



The Printer Working Group

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Working Draft

## IPP Everywhere™ v2.0

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.

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<https://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

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## 1. Introduction

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

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

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

## 2. Terminology

### 2.1 Conformance Terminology

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

The term DEPRECATED is used for previously defined and approved protocol elements that SHOULD NOT be used or implemented. The term OBSOLETE is used for previously defined and approved protocol elements that MUST NOT be used or implemented.

### 2.2 Printing Terminology

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

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

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

203 *Enterprise Printer*: A high availability Output Device that is shared by large groups of people  
204 to produce medium to high volumes of hardcopy output [PWG5100.12].

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

207 *Logical Device*: a print server, software service, or gateway that processes Jobs and either  
208 forwards or stores the processed Job or uses one or more Physical Devices to render  
209 output.

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

211 *Physical Device*: a hardware implementation of an endpoint device, e.g., a marking engine,  
212 a fax modem, etc.

213 *Production Printer*: A high volume and/or large format Output Device that is used to deliver  
214 finished hardcopy output such as books, magazines, business cards, posters, and so forth  
215 [PWG5100.12].

216 *Workgroup Printer*: An Output Device that is used by a single End User or small groups of  
217 people to produce low volumes of hardcopy output [PWG5100.12].

## 218 **2.3 Protocol Role Terminology**

219 This document also defines the following protocol roles to specify unambiguous  
220 conformance requirements:

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

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

## 226 **2.4 Other Terminology**

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

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

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

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

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

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

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

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

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

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

247 *Secure Print*: A print job using the "document-password", "job-password", and/or "job-  
248 password-encryption" operation attributes to provide document and/or physical security.  
249 See [PWG5100.7] and [PWG5100.13].

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

## 252 **2.5 Acronyms and Organizations**

253 *IANA*: Internet Assigned Numbers Authority, <https://www.iana.org/>

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

255 *IETF*: Internet Engineering Task Force, <https://www.ietf.org/>

256 *ISO*: International Organization for Standardization, <https://www.iso.org/>

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

258 *PWG*: Printer Working Group, <https://www.pwg.org/>

259

## 3. Requirements

### 3.1 Rationale

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

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

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

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

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

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

The IPP Job Extensions v2.0 [PWG5100.7] defines new Job management, monitoring, and processing capabilities.

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

The IPP Transaction-Based Printing Extensions [PWG5100.16] define attributes required for Paid Imaging Services.

The IPP Job Password Repertoire [REPertoire] defines attributes that articulate the repertoire of allowable password strings.

The IPP Presets [PRESETS] define attributes for predefined sets of Job Template values.

The IPP Privacy Attributes v1.0 [PRIVACY] define attributes for specifying the privacy policies of Jobs and Printers.

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

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

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

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

303 Multicast DNS [RFC6762] defines a protocol for hostname lookups on link-local networks.

304 DNS Service Discovery [RFC6763] defines how to discover Printers using Domain Name  
305 System (DNS) service (SRV) and text (TXT) lookups.

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

## 309 **3.2 Use Cases**

### 310 **3.2.1 Select Printer**

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

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

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

#### 320 **3.2.1.1 Select the Last Used Printer**

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

323 The last used Printer may be automatically selected by the Client User Interface and may  
324 be affected by the current network topology or geo-location, for example the last used

325 Printer may be tracked on a per-network (e.g., default router or other criteria), per-location  
326 (e.g., geo-location), or per-Service (e.g., current local server) basis.

### 327 **3.2.1.2 Select Printer Using Name or Address**

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

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

### 334 **3.2.1.3 Select Printer Using URI**

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

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

### 339 **3.2.1.4 Select Printer Using a Directory Service**

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

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

### 346 **3.2.1.5 Select Printer Using a Cloud Service**

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

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

### 353 **3.2.1.6 Select Printer Using a Discovery Protocol**

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

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

#### 360 **3.2.1.7 Select Printer Using Geo-Location**

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

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

#### 367 **3.2.1.8 Select Printer Using Out of Band Method**

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

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

#### 374 **3.2.1.9 Select Printer Using Properties**

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

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

#### 386 **3.2.2 Print**

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

391 Preconditions: For all of the following use cases, the Printer must be Network Accessible to  
392 the Client in order to be selected, either directly or through an intermediate Service. Also,

393 the document to be printed must be Network Accessible to the Printer and in a format  
394 suitable for the Printer or converted by the Client or Service into a suitable format.

### 395 **3.2.2.1 Print a Document**

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

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

### 402 **3.2.2.2 Print a Document by Reference**

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

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

### 409 **3.2.2.3 Print Using Loaded Media**

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

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

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

### 421 **3.2.2.4 Print a Secure Form**

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

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

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

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

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

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

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

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

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

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

### 464 **3.2.2.7 Print to a Service**

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

### 472 **3.2.2.8 Print to a Recipient**

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

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

### 480 **3.2.2.9 Print with a Proof Copy**

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

## 487 **3.2.3 Exceptions**

### 488 **3.2.3.1 Print Action Canceled**

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

### 492 **3.2.3.2 Select Printer Canceled**

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

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

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

### **3.2.3.4 Not Authorized**

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

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

### **3.2.3.5 Needs Authentication**

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

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

### **3.2.3.6 Not Accepting Jobs**

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

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

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

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

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

### **3.2.3.9 Printer Fault**

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

### 527 3.2.3.10 Printer Warning

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

## 531 3.3 Out of Scope

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

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

## 540 3.4 Design Requirements

541 The IPP Everywhere™ design should:

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

549

## 4. Discovery Protocols

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

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

### 4.1 Printer Description Attributes Used in Discovery

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

**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-uuid	DUUID	printer-device-uuid (note 1)
document-formats-supported	pdf	printer-document-format-supported
finishings-supported	Bind, Punch, Sort, Staple	printer-finishings-supported
ipp-features-supported	(subtype)	printer-ipp-features-supported
media-supported	PaperCustom, PaperMax	printer-media-supported
multiple-document-handling	Collate	-
pages-per-minute	(note 2)	printer-pages-per-minute
pages-per-minute-color	(note 2)	printer-pages-per-minute-color
printer-charge-info	(note 2)	printer-charge-info (note 1)
printer-charge-info-uri	(note 2)	printer-charge-info-uri (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

IPP Attribute	DNS-SD TXT Key	LDAP/SLP Attribute
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

560 Note 1: Extension attribute to RFC 7612.

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

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

563 DNS Service Discovery (DNS-SD) [RFC6763] uses service (SRV) records and traditional  
 564 unicast and multicast DNS (mDNS) [RFC6762] queries. Services are identified by a service  
 565 instance name consisting of an instance name, a service type or subtype name, and a  
 566 domain name. Discovery of Printers involves multiple service types and subtypes  
 567 as described in the following sections.

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

### 571 4.2.1 IPP Everywhere™ Service Subtypes

572 In order for a Client to discover IPP Printers that conform to this specification (and not just  
 573 [STD92]), this specification defines the following DNS-SD service subtypes:

- 574 • "\_print.\_sub.\_ipp.\_tcp" for IPP Everywhere™ Printers using the "ipp" URI scheme  
 575 [RFC3510]; and
- 576 • "\_print.\_sub.\_ipps.\_tcp" for IPP Everywhere™ Printers using the "ipps" URI  
 577 scheme [RFC7472].

### 578 4.2.2 Service (SRV) Instance Name

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

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

582 Printers that support DNS-SD MUST advertise the "\_printer.\_tcp" (LPD) service over mDNS  
583 in order to conform to the Flagship Naming requirements as defined in [RFC6763]. For  
584 example, a Printer named "Example Printer" would advertise the service instance name  
585 "Example Printer.\_printer.\_tcp.local." with a port number of 0 to indicate that the LPD  
586 protocol is not actually supported.

587 Printers that support DNS-SD MUST also advertise the "\_ipp.\_tcp" (generic IPP) and  
588 "\_print.\_sub.\_ipp.\_tcp" (IPP Everywhere™) services over mDNS. For example, a Printer  
589 named "Example Printer" would advertise the service instance names "Example  
590 Printer.\_ipp.\_tcp.local." and "Example Printer.\_print.\_sub.\_ipp.\_tcp.local.".

591 Printers that support DNS-SD and the "ipps" URI scheme [RFC7472] MUST advertise the  
592 "\_ipps.\_tcp" (generic IPPS) and "\_print.\_sub.\_ipps.\_tcp" (IPP Everywhere™ Secure)  
593 services over mDNS. For example, a Printer named "Example Printer" would advertise the  
594 service instance names "Example Printer.\_ipps.\_tcp.local." and  
595 "Example Printer.\_print.\_sub.\_ipps.\_tcp.local.".

#### 596 4.2.3 Geo-Location (LOC)

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

#### 600 4.2.4 Text (TXT)

601 **4.2.4.1 Printers MUST publish a text (TXT) record that provides service information**  
602 **over mDNS. Printers that support dynamic DNS updates MUST publish separate**  
603 **TXT records for each domain that is updated. Table 1air**

604 The "air" key defines the type of authentication information that is required for imaging. The  
605 name "air" comes from the CUPS "auth-info-required" Printer Description attribute  
606 [CUPSIPP] that extends the "uri-authentication-supported" Printer Description attribute  
607 [STD92]. The following values are supported:

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

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

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

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

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

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

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

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

For example, the IPP "printer-more-info" attribute has a maximum length of 1023 octets, however the corresponding "adminurl" key cannot represent a value longer than 246 octets (255 - 9 octets for "adminurl="). Printers MUST truncate long strings as described in section 0.

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

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

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

**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	
note		Collate	
air		PaperMax	
TLS		PaperCustom	
adminurl		Bind	
		Punch	
		Sort	
		Staple	

#### 4.2.4.2 air

The "air" key defines the type of authentication information that is required for imaging. The name "air" comes from the CUPS "auth-info-required" Printer Description attribute [CUPSIPP] that extends the "uri-authentication-supported" Printer Description attribute [STD92]. The following values are supported:

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

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

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

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

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

658 The default value for the "air" key is 'none'.  
659

660

**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 4.2.4.2.	'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 Status attribute. See section 4.2.4.6.	" (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 0.	" (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)
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 4.2.4.4.	'none'
txtvers	The major version of the TXT record. 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 Status attribute. See section 4.2.4.5.	" (empty string)

661

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

662

#### 4.2.4.3 pdl

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

#### 4.2.4.4 TLS

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

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

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

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

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

'1.3'; TLS 1.3 [RFC8446] encryption is supported. This is equivalent to the value 'tls' for the "uri-security-supported" Printer Description attribute.

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

#### 4.2.4.5 UUID

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

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

The "UUID" key will have a value of:

12345678-9ABC-DEF0-1234-56789ABCDEF0

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

**4.2.4.6 DUUID**

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

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

The "DUUID" key will have a value of:

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

**4.3 LDAP and SLP Discovery**

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

## 5. Protocol Binding

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

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

### 5.1 HTTP Features

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

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

#### 5.1.1 Host

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

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

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

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

#### 5.1.3 Cache-Control

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

## 5.2 IPP Operations

Table 4 lists the REQUIRED operations for an IPP Everywhere™ Printer.

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

**Table 4 - IPP Everywhere™ Operations**

Code	Operation Name	Reference
0x0004	Validate-Job	STD 92
0x0005	Create-Job	STD 92
0x0006	Send-Document	STD 92
0x0008	Cancel-Job	STD 92
0x0009	Get-Job-Attributes	STD 92
0x000A	Get-Jobs	STD 92
0x000B	Get-Printer-Attributes	STD 92
0x0039	Cancel-My-Jobs	PWG 5100.7
0x003B	Close-Job	PWG 5100.7
0x003C	Identify-Printer (note 1)	PWG 5100.13
0x004F	Get-Printers (note 1)	PWG 5100.22
0x0066	Get-User-Printer-Attributes (note 2)	PWG 5100.11

Note 1: RECOMMENDED for Logical Devices, REQUIRED otherwise.

Note 2: REQUIRED for Enterprise Printers, RECOMMENDED otherwise.

## 5.3 IPP Printer Description Attributes

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

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

Attribute	Reference
baling-type-supported (note 3)	PWG 5100.1
baling-when-supported (note 3)	PWG 5100.1
binding-reference-edge-supported (note 3)	PWG 5100.1
binding-type-supported (note 3)	PWG 5100.1
charset-configured	STD 92
charset-supported	STD 92
color-supported	STD 92
compression-supported	STD 92
copies-default (note 2)	STD 92
copies-supported (note 2)	STD 92

Attribute	Reference
cover-back-default (note 10)	PWG 5100.3
cover-back-supported (note 10)	PWG 5100.3
cover-front-default (note 10)	PWG 5100.3
cover-front-supported (note 10)	PWG 5100.3
cover-type-supported (note 10)	PWG 5100.3
covering-name-supported (note 3)	PWG 5100.1
document-format-default	STD 92
document-format-supported	STD 92
document-password-supported (note 9)	PWG 5100.13
finishing-template-supported (notes 3)	PWG 5100.1
finishings-col-database (notes 3)	PWG 5100.1
finishings-col-default (notes 3)	PWG 5100.1
finishings-col-ready (notes 3)	PWG 5100.1
finishings-col-supported (notes 3)	PWG 5100.1
finishings-default (note 3)	STD 92
finishings-ready (notes 3)	STD 92
finishings-supported (note 3)	STD 92
folding-direction-supported (note 3)	PWG 5100.1
folding-offset-supported (note 3)	PWG 5100.1
folding-reference-edge-supported (note 3)	PWG 5100.1
generated-natural-language-supported	STD 92
identify-actions-default (note 8)	PWG 5100.13
identify-actions-supported (note 8)	PWG 5100.13
image-orientation-default (note 10)	PWG 5100.3
image-orientation-supported (note 10)	PWG 5100.3
imposition-template-default (note 10)	PWG 5100.3
imposition-template-supported (note 10)	PWG 5100.3
insert-count-supported (note 10)	PWG 5100.3
insert-sheet-default (note 10)	PWG 5100.3
insert-sheet-supported (note 10)	PWG 5100.3
ipp-features-supported	PWG 5100.13
ipp-versions-supported	STD 92
job-account-id-default (notes 1 and 10)	PWG 5100.7
job-account-id-supported (notes 1 and 10)	PWG 5100.7
job-account-type-default (note 1)	PWG 5100.16
job-account-type-supported (note 1)	PWG 5100.16
job-accounting-sheets-default (note 10)	PWG 5100.3
job-accounting-sheets-supported (note 10)	PWG 5100.3
job-accounting-sheets-type-supported (note 10)	PWG 5100.3
job-accounting-user-id-default (notes 1 and 10)	PWG 5100.7
job-accounting-user-id-supported (notes 1 and 10)	PWG 5100.7
job-authorization-uri-supported (note 1)	PWG 5100.16
job-constraints-supported	PWG 5100.13
job-creation-attributes-supported	PWG 5100.7

Attribute	Reference
job-error-sheet-default (note 10)	PWG 5100.3
job-error-sheet-supported (note 10)	PWG 5100.3
job-error-sheet-type-supported (note 10)	PWG 5100.3
job-error-sheet-when-supported (note 10)	PWG 5100.3
job-ids-supported	PWG 5100.7
job-mandatory-attributes-supported	PWG 5100.7
job-message-to-operator-supported (note 10)	PWG 5100.3
job-pages-per-set-supported (note 3)	PWG 5100.1
job-password-encryption-supported (note 4)	PWG 5100.11
job-password-length-supported (note 4)	PWG 5100.11
job-password-repertoire-configured (note 4)	PWG 5100.11
job-password-repertoire-supported (note 4)	PWG 5100.11
job-password-supported (note 4)	PWG 5100.11
job-presets-supported	PWG 5100.13
job-privacy-attributes	PRIVACY
job-privacy-scope	PRIVACY
job-release-action-default (note 4)	PWG 5100.11
job-release-action-supported (note 4)	PWG 5100.11
jpeg-features-supported	PWG 5100.16
jpeg-k-octets-supported	PWG 5100.13
jpeg-x-dimension-supported	PWG 5100.13
jpeg-y-dimension-supported	PWG 5100.13
max-page-ranges-supported (note 9)	IANA IPP Registry
job-resolvers-supported	PWG 5100.13
media-bottom-margin-supported	PWG 5100.7
media-col-database	PWG 5100.7
media-col-database.media-source-properties (note 5)	PWG 5100.7
media-col-default	PWG 5100.7
media-col-ready	PWG 5100.7
media-col-ready.media-source-properties (note 5)	PWG 5100.7
media-col-supported	PWG 5100.7
media-default	STD 92
media-left-margin-supported	PWG 5100.7
media-ready	STD 92
media-right-margin-supported	PWG 5100.7
media-size-supported	PWG 5100.7
media-source-supported	PWG 5100.7
media-supported	STD 92
media-top-margin-supported	PWG 5100.7
media-type-supported	PWG 5100.7
multiple-document-jobs-supported	STD 92
multiple-operation-timeout	STD 92
multiple-operation-timeout-action	PWG 5100.13
natural-language-configured	STD 92

Attribute	Reference
operations-supported	STD 92
orientation-requested-default	STD 92
orientation-requested-supported	STD 92
output-bin-default	PWG 5100.2
output-bin-supported	PWG 5100.2
overrides-supported (note 9)	PWG 5100.6
page-delivery-default (note 10)	PWG 5100.3
page-delivery-supported (note 10)	PWG 5100.3
page-ranges-supported (note 9)	STD 92
pdf-k-octets-supported (note 9)	PWG 5100.13
pdf-versions-supported (note 9)	PWG 5100.13
pdl-override-supported	STD 92
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-quality-default	STD 92
print-quality-supported	STD 92
print-rendering-intent-default (note 7)	PWG 5100.13
print-rendering-intent-supported (note 7)	PWG 5100.13
print-scaling-default	PWG 5100.13
print-scaling-supported	PWG 5100.13
printer-current-time	STD 92
printer-dns-sd-name	PWG 5100.13
printer-finisher (note 3)	PWG 5100.1
printer-finisher-description (note 3)	PWG 5100.1
printer-finisher-supplies (note 3)	PWG 5100.1
printer-finisher-supplies-description (note 3)	PWG 5100.1
printer-firmware-name	IANA IPP Registry
printer-firmware-patches	IANA IPP Registry
printer-firmware-string-version	IANA IPP Registry
printer-firmware-version	IANA IPP Registry
printer-geo-location	PWG 5100.13
printer-get-attributes-supported	PWG 5100.13
printer-icc-profiles (notes 6 and 7)	PWG 5100.13
printer-icons (note 6)	PWG 5100.13
printer-info	STD 92
printer-input-tray	PWG 5100.13
printer-location	STD 92
printer-make-and-model	STD 92
printer-mandatory-job-attributes (note 1)	PWG 5100.13
printer-name	STD 92
printer-organization	PWG 5100.13

Attribute	Reference
printer-organizational-unit	PWG 5100.13
printer-output-tray	PWG 5100.13
printer-privacy-policy-uri	PRIVACY
printer-requested-job-attributes (note 1)	PWG 5100.16
printer-resolution-default	STD 92
printer-resolution-supported	STD 92
printer-service-contact-col (notes 1 and 4)	PWG 5100.11
punching-hole-diameter-configured (note 3)	PWG 5100.1
punching-locations-supported (note 3)	PWG 5100.1
punching-offset-supported (note 3)	PWG 5100.1
punching-reference-edge-supported (note 3)	PWG 5100.1
pwg-raster-document-resolution-supported	PWG 5102.4
pwg-raster-document-sheet-back	PWG 5102.4
pwg-raster-document-type-supported	PWG 5102.4
separator-sheets-default (note 10)	PWG 5100.3
separator-sheets-supported (note 10)	PWG 5100.3
sides-default	STD 92
sides-supported	STD 92
stitching-angle-supported (note 3)	PWG 5100.1
stitching-method-supported (note 3)	PWG 5100.1
trimming-offset-supported (note 3)	PWG 5100.1
trimming-reference-edge-supported (note 3)	PWG 5100.1
trimming-type-supported (note 3)	PWG 5100.1
trimming-when-supported (note 3)	PWG 5100.1
uri-authentication-supported	STD 92
uri-security-supported	STD 92
which-jobs-supported	PWG 5100.7
x-image-position-default (note 10)	PWG 5100.3
x-image-position-supported (note 10)	PWG 5100.3
x-image-shift-default (note 10)	PWG 5100.3
x-image-shift-supported (note 10)	PWG 5100.3
x-side1-image-shift-default (note 10)	PWG 5100.3
x-side1-image-shift-supported (note 10)	PWG 5100.3
x-side2-image-shift-default (note 10)	PWG 5100.3
x-side2-image-shift-supported (note 10)	PWG 5100.3
y-image-position-default (note 10)	PWG 5100.3
y-image-position-supported (note 10)	PWG 5100.3
y-image-shift-default (note 10)	PWG 5100.3
y-image-shift-supported (note 10)	PWG 5100.3
y-side1-image-shift-default (note 10)	PWG 5100.3
y-side1-image-shift-supported (note 10)	PWG 5100.3
y-side2-image-shift-default (note 10)	PWG 5100.3
y-side2-image-shift-supported (note 10)	PWG 5100.3

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 Enterprise Printers, RECOMMENDED otherwise.

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

Note 8: RECOMMENDED for Logical Devices, REQUIRED otherwise.

Note 9: CONDITIONALLY REQUIRED for the "application/pdf" MIME media type.

Note 10: CONDITIONALLY REQUIRED for Production Printers, RECOMMENDED otherwise.

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

The REQUIRED "media-col-database" Printer attribute lists the supported combinations of "media-col" member attributes for a Printer. In addition to the requirements set forth in the IPP Job Extensions v2.0 [PWG5100.7], this specification defines how a Printer advertises custom and roll-fed media capabilities in the "media-col-database" attribute to be consistent with the definition of the "media-size-supported" attribute.

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

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

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

```
media-col-database=..., {
```

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

### 792 5.3.2 media-col-ready (1setOf collection)

793 The REQUIRED "media-col-ready" Printer attribute lists the loaded media combinations of  
794 "media-col" member attributes for a Printer. In addition to the requirements set forth in the  
795 IPP Job Extensions v2.0 [PWG5100.7], this specification defines how a Printer advertises  
796 manually-fed and roll-fed media in the "media-col-ready" attribute to be consistent with the  
797 definition of the "media-size-supported" attribute.

798 Note: Printers representing Logical Devices report a list of ready media that has either been  
799 configured by the Administrator or generated from the set of media loaded in all of the  
800 Physical Devices associated with the Logical Devices. This allows Clients that present UI  
801 based on the loaded media to function equally with both Physical Devices and Logical  
802 Devices.

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

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

### 815 5.3.3 media-ready (1setOf (type3 keyword | name(MAX)))

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

820 Note: Printers representing Logical Devices report a list of ready media that has either been  
821 configured by the Administrator or generated from the set of media loaded in all of the  
822 Physical Devices associated with the Logical Devices. This allows Clients that present UI  
823 based on the loaded media to function equally with both Physical Devices and Logical  
824 Devices.

825 Manual feed media sizes MUST NOT be reported in the "media-ready" attribute. By  
826 definition the 'manual-feed' media source requires the Printer to ask the End User/Operator

to load the requested media, thus the media can never be "ready" for use. However, many Printers offer a multi-purpose tray that serves as both a manual feed source and an ad-hoc paper tray. Printers that provide such a multi-purpose tray MUST advertise media loaded in the tray.

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

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

#### 5.3.4 media-size-supported (1setOf collection)

The REQUIRED "media-size-supported" Printer attribute lists the supported media sizes for a Printer. In addition to the requirements set forth in [PWG5100.7], this specification defines how a Printer advertises custom and roll-fed media in the "media-size" attribute.

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

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

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

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

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

The REQUIRED "media-supported" Printer attribute lists the supported media sizes for a Printer. In addition to the requirements set forth in the Internet Printing Protocol/1.1 [STD92],

864 this specification defines how a Printer advertises custom and roll-fed media in the "media-  
865 supported" attribute.

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

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

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

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

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

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

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

### 887 5.3.6 pdl-override-supported (type2 keyword)

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

891 When reporting capabilities for the 'application/pdf', 'image/jpeg', or 'image/pwg-raster'  
892 MIME media types, Printers MUST report either 'attempted' [STD92] or 'guaranteed'  
893 [PWG5100.7] for the "pdl-override-supported" Printer attribute.

## 894 5.4 IPP Printer Status Attributes

895 Table 6 lists the Printer Status attributes for an IPP Everywhere™ Printer. All attributes in  
896 the table are REQUIRED unless otherwise specified in a note below.

897 **Table 6 - IPP Everywhere™ Printer Status Attributes**

Attribute	Reference
pages-per-minute	STD 92
pages-per-minute-color	STD 92
printer-alert (note 4)	PWG 5100.9
printer-alert-description (note 4)	PWG 5100.9
printer-config-change-date-time	PWG 5100.13
printer-config-change-time	PWG 5100.13
printer-is-accepting-jobs	STD 92
printer-more-info (note 1)	STD 92
printer-state	STD 92
printer-state-change-date-time	RFC 3995
printer-state-change-time	RFC 3995
printer-state-message	STD 92
printer-state-reasons	STD 92
printer-strings-languages-supported	PWG 5100.13
printer-strings-uri (notes 1)	PWG 5100.13
printer-supply (notes 2 and 3)	PWG 5100.13
printer-supply-description (notes 2 and 3)	PWG 5100.13
printer-supply-info-uri (notes 1, 2, and 3)	PWG 5100.13
printer-up-time	STD 92
printer-uri-supported (note 1)	STD 92
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	STD 92

- 898 Note 1: URIs MUST be absolute, SHOULD use the Host value (including port  
 899 number) from the HTTP Host header (section 5.1.1), and MUST NOT use link-local  
 900 addresses (section 8.4).  
 901 Note 2: CONDITIONALLY REQUIRED for Printers that use marker supplies.  
 902 Note 3: RECOMMENDED for Logical Devices, REQUIRED otherwise.  
 903 Note 4: RECOMMENDED for Physical Devices, OPTIONAL for Logical Devices.

#### 904 **5.4.1 printer-alert (1setOf octetString(MAX))**

905 This attribute lists members of the prtAlertTable from the Printer MIB v2 [RFC3805].  
 906 Physical Devices SHOULD and Logical Devices MAY support this attribute. When  
 907 supported, Printers SHOULD NOT report the attribute if the prtAlertTable is empty.

908 Note: The IPP Printer State Extensions v1.0 [PWG5100.9] does not specify the behavior of  
 909 the "printer-alert" attribute when the prtAlertTable is empty. Some implementations have  
 910 chosen to report a placeholder value such as 'code=other' or the empty string.

**911 5.4.2 printer-alert-description (1setOf text(MAX))**

912 This attribute lists the prtAlertDescription values of the prtAlertTable from the Printer MIB  
913 v2 [RFC3805]. Physical Devices SHOULD and Logical Devices MAY support this attribute.  
914 When supported, Printers SHOULD NOT report the attribute if the prtAlertTable is empty.

**915 5.4.3 printer-uri-supported (1setOf uri)**

916 This REQUIRED attribute provides 'ipp' and 'ipps' URIs that can be used to access the  
917 Printer. Printers MUST advertise URIs with a resource path of the form "/ipp/print" or  
918 "/ipp/print/queueName".  
919

## 5.5 IPP Operation Attributes

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

**Table 7 - REQUIRED IPP Everywhere™ Operation Attributes**

Attribute	Reference
client-info	PWG 5100.13
compression	STD 92
document-format	STD 92
document-name	STD 92, PWG 5100.5
document-password (note 1)	PWG 5100.13
first-index	PWG 5100.13
first-job-id	STD 92
identify-actions	PWG 5100.13
ipp-attribute-fidelity	STD 92
job-authorization-uri (note 3)	PWG 5100.16
job-ids	PWG 5100.7
job-impressions-estimated (note 3)	PWG 5100.16
job-mandatory-attributes (note 3)	PWG 5100.7
job-name	STD 92
job-password (note 2)	PWG 5100.11
job-password-encryption (note 2)	PWG 5100.11
job-release-action (note 2)	PWG 5100.11
last-document	STD 92
limit	STD 92
requesting-user-name	STD 92
requesting-user-uri	PWG 5100.13
which-jobs	STD 92, PWG 5100.7

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

Note 2: CONDITIONALLY REQUIRED for Enterprise Printers, RECOMMENDED otherwise.

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

## 5.6 IPP Job Description Attributes

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

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

Attribute	Reference
job-name	STD 92

## 5.7 IPP Job Status Attributes

Table 9 lists the REQUIRED Job Status attributes for an IPP Everywhere™ Printer.

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

Attribute	Reference
date-time-at-completed	STD 92
date-time-at-creation	STD 92
date-time-at-processing	STD 92
job-id	STD 92
job-impressions	STD 92
job-impressions-completed	STD 92
job-originating-user-name	STD 92
job-printer-up-time	STD 92
job-printer-uri (note 1)	STD 92
job-state	STD 92
job-state-message	STD 92
job-state-reasons	STD 92
job-uri (note 1)	STD 92
job-uuid	PWG 5100.13
time-at-completed	STD 92
time-at-creation	STD 92
time-at-processing	STD 92

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

### 5.7.1 job-id (integer)

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

## 5.7.2 job-uri (uri)

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

## 5.8 IPP Job Template Attributes

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

**Table 10 - REQUIRED IPP Everywhere™ Job Template Attributes**

Attribute	Reference
copies (note 2)	STD 92
cover-back (note 8)	PWG 5100.3
cover-front (note 8)	PWG 5100.3
finishings (note 4)	STD 92
finishings-col (note 4)	PWG 5100.1
finishings-col.finishing-template (note 4)	PWG 5100.1
image-orientation (note 8)	PWG 5100.3
imposition-template (note 8)	PWG 5100.3
insert-sheet (note 8)	PWG 5100.3
job-account-id (note 1)	PWG 5100.7
job-account-type (note 1)	PWG 5100.16
job-accounting-sheets (note 8)	PWG 5100.3
job-accounting-user-id (note 1)	PWG 5100.7
job-error-sheet (note 8)	PWG 5100.3
job-message-to-operator (note 8)	PWG 5100.3
job-recipient-name (note 8)	PWG 5100.3
job-pages-per-set (note 4)	PWG 5100.1
media	STD 92
media-col	PWG 5100.7
media-col.media-bottom-margin	PWG 5100.7
media-col.media-left-margin	PWG 5100.7
media-col.media-right-margin	PWG 5100.7
media-col.media-size	PWG 5100.7
media-col.media-source	PWG 5100.7
media-col.media-top-margin	PWG 5100.7
media-col.media-type	PWG 5100.7
multiple-document-handling (note 3)	STD 92
orientation-requested	STD 92

Attribute	Reference
output-bin	PWG 5100.2
overrides (note 3)	PWG 5100.6
overrides.document-numbers (note 6)	PWG 5100.6
page-delivery (note 8)	PWG 5100.3
page-ranges (note 3)	STD 92
print-color-mode	PWG 5100.13
print-content-optimize	PWG 5100.7
print-rendering-intent (note 7)	PWG 5100.13
print-quality	STD 92
print-scaling	PWG 5100.13
printer-resolution	STD 92
separator-sheets (note 8)	PWG 5100.3
sides	STD 92
x-image-position (note 8)	PWG 5100.3
x-image-shift (note 8)	PWG 5100.3
x-side1-image-shift (note 8)	PWG 5100.3
x-side2-image-shift (note 8)	PWG 5100.3
y-image-position (note 8)	PWG 5100.3
y-image-shift (note 8)	PWG 5100.3
y-side1-image-shift (note 8)	PWG 5100.3
y-side2-image-shift (note 8)	PWG 5100.3

957 Note 1: CONDITIONALLY REQUIRED for Printers that implement paid imaging  
 958 services.  
 959 Note 2: CONDITIONALLY REQUIRED for the "application/pdf" and "image/jpeg"  
 960 MIME media types.  
 961 Note 3: CONDITIONALLY REQUIRED for Printers that support the "application/pdf"  
 962 MIME media type.  
 963 Note 4: CONDITIONALLY REQUIRED for Printers with finishers.  
 964 Note 5: CONDITIONALLY REQUIRED for Printers that support long-edge feed  
 965 media.  
 966 Note 6: CONDITIONALLY REQUIRED for Printers that support multiple-Document  
 967 Jobs.  
 968 Note 7: CONDITIONALLY REQUIRED for Printers that support ICC-based color  
 969 management.  
 970 Note 8: CONDITIONALLY REQUIRED for Production Printers, RECOMMENDED  
 971 otherwise.

## 972 6. Document Formats

973 Printers MUST support documents conforming to the PWG Raster Format [PWG5102.4]  
 974 ("image/pwg-raster"). Color Printers MUST and monochrome Printers SHOULD support  
 975 documents conforming to the JPEG File Information Format Version 1.02 [JFIF]  
 976 ("image/jpeg"), specifically the metadata and JPEG subset defined in the Standard of the

977 Camera & Imaging Products Association, CIPA DC-008-Translation-2016, Exchangeable  
978 image file format for digital still cameras: Exif Version 2.31 [EXIF].

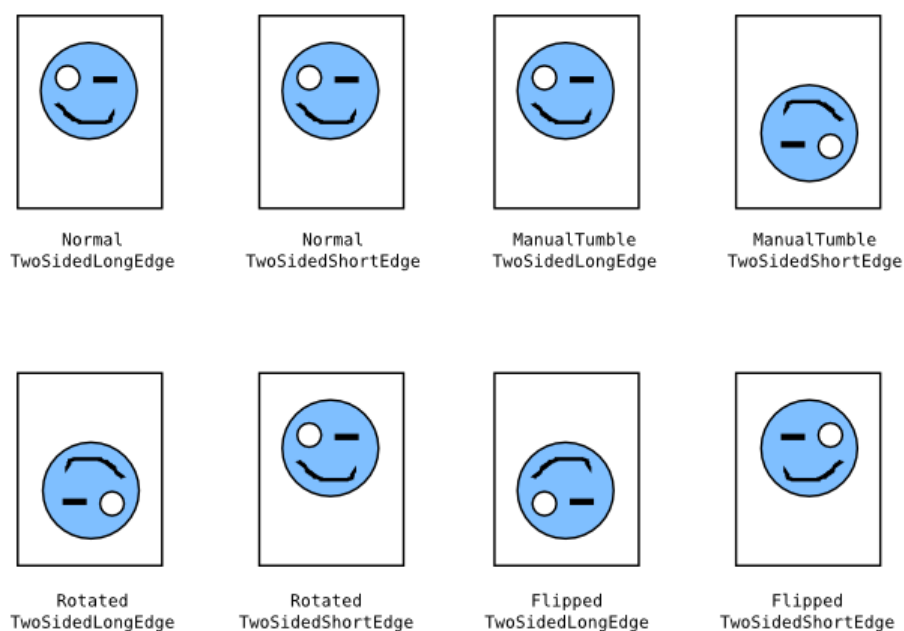
979 Printers representing Logical Devices MUST and Printers representing Physical Devices  
980 SHOULD support documents conforming to Document management — Portable document  
981 format — Part 2: PDF 2.0 [ISO32000] ("application/pdf").

## 982 6.1 Supporting Long-Edge Feed Media with PWG Raster Format 983 Documents

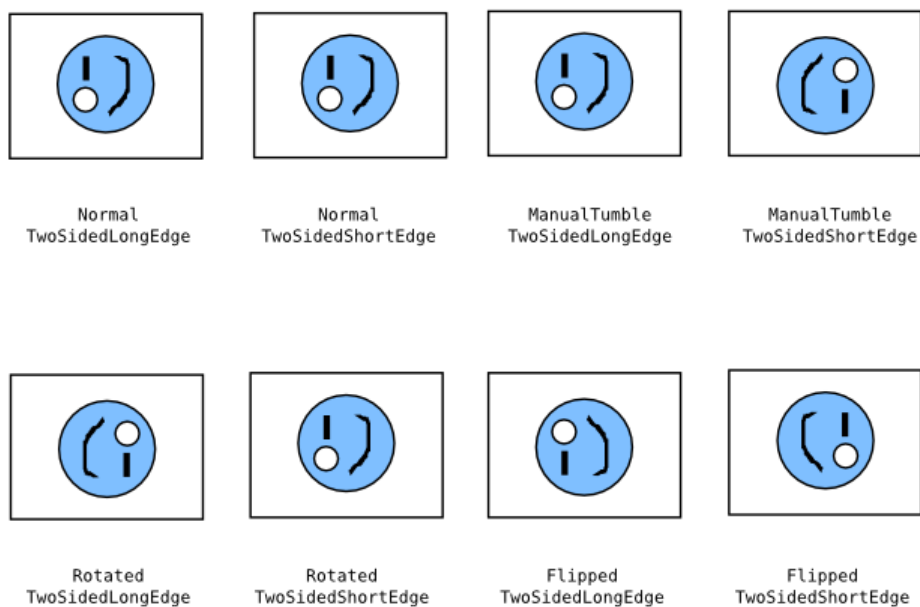
984 Printers that support long-edge feed media MUST report the "media-source-properties"  
985 member attribute in the "media-col-database" and "media-col-ready" Printer attributes.

986 When submitting a PWG Raster document in a Job or Document Creation request, Clients  
987 MUST additionally query the Printer for the "media-col-database" and/or "media-col-ready"  
988 Printer attributes in order to provide a document in the correct orientation and dimensions  
989 for the Printer.

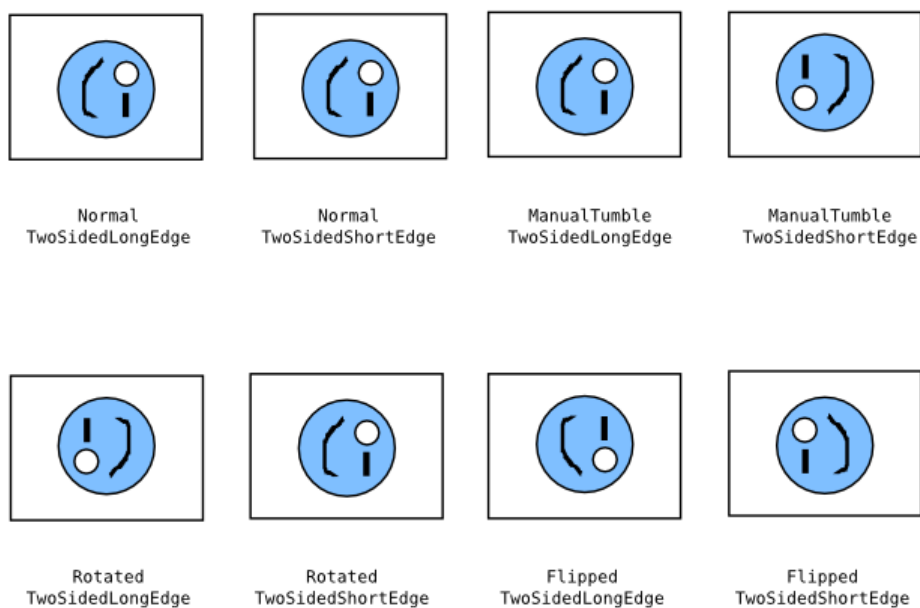
990 Figures 1 through 4 show how raster data must be formatted for each feed orientation.



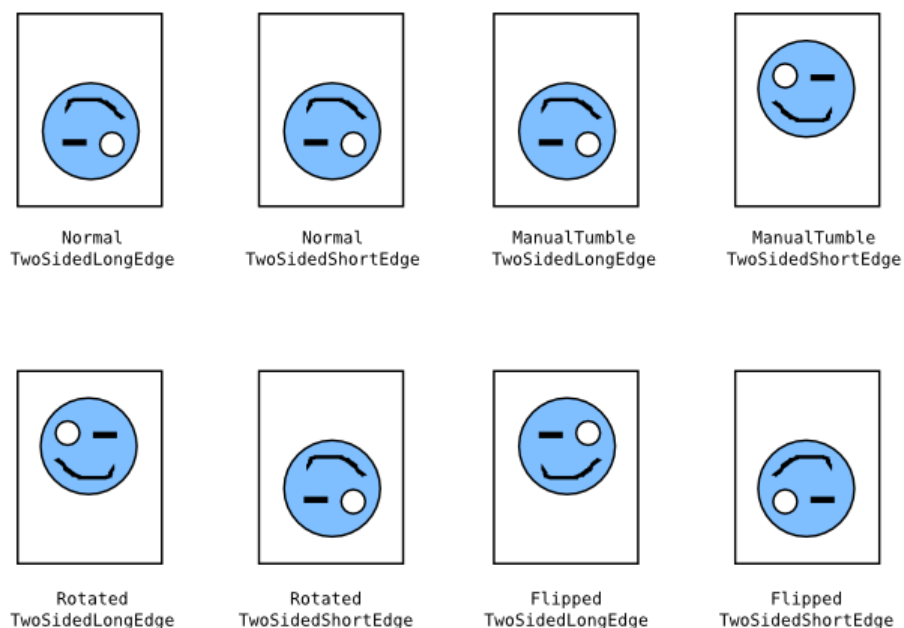
991  
992 **Figure 1 - PWG Raster Bitmaps with Portrait Feed Orientation**



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



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



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

## 7. Additional Values for Existing Attributes

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

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

This specification also defines the CONDITIONALLY REQUIRED keyword 'ipp-everywhere-server' for the "ipp-features-supported" Printer attribute. Printers representing Logical Devices MUST report this keyword. Printers representing Physical Devices MUST NOT report this keyword.

## 8. Additional Semantics for Existing Value Tags

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

### 8.1 `nameWithLanguage` and `nameWithoutLanguage`

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

### 8.2 `naturalLanguage`

Printers MUST return and compare `naturalLanguage` values that conform to Tags for Identifying Languages [BCP47]. Printer MUST use the shortest language tag, e.g., "en" instead of "eng" for English. Printers SHOULD also support legacy language tags such as:

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

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

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

### 8.3 `textWithLanguage` and `textWithoutLanguage`

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

### 8.4 `uri`

Printer MUST generate absolute URI values, i.e., "ipp://hostname.local/ipp/print" is acceptable but "///ipp/print" is not. Printers MUST NOT generate URI values with link-local addresses unless they are taken from the HTTP Host: field (section 5.1.1). Printers SHOULD NOT generate URI values with IP addresses obtained via Dynamic Host Configuration Protocol (DHCP) [RFC2131] or other auto-configuration protocols unless they are taken from the HTTP Host: field (section 5.1.1).

Printers SHOULD use the HTTP Host: header value when generating URIs for use in Client responses. Printers SHOULD use the "http" URI scheme when responding to requests

1039 using the "ipp" URI scheme and the "https" URI scheme when responding to requests using  
1040 the "ipps" URI scheme. Printers SHOULD use the same port number for IPP and HTTP  
1041 URIs.

## 1042 **9. Conformance Requirements**

1043 This section summarizes the Conformance Requirements detailed in the definitions in this  
1044 document for Clients and Printers.

### 1045 **9.1 Conformance Requirements for Clients**

1046 In order for a Client to claim conformance to this specification a Client MUST support the  
1047 following:

- 1048 1. DNS Service Discovery as defined in section 4.2
- 1049 2. IPP/2.0 as defined in section 5
- 1050 3. The REQUIRED operations listed in Table 4
- 1051 4. The REQUIRED Printer Description attributes listed in Table 5
- 1052 5. The REQUIRED operation attributes listed in Table 7
- 1053 6. The REQUIRED Job Template attributes listed in Table 10
- 1054 7. The REQUIRED Job Description attributes listed in Table 8
- 1055 8. The REQUIRED document formats listed in section 5.8
- 1056 9. The "media-source-properties" member attribute of the "media-col-database"  
1057 and "media-col-ready" Printer attributes as reported by the Printer and defined  
1058 in section 6.1
- 1059 10. The internationalization considerations as defined in section 10
- 1060 11. The security considerations as defined in section 11

### 1061 **9.2 Conformance Requirements for Printers**

1062 In order for a Printer to claim conformance to this specification a Printer MUST support the  
1063 following:

- 1064 1. DNS Service Discovery as defined in section 4.2
- 1065 2. IPP/2.0 as defined in section 5
- 1066 3. The REQUIRED operations listed in Table 4
- 1067 4. The REQUIRED Printer Description attributes listed in Table 5
- 1068 5. The REQUIRED operation attributes listed in Table 7
- 1069 6. The REQUIRED Job Template attributes listed in Table 10
- 1070 7. The REQUIRED Job Description attributes listed in Table 8
- 1071 8. The REQUIRED document formats listed in section 5.8
- 1072 9. The 'ipp-everywhere' value for the "ipp-features-supported" Printer Description  
1073 attribute as defined in section 7.1
- 1074 10. The additional semantics for attribute values as defined in section 8

- 1075 11. The internationalization considerations as defined in section 10  
1076 12. The security considerations as defined in section 11  
1077 13. The safe string truncation rules as defined in section 13

### 1078 9.3 Conditional Conformance Requirements for Printers

1079 Printers that support the "image/jpeg" [JFIF] MIME media type MUST support:

- 1080 1. The "copies-default", and "copies-supported" Printer Description attributes as  
1081 defined in section 5.3.  
1082 2. The "copies" Job Template attribute as defined in section 5.8.

1083 Printers that support the "application/pdf" [ISO32000] MIME media type MUST support:

- 1084 1. The "copies-default", "copies-supported", "document-password-supported", and  
1085 "page-ranges-supported" Printer Description attributes as defined in section 5.3,  
1086 2. The "document-password" Operation attribute as defined in section 5.4, and  
1087 3. The "copies", "multiple-document-handling", "overrides", and "page-ranges" Job  
1088 Template attributes as defined in section 5.8.

1089 Printers that support the Print to a Recipient use case (section 3.2.2.8) MUST support:

- 1090 1. The "job-password-supported" and "job-password-encryption-supported" Printer  
1091 Description attributes as defined in section 5.3, and  
1092 2. The "job-password" and "job-password-encryption" Operation attributes as  
1093 defined in section 5.4.

1094 Printers that provide Paid Print services MUST support:

- 1095 1. The "job-account-id-default", "job-account-id-supported", "job-accounting-user-  
1096 id-default", "job-accounting-user-id-supported", "job-mandatory-attributes-  
1097 default", "job-mandatory-attributes-supported", and "printer-mandatory-job-  
1098 attributes" Printer Description attributes as defined in section 5.3,  
1099 1. The "job-mandatory-attributes" operation attribute as defined in section 5.4, and  
1100 2. The "job-account-id" and "job-accounting-user-id" Job Template attributes as  
1101 defined in section 5.8.

1102 Printers that support long-edge feed media MUST support the "media-source-properties"  
1103 member attribute of the "media-col-database" and "media-col-ready" Printer Description  
1104 attributes as defined in section 5.3.

1105 Printers that support ICC-based color management MUST support:

- 1106 1. The "print-rendering-intent-default", "print-rendering-intent-supported", and  
1107 "printer-icc-profiles" Printer Description attributes as defined in section 5.3.  
1108 2. The "print-rendering-intent" Job Template attribute as defined in section 5.8.

1109 Printers representing Logical Devices MUST report the 'ipp-everywhere-server' value for  
1110 the "ipp-features-supported" Printer Description attribute as defined in section 7.1.

## 1111 **10. Internationalization Considerations**

1112 For interoperability and basic support for multiple languages, conforming implementations  
1113 MUST support:

- 1114 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)  
1115 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
- 1116 2. The Unicode Format for Network Interchange [RFC5198] which requires  
1117 transmission of well-formed UTF-8 strings and recommends transmission of  
1118 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

1119 Unicode NFC is defined as the result of performing Canonical Decomposition (into base  
1120 characters and combining marks) followed by Canonical Composition (into canonical  
1121 composed characters wherever Unicode has assigned them).

1122 WARNING – Performing normalization on UTF-8 strings received from Clients and  
1123 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client  
1124 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now  
1125 'hidden').

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

1128 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

1129 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

1130 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

1131 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

1132 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

1133 Unicode Collation Algorithm [UTS10] – sorting

1134 Unicode Locale Data Markup Language [UTS35] – locale databases

1135 Implementations of this specification are advised to also review the following informational  
1136 documents on processing of human-readable Unicode text strings:

1137 Unicode Character Encoding Model [UTR17] – multi-layer character model

1138 Unicode Character Property Model [UTR23] – character properties

Unicode Conformance Model [UTR33] – Unicode conformance basis

## 11. Security Considerations

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

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

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

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

Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

## 12. IANA Considerations

### 12.1 Attribute Value Registrations

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

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

The registry entries will contain the following information:

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

## 13. Safe String Truncation

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

### 13.1 Plain Text Strings

Printers MUST truncate plain text strings at the end of a valid character sequence. Printers SHOULD represent strings using the UTF-8 transformation format of ISO 10646 [STD0063] [ISO10646-1] and the Unicode Format for Network Interchange [RFC5198].

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

### 13.2 URIs

Printers MUST truncate URIs so that each URI remains valid and accepted by the Printer.

For example, the 46 octet URI "ipp://printer.example.com/ipp/really-long-name" might be shortened to fit within 32 octets by removing the last path name component, resulting in the 29 octet URI "ipp://printer.example.com/ipp". Similarly, the 52 octet URI "ipp://printer.example.com/ipp?query-string" might be shortened to fit within 32 octets by removing the query string.

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

### 13.3 MIME Media Types

Printers MUST truncate MIME media type strings at the end of each media subtype, removing any parameters that are included with the media type. If the resulting string still exceeds the maximum length it MUST be discarded.

For example, the 24 octet MIME media type "text/plain;charset=utf-8" would be shortened to fit within 16 octets by removing the trailing parameter, resulting in the 10 octet MIME media type "text/plain".

## 13.4 Delimited Lists

Delimited Lists combine one or more string types listed in the previous sections, separated by a delimiting character such as a comma or semicolon. Printers MUST shorten delimited lists by removing:

1. Unnecessary path components (URIs) and parameters (MIME media types), and then
2. Excess values after delimiting characters.

For example, the 40 octet list of MIME media types "text/plain;charset=utf-8,application/pdf" would be shortened to fit within 32 octets by removing the MIME media type parameter, resulting in the 26 octet list "text/plain,application/pdf". The same list would be shortened to fit within 16 octets by also removing the last MIME media type, resulting in the 10 octet list "text/plain".

## 14. Overview of Changes

### 14.1 IPP Everywhere™ v2.0

The following changes were made to PWG 5100.14-2020: IPP Everywhere™ v1.1 [PWG5100.14-2020]:

- TLS is now required
- PDF is now required for Printers representing Logical Devices
- Accounting, privacy, and preset attributes are now REQUIRED
- The "job-password-repertoire-xxx" Printer Description attributes are now REQUIRED for Printers that support the Print to a Recipient use case
- Added REQUIRED attributes and operations for Enterprise Printers
- Added REQUIRED attributes for Production Printers

### 14.2 IPP Everywhere™ v1.1

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

- Print Servers (Logical Devices) are now explicitly addressed;
- References now point to the current versions of dependent documents and specifications at the time of publication;

- 1221 • Requirements for WS-Discovery have been removed due to a lack of  
1222 implementations, which effectively made WS-Discovery support OPTIONAL;
- 1223 • References to OpenXPS and SSDP have been removed;
- 1224 • The "printer-alert" and "printer-alert-description" Printer Status attributes are now  
1225 RECOMMENDED for Printers representing Physical Devices and OPTIONAL for  
1226 Printers representing Logical Devices;
- 1227 • The "printer-device-id" Printer Description attribute and associated DNS-SD TXT  
1228 record keys are no longer required;
- 1229 • DNS-SD is now RECOMMENDED for Printers representing Logical Devices (print  
1230 servers);
- 1231 • ICC attributes are now CONDITIONALLY REQUIRED for printers that support ICC-  
1232 based color management;
- 1233 • JPEG support is now CONDITIONALLY REQUIRED for color printers;
- 1234 • The "compression-supplied", "document-format-supplied", "document-format-  
1235 version", "document-format-version-supplied", "document-name-supplied" attributes  
1236 are no longer required;
- 1237 • The "feed-orientation", "feed-orientation-default", and "feed-orientation-supported"  
1238 attributes are no longer required;
- 1239 • The "print-content-optimize", "print-content-optimize-default", and "print-content-  
1240 optimize-supported" attributes have been reduced to RECOMMENDED;
- 1241 • IPP Finishings 2.1 and the "finishings-col" Job Template attribute are now  
1242 RECOMMENDED;
- 1243 • The "printer-input-tray" and "printer-output-tray" Printer Description attributes are  
1244 now RECOMMENDED to provide tray information and status;
- 1245 • The "printer-supply", "printer-supply-description", and "printer-supply-info-uri" Printer  
1246 Status attributes are now CONDITIONALLY REQUIRED for Printers that have  
1247 supplies;
- 1248 • The "printer-strings-languages-supported" and "printer-strings-uri" Printer Status  
1249 attributes are now RECOMMENDED to support localization; and
- 1250 • Printer Status and Job Status attributes are now listed in a separate section to match  
1251 STD 92 and the IANA IPP registry.

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

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## 17. Change History

This section will be removed before the publication of this document.

### 17.1 January 24, 2022

- Status: Interim
- Updated all references
- Added Enterprise, Production, and Workgroup Printer definitions from IPPBASE
- Section 5.2: Fixed spelling mistake, added Get-Printers for print servers and removed Print-Job
- Section 5.3: Fixed references
- Section 5.5: Added client-info, moved table 8 attributes to table 7.
- Section 6: Updated PDF reference to 2.0

### 17.2 October 21, 2021

- Initial revision
- Made TLS required
- Updated document references