each feed orientation.
952

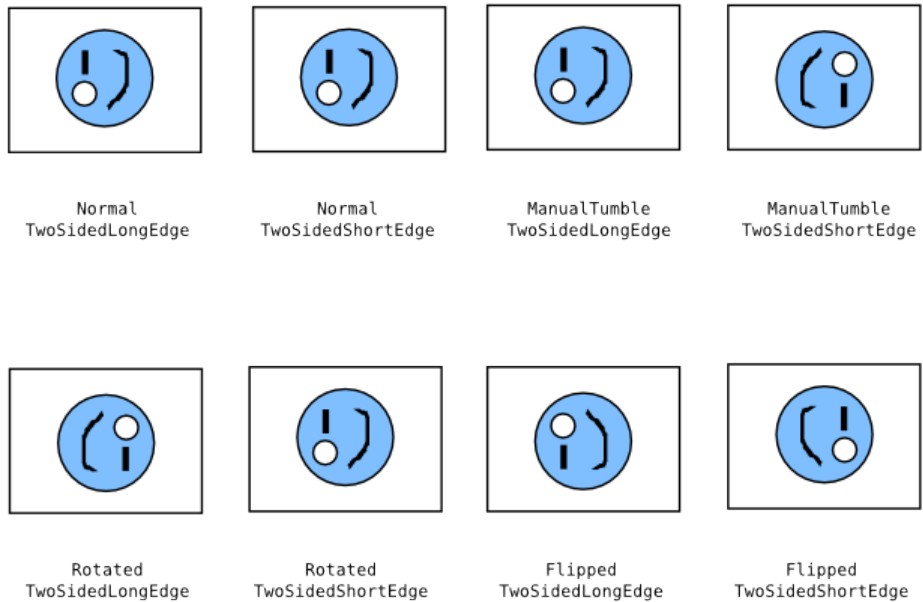


953

954

Figure 1 - PWG Raster Bitmaps with Portrait Feed Orientation

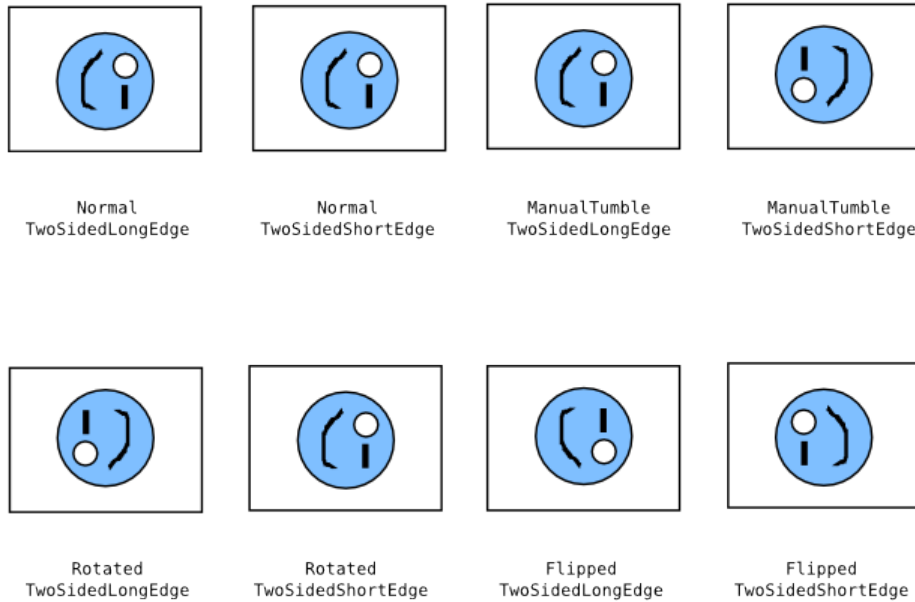
955



956

957

Figure 2 - PWG Raster Bitmaps with Landscape Feed Orientation

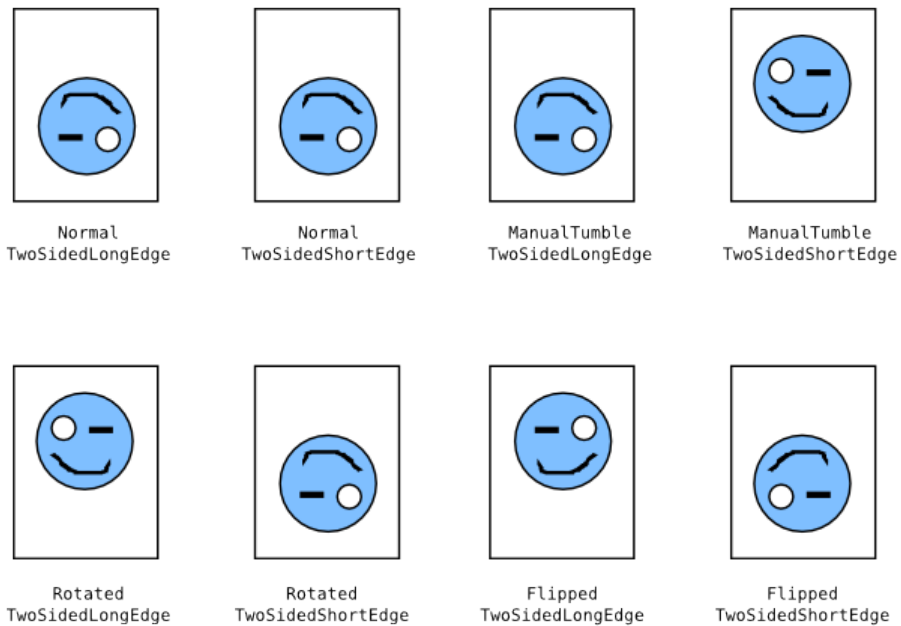


958

959

Figure 3 - PWG Raster Bitmaps with Reverse Landscape Feed Orientation

960



961

962

Figure 4 - PWG Raster Bitmaps with Reverse Portrait Feed Orientation

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

964 **7.1 ipp-features-supported (1setOf type2 keyword)**

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

967

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

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

973 **8.1 nameWithLanguage and nameWithoutLanguage**

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

978 **8.2 naturalLanguage**

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

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

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

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

985 **8.3 textWithLanguage and textWithoutLanguage**

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

989 **8.4 uri**

990 URI values MUST be in absolute form, i.e., "ipp://hostname.local/ipp/print" is acceptable but
991 "//ipp/print" is not. URI values MUST NOT contain link-local addresses in the host field.
992 Printers MUST NOT generate URI values with link-local addresses and SHOULD NOT
993 generate URI values with IP addresses obtained via Dynamic Host Control Protocol (DHCP)
994 [RFC2131] or other auto-configuration protocols. Printers SHOULD use the HTTP Host:
995 header value when generating URIs for use in Client responses.
996

997 **9. Conformance Requirements**

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

1000 **9.1 Conformance Requirements for Clients**

1001 In order for a Client to claim conformance to this specification a Client MUST support the
1002 following:

- 1003 1. DNS Service Discovery as defined in section 4.2
- 1004 2. IPP/2.0 as defined in section 5
- 1005 3. The REQUIRED operations listed in Table 4
- 1006 4. The REQUIRED Printer Description attributes listed in Table 5
- 1007 5. The REQUIRED operation attributes listed in Table 7
- 1008 6. The REQUIRED Job Template attributes listed in Table 10
- 1009 7. The REQUIRED Job Description attributes listed in Table 8
- 1010 8. The REQUIRED document formats listed in section 5.8
- 1011 9. The "feed-orientation-supported" Printer attribute and "media-source-properties"
1012 member attribute of the "media-col-database" and "media-col-ready" Printer
1013 attributes as reported by the Printer and defined in section 6.1
- 1014 10. The internationalization considerations as defined in section 10
- 1015 11. The security considerations as defined in section 0

1016 **9.2 Conformance Requirements for Printers**

1017 In order for a Printer to claim conformance to this specification a Printer MUST support the
1018 following:

- 1019 1. DNS Service Discovery as defined in section 4.2
- 1020 2. IPP/2.0 as defined in section 5
- 1021 3. The REQUIRED operations listed in Table 4
- 1022 4. The REQUIRED Printer Description attributes listed in Table 5
- 1023 5. The REQUIRED operation attributes listed in Table 7
- 1024 6. The REQUIRED Job Template attributes listed in Table 10
- 1025 7. The REQUIRED Job Description attributes listed in Table 8
- 1026 8. The REQUIRED document formats listed in section 5.8
- 1027 9. The 'ipp-everywhere' value for the "ipp-features-supported" Printer Description
1028 attribute as defined in section 7.1
- 1029 10. The additional semantics for attribute values as defined in section 8
- 1030 11. The internationalization considerations as defined in section 10
- 1031 12. The security considerations as defined in section 0
- 1032 13. The safe string truncation rules as defined in section 13

1033 9.3 Conditional Conformance Requirements for Printers

1034 Printers that support the "image/jpeg" [JFIF] MIME media type MUST support:

- 1035 1. The "copies-default", and "copies-supported" Printer Description attributes as
1036 defined in section 5.3.
- 1037 2. The "copies" Job Template attribute as defined in section 5.8.

1038 Printers that support the "application/pdf" [ISO32000] MIME media type MUST support:

- 1039 1. The "copies-default", "copies-supported", "document-password-supported", and
1040 "page-ranges-supported" Printer Description attributes as defined in section 5.3,
- 1041 2. The "document-password" Operation attribute as defined in section 5.4, and
- 1042 3. The "copies", "multiple-document-handling", "overrides", and "page-ranges" Job
1043 Template attributes as defined in section 5.8.

1044 Printers that support the Print to a Recipient use case (section 3.2.2.8) MUST support:

- 1045 1. The "job-password-supported" and "job-password-encryption-supported" Printer
1046 Description attributes as defined in section 5.3, and
- 1047 2. The "job-password" and "job-password-encryption" Operation attributes as
1048 defined in section 5.4.

1049 Printers that provide Paid Print services MUST support:

- 1050 1. The "job-account-id-default", "job-account-id-supported", "job-accounting-user-
1051 id-default", "job-accounting-user-id-supported", "job-mandatory-attributes-
1052 default", "job-mandatory-attributes-supported", and "printer-mandatory-job-
1053 attributes" Printer Description attributes as defined in section 5.3,
- 1054 2. The "job-mandatory-attributes" operation attribute as defined in section 5.4, and
- 1055 3. The "job-account-id" and "job-accounting-user-id" Job Template attributes as
1056 defined in section 5.8.

1057 Printers that support long-edge feed media MUST support:

- 1058 1. The "feed-orientation-default" and "feed-orientation-supported" Printer
1059 Description attributes as defined in section 5.3.
- 1060 2. The "media-source-properties" member attribute of the "media-col-database"
1061 and "media-col-ready" Printer Description attributes as defined in section 5.3.
- 1062 3. The "feed-orientation" Job Template attribute as defined in section 5.8.

1063 Printers that support ICC-based color management MUST support:

- 1064 4. The "print-rendering-intent-default", "print-rendering-intent-supported", and
1065 "printer-icc-profiles" Printer Description attributes as defined in section 5.3.
- 1066 5. The "print-render-intent" Job Template attribute as defined in section 5.8.

1067 **10. Internationalization Considerations**

1068 For interoperability and basic support for multiple languages, conforming implementations
1069 MUST support:

- 1070 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
1071 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 1072 2. The Unicode Format for Network Interchange [RFC5198] which requires
1073 transmission of well-formed UTF-8 strings and recommends transmission of
1074 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

1075 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
1076 characters and combining marks) followed by Canonical Composition (into canonical
1077 composed characters wherever Unicode has assigned them).

1078 WARNING – Performing normalization on UTF-8 strings received from Clients and
1079 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client
1080 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
1081 'hidden').

1082 Implementations of this specification SHOULD conform to the following standards on
1083 processing of human-readable Unicode text strings, see:

1084 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

1085 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

1086 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

1087 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

1088 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

1089 Unicode Collation Algorithm [UTS10] – sorting

1090 Unicode Locale Data Markup Language [UTS35] – locale databases

1091 Implementations of this specification are advised to also review the following informational
1092 documents on processing of human-readable Unicode text strings:

1093 Unicode Character Encoding Model [UTR17] – multi-layer character model

1094 Unicode Character Property Model [UTR23] – character properties

1095 Unicode Conformance Model [UTR33] – Unicode conformance basis

1096 **11. Security Considerations**

1097 The IPP extensions defined in this document require the same security considerations as
1098 defined in the Internet Printing Protocol/1.1 [STD92]. In addition, Printers MUST validate
1099 the HTTP Host request header in order to protect against DNS rebinding attacks.

1100 Implementations of this specification SHOULD conform to the following standard on
1101 processing of human-readable Unicode text strings, see:

1102 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

1103 Implementations of this specification are advised to also review the following
1104 informational document on processing of human-readable Unicode text strings:

1105 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

1106

1107

1108 12. IANA Considerations

1109 12.1 Attribute Value Registrations

1110 The keyword attribute values defined in this document will be published by IANA according
1111 to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

1112 <http://www.iana.org/assignments/ipp-registrations>

1113 The registry entries will contain the following information:

1114	Attributes (attribute syntax)		Reference
1115	Keyword Attribute Value	-----	-----
1116	-----		
1117	ipp-features-supported (1setOf type2 keyword)		[PWG5100.13]
1118	ipp-everywhere		[PWG5100.14]

1119 13. Safe String Truncation

1120 Strings can be truncated or omitted when transferred over alternate protocols. Printers
1121 MUST truncate long strings at logical boundaries. The following subsections describe how
1122 this truncation is performed for different kinds of strings.

1123 13.1 Plain Text Strings

1124 Plain text strings MUST be truncated at the end of a valid character sequence. For example,
1125 strings using the UTF-8 transformation format of ISO 10646 [STD0063] [ISO10646-1]
1126 SHOULD be represented using the Unicode Format for Network Interchange [RFC5198]
1127 and MUST be truncated at the end of a valid UTF-8 sequence.

1128 For example, the 9 octet UTF-8 sequence 0x48.65.CA.81.6C.6C.6F.C2.81 (Héllöj) would
1129 be shortened to fit within 6 octets by composing the é (0x65.CA.81 becomes 0xC3.A9) and
1130 removing the trailing UTF-8 sequence 0xC2.81 (j), resulting in the 6 octet UTF-8 sequence
1131 0x48.C3.A9.6C.6C.6F (Héllö).

1132 13.2 URIs

1133 URIs MUST be truncated so that the URI remains valid and accepted by the Printer. For
1134 example, the 46 octet URI "ipp://printer.example.com/ipp/really-long-name" might be
1135 shortened to fit within 32 octets by removing the last path name component, resulting in the
1136 29 octet URI "ipp://printer.example.com/ipp". Similarly, the 52 octet URI
1137 "ipp://printer.example.com/ipp?query-string" might be shortened to fit within 32 octets by
1138 removing the query string.

1139 As recommended by the Uniform Resource Identifier (URI): Generic Syntax [STD66],
1140 Printers SHOULD omit the port number from the URI when it has the default value, e.g., 80
1141 for "http", 443 for "https", and 631 for "ipp" and "ipps" URIs.

1142 **13.3 MIME Media Types**

1143 MIME media type strings MUST be truncated at the end of the media subtype, removing
1144 any parameters that are included with the media type. If the resulting string still exceeds the
1145 maximum length it MUST be discarded. For example, the 24 octet MIME media type
1146 "text/plain;charset=utf-8" would be shortened to fit within 16 octets by removing the trailing
1147 parameter, resulting in the 10 octet MIME media type "text/plain".

1148 **13.4 Delimited Lists**

1149 Delimited Lists combine one or more string types listed in the previous sections, separated
1150 by a delimiting character such as a comma or semicolon. Delimited lists MUST first be
1151 shortened by removal of unnecessary path components (URIs) and parameters (MIME
1152 media types) and second truncated at a delimiting character. For example, the 40 octet list
1153 of MIME media types "text/plain;charset=utf-8,application/pdf" would be shortened to fit
1154 within 32 octets by removing the MIME media type parameter, resulting in the 26 octet list
1155 "text/plain,application/pdf". The same list would be shortened to fit within 16 octets by also
1156 removing the last MIME media type, resulting in the 10 octet list "text/plain".

1157

1158 **14. Overview of Changes**

1159 **14.1 IPP Everywhere™ v1.1**

1160 The following changes were made to PWG 5100.14-2013: IPP Everywhere [PWG5100.14]:

- 1161 • References now point to the current versions of dependent documents and
1162 specifications at the time of publication;
- 1163 • Requirements for WS-Discovery have been removed due to a lack of
1164 implementations, which effectively made WS-Discovery support OPTIONAL;
- 1165 • References to OpenXPS and SSDP have been removed;
- 1166 • The "printer-device-id" Printer Description attribute and associated DNS-SD TXT
1167 record keys are no longer required;
- 1168 • DNS-SD is now RECOMMENDED for Printers representing Logical Devices (print
1169 servers);
- 1170 • ICC attributes are now CONDITIONALLY REQUIRED for printers that support ICC-
1171 based color management;
- 1172 • JPEG support is now CONDITIONALLY REQUIRED for color printers;
- 1173 • IPP Finishings 2.1 and the "finishings-col" Job Template attribute are now
1174 RECOMMENDED;
- 1175 • The "printer-strings-languages-supported" and "printer-strings-uri" Printer Status
1176 attributes are now RECOMMENDED to support localization; and
- 1177 • Printer Status and Job Status attributes are now listed in a separate section to match
1178 STD 92 and the IANA IPP registry.
1179

1180 15. References

1181 15.1 Normative References

- 1182 [BCP14] S. Bradner, "Key words for use in RFCs to Indicate Requirement
1183 Levels", RFC 2119/BCP 14, March 1997,
1184 <https://tools.ietf.org/html/rfc2119>
- 1185 [BCP47] A. Phillips, Ed., M. Davis, Ed., "Tags for Identifying Languages", BCP
1186 47/RFC 5646, September 2009, <https://tools.ietf.org/html/rfc5646>
- 1187 [EXIF] "Standard of the Camera & Imaging Products Association, CIPA DC-
1188 008-Translation-2016, Exchangeable image file format for digital still
1189 cameras: Exif Version 2.31", July 2016,
1190 <http://www.cipa.jp/std/documents/e/DC-008-Translation-2016-E.pdf>
- 1191 [GUPA] S. Kennedy, "IPP Get-User-Printer-Attributes Operation (GUPA)",
1192 December 2017, [https://ftp.pwg.org/pub/pwg/ipp/registrations/reg-
1193 ippgupa-20171214.pdf](https://ftp.pwg.org/pub/pwg/ipp/registrations/reg-ippgupa-20171214.pdf)
- 1194 [ISO10646] "Information technology -- Universal Coded Character Set (UCS)",
1195 ISO/IEC 10646:2011
- 1196 [ISO32000] "Document management — Portable document format — Part 1: PDF
1197 1.7", ISO 32000-2008
- 1198 [JFIF] E. Hamilton, "JPEG File Interchange Format Version 1.02",
1199 September 1992, <http://www.w3.org/Graphics/JPEG/jif3.pdf>
- 1200 [PWG5100.1] S.Kennedy, M.Sweet, "IPP Finishings 2.1 (FIN)", PWG 5100.1-2017,
1201 February 2017, [https://ftp.pwg.org/pub/pwg/candidates/cs-
1202 ipppfinishings21-20170217-5100.1.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippfinishings21-20170217-5100.1.pdf)
- 1203 [PWG5100.3] K. Ocke, T. Hastings, "Internet Printing Protocol (IPP): Production
1204 Printing Attributes – Set1", PWG 5100.3-2001, February 2001,
1205 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-
1206 5100.3.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-5100.3.pdf)
- 1207 [PWG5100.7] T. Hastings, P. Zehler, "Standard for The Internet Printing Protocol
1208 (IPP): Job Extensions", PWG 5100.7-2003, October 2003,
1209 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-
1210 5100.7.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-5100.7.pdf)
- 1211 [PWG5100.9] I. McDonald, C. Whittle, "Internet Printing Protocol (IPP)/ Printer State
1212 Extensions v1.0", PWG 5100.9-2009, July 2009,

1213		https://ftp.pwg.org/pub/pwg/candidates/cs-ippstate10-20090731-5100.9.pdf
1214		
1215	[PWG5100.11]	T. Hastings, D. Fullman, "IPP: Job and Printer Operations - Set 2", PWG 5100.11-2010, October 2010,
1216		
1217		https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-20101030-5100.11.pdf
1218		
1219	[PWG5100.12]	R. Bergman, H. Lewis, I. McDonald, M. Sweet, "IPP Version 2.0, 2.1, and 2.2", PWG Standard 5100.12-2015, October 2015,
1220		
1221		https://ftp.pwg.org/pub/pwg/standards/std-ipp20-20151030-5100.12.pdf
1222		
1223	[PWG5100.13]	M. Sweet, I. McDonald, "IPP: Job and Printer Extensions - Set 3 (JPS3)", PWG 5100.13-2012, July 2012,
1224		
1225		https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-5100.13.pdf
1226		
1227	[PWG5100.18]	M. Sweet, I. McDonald, "IPP Shared Infrastructure Extensions (INFRA)", PWG 5100.18-2015, June 2015,
1228		
1229		https://ftp.pwg.org/pub/pwg/candidates/cs-ippinfra10-20150619-5100.18.pdf
1230		
1231	[PWG5101.1]	M. Sweet, R. Bergman, T. Hastings, "PWG Media Standardized Names 2.0 (MSN2)", PWG 5101.1-2013, March 2013,
1232		
1233		https://ftp.pwg.org/pub/pwg/candidates/cs-pwgmsn20-20130328-5101.1.pdf
1234		
1235	[PWG5102.4]	M. Sweet, "PWG Raster Format", PWG 5102.4-2012, April 2012,
1236		
1237		https://ftp.pwg.org/pub/pwg/candidates/cs-ipp raster10-20120420-5102.4.pdf
1238	[RFC2083]	T. Boutell, "PNG (Portable Network Graphics) Specification Version 1.0", RFC 2083, March 1997, https://tools.ietf.org/html/rfc2083
1239		
1240	[RFC2131]	R. Droms, "Dynamic Host Configuration Protocol", RFC 2131, March 1997, https://tools.ietf.org/html/rfc2131
1241		
1242	[RFC2136]	P. Vixie, S. Thomson, Y. Rekhter, J. Bound, "Dynamic Updates in the Domain Name System (DNS UPDATE)", RFC 2136, April 1997,
1243		
1244		https://tools.ietf.org/html/rfc2136
1245	[RFC2246]	T. Dierks, C. Allen, "The TLS Protocol Version 1.0", RFC 2246, January 1999, https://tools.ietf.org/html/rfc2246
1246		

- 1247 [RFC2608] E. Guttman, C. Perkins, J. Veizades, M. Day, "Service Location
1248 Protocol, Version 2", RFC 2608, June 1999,
1249 <https://tools.ietf.org/html/rfc2608>
- 1250 [RFC2782] A. Gulbrandsen, P. Vixie, L. Esibov, "A DNS RR for specifying the
1251 location of services (DNS SRV)", RFC 2782, February 2000,
1252 <https://tools.ietf.org/html/rfc2782>
- 1253 [RFC3510] R. Herriot, I. McDonald, "Internet Printing Protocol/1.1: IPP URL
1254 Scheme", RFC 3510, April 2003, <https://tools.ietf.org/html/rfc3510>
- 1255 [RFC3805] R. Bergman, H. Lewis, I. McDonald, "Printer MIB v2", RFC 3805,
1256 June 2004, <https://tools.ietf.org/html/rfc3805>
- 1257 [RFC3806] R. Bergman, H. Lewis, I. McDonald, "Printer Finishing MIB", RFC
1258 3806, June 2004, <https://tools.ietf.org/html/rfc3806>
- 1259 [RFC3927] S. Cheshire, B. Aboba, E. Guttman, "Dynamic Configuration of IPv4
1260 Link-Local Addresses", RFC 3927, May 2005,
1261 <https://tools.ietf.org/html/rfc3927>
- 1262 [RFC3995] R. Herriot, T. Hastings, "IPP Event Notifications and Subscriptions",
1263 RFC 3995, March 2005, <https://tools.ietf.org/html/rfc3995>
- 1264 [RFC4122] P. Leach, M. Mealling, R. Salz, "A Universally Unique IDentifier
1265 (UUID) URN Namespace", RFC 4122, July 2005,
1266 <https://tools.ietf.org/html/rfc4122>
- 1267 [RFC4346] T.Dierks, E. Rescorla, "Transport Layer Security 1.1", RFC 4346,
1268 April 2006, <https://tools.ietf.org/html/rfc4346>
- 1269 [RFC4510] K. Zeilenga, "Lightweight Directory Access Protocol (LDAP):
1270 Technical Specification Road Map", RFC 4510, June 2006,
1271 <https://tools.ietf.org/html/rfc4510>
- 1272 [RFC4519] A. Sciberras, "Lightweight Directory Access Protocol (LDAP): Schema
1273 for User Applications", RFC 4519, June 2006,
1274 <https://tools.ietf.org/html/rfc4519>
- 1275 [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange",
1276 RFC 5198, March 2008, <https://tools.ietf.org/html/rfc5198>
- 1277 [RFC5246] T.Dierks, E. Rescorla, "Transport Layer Security 1.2", RFC 5246,
1278 August 2008, <https://tools.ietf.org/html/rfc5246>

- 1279 [RFC5870] A. Mayrhofer, C. Spanring, "A Uniform Resource Identifier for
1280 Geographic Locations ('geo' URI)", RFC 5870, June 2010,
1281 <https://tools.ietf.org/html/rfc5870>
- 1282 [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange",
1283 RFC 5198, March 2008, <https://tools.ietf.org/html/rfc5198>
- 1284 [RFC6749] D. Hardt, "The OAuth 2.0 Authorization Framework", RFC 6749,
1285 October 2012, <https://tools.ietf.org/html/rfc6749>
- 1286 [RFC6750] M. Jones, D. Hardt, "The OAuth 2.0 Authorization Framework: Bearer
1287 Token Usage", RFC 6750, October 2012,
1288 <https://tools.ietf.org/html/rfc6750>
- 1289 [RFC7230] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1290 Message Syntax and Routing", RFC 7230, June 2014,
1291 <https://tools.ietf.org/html/rfc7230>
- 1292 [RFC7231] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1293 Semantics and Content", RFC 7231, June 2014,
1294 <https://tools.ietf.org/html/rfc7231>
- 1295 [RFC7232] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1296 Conditional Requests", RFC 7232, June 2014,
1297 <https://tools.ietf.org/html/rfc7232>
- 1298 [RFC7234] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1299 Caching", RFC 7234, June 2014, <https://tools.ietf.org/html/rfc7234>
- 1300 [RFC7472] I. McDonald, M. Sweet, "Internet Printing Protocol (IPP) over HTTPS
1301 Transport Binding and the 'ipps' URI Scheme", RFC 7472, March
1302 2015, <https://tools.ietf.org/html/rfc7472>
- 1303 [RFC7612] P. Fleming, I. McDonald, "Lightweight Directory Access Protocol
1304 (LDAP): Schema for Printer Services", RFC 7612, June 2015,
1305 <https://tools.ietf.org/html/rfc7612>
- 1306 [RFC8446] E. Rescorla, "The Transport Layer Security (TLS) Protocol Version
1307 1.3", RFC 8446, August 2018, <https://tools.ietf.org/html/rfc8446>
- 1308 [STD63] F. Yergeau, "UTF-8, a transformation format of ISO 10646", RFC
1309 3629/STD 63, November 2003, <https://tools.ietf.org/html/rfc3629>
- 1310 [STD66] T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifier
1311 (URI): Generic Syntax", RFC 3986/STD 66, January 2005,
1312 <https://tools.ietf.org/html/rfc3986>

- 1313 [STD92] M. Sweet, I. McDonald, "Internet Printing Protocol/1.1", STD 92, June
1314 2018, <https://tools.ietf.org/html/std92>
- 1315 [UAX9] Unicode Consortium, "Unicode Bidirectional Algorithm", UAX#9, May
1316 2018, <https://www.unicode.org/reports/tr9>
- 1317 [UAX14] Unicode Consortium, "Unicode Line Breaking Algorithm", UAX#14,
1318 May 2018, <https://www.unicode.org/reports/tr14>
- 1319 [UAX15] M. Davis, M. Duerst, "Unicode Normalization Forms", Unicode
1320 Standard Annex 15, May 2018, <https://www.unicode.org/reports/tr15>
- 1321 [UAX29] Unicode Consortium, "Unicode Text Segmentation", UAX#29, May
1322 2018, <https://www.unicode.org/reports/tr29>
- 1323 [UAX31] Unicode Consortium, "Unicode Identifier and Pattern Syntax",
1324 UAX#31, June 2018, <https://www.unicode.org/reports/tr31>
- 1325 [UNICODE] Unicode Consortium, "Unicode Standard", Version 11.0.0, June 2018,
1326 <https://www.unicode.org/versions/Unicode11.0.0/>
- 1327 [UTS10] Unicode Consortium, "Unicode Collation Algorithm", UTS#10, May
1328 2018, <https://www.unicode.org/reports/tr10>
- 1329 [UTS35] Unicode Consortium, "Unicode Locale Data Markup Language",
1330 UTS#35, March 2018, <https://www.unicode.org/reports/tr35>
- 1331 [UTS39] Unicode Consortium, "Unicode Security Mechanisms", UTS#39, May
1332 2018, <https://www.unicode.org/reports/tr39>
- 1333 [WGS84] National Geospatial-Intelligence Agency, "Department of Defense
1334 World Geodetic System 1984, Its Definition and Relationships With
1335 Local Geodetic Systems, Third Edition", NIMA Technical Report
1336 TR8350.2, January 2000,
1337 <http://earth-info.nga.mil/GandG/publications/tr8350.2/wgs84fin.pdf>
- 1338 [X.520] International Telecommunication Union, "Information technology -
1339 Open Systems Interconnection - The Directory: Selected attribute
1340 types", ITU-T X.520, November 2008.
1341

1342 15.2 Informative References

- 1343 [BONJOUR] Apple Inc., "Bonjour Printing Specification Version 1.2.1", February
1344 2015, <https://developer.apple.com/bonjour/>
- 1345 [CUPSIPP] Apple Inc., "CUPS Implementation of IPP",
1346 <https://www.cups.org/doc/spec-ipp.html>
- 1347 [PWG5100.14] M. Sweet, I. McDonald, A. Mitchell, J. Hutchings, "IPP Everywhere",
1348 PWG 5100.14-2013, January 2013,
1349 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippeve10-20130128-
1350 5100.14.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippeve10-20130128-5100.14.pdf)
- 1351 [RFC3196] T. Hastings, C. Manros, P. Zehler, C. Kugler, H. Holst, "Internet
1352 Printing Protocol/1.1: Implementer's Guide", RFC 3196, November
1353 2001, <https://tools.ietf.org/html/rfc3196>
- 1354 [UTR17] Unicode Consortium "Unicode Character Encoding Model", UTR#17,
1355 November 2008, <https://www.unicode.org/reports/tr17>
- 1356 [UTR23] Unicode Consortium "Unicode Character Property Model", UTR#23,
1357 May 2015, <https://www.unicode.org/reports/tr23>
- 1358 [UTR33] Unicode Consortium "Unicode Conformance Model", UTR#33,
1359 November 2008, <https://www.unicode.org/reports/tr33>
- 1360 [UNISECFAQ] Unicode Consortium "Unicode Security FAQ", November 2013,
1361 <https://www.unicode.org/faq/security.html>
1362

1363 16. Authors' Addresses

1364 Primary authors:

1365 Michael Sweet
1366 Apple Inc.
1367 One Apple Park Way
1368 MS 111-HOMC
1369 Cupertino CA 95014
1370 USA

1371
1372 Ira McDonald
1373 High North
1374 PO Box 221
1375 Grand Marais, MI 49839

1376 Send comments to the PWG IPP Mailing List:

1377 ipp@pwg.org (subscribers only)

1378 To subscribe, see the PWG web page:

1379 <http://www.pwg.org/>

1380 Implementers of this specification document are encouraged to join the IPP Mailing List in
1381 order to participate in any discussions of clarification issues and review of registration
1382 proposals for additional attributes and values.

1383 The editors would like to especially thank the following individuals who also contributed
1384 significantly to the development of this document:

1385 Andrew Mitchell
1386 Jerry Thrasher - Lexmark
1387 Peter Zehler - Xerox
1388

1389 **17. Change History**

1390 **17.1 August 24, 2018**

- 1391 • The current version of the Bonjour Printing Specification is 1.2.1.
- 1392 • Section 4: DNS-SD is now required for physical devices and recommended for
1393 logical devices (print servers)
- 1394 • Section 5.1: Clarified that the use of the Host header value includes the port number.
- 1395 • Section 5.3: Moved printer-more-info to 5.4 Printer Status attributes
- 1396 • Section 5.4: Added RECOMMENDED printer-strings-languages-supported and
1397 printer-strings-uri attributes from JPS3
- 1398 • Section 6: Still recommend JPEG for monochrome printers
- 1399 • Section 8.4: Clarified that we mean IP addresses from DHCP
- 1400 • Section 9.3: Fixed section 5.3 references
- 1401 • Section 10: Dropped UTR20 (now maintained by the W3C, but why do we care about
1402 XML here?)
- 1403 • Section 12.1: Fixed STD 92 reference
- 1404 • Section 14.1: Updated the change list
- 1405 • Section 15.1: Fixed up STD 92 reference, added references to PWG 5100.18 (IPP
1406 INFRA) and RFCs 6749 and 6750 (OAuth 2.0), updated all Unicode references,
1407 dropped UTR20 (which is now maintained by the W3C)

1408 **17.2 July 4, 2018**

- 1409 • Status: Prototype
- 1410 • RFC 8011 is now STD 92
- 1411 • Updated Unicode to 11.0.0.

1412 **17.3 June 6, 2018**

- 1413 • Section 5.7: Fixed cross-reference to Table 10.

1414 • Section 14.1: Cleaned up WS-Discovery bullet.

1415 • Section 15.2: Updated Bonjour Printing specification reference.

1416 **17.4 April 17, 2018**

1417 • Removed all references to 1284 device IDs and associated information.

1418 **17.5 April 16, 2018**

1419 • Made sure IPP Everywhere™ consistently has trademark symbol.

1420 • Section 1: Drop examples of mobile devices.

1421 • Section 4.2.3.4: TLS key required for IPPS.

1422 • Section 5.1: Fix typos.

1423 • Section 5.2: Made Identify-Printer operation recommended for logical devices,
1424 required otherwise.

1425 • Sections 5.3 and 5.8: Made print-rendering-intent and printer-icc-profiles
1426 conditionally required for printers that support ICC-based color management.

1427 • Section 5.3.6: Clarify pdl-override-supported values and usage.

1428 • Section 5.7: Deleted stray "note 7"

1429 • Section 9.3: Added ICC attributes here.

1430 • Section 14: Reworded for present tense, clarified why WS-Discovery has been
1431 removed, removed reason for removing OpenXPS and SSDP.

1432 **17.6 April 3, 2018**

1433 • Make JPEG support conditionally required for color printers.

1434 **17.7 February 9, 2018**

1435 • Initial v1.1 draft

1436 • Updated template

1437 • Updated abstract (can't call it a standard in the abstract)

- 1438 • Updated spec references to current versions
- 1439 • Dropped all mention of UPNP, SSDP, WS-Discovery, and OpenXPS (never
1440 implemented)
- 1441 • Added a new "Overview of Changes" chapter that documents the high-level changes
1442 since the original IPP Everywhere specification
- 1443 • Now recommend support for the Get-User-Printer-Attributes operation
- 1444 • Now recommend support for the "finishings-col" attributes (PWG 5100.1)
- 1445 • Now recommend support for TLS 1.3
- 1446 • Now recommend using a resource path of /ipp/print or /ipp/print/name in Printer URIs
- 1447 • Issue 11: printer-current-time is now listed as an IPP Everywhere attribute, although
1448 only RECOMMENDED since it was missing in the 1.0 spec. (all of the date-time
1449 attributes were previously required, so printer-current-time would have implicitly been
1450 required)
- 1451 • Issue 12: The reference to PWG 5100.12 has been corrected
- 1452 • Issue 13: The reference to the EXIF specification has been updated.
- 1453 • Issue 13: The reference to PWG 5101.1 has been updated.
- 1454 • Issue 14: Clarified the pdl-override-supported requirements ('attempted' or
1455 'guaranteed')
- 1456 • Issue 15: Clarified that relative URIs ("//ipp/print") are not allowed in IPP.
- 1457 • Issue 26: "job-preferred-attributes-supported" should have been "preferred-
1458 attributes-supported"
- 1459 • Issue 31: Incorrect references to PWG 5101.2 have been changed to PWG 5101.1
1460 (MSN)
- 1461 • Issue 33: The notes concerning IPP/2.x conformance changes were confusing and
1462 have been removed
- 1463 • Issue 34: Table 6: overrides-supported now correctly references "note 2"
1464 (conditionally required).
- 1465 • Issue 35: overrides-supported.document-numbers is now **CONDITIONALLY**
1466 **REQUIRED**

- 1467 • Fixed attribute examples to use PAPI encoding
- 1468 • Fixed notes concerning "copies" to indicate that support is required for JPEG and
1469 PDF documents
- 1470 • Separated Printer Status attributes from Printer Description
- 1471 • Separated Job Status attributes from Job Description