



The Printer Working Group

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Working Draft

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IPP Everywhere™ v1.1

Status: Interim

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:

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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:

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192 **1. Introduction**

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

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

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

205 **2. Terminology**

206 **2.1 Printing Terminology**

207 Normative definitions and semantics of printing terms are imported from IETF Printer MIB
208 v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1:
209 Model and Semantics [RFC8011].

210 *Device*: A Logical or Physical Device associated with one or more Printers; also see section
211 2.3 of [RFC8011].

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

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

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

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

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

222 **2.2 Protocol Role Terminology**

223 This document also defines the following protocol roles to specify unambiguous
224 conformance requirements:

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

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

230 **2.3 Other Terminology**

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

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

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

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

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

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

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

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

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

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

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

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

256 **2.4 Acronyms and Organizations**

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

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

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

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

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

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

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

265

266 **3. Requirements**

267 **3.1 Rationale**

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

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

277 Internet Printing Protocol/1.1: Encoding and Transport [RFC8010] and Internet Printing
278 Protocol/1.1: Model and Semantics [RFC8011] define the core Internet Printing Protocol.

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

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

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

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

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

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

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

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

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

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

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

311 **3.2 Use Cases**

312 **3.2.1 Select Printer**

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

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

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

322 **3.2.1.1 Select the Last Used Printer**

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

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

329 3.2.1.2 Select Printer Using Name or Address

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

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

336 3.2.1.3 Select Printer Using URI

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

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

341 3.2.1.4 Select Printer Using a Directory Service

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

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

348 3.2.1.5 Select Printer Using a Cloud Service

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

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

355 3.2.1.6 Select Printer Using a Discovery Protocol

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

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

362 3.2.1.7 Select Printer Using Geo-Location

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

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

369 3.2.1.8 Select Printer Using Out of Band Method

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

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

376 3.2.1.9 Select Printer Using Properties

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

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

388 3.2.2 Print

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

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

397 **3.2.2.1 Print a Document**

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

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

404 **3.2.2.2 Print a Document by Reference**

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

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

411 **3.2.2.3 Print Using Loaded Media**

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

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

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

423 **3.2.2.4 Print a Secure Form**

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

428 The treasurer loads check blanks into the Printer and configured the loaded media as
429 necessary at the Printer. After he initiates a print action from the accounting program,
430 selects a Printer for printing, and selects checks to be printed, the Client User Interface
431 displays a preview of the printed checks and he confirms that the checks are correctly

432 paginated and oriented and the amounts, payees and signature are correct. The Client
433 automatically selects the check blank media. The treasurer selects additional processing
434 intent for the Job and confirms the print action. The Client sends a print job request to the
435 Printer with the Job Ticket and document data containing the check information, correctly
436 oriented for the check blank media. He waits for the checks to be printed and removes any
437 excess media from the Printer.

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

441 **3.2.2.5 Print with Special Formatting**

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

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

454 **3.2.2.6 Print and Select at Printer**

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

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

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

466 3.2.2.7 Print to a Service

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

474 3.2.2.8 Print to a Recipient

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

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

482 3.2.2.9 Print with a Proof Copy

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

489 3.2.3 Exceptions**490 3.2.3.1 Print Action Canceled**

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

494 3.2.3.2 Select Printer Canceled

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

497 3.2.3.3 Printer No Longer Network Accessible after Selection

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

501 3.2.3.4 Not Authorized

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

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

508 3.2.3.5 Needs Authentication

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

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

513 3.2.3.6 Not Accepting Jobs

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

516 3.2.3.7 Job Ticket or Document Format Not Supported

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

520 3.2.3.8 Job or Document Processing Failures

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

525 3.2.3.9 Printer Fault

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

529 3.2.3.10 Printer Warning

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

533 3.3 Out of Scope

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

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

542 3.4 Design Requirements

543 The IPP Everywhere™ design should:

- 544 1. Define conformance profiles that reference the IPP/2.0 versions [PWG5100.12];
- 545 2. Follow the naming conventions defined in IETF IPP/1.1 [RFC8011], including
546 keyword value case (lower) and hyphenation requirements;
- 547 3. Define conformance requirements for both Printers and Clients; and
- 548 4. Support printing with vendor-neutral Client software from any Client to any
549 Printer using a variety of discovery protocols, IPP for the transport, and
550 standard document formats.

551

552 **4. Discovery Protocols**

553 Printers **MUST** support DNS-SD based Discovery. Printers **MAY** support other Discovery
554 protocols such as LDAP and SLP.

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

557 **4.1 Printer Description Attributes Used in Discovery**

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

560 **4.2 DNS Service Discovery (DNS-SD)**

561 DNS Service Discovery [RFC6762] uses service (SRV) records and traditional unicast and
562 multicast DNS (mDNS) [RFC6763] queries. This discovery protocol is collectively defined
563 in the Bonjour Printing Specification version 1.2 [BONJOUR] and extended in this
564 specification.

565 Printers **MUST** support mDNS and **MAY** support dynamic DNS updates via Dynamic
566 Updates in the Domain Name System (DNS UPDATE) [RFC2136] and other mechanisms.

567 **4.2.1 Service (SRV) Instance Name**

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

570 Printers **MUST** advertise the "_ipp._tcp" (generic IPP) and "_print._sub._ipp._tcp" (IPP
571 Everywhere™) services over mDNS.

572 Printers supporting the "ipps" URI scheme [RFC7472] **MUST** advertise the "_ipps._tcp"
573 (generic IPPS) and "_print._sub._ipps._tcp" (IPP Everywhere™ Secure) services over
574 mDNS.

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

576 **4.2.2 Geo-Location (LOC)**

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

581

Table 1 - Attributes in Discovery Protocols

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

582 Note 1: Extension attribute to RFC 7612.

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

584 **4.2.3 Text (TXT)**

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

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

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

594 For example, the IPP "printer-more-info" attribute has a maximum length of 1023 octets,
 595 however the corresponding "adminurl" key cannot represent a value longer than 246 octets
 596 (255 - 9 octets for "adminurl="). Printers MUST truncate long strings as described in section
 597 13.

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

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

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

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

603 Clients MUST ignore incomplete key/value pairs at the end of a truncated TXT record.
 604

605

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)

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

607 **4.2.3.1 air**

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

610 [CUPSIPP] that extends the "uri-authentication-supported" Printer Description attribute
611 [RFC8011]. The following values are supported:

612 'certificate'; Authentication using Secure Sockets Layer (SSL) and Transport Layer
613 Security (TLS) certificates. This is equivalent to the value 'certificate' for the "uri-
614 authentication-supported" Printer Description attribute [RFC8011].

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

618 'none'; No authentication is required. This is equivalent to the value 'none' for the
619 "uri-authentication-supported" Printer Description attribute [RFC8011].

620 'username,password'; Username + password authentication is required. This is
621 equivalent to the values 'basic' or 'digest' for the "uri-authentication-supported"
622 Printer Description attribute [RFC8011].

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

624 **4.2.3.2 pdl**

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

631 **4.2.3.3 qtotal**

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

641 **4.2.3.4 TLS**

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

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

646 '1.0'; TLS 1.0 [RFC2246] encryption is supported. This is equivalent to the value 'tls'
647 for the "uri-security-supported" Printer Description attribute.

648 '1.1'; TLS 1.1 [RFC4346] encryption is supported. This is equivalent to the value 'tls'
649 for the "uri-security-supported" Printer Description attribute.

650 '1.2'; TLS 1.2 [RFC5246] encryption is supported. This is equivalent to the value 'tls'
651 for the "uri-security-supported" Printer Description attribute.

652 '1.3'; TLS 1.3 [RFC-TLS1.3] encryption is supported. This is equivalent to the value
653 'tls' for the "uri-security-supported" Printer Description attribute.

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

657 **4.2.3.5 UUID**

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

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

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

663 12345678-9ABC-DEF0-1234-56789ABCDEF0

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

666 **4.2.3.6 DUUID**

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

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

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

672 12345678-9ABC-DEF0-1234-56789ABCDEF0

673 4.3 LDAP and SLP Discovery

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

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

679 For example, the IPP "printer-device-id" attribute has a maximum length of 1023 octets,
680 however the corresponding LDAP "printer-device-id" attribute has a maximum length of 255
681 octets. Printers MUST truncate long strings as defined in section 13.
682

683 **5. Protocol Binding**

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

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

688 **5.1 HTTP Features**

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

694 Clients and Printers **MUST** support IPP over HTTP [RFC3510] and **SHOULD** support IPP
695 over HTTPS [RFC7472] with the most recent version of TLS [RFC-TLS1.3].

696 **5.1.1 Host**

697 Printers **MUST** validate the Host request header and **SHOULD** use the Host value in
698 generated URIs.

699 **5.1.2 If-Modified-Since, Last-Modified, and 304 Not Modified**

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

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

706 **5.1.3 Cache-Control**

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

712

713 5.2 IPP Operations

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

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

720 **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

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

722 5.3 IPP Printer Description Attributes

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

725 **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-more-info (note 6)	RFC 8011
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

- 726
727 Note 1: CONDITIONALLY REQUIRED for Printers that implement Paid Imaging
728 services.
729 Note 2: REQUIRED for the "application/pdf" and "image/jpeg" MIME media types.
730 Note 3: CONDITIONALLY REQUIRED for Printers with finishers.
731 Note 4: CONDITIONALLY REQUIRED for Printers that support the Print to a
732 Recipient (section 3.2.2.8) use case.
733 Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed
734 media.
735 Note 6: URIs MUST be absolute, SHOULD use the Host value from HTTP header
736 (section 5.1.1), and MUST NOT use link-local addresses (section 8.4).
737 Note 7: RECOMMENDED due to its omission from IPP Everywhere™ 1.0, however
738 it is needed for the underlying functionality.
739 Note 8: CONDITIONALLY REQUIRED for Printers that support ICC-based color
740 management.

741 5.3.1 media-col-database (1setOf collection)

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

746 Custom media sizes are described using rangeOfInteger values for the "x-dimension" and
747 "y-dimension" member attributes of the "media-size" member attribute. Dimensions are

748 provided for sheets in portrait orientation, that is the "x-dimension" ranges refer to the short
749 axis and the "y-dimension" ranges refer to the long axis of the sheet. For example, a Printer
750 supporting sheet media from 50x50mm to 330.2x482.6mm from the by-pass tray could
751 report:

```
752     media-col-database=..., {  
753         media-size={  
754             x-dimension=5000-33020  
755             y-dimension=5000-48260 }  
756         media-source='by-pass-tray' }, ...
```

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

```
763     media-col-database=..., {  
764         media-size={  
765             x-dimension=20320-152400  
766             y-dimension=1524-9144000 }, ...
```

767 5.3.2 media-col-ready (1setOf collection)

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

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

778 Roll media sizes are described using an integer value for the "x-dimension" and a
779 rangeOfInteger value for the "y-dimension" member attributes of the "media-size" member
780 attribute. The "x-dimension" value refers to the width of the loaded roll, the lower bound of
781 the "y-dimension" value refers to the minimum length allowed, and the upper bound of the
782 "y-dimension" value refers to the remaining length of the loaded roll or, if the remainder is
783 not known, the maximum length allowed.

784 5.3.3 media-ready (1setOf (type3 keyword | name(MAX)))

785 The REQUIRED "media-ready" Printer attribute lists the loaded media for a Printer. In
786 addition to the requirements set forth in Internet Printing Protocol/1.1: Model and Semantics

787 [RFC8011], this specification defines how a Printer advertises custom, manually-fed, and
788 roll-fed media in the "media-ready" attribute.

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

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

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

804 **5.3.4 media-size-supported (1setOf collection)**

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

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

```
813     media-size-supported=..., {  
814         x-dimension=5000-33020  
815         y-dimension=5000-48260 }, ...
```

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

```
822     media-size-supported=..., {  
823         x-dimension=20320-152400  
824         y-dimension=1524-9144000 }, ...
```

825 **5.3.5 media-supported (1setOf (type3 keyword | name(MAX)))**

826 The REQUIRED "media-supported" Printer attribute lists the supported media sizes for a
827 Printer. In addition to the requirements set forth in [RFC8011], this specification defines how
828 a Printer advertises custom and roll-fed media in the "media-supported" attribute.

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

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

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

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

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

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

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

850 **5.3.6 pdl-override-supported (type2 keyword)**

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

854 When reporting capabilities for the 'application/pdf', 'image/jpeg', or 'image/pwg-raster'
855 MIME media types, Printers MUST report either 'attempted' [RFC8011] or 'guaranteed'
856 [PWG5100.11] for the "pdl-override-supported" Printer attribute.

857 **5.4 IPP Printer Status Attributes**

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

860 **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-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-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

861
862 Note 1: URIs MUST be absolute, SHOULD use the Host value from HTTP header
863 (section 5.1.1), and MUST NOT use link-local addresses (section 8.4).

864 **5.4.1 printer-uri-supported (1setOf uri)**

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

868 **5.5 IPP Operation Attributes**

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

870 **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

871
872 Note 1: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"
873 MIME media type.
874 Note 2: CONDITIONALLY REQUIRED for Printers that support the Print to a
875 Recipient (section 3.2.2.8) use case.
876 Note 3: CONDITIONALLY REQUIRED for Printers that implement Paid Imaging
877 services.
878

879 5.6 IPP Job Description Attributes

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

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

Attribute	Source
job-name	RFC 8011

882 5.7 IPP Job Status Attributes

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

884 **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

885
 886 Note 1: URIs MUST be absolute, SHOULD use the Host value from HTTP header
 887 (section 5.1.1), and MUST NOT use link-local addresses (section 8.4).

888 5.7.1 job-id (integer)

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

894 5.7.2 job-uri (uri)

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

901 5.8 IPP Job Template Attributes

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

904 **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

905
 906 Note 1: CONDITIONALLY REQUIRED for Printers that implement paid imaging
 907 services.

908 Note 2: REQUIRED for the "application/pdf" and "image/jpeg" MIME media types.
909 Note 3: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"
910 MIME media type.
911 Note 4: CONDITIONALLY REQUIRED for Printers with finishers.
912 Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed
913 media.
914 Note 6: CONDITIONALLY REQUIRED for Printers that support multiple-Document
915 Jobs.
916 Note 7: CONDITIONALLY REQUIRED for Printers that support ICC-based color
917 management.

918 **6. Document Formats**

919 Printers MUST support documents conforming to the PWG Raster Format [PWG5102.4]
920 ("image/pwg-raster"). Color Printers MUST support documents conforming to the JPEG File
921 Information Format Version 1.02 [JFIF] ("image/jpeg"), specifically the metadata and JPEG
922 subset defined in the Standard of the Camera & Imaging Products Association, CIPA DC-
923 008-Translation-2016, Exchangeable image file format for digital still cameras: Exif Version
924 2.31 [EXIF].

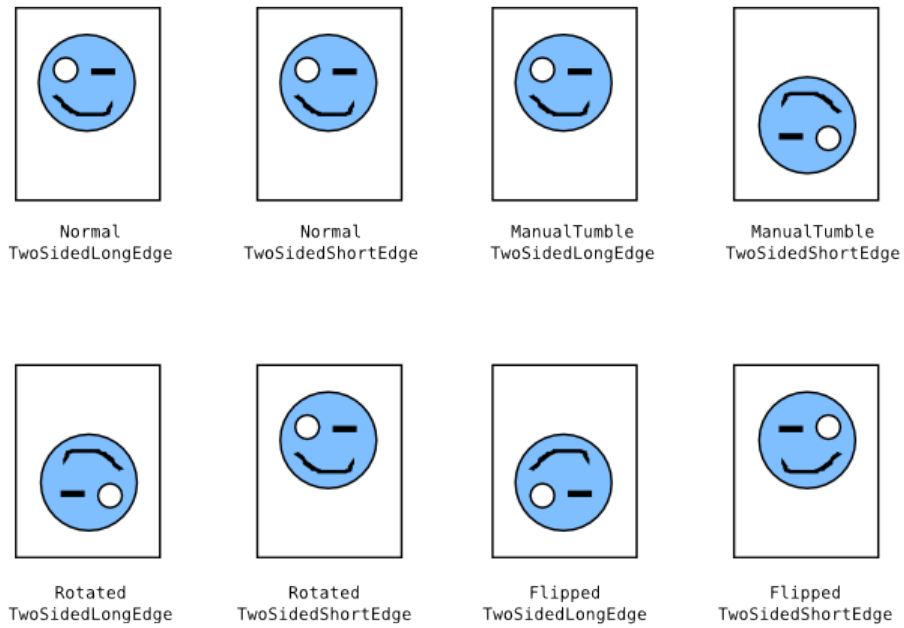
925 IPP/2.1 and IPP/2.2 Printers MUST and IPP/2.0 Printers SHOULD support documents
926 conforming to Document management — Portable document format — Part 1: PDF 1.7
927 [ISO32000] ("application/pdf"). IPP/2.0, IPP/2.1, and IPP/2.2 Printers are defined in
928 [PWG5100.12].

929 **6.1 Supporting Long-Edge Feed Media with PWG Raster Format** 930 **Documents**

931 Printers that support long-edge feed media MUST support the "feed-orientation" Job
932 Template attribute and corresponding "feed-orientation-default" and "feed-orientation-
933 supported" Printer attributes. In addition, Printers that support long-edge feed media MUST
934 report the "media-source-properties" member attribute in the "media-col-database" and
935 "media-col-ready" Printer attributes.

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

940 Figures 2 through 5 show how raster data must be formatted for each feed orientation.
941

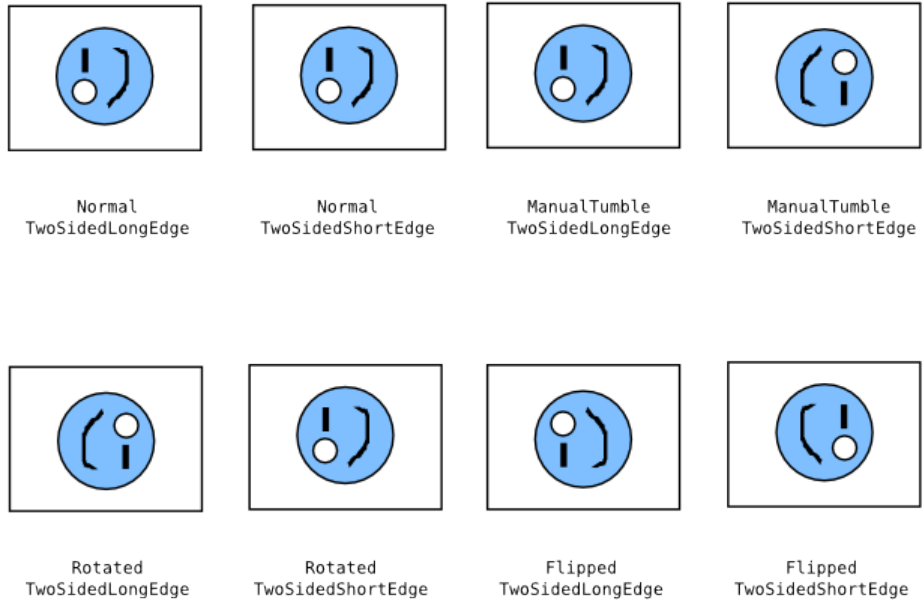


942

943

Figure 1 - PWG Raster Bitmaps with Portrait Feed Orientation

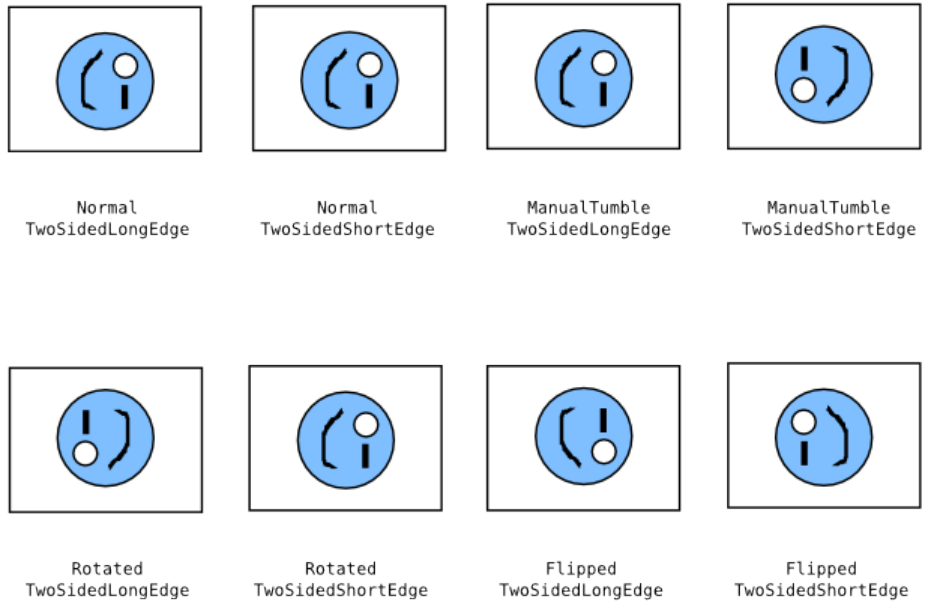
944



945

946

Figure 2 - PWG Raster Bitmaps with Landscape Feed Orientation

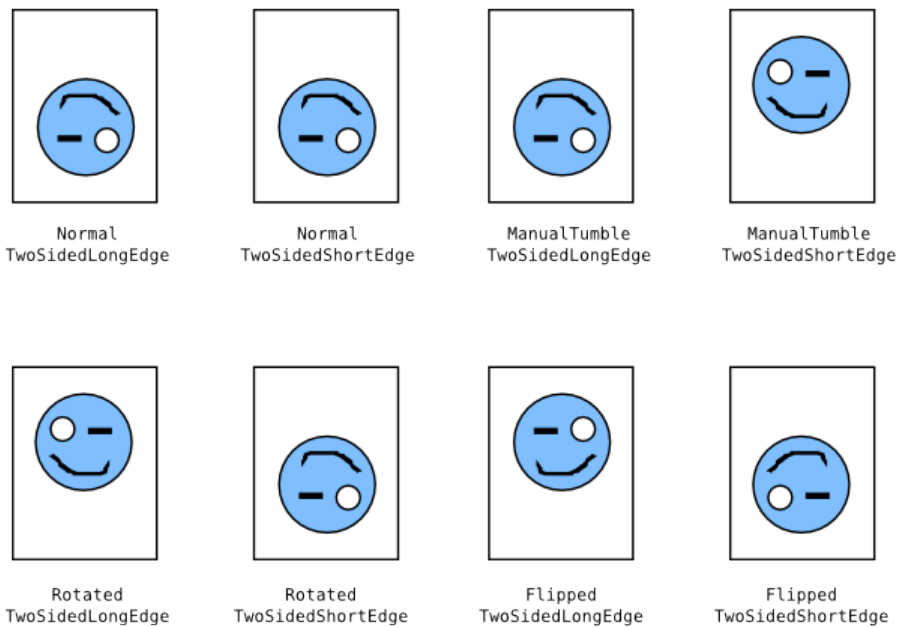


947

948

Figure 3 - PWG Raster Bitmaps with Reverse Landscape Feed Orientation

949



950

951

Figure 4 - PWG Raster Bitmaps with Reverse Portrait Feed Orientation

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

953 **7.1 ipp-features-supported (1setOf type2 keyword)**

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

956

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

958 This specification amends the definition of the nameWithLanguage,
959 nameWithoutLanguage, naturalLanguage, textWithLanguage, textWithoutLanguage, and
960 URI value tags defined in IPP/1.1: Model and Semantics [RFC8011] with additional
961 restrictions to improve interoperability.

962 **8.1 nameWithLanguage and nameWithoutLanguage**

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

967 **8.2 naturalLanguage**

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

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

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

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

974 **8.3 textWithLanguage and textWithoutLanguage**

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

978 **8.4 uri**

979 URI values MUST be in absolute form, i.e., "ipp://hostname.local/ipp/print" is acceptable but
980 "//ipp/print" is not. URI values MUST NOT contain link-local addresses in the host field.
981 Printers MUST NOT generate URI values with link-local addresses and SHOULD NOT
982 generate URI values with addresses obtained via Dynamic Host Control Protocol (DHCP)
983 [RFC2131] or other auto-configuration protocols. Printers SHOULD use the HTTP Host:
984 header value when generating URIs for use in Client responses.
985

986 **9. Conformance Requirements**

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

989 **9.1 Conformance Requirements for Clients**

990 In order for a Client to claim conformance to this specification a Client MUST support the
991 following:

- 992 1. DNS Service Discovery as defined in section 4.2
- 993 2. IPP/2.0 as defined in section 5
- 994 3. The REQUIRED operations listed in Table 4
- 995 4. The REQUIRED Printer Description attributes listed in Table 5
- 996 5. The REQUIRED operation attributes listed in Table 7
- 997 6. The REQUIRED Job Template attributes listed in Table 10
- 998 7. The REQUIRED Job Description attributes listed in Table 8
- 999 8. The REQUIRED document formats listed in section 5.8
- 1000 9. The "feed-orientation-supported" Printer attribute and "media-source-properties"
1001 member attribute of the "media-col-database" and "media-col-ready" Printer
1002 attributes as reported by the Printer and defined in section 6.1
- 1003 10. The internationalization considerations as defined in section 10
- 1004 11. The security considerations as defined in section 0

1005 **9.2 Conformance Requirements for Printers**

1006 In order for a Printer to claim conformance to this specification a Printer MUST support the
1007 following:

- 1008 1. DNS Service Discovery as defined in section 4.2
- 1009 2. IPP/2.0 as defined in section 5
- 1010 3. The REQUIRED operations listed in Table 4
- 1011 4. The REQUIRED Printer Description attributes listed in Table 5
- 1012 5. The REQUIRED operation attributes listed in Table 7
- 1013 6. The REQUIRED Job Template attributes listed in Table 10
- 1014 7. The REQUIRED Job Description attributes listed in Table 8
- 1015 8. The REQUIRED document formats listed in section 5.8
- 1016 9. The 'ipp-everywhere' value for the "ipp-features-supported" Printer Description
1017 attribute as defined in section 7.1
- 1018 10. The additional semantics for attribute values as defined in section 8
- 1019 11. The internationalization considerations as defined in section 10
- 1020 12. The security considerations as defined in section 0
- 1021 13. The safe string truncation rules as defined in section 13

1022 9.3 Conditional Conformance Requirements for Printers

1023 Printers that support the "image/jpeg" [JFIF] MIME media type MUST support:

- 1024 1. The "copies-default", and "copies-supported" Printer Description attributes as
1025 defined in section 0.
- 1026 2. The "copies" Job Template attribute as defined in section 5.8.

1027 Printers that support the "application/pdf" [ISO32000] MIME media type MUST support:

- 1028 1. The "copies-default", "copies-supported", "document-password-supported", and
1029 "page-ranges-supported" Printer Description attributes as defined in section 0,
- 1030 2. The "document-password" Operation attribute as defined in section 5.4, and
- 1031 3. The "copies", "multiple-document-handling", "overrides", and "page-ranges" Job
1032 Template attributes as defined in section 5.8.

1033 Printers that support the Print to a Recipient use case (section 3.2.2.8) MUST support:

- 1034 1. The "job-password-supported" and "job-password-encryption-supported" Printer
1035 Description attributes as defined in section 0, and
- 1036 2. The "job-password" and "job-password-encryption" Operation attributes as
1037 defined in section 5.4.

1038 Printers that provide Paid Print services MUST support:

- 1039 1. The "job-account-id-default", "job-account-id-supported", "job-accounting-user-
1040 id-default", "job-accounting-user-id-supported", "job-mandatory-attributes-
1041 default", "job-mandatory-attributes-supported", and "printer-mandatory-job-
1042 attributes" Printer Description attributes as defined in section 0,
- 1043 2. The "job-mandatory-attributes" operation attribute as defined in section 5.4, and
- 1044 3. The "job-account-id" and "job-accounting-user-id" Job Template attributes as
1045 defined in section 5.8.

1046 Printers that support long-edge feed media MUST support:

- 1047 1. The "feed-orientation-default" and "feed-orientation-supported" Printer
1048 Description attributes as defined in section 0.
- 1049 2. The "media-source-properties" member attribute of the "media-col-database"
1050 and "media-col-ready" Printer Description attributes as defined in section 0.
- 1051 3. The "feed-orientation" Job Template attribute as defined in section 5.8.

1052 Printers that support ICC-based color management MUST support:

- 1053 4. The "print-rendering-intent-default", "print-rendering-intent-supported", and
1054 "printer-icc-profiles" Printer Description attributes as defined in section 5.3.
- 1055 5. The "print-render-intent" Job Template attribute as defined in section 5.8.

1056 **10. Internationalization Considerations**

1057 For interoperability and basic support for multiple languages, conforming implementations
1058 MUST support:

- 1059 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
1060 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 1061 2. The Unicode Format for Network Interchange [RFC5198] which requires
1062 transmission of well-formed UTF-8 strings and recommends transmission of
1063 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

1064 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
1065 characters and combining marks) followed by Canonical Composition (into canonical
1066 composed characters wherever Unicode has assigned them).

1067 WARNING – Performing normalization on UTF-8 strings received from Clients and
1068 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client
1069 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
1070 'hidden').

1071 Implementations of this specification SHOULD conform to the following standards on
1072 processing of human-readable Unicode text strings, see:

1073 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

1074 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

1075 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

1076 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

1077 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

1078 Unicode Collation Algorithm [UTS10] – sorting

1079 Unicode Locale Data Markup Language [UTS35] – locale databases

1080 Implementations of this specification are advised to also review the following informational
1081 documents on processing of human-readable Unicode text strings:

1082 Unicode Character Encoding Model [UTR17] – multi-layer character model

1083 Unicode in XML and other Markup Languages [UTR20] – XML usage

1084 Unicode Character Property Model [UTR23] – character properties

1085 Unicode Conformance Model [UTR33] – Unicode conformance basis

1086 11. Security Considerations

1087 The IPP extensions defined in this document require the same security considerations as
1088 defined in the IPP/1.1: Model and Semantics [RFC8011]. In addition, Printers MUST
1089 validate the HTTP Host request header in order to protect against DNS rebinding attacks.

1090 Implementations of this specification SHOULD conform to the following standard on
1091 processing of human-readable Unicode text strings, see:

1092 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

1093 Implementations of this specification are advised to also review the following
1094 informational document on processing of human-readable Unicode text strings:

1095 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

1096

1097

1098 12. IANA Considerations

1099 12.1 Attribute Value Registrations

1100 The keyword attribute values defined in this document will be published by IANA according
1101 to the procedures in the IPP Model and Semantics [RFC8011] section 7.3 in the following
1102 file:

1103 <http://www.iana.org/assignments/ipp-registrations>

1104 The registry entries will contain the following information:

1105	Attributes (attribute syntax)		Reference
1106	Keyword Attribute Value	-----	-----
1107	-----		
1108	ipp-features-supported (1setOf type2 keyword)		[PWG5100.13]
1109	ipp-everywhere		[PWG5100.14]

1110 13. Safe String Truncation

1111 Strings can be truncated or omitted when transferred over alternate protocols. Printers
1112 MUST truncate long strings at logical boundaries. The following subsections describe how
1113 this truncation is performed for different kinds of strings.

1114 13.1 Plain Text Strings

1115 Plain text strings MUST be truncated at the end of a valid character sequence. For example,
1116 strings using the UTF-8 transformation format of ISO 10646 [STD0063] [ISO10646-1]
1117 SHOULD be represented using the Unicode Format for Network Interchange [RFC5198]
1118 and MUST be truncated at the end of a valid UTF-8 sequence.

1119 For example, the 9 octet UTF-8 sequence 0x48.65.CA.81.6C.6C.6F.C2.81 (Héllöj) would
1120 be shortened to fit within 6 octets by composing the é (0x65.CA.81 becomes 0xC3.A9) and
1121 removing the trailing UTF-8 sequence 0xC2.81 (j), resulting in the 6 octet UTF-8 sequence
1122 0x48.C3.A9.6C.6C.6F (Héllö).

1123 13.2 URIs

1124 URIs MUST be truncated so that the URI remains valid and accepted by the Printer. For
1125 example, the 46 octet URI "ipp://printer.example.com/ipp/really-long-name" might be
1126 shortened to fit within 32 octets by removing the last path name component, resulting in the
1127 29 octet URI "ipp://printer.example.com/ipp". Similarly, the 52 octet URI
1128 "ipp://printer.example.com/ipp?query-string" might be shortened to fit within 32 octets by
1129 removing the query string.

1130 As recommended by the Uniform Resource Identifier (URI): Generic Syntax [STD66],
1131 Printers SHOULD omit the port number from the URI when it has the default value, e.g., 80
1132 for "http", 443 for "https", and 631 for "ipp" and "ipps" URIs.

1133 **13.3 MIME Media Types**

1134 MIME media type strings MUST be truncated at the end of the media subtype, removing
1135 any parameters that are included with the media type. If the resulting string still exceeds the
1136 maximum length it MUST be discarded. For example, the 24 octet MIME media type
1137 "text/plain;charset=utf-8" would be shortened to fit within 16 octets by removing the trailing
1138 parameter, resulting in the 10 octet MIME media type "text/plain".

1139 **13.4 Delimited Lists**

1140 Delimited Lists combine one or more string types listed in the previous sections, separated
1141 by a delimiting character such as a comma or semicolon. Delimited lists MUST first be
1142 shortened by removal of unnecessary path components (URIs) and parameters (MIME
1143 media types) and second truncated at a delimiting character. For example, the 40 octet list
1144 of MIME media types "text/plain;charset=utf-8,application/pdf" would be shortened to fit
1145 within 32 octets by removing the MIME media type parameter, resulting in the 26 octet list
1146 "text/plain,application/pdf". The same list would be shortened to fit within 16 octets by also
1147 removing the last MIME media type, resulting in the 10 octet list "text/plain".

1148 **14. Overview of Changes**

1149 **14.1 IPP Everywhere™ v1.1**

1150 The following changes were made to PWG 5100.14-2013: IPP Everywhere [PWG5100.14]:

- 1151 • References now point to the current versions of dependent documents and
1152 specifications at the time of publication;
- 1153 • Requirements to support and definitions of WS-Discovery have been removed due
1154 to a lack of implementations, which effectively made WS-Discovery support
1155 OPTIONAL;
- 1156 • References to OpenXPS and SSDP have been removed;
- 1157 • The "printer-device-id" Printer Description attribute and associated DNS-SD TXT
1158 record keys are no longer required;
- 1159 • ICC attributes are now CONDITIONALLY REQUIRED for printers that support ICC-
1160 based color management;

- 1161 • JPEG support is now **CONDITIONALLY REQUIRED** for color printers;
- 1162 • IPP Finishings 2.1 and the "finishings-col" Job Template attribute are now
1163 **RECOMMENDED**; and
- 1164 • Printer Status and Job Status attributes are now listed in a separate section to match
1165 RFC 8011 and the IANA IPP registry.

1166 **15. References**

1167 **15.1 Normative References**

- 1168 [BCP14] S. Bradner, "Key words for use in RFCs to Indicate Requirement
1169 Levels", RFC 2119/BCP 14, March 1997,
1170 <https://tools.ietf.org/html/rfc2119>
- 1171 [BCP47] A. Phillips, Ed., M. Davis, Ed., "Tags for Identifying Languages", BCP
1172 47, RFC 5646, September 2009, <https://tools.ietf.org/html/rfc5646>
- 1173 [EXIF] "Standard of the Camera & Imaging Products Association, CIPA DC-
1174 008-Translation-2016, Exchangeable image file format for digital still
1175 cameras: Exif Version 2.31", July 2016,
1176 <http://www.cipa.jp/std/documents/e/DC-008-Translation-2016-E.pdf>
- 1177 [GUPA] S. Kennedy, "IPP Get-User-Printer-Attributes Operation (GUPA)",
1178 December 2017, [https://ftp.pwg.org/pub/pwg/ipp/registrations/reg-
1179 ippgupa-20171214.pdf](https://ftp.pwg.org/pub/pwg/ipp/registrations/reg-ippgupa-20171214.pdf)
- 1180 [ISO10646] "Information technology -- Universal Coded Character Set (UCS)",
1181 ISO/IEC 10646:2011
- 1182 [ISO32000] "Document management — Portable document format — Part 1: PDF
1183 1.7", ISO 32000-2008
- 1184 [JFIF] E. Hamilton, "JPEG File Interchange Format Version 1.02",
1185 September 1992, <http://www.w3.org/Graphics/JPEG/jif3.pdf>
- 1186 [PWG5100.1] S.Kennedy, M.Sweet, "IPP Finishings 2.1 (FIN)", PWG 5100.1-2017,
1187 February 2017, [https://ftp.pwg.org/pub/pwg/candidates/cs-
1188 ippfinishings21-20170217-5100.1.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippfinishings21-20170217-5100.1.pdf)
- 1189 [PWG5100.3] K. Ocke, T. Hastings, "Internet Printing Protocol (IPP): Production
1190 Printing Attributes – Set1", PWG 5100.3-2001, February 2001,
1191 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-
1192 5100.3.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-5100.3.pdf)

- 1193 [PWG5100.7] T. Hastings, P. Zehler, "Standard for The Internet Printing Protocol
1194 (IPP): Job Extensions", PWG 5100.7-2003, October 2003,
1195 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-
1196 5100.7.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-5100.7.pdf)
- 1197 [PWG5100.9] I. McDonald, C. Whittle, "Internet Printing Protocol (IPP)/ Printer State
1198 Extensions v1.0", PWG 5100.9-2009, July 2009,
1199 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippstate10-20090731-
1200 5100.9.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippstate10-20090731-5100.9.pdf)
- 1201 [PWG5100.11] T. Hastings, D. Fullman, "IPP: Job and Printer Operations - Set 2",
1202 PWG 5100.11-2010, October 2010,
1203 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-
1204 20101030-5100.11.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-20101030-5100.11.pdf)
- 1205 [PWG5100.12] R. Bergman, H. Lewis, I. McDonald, M. Sweet, "IPP Version 2.0, 2.1,
1206 and 2.2", PWG Standard 5100.12-2015, October 2015,
1207 [https://ftp.pwg.org/pub/pwg/standards/std-ipp20-20151030-
1208 5100.12.pdf](https://ftp.pwg.org/pub/pwg/standards/std-ipp20-20151030-5100.12.pdf)
- 1209 [PWG5100.13] M. Sweet, I. McDonald, "IPP: Job and Printer Extensions - Set 3
1210 (JPS3)", PWG 5100.13-2012, July 2012,
1211 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-
1212 20120727-5100.13.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-5100.13.pdf)
- 1213 [PWG5101.1] M. Sweet, R. Bergman, T. Hastings, "PWG Media Standardized
1214 Names 2.0 (MSN2)", PWG 5101.1-2013, March 2013,
1215 [https://ftp.pwg.org/pub/pwg/candidates/cs-pwgmsn20-20130328-
1216 5101.1.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-pwgmsn20-20130328-5101.1.pdf)
- 1217 [PWG5102.4] M. Sweet, "PWG Raster Format", PWG 5102.4-2012, April 2012,
1218 [https://ftp.pwg.org/pub/pwg/candidates/cs-ipp raster10-20120420-
1219 5102.4.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ipp raster10-20120420-5102.4.pdf)
- 1220 [RFC2083] T. Boutell, "PNG (Portable Network Graphics) Specification Version
1221 1.0", RFC 2083, March 1997, <https://tools.ietf.org/html/rfc2083>
- 1222 [RFC2131] R. Droms, "Dynamic Host Configuration Protocol", RFC 2131, March
1223 1997, <https://tools.ietf.org/html/rfc2131>
- 1224 [RFC2136] P. Vixie, S. Thomson, Y. Rekhter, J. Bound, "Dynamic Updates in the
1225 Domain Name System (DNS UPDATE)", RFC 2136, April 1997,
1226 <https://tools.ietf.org/html/rfc2136>
- 1227 [RFC2246] T. Dierks, C. Allen, "The TLS Protocol Version 1.0", RFC 2246,
1228 January 1999, <https://tools.ietf.org/html/rfc2246>

- 1229 [RFC2608] E. Guttman, C. Perkins, J. Veizades, M. Day, "Service Location
1230 Protocol, Version 2", RFC 2608, June 1999,
1231 <https://tools.ietf.org/html/rfc2608>
- 1232 [RFC2782] A. Gulbrandsen, P. Vixie, L. Esibov, "A DNS RR for specifying the
1233 location of services (DNS SRV)", RFC 2782, February 2000,
1234 <https://tools.ietf.org/html/rfc2782>
- 1235 [RFC3510] R. Herriot, I. McDonald, "Internet Printing Protocol/1.1: IPP URL
1236 Scheme", RFC 3510, April 2003, <https://tools.ietf.org/html/rfc3510>
- 1237 [RFC3805] R. Bergman, H. Lewis, I. McDonald, "Printer MIB v2", RFC 3805,
1238 June 2004, <https://tools.ietf.org/html/rfc3805>
- 1239 [RFC3806] R. Bergman, H. Lewis, I. McDonald, "Printer Finishing MIB", RFC
1240 3806, June 2004, <https://tools.ietf.org/html/rfc3806>
- 1241 [RFC3927] S. Cheshire, B. Aboba, E. Guttman, "Dynamic Configuration of IPv4
1242 Link-Local Addresses", RFC 3927, May 2005,
1243 <https://tools.ietf.org/html/rfc3927>
- 1244 [RFC3995] R. Herriot, T. Hastings, "IPP Event Notifications and Subscriptions",
1245 RFC 3995, March 2005, <https://tools.ietf.org/html/rfc3995>
- 1246 [RFC4122] P. Leach, M. Mealling, R. Salz, "A Universally Unique IDentifier
1247 (UUID) URN Namespace", RFC 4122, July 2005,
1248 <https://tools.ietf.org/html/rfc4122>
- 1249 [RFC4346] T.Dierks, E. Rescorla, "Transport Layer Security 1.1", RFC 4346,
1250 April 2006, <https://tools.ietf.org/html/rfc4346>
- 1251 [RFC4510] K. Zeilenga, "Lightweight Directory Access Protocol (LDAP):
1252 Technical Specification Road Map", RFC 4510, June 2006,
1253 <https://tools.ietf.org/html/rfc4510>
- 1254 [RFC4519] A. Sciberras, "Lightweight Directory Access Protocol (LDAP): Schema
1255 for User Applications", RFC 4519, June 2006,
1256 <https://tools.ietf.org/html/rfc4519>
- 1257 [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange",
1258 RFC 5198, March 2008, <https://tools.ietf.org/html/rfc5198>
- 1259 [RFC5246] T.Dierks, E. Rescorla, "Transport Layer Security 1.2", RFC 5246,
1260 August 2008, <https://tools.ietf.org/html/rfc5246>

- 1261 [RFC5870] A. Mayrhofer, C. Spanring, "A Uniform Resource Identifier for
1262 Geographic Locations ('geo' URI)", RFC 5870, June 2010,
1263 <https://tools.ietf.org/html/rfc5870>
- 1264 [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange",
1265 RFC 5198, March 2008, <https://tools.ietf.org/html/rfc5198>
- 1266 [RFC7230] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1267 Message Syntax and Routing", RFC 7230, June 2014,
1268 <https://tools.ietf.org/html/rfc7230>
- 1269 [RFC7231] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1270 Semantics and Content", RFC 7231, June 2014,
1271 <https://tools.ietf.org/html/rfc7231>
- 1272 [RFC7232] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1273 Conditional Requests", RFC 7232, June 2014,
1274 <https://tools.ietf.org/html/rfc7232>
- 1275 [RFC7234] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1276 Caching", RFC 7234, June 2014, <https://tools.ietf.org/html/rfc7234>
- 1277 [RFC7472] I. McDonald, M. Sweet, "Internet Printing Protocol (IPP) over HTTPS
1278 Transport Binding and the 'ipps' URI Scheme", RFC 7472, March
1279 2015, <https://tools.ietf.org/html/rfc7472>
- 1280 [RFC7612] P. Fleming, I. McDonald, "Lightweight Directory Access Protocol
1281 (LDAP): Schema for Printer Services", RFC 7612, June 2015,
1282 <https://tools.ietf.org/html/rfc7612>
- 1283 [RFC8011] M. Sweet, I. McDonald, "Internet Printing Protocol/1.1: Model and
1284 Semantics", RFC 8011, January 2017,
1285 <https://tools.ietf.org/html/rfc8011>
- 1286 [[RFC-TLS1.3](https://tools.ietf.org/html/rfc8011)] [E. Rescorla, "The Transport Layer Security \(TLS\) Protocol Version
1287 1.3", draft-ietf-tls-tls13-23, https://tools.ietf.org/html/draft-ietf-tls-tls13-
1288 23](https://tools.ietf.org/html/rfc8011)
- 1289 [STD63] F. Yergeau, "UTF-8, a transformation format of ISO 10646", RFC
1290 3629/STD 63, November 2003, <https://tools.ietf.org/html/rfc3629>
- 1291 [STD66] T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifier
1292 (URI): Generic Syntax", RFC 3986/STD 66, January 2005,
1293 <https://tools.ietf.org/html/rfc3986>

1294	[UAX9]	Unicode Consortium, “Unicode Bidirectional Algorithm”, UAX#9, June 2014,
1295		
1296		https://www.unicode.org/reports/tr9/tr9-31.html
1297	[UAX14]	Unicode Consortium, “Unicode Line Breaking Algorithm”, UAX#14, June 2014,
1298		
1299		https://www.unicode.org/reports/tr14/tr14-33.html
1300	[UAX15]	M. Davis, M. Duerst, "Unicode Normalization Forms", Unicode Standard Annex 15, March 2008,
1301		
1302		https://www.unicode.org/reports/tr15/
1303	[UAX29]	Unicode Consortium, “Unicode Text Segmentation”, UAX#29, June 2014,
1304		
1305		https://www.unicode.org/reports/tr29/tr29-25.html
1306	[UAX31]	Unicode Consortium, “Unicode Identifier and Pattern Syntax”, UAX#31, June 2014,
1307		
1308		https://www.unicode.org/reports/tr31/tr31-21.html
1309	[UNICODE]	Unicode Consortium, "Unicode Standard", Version 10.0.0, June 2017,
1310		https://www.unicode.org/versions/Unicode10.0.0/
1311	[UTS10]	Unicode Consortium, “Unicode Collation Algorithm”, UTS#10, June 2014,
1312		
1313		https://www.unicode.org/reports/tr10/tr10-30.html
1314	[UTS35]	Unicode Consortium, “Unicode Locale Data Markup Language”, UTS#35, September 2014,
1315		
1316		https://www.unicode.org/reports/tr35/tr35-37/tr35.html
1317	[UTS39]	Unicode Consortium, “Unicode Security Mechanisms”, UTS#39, September 2014,
1318		
1319		https://www.unicode.org/reports/tr39/tr39-9.html
1320	[WGS84]	National Geospatial-Intelligence Agency, "Department of Defense World Geodetic System 1984, Its Definition and Relationships With Local Geodetic Systems, Third Edition", NIMA Technical Report TR8350.2, January 2000,
1321		
1322		
1323		
1324		http://earth-info.nga.mil/GandG/publications/tr8350.2/wgs84fin.pdf
1325	[X.520]	International Telecommunication Union, "Information technology - Open Systems Interconnection - The Directory: Selected attribute types", ITU-T X.520, November 2008.
1326		
1327		

1328 15.2 Informative References

- 1329 [BONJOUR] Apple Inc., "Bonjour Printing Specification Version 1.2", April 2005,
1330 <http://developer.apple.com/bonjour/>
- 1331 [CUPSIPP] Apple Inc., "CUPS Implementation of IPP",
1332 <https://www.cups.org/doc/spec-ipp.html>
- 1333 [PWG5100.14] M. Sweet, I. McDonald, A. Mitchell, J. Hutchings, "IPP Everywhere",
1334 PWG 5100.14-2013, January 2013,
1335 <https://ftp.pwg.org/pub/pwg/candidates/cs-ippeve10-20130128-5100.14.pdf>
1336
- 1337 [RFC3196] T. Hastings, C. Manros, P. Zehler, C. Kugler, H. Holst, "Internet
1338 Printing Protocol/1.1: Implementer's Guide", RFC 3196, November
1339 2001, <https://tools.ietf.org/html/rfc3196>
- 1340 [UTR17] Unicode Consortium "Unicode Character Encoding Model", UTR#17,
1341 November 2008,
1342 <https://www.unicode.org/reports/tr17/tr17-7.html>
- 1343 [UTR20] Unicode Consortium "Unicode in XML and other Markup Languages",
1344 UTR#20, January 2013,
1345 <https://www.unicode.org/reports/tr20/tr20-9.html>
- 1346 [UTR23] Unicode Consortium "Unicode Character Property Model", UTR#23,
1347 November 2008,
1348 <https://www.unicode.org/reports/tr23/tr23-9.html>
- 1349 [UTR33] Unicode Consortium "Unicode Conformance Model", UTR#33,
1350 November 2008,
1351 <https://www.unicode.org/reports/tr33/tr33-5.html>
- 1352 [UNISECFAQ] Unicode Consortium "Unicode Security FAQ", November 2013,
1353 <https://www.unicode.org/faq/security.html>

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1368 ipp@pwg.org (subscribers only)

1369 To subscribe, see the PWG web page:

1370 <http://www.pwg.org/>

1371 Implementers of this specification document are encouraged to join the IPP Mailing List in
1372 order to participate in any discussions of clarification issues and review of registration
1373 proposals for additional attributes and values.

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1375 significantly to the development of this document:

1376 Andrew Mitchell
1377 Jerry Thrasher - Lexmark
1378 Peter Zehler - Xerox
1379

1380 **17. Change History**

1381 **17.1 April 17, 2018**

- 1382 3. Removed all references to 1284 device IDs and associated information.

1383 **17.2 April 16, 2018**

- 1384 4. Made sure IPP Everywhere™ consistently has trademark symbol.
1385 5. Section 1: Drop examples of mobile devices.
1386 6. Section 4.2.3.4: TLS key required for IPPS.
1387 7. Section 5.1: Fix typos.
1388 8. Section 5.2: Made Identify-Printer operation recommended for logical devices,
1389 required otherwise.
1390 9. Sections 5.3 and 5.8: Made print-rendering-intent and printer-icc-profiles
1391 conditionally required for printers that support ICC-based color management.
1392 10. Section 5.3.6: Clarify pdl-override-supported values and usage.
1393 11. Section 5.7: Deleted stray "note 7"
1394 12. Section 9.3: Added ICC attributes here.
1395 13. Section 14: Reworded for present tense, clarified why WS-Discovery has been
1396 removed, removed reason for removing OpenXPS and SSDP.

1397 **17.3 April 3, 2018**

- 1398 1. Make JPEG support conditionally required for color printers.

1399 **17.4 February 9, 2018**

- 1400 1. Initial v1.1 draft
1401 2. Updated template
1402 3. Updated abstract (can't call it a standard in the abstract)
1403 4. Updated spec references to current versions
1404 5. Dropped all mention of UPNP, SSDP, WS-Discovery, and OpenXPS (never
1405 implemented)
1406 6. Added a new "Overview of Changes" chapter that documents the high-level
1407 changes since the original IPP Everywhere specification
1408 7. Now recommend support for the Get-User-Printer-Attributes operation
1409 8. Now recommend support for the "finishings-col" attributes (PWG 5100.1)
1410 9. Now recommend support for TLS 1.3
1411 10. Now recommend using a resource path of /ipp/print or /ipp/print/name in Printer
1412 URIs
1413 11. Issue 11: printer-current-time is now listed as an IPP Everywhere attribute,
1414 although only RECOMMENDED since it was missing in the 1.0 spec. (all of the

- 1415 date-time attributes were previously required, so printer-current-time would
1416 have implicitly been required)
- 1417 12. Issue 12: The reference to PWG 5100.12 has been corrected
- 1418 13. Issue 13: The reference to the EXIF specification has been updated.
- 1419 14. Issue 13: The reference to PWG 5101.1 has been updated.
- 1420 15. Issue 14: Clarified the pdl-override-supported requirements ('attempted' or
1421 'guaranteed')
- 1422 16. Issue 15: Clarified that relative URIs ("//ipp/print") are not allowed in IPP.
- 1423 17. Issue 26: "job-preferred-attributes-supported" should have been "preferred-
1424 attributes-supported"
- 1425 18. Issue 31: Incorrect references to PWG 5101.2 have been changed to PWG
1426 5101.1 (MSN)
- 1427 19. Issue 33: The notes concerning IPP/2.x conformance changes were confusing
1428 and have been removed
- 1429 20. Issue 34: Table 6: overrides-supported now correctly references "note 2"
1430 (conditionally required).
- 1431 21. Issue 35: overrides-supported.document-numbers is now **CONDITIONALLY**
1432 **REQUIRED**
- 1433 22. Fixed attribute examples to use PAPI encoding
- 1434 23. Fixed notes concerning "copies" to indicate that support is required for JPEG
1435 and PDF documents
- 1436 24. Separated Printer Status attributes from Printer Description
- 1437 25. Separated Job Status attributes from Job Description