



The Printer Working Group

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# IPP Everywhere™ v1.1

Status: Prototype

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

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79 system providers, network connectivity vendors, and print management application  
80 developers. The PWG is chartered to make printers and the applications and operating  
81 systems supporting them work together better. All references to the PWG in this document  
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85 a stable, well understood, and technically competent specification that is widely used with  
86 multiple independent and interoperable implementations. Printer manufacturers and  
87 vendors of printer related software benefit from the interoperability provided by voluntary  
88 conformance to these standards.

89 For additional information regarding the Printer Working Group visit:

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## 204 1. Introduction

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

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

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

## 217 2. Terminology

### 218 2.1 Printing Terminology

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

Deleted: : Model and Semantics

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

Deleted: ; also see section 2.3 of

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

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

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

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

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

## 235 **2.2 Protocol Role Terminology**

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

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

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

## 243 **2.3 Other Terminology**

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

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

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

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

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

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

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

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

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

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



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

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

## 269 **2.4 Acronyms and Organizations**

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

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

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

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

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

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

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

278

## 279 3. Requirements

### 280 3.1 Rationale

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

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

290 [The Internet Printing Protocol/1.1](#), [STD92] defines the core Internet Printing Protocol.

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

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

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

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

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

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

- 307 1. A rich file format for transmission of multi-page color and grayscale vector and  
308 bitmap images
- 309 2. Standard page attributes to support page size, orientation, and duplex  
310 functionality

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

**Deleted:** : Encoding and Transport [RFC8010]  
and Internet Printing Protocol/1.1: Model and  
Semantics

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

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

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

## 326 **3.2 Use Cases**

### 327 **3.2.1 Select Printer**

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

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

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

#### 337 **3.2.1.1 Select the Last Used Printer**

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

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

#### 344 **3.2.1.2 Select Printer Using Name or Address**

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

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

#### 351 **3.2.1.3 Select Printer Using URI**

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

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

#### 356 **3.2.1.4 Select Printer Using a Directory Service**

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

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

#### 363 **3.2.1.5 Select Printer Using a Cloud Service**

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

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

#### 370 **3.2.1.6 Select Printer Using a Discovery Protocol**

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

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

#### 377 **3.2.1.7 Select Printer Using Geo-Location**

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

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

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

#### 384 **3.2.1.8 Select Printer Using Out of Band Method**

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

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

#### 391 **3.2.1.9 Select Printer Using Properties**

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

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

#### 403 **3.2.2 Print**

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

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

#### 412 **3.2.2.1 Print a Document**

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

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

#### 419 **3.2.2.2 Print a Document by Reference**

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

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

#### 426 **3.2.2.3 Print Using Loaded Media**

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

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

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

#### 438 **3.2.2.4 Print a Secure Form**

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

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

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

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

#### 456 **3.2.2.5 Print with Special Formatting**

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

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

#### 469 **3.2.2.6 Print and Select at Printer**

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

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

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

#### 481 **3.2.2.7 Print to a Service**

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

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

#### 489 **3.2.2.8 Print to a Recipient**

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

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

#### 497 **3.2.2.9 Print with a Proof Copy**

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

### 504 **3.2.3 Exceptions**

#### 505 **3.2.3.1 Print Action Canceled**

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

#### 509 **3.2.3.2 Select Printer Canceled**

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

#### 512 **3.2.3.3 Printer No Longer Network Accessible after Selection**

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

#### 516 **3.2.3.4 Not Authorized**

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



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

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

#### 523 **3.2.3.5 Needs Authentication**

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

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

#### 528 **3.2.3.6 Not Accepting Jobs**

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

#### 531 **3.2.3.7 Job Ticket or Document Format Not Supported**

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

#### 535 **3.2.3.8 Job or Document Processing Failures**

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

#### 540 **3.2.3.9 Printer Fault**

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

#### 544 **3.2.3.10 Printer Warning**

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

### 548 **3.3 Out of Scope**

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

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

### 557 3.4 Design Requirements

558 The IPP Everywhere™ design should:

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

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## 568 4. Discovery Protocols

569 Printers [representing Physical Devices](#) MUST and [Printers representing Logical Devices](#)  
570 [\(i.e. print servers\)](#) SHOULD support DNS-SD based Discovery. Printers MAY support other  
571 Discovery protocols such as LDAP and SLP.

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

### 574 4.1 Printer Description Attributes Used in Discovery

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

### 577 4.2 DNS Service Discovery (DNS-SD)

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

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

#### 585 4.2.1 Service (SRV) Instance Name

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

588 Printers [that support DNS-SD](#) MUST advertise the "\_ipp.\_tcp" (generic IPP) and  
589 "\_print.\_sub.\_ipp.\_tcp" (IPP Everywhere™) services over mDNS.

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

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

#### 594 4.2.2 Geo-Location (LOC)

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

Deleted: supporting

600

**Table 1 - Attributes in Discovery Protocols**

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

601 Note 1: Extension attribute to RFC 7612.

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

603 **4.2.3 Text (TXT)**

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

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

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

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

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

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

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

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

622 Clients MUST ignore incomplete key/value pairs at the end of a truncated TXT record.  
 623

624

**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)

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

#### 626 4.2.3.1 air

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

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

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

Deleted: value

Deleted: [STD92]

634 'negotiate'; Kerberized authentication is required [RFC4559]. This is equivalent to the  
635 'negotiate' value [\[PWG5100.13\]](#) for the "uri-authentication-supported" Printer  
636 Description attribute.

Deleted: [PWG5100.13]

637 'none'; No authentication is required. This is equivalent to the 'none' [value](#) for the  
638 "uri-authentication-supported" Printer Description attribute.

Deleted: value

Deleted: [STD92]

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

642 'username,password'; Username + password authentication is required. This is  
643 equivalent to the 'basic' or 'digest' [values](#) for the "uri-authentication-supported"  
644 Printer Description attribute.

Deleted: values

Deleted: [STD92]

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

#### 646 4.2.3.2 pdl

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

#### 653 4.2.3.3 qtotal

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

**670 4.2.3.4 TLS**

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

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

675 '1.0'; TLS 1.0 [RFC2246] encryption is supported. This is equivalent to the value 'tls'  
676 for the "uri-security-supported" Printer Description attribute.

677 '1.1'; TLS 1.1 [RFC4346] encryption is supported. This is equivalent to the value 'tls'  
678 for the "uri-security-supported" Printer Description attribute.

679 '1.2'; TLS 1.2 [RFC5246] encryption is supported. This is equivalent to the value 'tls'  
680 for the "uri-security-supported" Printer Description attribute.

681 '1.3'; TLS 1.3 [RFC-TLS1.3] encryption is supported. This is equivalent to the value  
682 'tls' for the "uri-security-supported" Printer Description attribute.

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

**686 4.2.3.5 UUID**

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

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

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

692 12345678-9ABC-DEF0-1234-56789ABCDEF0

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

**695 4.2.3.6 DUUID**

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

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

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



701 12345678-9ABC-DEF0-1234-56789ABCDEF0

702 **4.3 LDAP and SLP Discovery**

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

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

708 For example, the IPP "printer-device-id" attribute has a maximum length of 1023 octets,  
709 however the corresponding LDAP "printer-device-id" attribute has a maximum length of 255  
710 octets. Printers MUST truncate long strings as defined in section 13.  
711

## 712 5. Protocol Binding

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

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

### 717 5.1 HTTP Features

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

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

Deleted: -TLS1.3

#### 725 5.1.1 Host

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

#### 728 5.1.2 If-Modified-Since, Last-Modified, and 304 Not Modified

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

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

#### 735 5.1.3 Cache-Control

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

741

743 **5.2 IPP Operations**

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

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

750 **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

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

752 **5.3 IPP Printer Description Attributes**

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

755 **Table 5 - IPP Everywhere™ Printer Description Attributes**

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

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

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

Deleted: printer-more-info (note 6) ... [1]

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

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

Note 3: CONDITIONALLY REQUIRED for Printers with finishers.

Note 4: CONDITIONALLY REQUIRED for Printers that support the Print to a Recipient (section 3.2.2.8) use case.

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

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

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

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

### 772 5.3.1 media-col-database (1setOf collection)

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

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

```
784     media-col-database=..., {  
785         media-size={  
786             x-dimension=5000-33020  
787             y-dimension=5000-48260 }  
788         media-source='by-pass-tray' }, ...
```

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

```
795     media-col-database=..., {  
796         media-size={  
797             x-dimension=20320-152400  
798             y-dimension=1524-9144000 }, ...
```

### 799 5.3.2 media-col-ready (1setOf collection)

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

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

810 Roll media sizes are described using an integer value for the "x-dimension" and a  
811 rangeOfInteger value for the "y-dimension" member attributes of the "media-size" member  
812 attribute. The "x-dimension" value refers to the width of the loaded roll, the lower bound of  
813 the "y-dimension" value refers to the minimum length allowed, and the upper bound of the  
814 "y-dimension" value refers to the remaining length of the loaded roll or, if the remainder is  
815 not known, the maximum length allowed.

**816 5.3.3 media-ready (1setOf (type3 keyword | name(MAX)))**

817 The REQUIRED "media-ready" Printer attribute lists the loaded media for a Printer. In  
818 addition to the requirements set forth in [the](#) Internet Printing Protocol/1.1, [STD92], this  
819 specification defines how a Printer advertises custom, manually-fed, and roll-fed media in  
820 the "media-ready" attribute.

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

827 Custom media sizes are described using the "custom" self-describing media size names  
828 defined in section 5 of the PWG Media Standardized Names [PWG5101.1] specification.  
829 For example, a custom media size of 4x8 inches might be listed with the name  
830 "custom\_current\_4x8in". The size name MUST include the source name if more than one  
831 custom size is loaded, for example "custom\_current.tray-1\_4x8in".

832 Similarly, roll media sized are described using "roll" self-describing media size names with  
833 the width of the loaded roll and a length of 0. For example, a 36 inch roll might be listed with  
834 the name "roll\_current\_36x0in". As for custom sizes, the size name MUST include the  
835 source name if more than one roll is loaded, for example "roll\_current.roll-1\_36x0in".

**836 5.3.4 media-size-supported (1setOf collection)**

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

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

```
845     media-size-supported=..., {  
846         x-dimension=5000-33020  
847         y-dimension=5000-48260 }, ...
```

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

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```
855     media-size-supported=..., {  
856         x-dimension=20320-152400  
857         y-dimension=1524-9144000 }, ...
```

### 858 5.3.5 media-supported (1setOf (type3 keyword | name(MAX)))

859 The REQUIRED "media-supported" Printer attribute lists the supported media sizes for a  
860 Printer. In addition to the requirements set forth in [the Internet Printing Protocol/1.1](#) [STD92],  
861 this specification defines how a Printer advertises custom and roll-fed media in the "media-  
862 supported" attribute.

863 Custom media sizes are described using two self-describing media names. The  
864 "custom\_min\_WIDTHxHEIGHTunits" value provides the minimum custom media  
865 dimensions and the "custom\_max\_WIDTHxHEIGHTunits" value provides the maximum  
866 custom media dimensions. The size name MUST include the source name if different  
867 dimensions are supported by each source. Dimensions are provided for sheets in portrait  
868 orientation, that is the "WIDTH" values refer to the short axis and the "HEIGHT" values refer  
869 to the long axis of the sheet. For example, a Printer supporting sheet media from 50x50mm  
870 to 330.2x482.6mm from the by-pass tray could report:

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

873 Similarly, roll media sizes are described using the "roll\_min\_WIDTHxHEIGHTunits" and  
874 "roll\_max\_WIDTHxHEIGHTunits" names. The "WIDTH" values refer to the supported roll  
875 widths while the "HEIGHT" values refer to the supported roll lengths. The size name MUST  
876 include the source name if the Printer supports multiple source with different roll limits.

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

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

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

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

### 884 5.3.6 pdl-override-supported (type2 keyword)

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

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



891 **5.4 IPP Printer Status Attributes**

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

894 **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
<a href="#">printer-more-info (note 1)</a>	<a href="#">RFC 8011</a>
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
<a href="#">printer-strings-languages-supported (note 2)</a>	<a href="#">PWG 5100.13</a>
<a href="#">printer-strings-uri (notes 1 and 2)</a>	<a href="#">PWG 5100.13</a>
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

895  
896 Note 1: URIs MUST be absolute, SHOULD use the Host value ([including port](#)  
897 [number](#)) from [the HTTP Host](#) header (section 5.1.1), and MUST NOT use link-local  
898 addresses (section 8.4).  
899 [Note 2: RECOMMENDED due to its omission from IPP Everywhere™ 1.0, however](#)  
900 [it is needed for the underlying functionality.](#)

901 **5.4.1 printer-uri-supported (1setOf uri)**

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

905 **5.5 IPP Operation Attributes**

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

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

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

Deleted: document-format-version ... [2]

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

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

913 Note 3: CONDITIONALLY REQUIRED for Printers that implement Paid Imaging  
914 services.

915

917 **5.6 IPP Job Description Attributes**

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

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

Attribute	Source
job-name	RFC 8011

920 **5.7 IPP Job Status Attributes**

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

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

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

Deleted: compression-supplied ... [3]

Deleted: document-format-supplied ... [4]

923 Note 1: URIs MUST be absolute, SHOULD use the Host value from HTTP header  
 924 (section 5.1.1), and MUST NOT use link-local addresses (section 8.4).  
 925

926 **5.7.1 job-id (integer)**

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

932 **5.7.2 job-uri (uri)**

933 The REQUIRED "job-uri" Job Description attribute contains the absolute URI of the Job. In  
 934 order to support reliable job submission and management, Printers MUST NOT reuse

937 "job-uri" values since the Printer was last powered up and SHOULD NOT reuse "job-uri"  
 938 values for the life of the Printer as described in section 3.1.2.3.9 of the Internet Printing  
 939 Protocol/1.1: Implementer's Guide [RFC3196]. In addition, the "job-uri" value SHOULD be  
 940 derived from the "job-id" value as described in the IPP URL Scheme [RFC3510].

## 941 5.8 IPP Job Template Attributes

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

944 **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

945 Note 1: CONDITIONALLY REQUIRED for Printers that implement paid imaging  
 946 services.

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

948 Note 3: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"  
 949 MIME media type.

950 Note 4: CONDITIONALLY REQUIRED for Printers with finishers.  
 951

952 Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed  
953 media.  
954 Note 6: CONDITIONALLY REQUIRED for Printers that support multiple-Document  
955 Jobs.  
956 Note 7: CONDITIONALLY REQUIRED for Printers that support ICC-based color  
957 management.

## 958 6. Document Formats

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

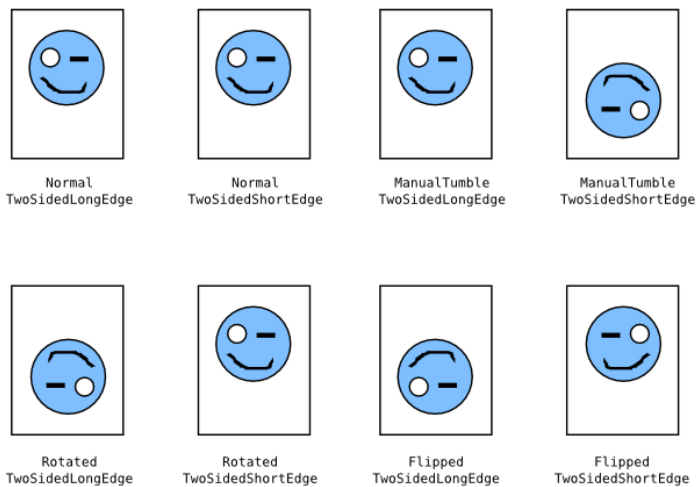
965 IPP/2.1 and IPP/2.2 Printers MUST and IPP/2.0 Printers SHOULD support documents  
966 conforming to Document management — Portable document format — Part 1: PDF 1.7  
967 [ISO32000] ("application/pdf"). IPP/2.0, IPP/2.1, and IPP/2.2 Printers are defined in  
968 [PWG5100.12].

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

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

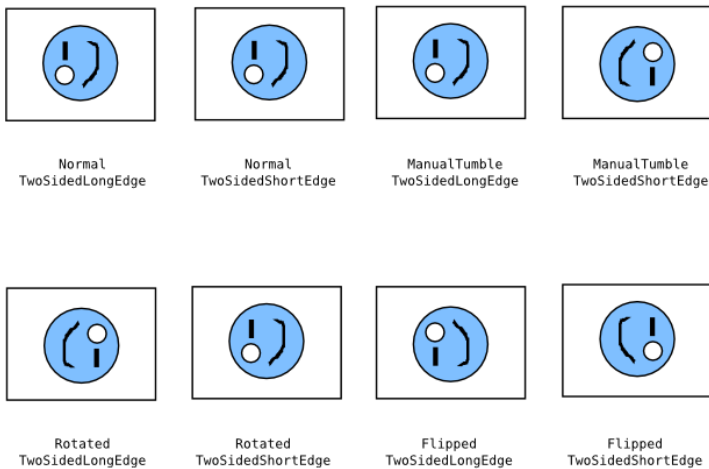
976 When submitting a PWG Raster document in a job or document creation request, Clients  
977 MUST additionally query the Printer for the "feed-orientation-supported", "media-col-  
978 database", and/or "media-col-ready" Printer attributes in order to provide a document in the  
979 correct orientation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

980 Figures 2 through 5 show how raster data must be formatted for each feed orientation.  
981



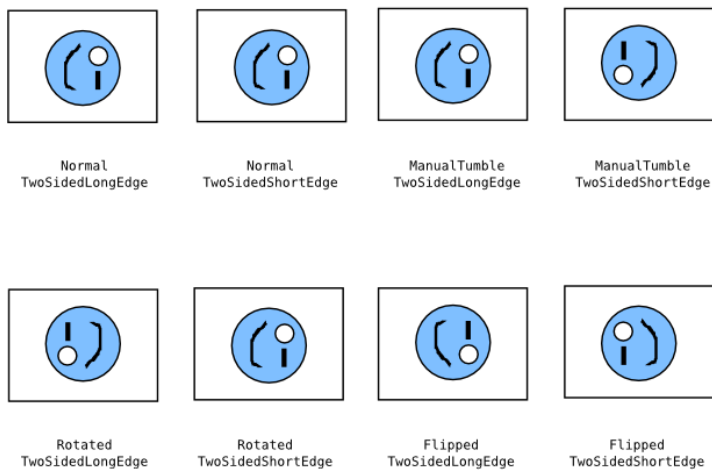
982  
983  
984

**Figure 1 - PWG Raster Bitmaps with Portrait Feed Orientation**



985  
986

**Figure 2 - PWG Raster Bitmaps with Landscape Feed Orientation**

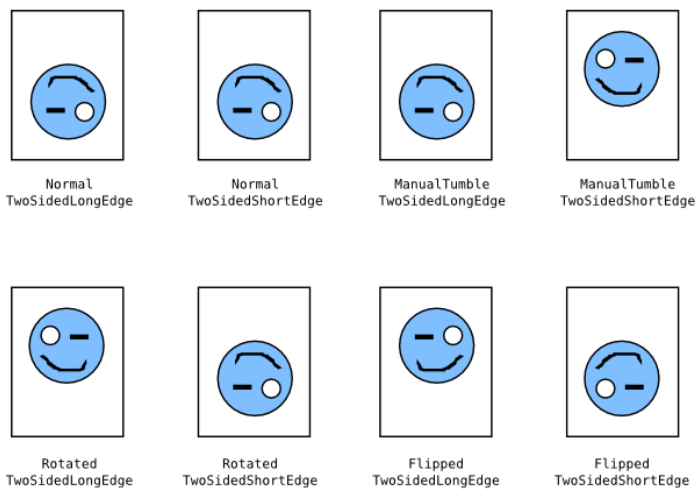


987

988

**Figure 3 - PWG Raster Bitmaps with Reverse Landscape Feed Orientation**

989



990

991

**Figure 4 - PWG Raster Bitmaps with Reverse Portrait Feed Orientation**

## 992 7. Additional Values for Existing Attributes

### 993 7.1 ipp-features-supported (1setOf type2 keyword)

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

## 996 8. Additional Semantics for Existing Value Tags

997 This specification amends the definition of the nameWithLanguage,  
998 nameWithoutLanguage, naturalLanguage, textWithLanguage, textWithoutLanguage, and  
999 URI value tags defined in [the Internet Printing Protocol/1.1](#), [STD92] with additional  
1000 restrictions to improve interoperability.

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### 1001 8.1 nameWithLanguage and nameWithoutLanguage

1002 Name values MUST NOT contain characters in the "C0 Control Character Set" or the DEL  
1003 character as defined in Unicode Format for Network Interchange [RFC5198]. Printers MUST  
1004 transcode and filter values from MIBs and other sources to conform to the added  
1005 restrictions.

### 1006 8.2 naturalLanguage

1007 NaturalLanguage values MUST conform to and be compared as defined in Tags for  
1008 Identifying Languages [BCP47]. The shortest language tag MUST be used, e.g., "en"  
1009 instead of "eng" for English. Printers SHOULD also support legacy language tags such as:

1010 'no'; replaced by 'nb' (Norwegian Bokmål),

1011 'zh-cn'; replaced by 'zh-hans' (Simplified Chinese), and

1012 'zh-tw'; replaced by 'zh-hant' (Traditional Chinese)

### 1013 8.3 textWithLanguage and textWithoutLanguage

1014 Text values MUST NOT contain the DEL character or characters in the "C0 Control  
1015 Character Set" other than CR, LF, and HT [RFC5198]. Printers MUST transcode and filter  
1016 values from MIBs and other sources to conform to the added restrictions.

### 1017 8.4 uri

1018 URI values MUST be in absolute form, i.e., "ipp://hostname.local/ipp/print" is acceptable but  
1019 "//ipp/print" is not. URI values MUST NOT contain link-local addresses in the host field.



1021 Printers MUST NOT generate URI values with link-local addresses and SHOULD NOT  
1022 generate URI values with IP addresses obtained via Dynamic Host Control Protocol (DHCP)  
1023 [RFC2131] or other auto-configuration protocols. Printers SHOULD use the HTTP Host:  
1024 header value when generating URIs for use in Client responses.

## 1025 9. Conformance Requirements

1026 This section summarizes the Conformance Requirements detailed in the definitions in this  
1027 document for Clients and Printers.

### 1028 9.1 Conformance Requirements for Clients

1029 In order for a Client to claim conformance to this specification a Client MUST support the  
1030 following:

- 1031 1. DNS Service Discovery as defined in section 4.2
- 1032 2. IPP/2.0 as defined in section 5
- 1033 3. The REQUIRED operations listed in Table 4
- 1034 4. The REQUIRED Printer Description attributes listed in Table 5
- 1035 5. The REQUIRED operation attributes listed in Table 7
- 1036 6. The REQUIRED Job Template attributes listed in Table 10
- 1037 7. The REQUIRED Job Description attributes listed in Table 8
- 1038 8. The REQUIRED document formats listed in section 5.8
- 1039 9. The "feed-orientation-supported" Printer attribute and "media-source-properties"  
1040 member attribute of the "media-col-database" and "media-col-ready" Printer  
1041 attributes as reported by the Printer and defined in section 6.1
- 1042 10. The internationalization considerations as defined in section 10
- 1043 11. The security considerations as defined in section 0

### 1044 9.2 Conformance Requirements for Printers

1045 In order for a Printer to claim conformance to this specification a Printer MUST support the  
1046 following:

- 1047 1. DNS Service Discovery as defined in section 4.2
- 1048 2. IPP/2.0 as defined in section 5
- 1049 3. The REQUIRED operations listed in Table 4
- 1050 4. The REQUIRED Printer Description attributes listed in Table 5
- 1051 5. The REQUIRED operation attributes listed in Table 7
- 1052 6. The REQUIRED Job Template attributes listed in Table 10
- 1053 7. The REQUIRED Job Description attributes listed in Table 8
- 1054 8. The REQUIRED document formats listed in section 5.8
- 1055 9. The 'ipp-everywhere' value for the "ipp-features-supported" Printer Description  
1056 attribute as defined in section 7.1

- 1057 10. The additional semantics for attribute values as defined in section 8
- 1058 11. The internationalization considerations as defined in section 10
- 1059 12. The security considerations as defined in section 0
- 1060 13. The safe string truncation rules as defined in section 13

### 1061 9.3 Conditional Conformance Requirements for Printers

1062 Printers that support the "image/jpeg" [JFIF] MIME media type MUST support:

- 1063 1. The "copies-default", and "copies-supported" Printer Description attributes as
- 1064 defined in section 5.3.
- 1065 2. The "copies" Job Template attribute as defined in section 5.8.

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1066 Printers that support the "application/pdf" [ISO32000] MIME media type MUST support:

- 1067 1. The "copies-default", "copies-supported", "document-password-supported", and
- 1068 "page-ranges-supported" Printer Description attributes as defined in section 5.3.
- 1069 2. The "document-password" Operation attribute as defined in section 5.4, and
- 1070 3. The "copies", "multiple-document-handling", "overrides", and "page-ranges" Job
- 1071 Template attributes as defined in section 5.8.

Deleted: 5.3

1072 Printers that support the Print to a Recipient use case (section 3.2.2.8) MUST support:

- 1073 1. The "job-password-supported" and "job-password-encryption-supported" Printer
- 1074 Description attributes as defined in section 5.3, and
- 1075 2. The "job-password" and "job-password-encryption" Operation attributes as
- 1076 defined in section 5.4.

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1077 Printers that provide Paid Print services MUST support:

- 1078 1. The "job-account-id-default", "job-account-id-supported", "job-accounting-user-
- 1079 id-default", "job-accounting-user-id-supported", "job-mandatory-attributes-
- 1080 default", "job-mandatory-attributes-supported", and "printer-mandatory-job-
- 1081 attributes" Printer Description attributes as defined in section 5.3.
- 1082 2. The "job-mandatory-attributes" operation attribute as defined in section 5.4, and
- 1083 3. The "job-account-id" and "job-accounting-user-id" Job Template attributes as
- 1084 defined in section 5.8.

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1085 Printers that support long-edge feed media MUST support:

- 1086 1. The "feed-orientation-default" and "feed-orientation-supported" Printer
- 1087 Description attributes as defined in section 5.3.
- 1088 2. The "media-source-properties" member attribute of the "media-col-database"
- 1089 and "media-col-ready" Printer Description attributes as defined in section 5.3.
- 1090 3. The "feed-orientation" Job Template attribute as defined in section 5.8.

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1097 Printers that support ICC-based color management MUST support:

- 1098 4. The "print-rendering-intent-default", "print-rendering-intent-supported", and
- 1099 "printer-icc-profiles" Printer Description attributes as defined in section 5.3.
- 1100 5. The "print-render-intent" Job Template attribute as defined in section 5.8.

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## 1101 10. Internationalization Considerations

1102 For interoperability and basic support for multiple languages, conforming implementations  
1103 MUST support:

- 1104 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
- 1105 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 1106 2. The Unicode Format for Network Interchange [RFC5198] which requires
- 1107 transmission of well-formed UTF-8 strings and recommends transmission of
- 1108 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

1109 Unicode NFC is defined as the result of performing Canonical Decomposition (into base  
1110 characters and combining marks) followed by Canonical Composition (into canonical  
1111 composed characters wherever Unicode has assigned them).

1112 WARNING – Performing normalization on UTF-8 strings received from Clients and  
1113 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client  
1114 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now  
1115 'hidden').

1116 Implementations of this specification SHOULD conform to the following standards on  
1117 processing of human-readable Unicode text strings, see:

1118 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

1119 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

1120 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

1121 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

1122 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

1123 Unicode Collation Algorithm [UTS10] – sorting

1124 Unicode Locale Data Markup Language [UTS35] – locale databases

1125 Implementations of this specification are advised to also review the following informational  
1126 documents on processing of human-readable Unicode text strings:

1128 Unicode Character Encoding Model [UTR17] – multi-layer character model

1129 ~~Unicode Character Property Model [UTR23] – character properties~~

**Deleted:** Unicode in XML and other Markup Languages [UTR20] – XML usage

1130 Unicode Conformance Model [UTR33] – Unicode conformance basis

## 1131 11. Security Considerations

1132 The IPP extensions defined in this document require the same security considerations as  
1133 defined in the [Internet Printing Protocol/1.1](#) [STD92]. In addition, Printers MUST validate  
1134 the HTTP Host request header in order to protect against DNS rebinding attacks.

**Deleted:** : Model and Semantics

1135 Implementations of this specification SHOULD conform to the following standard on  
1136 processing of human-readable Unicode text strings, see:

1137 Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

1138 Implementations of this specification are advised to also review the following  
1139 informational document on processing of human-readable Unicode text strings:

1140 Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

## 1141 12. IANA Considerations

### 1142 12.1 Attribute Value Registrations

1143 The keyword attribute values defined in this document will be published by IANA according  
1144 to the procedures in the [Internet Printing Protocol/1.1](#) [STD92] in the following file:

**Deleted:** IPP Model and Semantics

1145 <http://www.iana.org/assignments/ipp-registrations>

**Deleted:** section 7.3

1146 The registry entries will contain the following information:

1147 Attributes (attribute syntax)		Reference
1148 Keyword Attribute Value	-----	-----
1149		
1150 ipp-features-supported (1setOf type2 keyword)		[PWG5100.13]
1151 ipp-everywhere		[PWG5100.14]

## 1152 13. Safe String Truncation

1153 Strings can be truncated or omitted when transferred over alternate protocols. Printers  
1154 MUST truncate long strings at logical boundaries. The following subsections describe how  
1155 this truncation is performed for different kinds of strings.

### 1161 **13.1 Plain Text Strings**

1162 Plain text strings MUST be truncated at the end of a valid character sequence. For example,  
1163 strings using the UTF-8 transformation format of ISO 10646 [STD0063] [ISO10646-1]  
1164 SHOULD be represented using the Unicode Format for Network Interchange [RFC5198]  
1165 and MUST be truncated at the end of a valid UTF-8 sequence.

1166 For example, the 9 octet UTF-8 sequence 0x48.65.CA.81.6C.6C.6F.C2.81 (Héllö<sub>i</sub>) would  
1167 be shortened to fit within 6 octets by composing the é (0x65.CA.81 becomes 0xC3.A9) and  
1168 removing the trailing UTF-8 sequence 0xC2.81 (i), resulting in the 6 octet UTF-8 sequence  
1169 0x48.C3.A9.6C.6C.6F (Héllö).

### 1170 **13.2 URIs**

1171 URIs MUST be truncated so that the URI remains valid and accepted by the Printer. For  
1172 example, the 46 octet URI "ipp://printer.example.com/ipp/really-long-name" might be  
1173 shortened to fit within 32 octets by removing the last path name component, resulting in the  
1174 29 octet URI "ipp://printer.example.com/ipp". Similarly, the 52 octet URI  
1175 "ipp://printer.example.com/ipp?query-string" might be shortened to fit within 32 octets by  
1176 removing the query string.

1177 As recommended by the Uniform Resource Identifier (URI): Generic Syntax [STD66],  
1178 Printers SHOULD omit the port number from the URI when it has the default value, e.g., 80  
1179 for "http", 443 for "https", and 631 for "ipp" and "ipps" URIs.

### 1180 **13.3 MIME Media Types**

1181 MIME media type strings MUST be truncated at the end of the media subtype, removing  
1182 any parameters that are included with the media type. If the resulting string still exceeds the  
1183 maximum length it MUST be discarded. For example, the 24 octet MIME media type  
1184 "text/plain;charset=utf-8" would be shortened to fit within 16 octets by removing the trailing  
1185 parameter, resulting in the 10 octet MIME media type "text/plain".

### 1186 **13.4 Delimited Lists**

1187 Delimited Lists combine one or more string types listed in the previous sections, separated  
1188 by a delimiting character such as a comma or semicolon. Delimited lists MUST first be  
1189 shortened by removal of unnecessary path components (URIs) and parameters (MIME  
1190 media types) and second truncated at a delimiting character. For example, the 40 octet list  
1191 of MIME media types "text/plain;charset=utf-8,application/pdf" would be shortened to fit  
1192 within 32 octets by removing the MIME media type parameter, resulting in the 26 octet list  
1193 "text/plain,application/pdf". The same list would be shortened to fit within 16 octets by also  
1194 removing the last MIME media type, resulting in the 10 octet list "text/plain".

## 1195 14. Overview of Changes

### 1196 14.1 IPP Everywhere™ v1.1

1197 The following changes were made to PWG 5100.14-2013: IPP Everywhere [PWG5100.14]:

- 1198 • References now point to the current versions of dependent documents and  
1199 specifications at the time of publication;
- 1200 • Requirements for WS-Discovery have been removed due to a lack of  
1201 implementations, which effectively made WS-Discovery support OPTIONAL;
- 1202 • References to OpenXPS and SSDP have been removed;
- 1203 • The "printer-device-id" Printer Description attribute and associated DNS-SD TXT  
1204 record keys are no longer required;
- 1205 • [DNS-SD is now RECOMMENDED for Printers representing Logical Devices \(print  
1206 servers\);](#)
- 1207 • ICC attributes are now CONDITIONALLY REQUIRED for printers that support ICC-  
1208 based color management;
- 1209 • JPEG support is now CONDITIONALLY REQUIRED for color printers;
- 1210 • [The "compression-supplied", "document-format-supplied", "document-format-  
1211 version", "document-format-version-supplied", "document-name-supplied" attributes  
1212 are no longer required;](#)
- 1213 • [IPP Finishings 2.1 and the "finishings-col" Job Template attribute are now  
1214 RECOMMENDED;](#)
- 1215 • [The "printer-strings-languages-supported" and "printer-strings-uri" Printer Status  
1216 attributes are now RECOMMENDED to support localization;](#) and
- 1217 • Printer Status and Job Status attributes are now listed in a separate section to match  
1218 [STD 92](#) and the IANA IPP registry.
- 1219

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1512 To subscribe, see the PWG web page:

1513 <http://www.pwg.org/>

1514 Implementers of this specification document are encouraged to join the IPP Mailing List in  
1515 order to participate in any discussions of clarification issues and review of registration  
1516 proposals for additional attributes and values.

1517 The editors would like to especially thank the following individuals who also contributed  
1518 significantly to the development of this document:

1519 Andrew Mitchell  
1520 Jerry Thrasher - Lexmark  
1521 Peter Zehler - Xerox  
1522

## 1523 17. Change History

### 1524 17.1 September 26, 2018

- 1525 • [Removed the "compression-supplied", "document-format-supplied", "document-](#)
- 1526 [format-version", "document-format-version-supplied", and "document-name-](#)
- 1527 [supplied" attributes from the required attribute lists since the corresponding attributes](#)
- 1528 [are being obsoleted in PWG 5100.7.](#)

### 1529 17.2 August 24, 2018

- 1530 • [The current version of the Bonjour Printing Specification is 1.2.1.](#)
- 1531 • [Section 4: DNS-SD is now required for physical devices and recommended for](#)
- 1532 [logical devices \(print servers\)](#)
- 1533 • [Section 5.1: Clarified that the use of the Host header value includes the port number.](#)
- 1534 • [Section 5.3: Moved printer-more-info to 5.4 Printer Status attributes](#)
- 1535 • [Section 5.4: Added RECOMMENDED printer-strings-languages-supported and](#)
- 1536 [printer-strings-uri attributes from JPS3](#)
- 1537 • [Section 6: Still recommend JPEG for monochrome printers](#)
- 1538 • [Section 8.4: Clarified that we mean IP addresses from DHCP](#)
- 1539 • [Section 9.3: Fixed section 5.3 references](#)
- 1540 • [Section 10: Dropped UTR20 \(now maintained by the W3C, but why do we care about](#)
- 1541 [XML here?\)](#)
- 1542 • [Section 12.1: Fixed STD 92 reference](#)
- 1543 • [Section 14.1: Updated the change list](#)
- 1544 • [Section 15.1: Fixed up STD 92 reference, added references to PWG 5100.18 \(IPP](#)
- 1545 [INFRA\) and RFCs 6749 and 6750 \(OAuth 2.0\), updated all Unicode references,](#)
- 1546 [dropped UTR20 \(which is now maintained by the W3C\)](#)

### 1547 17.3 July 4, 2018

- 1548 • Status: Prototype

1549      • RFC 8011 is now STD 92

1550      • Updated Unicode to 11.0.0.

1551      **17.4 June 6, 2018**

1552      • Section 5.7: Fixed cross-reference to Table 10.

1553      • Section 14.1: Cleaned up WS-Discovery bullet.

1554      • Section 15.2: Updated Bonjour Printing specification reference.

1555      **17.5 April 17, 2018**

1556      • Removed all references to 1284 device IDs and associated information.

1557      **17.6 April 16, 2018**

1558      • Made sure IPP Everywhere™ consistently has trademark symbol.

1559      • Section 1: Drop examples of mobile devices.

1560      • Section 4.2.3.4: TLS key required for IPPS.

1561      • Section 5.1: Fix typos.

1562      • Section 5.2: Made Identify-Printer operation recommended for logical devices,  
1563      required otherwise.

1564      • Sections 5.3 and 5.8: Made print-rendering-intent and printer-icc-profiles  
1565      conditionally required for printers that support ICC-based color management.

1566      • Section 5.3.6: Clarify pdl-override-supported values and usage.

1567      • Section 5.7: Deleted stray "note 7"

1568      • Section 9.3: Added ICC attributes here.

1569      • Section 14: Reworded for present tense, clarified why WS-Discovery has been  
1570      removed, removed reason for removing OpenXPS and SSDP.

1571      **17.7 April 3, 2018**

1572      • Make JPEG support conditionally required for color printers.

1573 **17.8 February 9, 2018**

- 1574 • Initial v1.1 draft
- 1575 • Updated template
- 1576 • Updated abstract (can't call it a standard in the abstract)
- 1577 • Updated spec references to current versions
- 1578 • Dropped all mention of UPNP, SSDP, WS-Discovery, and OpenXPS (never  
1579 implemented)
- 1580 • Added a new "Overview of Changes" chapter that documents the high-level changes  
1581 since the original IPP Everywhere specification
- 1582 • Now recommend support for the Get-User-Printer-Attributes operation
- 1583 • Now recommend support for the "finishings-col" attributes (PWG 5100.1)
- 1584 • Now recommend support for TLS 1.3
- 1585 • Now recommend using a resource path of /ipp/print or /ipp/print/name in Printer URIs
- 1586 • Issue 11: printer-current-time is now listed as an IPP Everywhere attribute, although  
1587 only RECOMMENDED since it was missing in the 1.0 spec. (all of the date-time  
1588 attributes were previously required, so printer-current-time would have implicitly been  
1589 required)
- 1590 • Issue 12: The reference to PWG 5100.12 has been corrected
- 1591 • Issue 13: The reference to the EXIF specification has been updated.
- 1592 • Issue 13: The reference to PWG 5101.1 has been updated.
- 1593 • Issue 14: Clarified the pdl-override-supported requirements ('attempted' or  
1594 'guaranteed')
- 1595 • Issue 15: Clarified that relative URIs ("//ipp/print") are not allowed in IPP.
- 1596 • Issue 26: "job-preferred-attributes-supported" should have been "preferred-  
1597 attributes-supported"
- 1598 • Issue 31: Incorrect references to PWG 5101.2 have been changed to PWG 5101.1  
1599 (MSN)



- 1600 • Issue 33: The notes concerning IPP/2.x conformance changes were confusing and  
1601 have been removed
- 1602 • Issue 34: Table 6: overrides-supported now correctly references "note 2"  
1603 (conditionally required).
- 1604 • Issue 35: overrides-supported.document-numbers is now CONDITIONALLY  
1605 REQUIRED
- 1606 • Fixed attribute examples to use PAPI encoding
- 1607 • Fixed notes concerning "copies" to indicate that support is required for JPEG and  
1608 PDF documents
- 1609 • Separated Printer Status attributes from Printer Description
- 1610 • Separated Job Status attributes from Job Description

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