



The Printer Working Group

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IPP Transaction-Based Printing Extensions v1.1 (TRANS)

Status: Stable

Abstract: This document defines extensions to the Internet Printing Protocol that support the business transaction logic needed for paid and quota-based printing through local and commercial services.

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50 systems supporting them work together better. All references to the PWG in this document
51 implicitly mean “The Printer Working Group, a Program of the IEEE ISTO.”

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53 define print related protocols, interfaces, procedures, and conventions. A PWG standard is
54 a stable, well understood, and technically competent specification that is widely used with
55 multiple independent and interoperable implementations. Printer manufacturers and
56 vendors of printer related software benefit from the interoperability provided by voluntary
57 conformance to these standards.

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141 1. Introduction

142 Whether provided by a third-party or an organization's infrastructure services, transaction-
143 based printing services such as ~~quota-based, managed, and account/payment-based~~
144 printing are increasingly common. For example, a school may provide printing services to
145 its students; each student submits print requests, authenticates with the print service either
146 at time of submission or at the printer, and is then "billed" for their usage, where billing may
147 just apply the print job against a monthly quota allowed by their student fees. Other
148 organizations may require accounting of all print jobs; in those cases, the transactions
149 associate print jobs with customer accounts and/or track usage and content for regulatory
150 compliance.

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151 Whatever the usage, IPP currently exposes only a handful of attributes that describe a
152 Printer's business transaction capabilities and does not allow a Client to directly participate
153 in transaction-based printing through IPP. This specification defines additional attributes,
154 values, and semantics to enable a variety of transaction-based printing services directly
155 through IPP. The intent is not to define a full framework for a particular class of transaction-
156 based printing such as that envisioned by the CIP4 PrintTalk [PrintTalk] specification, but
157 rather to define a general-purpose framework that can be used by a variety of solutions using
158 business transactions that is compatible with other public standards.

159 This specification updates the previous version [PWG5100.16-2013], ~~adds related attributes~~
160 from other specifications, ~~and moves unrelated attributes to other specifications~~. A list of
161 changes can be found in section 0.

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162 2. Terminology

163 2.1 Conformance Terminology

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

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

172 2.2 Protocol Role Terminology

173 The following protocol roles are defined to specify unambiguous conformance requirements:

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

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

181 2.3 Printing Terminology

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

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

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

188 *Job Creation Request*: Any operation that causes the creation of a Job object, e.g., the
 189 Create-Job, Print-Job, and Print-URI operations [STD92].

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

192 *Output Device*: A single Logical or Physical Device

193 *Paid Imaging Services*: Printing, facsimile, and scanning performed for a monetary fee.
 194 Facsimile, scanning, and the means of collecting payment are outside the scope of this
 195 specification.

196 *Physical Device*: A hardware implementation of a endpoint device, e.g., a marking engine,
 197 a fax modem, etc.

198 *Quota-Based Printing*: Printing where Jobs are measured and potentially limited by the
 199 Printer. The method of measurement and limiting are outside the scope of this document.

200 *Transaction-Based Printing*: Printing, including Paid Imaging Services, and Quota-Based
 201 Printing, where authorized Jobs are a business transaction between the End User/Client and
 202 Printer.

203 2.4 Acronyms and Organizations

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

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

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

207 *PWG*: Printer Working Group, <https://www.pwg.org/>
 208

Deleted: a

Deleted: a

Deleted: *PIN Printing*: Printing where the User/Client provides a passcode or number in the print request that is later used to release the Job at the Printer's console or control panel.¶

Deleted: *Release Printing*: Printing where Jobs are submitted to the print service and held until the User subsequently provides identification information at the Printer, such as by entering a username and password at the console or swiping or presenting an identification card to a card reader on the Printer. Jobs may be directed at a Physical Printer or at a Logical Printer such as a central print service.¶

Deleted: , PIN Printing, Release Printing,...

Deleted: *PIN*: Personal Identification Number¶

231 3. Requirements

232 3.1 Rationale for IPP Transaction-Based Printing Extensions

233 Given the following existing specifications and the need for a standard method of supporting
234 Transaction-Based Printing without vendor-specific driver software, the IPP Transaction-
235 Based Printing Extensions specification should:

- 236 1. Use the existing IPP specifications to support job submission to and monitoring
237 of Paid Imaging Services,
- 238 2. Define HTTP authorization requirements as needed to support Transaction-
239 Based Printing,
- 240 3. Define operation attributes and amend operation semantics as needed for a
241 Client to obtain and supply authorization from an IPP Printer,
- 242 4. Define status code values needed for Transaction-Based Printing to inform a
243 Client when exceptions occur during job submission,
- 244 5. Define Job Status attributes and values needed for Transaction-Based Printing
245 to provide authorization status information to Clients,
- 246 6. Define Job Template attributes needed to clearly express output intent for
247 Transaction-Based Printing, and
- 248 7. Define Printer Description attributes and values needed for Transaction-Based
249 Printing.

Deleted: existing

250 The IPP Job Extensions v2.0 (JOBEXT) [PWG5100.7] defines attributes for Job accounting.

251 The IPP 2.0, 2.1, and 2.2 specification [PWG5100.12] defines:

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

Deleted: The IPP Enterprise Printing Extensions v2.0 (EPX) [PWG5100.11] defines attributes for PIN and Release Printing.¶

258 IPP Everywhere [PWG5100.14] defines:

- 259 1. Protocols and schema to support discovery, identification, and auto-
260 configuration of Imaging Devices,
- 261 2. A standard profile of IPP attributes, operations, and values to promote
262 interoperability, and
- 263 3. Standard document formats for job submission.

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

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

- 273 1. A rich file format for transmission of multi-page color and grayscale vector and
274 bitmap images
- 275 2. Standard page attributes to support page size, orientation, and duplex
276 functionality

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

279 **3.2 Use Cases**

280 **3.2.1 Printing at a School**

281 Jane wants to print her thesis on the laser printer in her school's computing lab. After
282 initiating the print action in her application and selecting the laser printer, the application
283 software validates access to the printer by providing the proposed job ticket information. The
284 print service supporting the laser printer provides the application software an authorization
285 code for the job submission. After Jane confirms the print action, the application software
286 submits the print job with the authorization code to the print service. The print service then
287 prints the job on the laser printer and includes the print job in her student activity fees.

288 **3.2.2 Printing to a Reprographics Shop**

289 John wants to print 100 marketing booklets for a real estate conference using a local
290 reprographics shop. John prepares the electronic files needed for the booklets and then
291 initiates a job submission through a generic job management utility. After selecting the
292 reprographics shop and specifying the job processing intent and delivery location, the utility
293 software validates access to the service for the shop. The service challenges the user (via
294 the utility software) to provide user account information. Once accepted, the service provides
295 an authorization code to the utility software, which then submits the complete job, including
296 the authorization code, for printing. The shop charges John's account, prints the job, and
297 delivers the booklets to the conference.

298 **3.3 Exceptions**

299 The following subsections define exceptions in addition to those defined in the Internet
300 Printing Protocol/1.1 [STD92].

301 **3.3.1 Account Exceeded Limit Exception**

302 Jane wants to print flyers for a school event on the school's large format printer. After
303 initiating the print action in her application and selecting the large format printer, the
304 application software validates access to the printer, obtains an authorization code, and
305 submits the job. After pre-processing the job, the print service associated with the printer

306 determines that Jane's account lacks sufficient funds to complete the print job and stops the
 307 job from printing, adding status information to the job indicating the reason. The application
 308 software queries the print service for the job status and presents the issue to Jane. Jane
 309 then visits the web page provided by the print service to add additional printing credits to her
 310 school activity account. The print service then resumes processing of the job, printing the
 311 flyers on the large format printer.

312 3.4 Out of Scope

313 The following are considered out of scope for this specification:

- 314 1. The actual method of payment for Paid Imaging Services,
- 315 2. The actual methods of measurement and limit enforcement for Quota-Based
 §16 Printing, and
- 317 3. Definition of new HTTP authentication methods.

Deleted: ¶
 The actual methods of multi-factor authentication for PIN and Release Printing, e.g., smart cards,...

318 3.5 Design Requirements

319 The design requirements for the IPP Transaction-Based Printing Extensions specification
 320 are:

- 321 1. Define HTTP authorization extensions and requirements;
- §22 2. Follow the naming conventions defines in [the Internet Printing Protocol/1.1](#),
 §23 [\[STD92\]](#), including keyword value case (lower) and hyphenation requirements;
- §24 3. Define attributes and values to support Transaction-Based Printing; **and**
- §25 4. Amend operation semantics to support Transaction-Based Printing.

Deleted: IPP

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Deleted: Model and Semantics

Deleted: RFC2911

Deleted: ¶
 Support printing with vender-neutral Client software from any Client to any Printer using a variety of discovery protocols, IPP for the transport, and standard document formats.

343 4. IPP Model

344 This document defines new attributes, keyword values for the “job-state-reasons” Job **Status**
 345 attribute, and status codes for the Create-Job, Print-Job, Print-URI, and Validate-Job
 346 operations that allows IPP to support Transaction-Based Printing. Figure 1 shows the
 347 general model of Transaction-Based Printing while Figure 2 shows a typical Paid Imaging
 348 Service interaction between a Client and Printer.

349 The “printer-charge-info-uri” Printer Description attribute (section 6.4.5) provides a URL that
 350 allows **End Users** to manage **Paid Printing** accounts on the Printer. Typically, this web page
 351 will allow new **End Users** to sign up for the Paid Imaging Service, purchase additional pages,
 352 **and/or** credits for printing, manage queued **Jobs**, and so forth.

353 The “job-authorization-uri” (section 6.1.2) operation attribute allows a Printer to provide an
 354 authorization or transaction code to the Client that is used in subsequent **Job Creation**
 355 **Requests** to obtain a printout. The valid time period, number of print jobs, and/or number of
 356 pages for an authorization code is specific to the implementation. However, since there is
 357 no way for the Client to tell the Printer it will not be using the authorization code, the Printer
 358 MUST automatically expire the provided URI after a suitable period of time that SHOULD be
 359 longer than 60 seconds. Printers notify Clients that they require a “job-authorization-uri”
 360 value in a print **Job Creation Request** by including the attribute name in the “printer-
 361 mandatory-job-attributes” Printer **Description** attribute (section 6.4.6). Printers notify Clients
 362 that a “job-authorization-uri” value is no longer valid by returning the client-error-account-
 363 authorization-failed (section 8.2) status code and placing the “job-authorization-uri” attribute
 364 in the unsupported attributes group of the response.

365 The “job-impressions-estimated” (section 6.1.3) operation attribute allows the Client to
 366 supply an estimate of the number of impressions or sides that will be submitted for printing.

367 The “charge-info-message” (section 6.1.1) operation attribute allows the Printer to return a
 368 localized message to the Client tailored to the requesting user. The message is typically the
 369 current status of the account (number of pages **and/or** amount of credit remaining) but can
 370 also contain account-specific error messages when the account cannot be used for printing.
 371 Once a **Job** is created, the “job-charge-info” (section 6.2.1) Job **Status** attribute provides any
 372 updated account information for that **Job**.

373 Account issues that are discovered at validation or **Job** creation time are reported using the
 374 new status codes defined in section 8.2. Once a **Job** has been created, these same issues
 375 are reported in the “job-state-reasons” (section 8.1) Job **Status** attribute with the
 376 corresponding keyword values.
 377

Deleted: Description

Deleted: paid

Deleted: printing

Deleted: users

Deleted: /

Deleted: jobs

Deleted: job

Deleted: creation

Deleted: requests

Deleted: job

Deleted: creation

Deleted: request

Deleted: [PWG5100.7]

Deleted: /

Deleted: job

Deleted: Description

Deleted: job

Deleted: job

Deleted: job

Deleted: Description

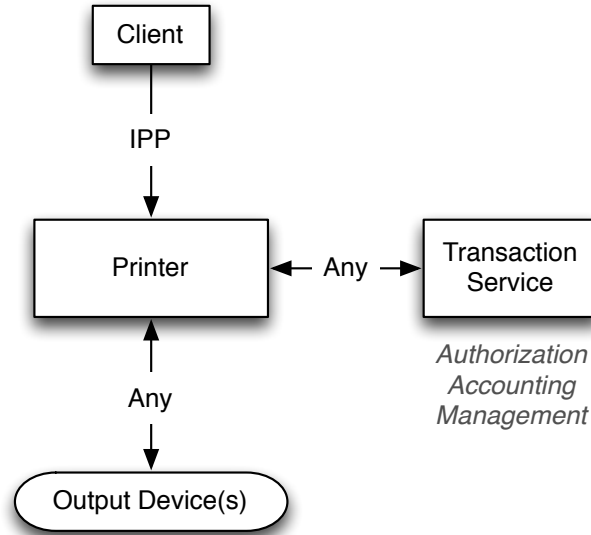


Figure 1 - Transaction-Based Printing Model

398

399

400 **4.1 User Accounts vs. Payment/Billing Accounts**

401 Printers that support multiple payment or billing options for each End User account can
 402 support them via the “job-account-id” and “job-accounting-user-id” Job Template attributes
 403 [PWG5100.7]. Printers notify Clients that they require these values in a print Job Creation
 404 Request by including the corresponding attribute names in the “printer-mandatory-job-
 405 attributes” Printer Description attribute (section 6.4.6).

- Deleted: user
- Deleted: job
- Deleted: creation
- Deleted: request
- Deleted: [PWG5100.7]

406 **4.2 Priority of Service**

407 The “job-priority” [STD92] Job Template attribute can be used by the Printer to determine
 408 the cost of or type of service for the Job. For example, a Job with a priority of 100 would
 409 cause the Job to be processed before other Jobs of lesser priority and might then be billed
 410 at twice the normal rate. Similarly, a Job with a priority of 1 would cause the Job to be
 411 processed after all other Jobs and might be billed at half the normal rate.

Deleted: <#>PIN Printing
 <#>Printers support PIN Printing using the “job-password” and “job-password-encryption” operation attributes [PWG5100.11]. Jobs created with these attributes MUST be placed in the ‘pending-held’ state with the ‘job-password-wait’ keyword added to the “job-state-reasons” Job Description attribute.
 <#>When the User later enters the PIN/passcode on the Printer, the job is placed in the ‘pending’ or ‘processing’ state and the ‘job-password-wait’ keyword is removed from the “job-state-reasons” Job Description attribute.

412

```

435      Client                                Printer
436      POST Validate-Job Request →
437
438
439      POST Validate-Job Request →
440      Authentication: Basic dGVzdDp0ZXN0MTIzCg==
441      job-impressions-estimated=20
442
443      ← 401 Unauthorized
444      WWW-Authenticate: Basic realm="Example"
445
446      POST Print-Job Request →
447      Authentication: Basic dGVzdDp0ZXN0MTIzCg==
448      job-authorization-uri = "urn:uuid:..."
449      <20 page document>
450
451      ← 200 OK
452      Validate-Job Response = successful-ok
453      charge-info-message="14 pages in account."
454      job-authorization-uri = "urn:uuid:..."
455
456      POST Get-Job-Attributes Request →
457      Authentication: Basic dGVzdDp0ZXN0MTIzCg==
458      job-id=1234
459
460      ← 200 OK
461      Print-Job Response = successful-ok
462      charge-info-message="14 pages in account."
463      job-id=1234
464      job-state=pending
465      job-state-reasons="none"
466
467      POST Get-Job-Attributes Request →
468      Authentication: Basic dGVzdDp0ZXN0MTIzCg==
469      job-id=1234
470
471      ← 200 OK
472      Get-Job-Attributes Response = successful-ok
473      job-charge-info="6 pages in account."
474      job-impressions-completed=8
475      job-state=processing
476      job-state-reasons="job-printing"
477
478      POST Get-Job-Attributes Request →
479      Authentication: Basic dGVzdDp0ZXN0MTIzCg==
480      job-id=1234
481
482      ← 200 OK
483      Get-Job-Attributes Response = successful-ok
484      job-charge-info="Need to order more pages."
485      job-impressions-completed=14
486      job-state=processing-stopped
487      job-state-reasons="account-limit-reached"
488
489      ... User Visits printer-charge-info-uri to order 10 more pages ...
490
491      POST Get-Job-Attributes Request →
492      Authentication: Basic dGVzdDp0ZXN0MTIzCg==
493      job-id=1234
494
495      ← 200 OK
496      Get-Job-Attributes Response = successful-ok
497      job-charge-info="20 pages charged."
498      job-impressions-completed=20
499      job-state=completed
500      job-state-reasons="none"

```

Figure 2 - Typical Paid Imaging Sequence Diagram

487 4.3 Job Review

488 Printers can institute a policy of holding new Jobs for review, such as when an unusual print
 489 request is received ("print one million copies of a brochure"), randomly as a means of
 490 auditing all print jobs, or as a blanket policy ("all color print jobs from students are held for
 491 review"). Such Jobs are placed in the 'pending-held' state with the 'job-held-for-review'
 492 keyword added to the "job-state-reasons" Job [Status](#) attribute. When released by an
 493 authorized user, the Printer then places the Job in the 'pending' or 'processing' states and
 494 removes the 'job-held-for-review' keyword.

495 5. HTTP Authentication - Default Username

496 Printers supporting Basic authentication [RFC7617] MUST support a default username
 497 specified in the WWW-Authenticate header. For example:

```
498 WWW-Authenticate: Basic realm="Example Printer" username="guest"
```

499 Printers supporting Digest authentication [RFC7616] MUST support a default username
 500 specified in the WWW-Authenticate header. For example:

```
501 WWW-Authenticate: Digest realm="Example Printer" \  

  502 nonce="0123456789abcdefg" username="guest"
```

503 The default username can be changed or disabled through the Printer's web interface or
 504 other mechanisms.
 505

Deleted: [<#>Release Printing](#)
 <#>Printers can act as "release printing" services for one or more associated output devices, where print jobs are spooled and later released by the User at an output device by entering a PIN/passcode (see section 4.2), swiping an identification card, or providing other identification to the associated Printer.
 <#>Jobs submitted to such a Printer can be placed in the 'pending-held' state with the 'job-release-wait' keyword added to the "job-state-reasons" Job Description attribute. The Job is placed in the 'pending-held' state only if it cannot be processed until the Output Device has been selected, which determines the security policy and (if applicable) costs that must be accounted for and paid. When the User later releases the job at an output device, the Job is placed in the 'pending' or 'processing' state and the 'job-release-wait' keyword is removed from the "job-state-reasons" Job Description attribute.

Deleted: Description

536 6. JPP Attributes

Deleted: ¶

537 6.1 Operation Attributes

538 6.1.1 charge-info-message (text)

539 This attribute provides a localized message concerning any Paid Imaging Service charge
 540 information, typically the remaining balance on the requesting user's account. Printers that
 541 implement Paid Imaging Services SHOULD return this attribute in response to a Create-Job,
 542 Print-Job, Print-URI, or Validate-Job request.

543 6.1.2 job-authorization-uri (uri)

544 This **RECOMMENDED** attribute specifies an implementation-specific URI representing an
 545 authorization or reservation code for a **Job Creation Request**. It is returned by the Validate-
 546 Job operation (section 7.2) and supplied in the Create-Job, Print-Job, and Print-URI
 547 operations (section 7.1).

Deleted: print

Deleted: job

Deleted: creation

Deleted: request

548 Printers that support this attribute MUST also support the "job-authorization-uri-supported"
 549 (section 6.4.3) Printer **Description** attribute.

550 6.1.3 job-impressions-estimated (integer(1:MAX))

551 This attribute specifies the estimated "job-impressions" **STD92** value for a subsequent **Job**
 552 **Creation Request**. It is supplied in a Validate-Job request (section 7.2) when supporting
 553 accounting or Paid Imaging Services.

Deleted: print j

Deleted: creation

Deleted: request

554 6.2 Job Status Attributes

555 6.2.1 job-charge-info (text)

556 This **RECOMMENDED** attribute provides a localized message concerning any Paid Imaging
 557 Service charge information, typically the cost charged to the requesting user's account.

558

567 6.3 Job Template Attributes

568 6.3.1 job-account-type (type2 keyword | name(MAX))

569 This RECOMMENDED attribute specifies the type of value that was specified in the "job-
570 account-id" Job Template attribute [PWG5100.7]. The following values are defined in this
571 specification:

572 'general': A general-purpose identifier was supplied.

573 'group': A group identifier was supplied.

574 'none': No account identifier was supplied.

575 6.4 Printer Description Attributes

576 6.4.1 job-account-type-default (type2 keyword | name(MAX))

577 The default value supplied by the Printer if the Client omits the "job-account-type" (section
578 6.3.1) Job Template attribute. This attribute is REQUIRED if the "job-account-type" Job
579 Template attribute is supported.

580 6.4.2 job-account-type-supported (1setOf (type2 keyword | name(MAX)))

581 The list of supported "job-account-type" (section 6.3.1) Job Template attribute values. This
582 attribute is REQUIRED if the "job-account-type" Job Template attribute is supported.

583 6.4.3 job-authorization-uri-supported (boolean)

584 This attribute specifies whether the "job-authorization-uri" (section 6.1.2) operation attribute
585 is supported. This attribute is REQUIRED if the "job-authorization-uri" operation attribute is
586 supported.

587 6.4.4 printer-charge-info (text(MAX))

588 This RECOMMENDED attribute provides a human-readable description of Paid Imaging
589 Services for the Printer. Typically, this description will provide a summary of cost information.

590 6.4.5 printer-charge-info-uri (uri)

591 This RECOMMENDED attribute provides a "http:" or "https:" URI referring to a human-
592 readable web page for Paid Imaging Services for the Printer. Typically, this web page will
593 provide cost information and allow the Client to obtain a "job-accounting-id" value for
594 subsequent print jobs.

Deleted: <#>profile-uri-actual (uri)
 <#>This attribute is returned by the Validate-Job operation (section 7.2) and specifies which ICC color profile will be used by the Printer for the given Job Template attributes. This attribute MUST be supported if the "printer-icc-profiles" Printer attribute [PWG5100.13] is supported.
 <#>The ICC profile can be used for Client-based color matching and soft proofing.

Deleted: <#>print-scaling (type2 keyword)
 <#>This REQUIRED attribute specifies how the Printer scales the Document data to fit the requested media. Standard keywords are:
 <#>'auto'; if the "ipp-attribute-fidelity" attribute is true or the document is larger than the requested media, scale the document using the 'fit' method if the margins are non-zero, otherwise scale using the 'fill' method. If the "ipp-attribute-fidelity" attribute is false or unspecified and the document is smaller than the requested media, scale using the 'none' method.
 <#>'auto-fit'; if the "ipp-attribute-fidelity" attribute is true or the document is larger than the requested media, scale the document using the 'fit' method. Otherwise, scale using the 'none' method.
 <#>'fill'; scale the document to fill the requested media size, preserving the aspect ratio of the document data but potentially cropping portions of the document.
 <#>'fit'; scale the document to fit the printable area of the requested media size, preserving the aspect ratio of the document data without cropping the document.
 <#>'none'; do not scale the document to fit the requested media size. If the document is larger than the requested

Deleted: jpeg-k-octets-supported (rangeOfInteger(0:MAX))
 This attribute specifies the upper and lower bounds of total sizes of JFIF jobs in K octets, i.e., in units of 1024 octets. The lower bound is always 0. Printers that support the "image/jpeg" MIME media type MUST support this attribute.
jpeg-x-dimension-supported (rangeOfInteger(0:65535))
 This attribute specifies the maximum horizontal dimension of JFIF jobs in samples per line. Pursuant to the JPEG File Information Format Version 1.02 [JFIF], the lower bound is always 0. Printers that support the "image/jpeg" MIME media type MUST support this attribute. ... [2]

6.4.6 printer-mandatory-job-attributes (1setOf keyword)

This RECOMMENDED Printer Description attribute lists the minimum Job Template and operation attributes that are required for a successful Job Creation Request. A Printer MAY reject the Job Creation Request if the Client does not supply these attributes in its request.

Member attributes of collections are specified by concatenating attribute names delimited by the period (".") character, e.g., the "media-source" member attribute of the "media-col" Job Template attribute [PWG5100.7] would be requested using the keyword value 'media-col.media-source'.

Printers MUST NOT report this attribute in a Get-Printer-Attributes response if no attributes are required for a successful Job Creation Request.

6.4.7 printer-requested-job-attributes (1setOf keyword)

This RECOMMENDED attribute lists the attributes the Printer wants but does not need in order to support Job Accounting. Member attributes of collections are specified by concatenating attribute names delimited by the period (".") character, e.g., the "document-source-application-name" member attribute of the "document-format-details" operation attribute [PWG5100.7] would be requested using the keyword value 'document-format-details.document-source-application-name'. If supported, Clients MUST allow the End User to explicitly consent to the sending of any attributes or values that are not explicitly chosen by the End User.

For example, a Printer can list the 'media' and 'media-col' keywords in "printer-requested-job-attributes". If the Client application provides a UI control for selecting a media size, no additional consent is needed since the UI allows the User to select which value is sent.

However, if a Printer lists the "document-format-details.document-source-application-name" keyword in "printer-requested-job-attributes", it is unlikely that the Client application will provide a UI control for selecting the application name that is sent to the Printer. In this case, the Client MUST provide a UI that allows the End User to opt out of sending the requested information. If the End User opts out of sending the requested information, the Client MUST NOT send it.

7. Additional Semantics for Existing Operations

7.1 Create-Job, Print-Job, and Print-URI

Printers that support Paid Imaging Services SHOULD accept the "job-authorization-uri" (section 6.1.2) operation attribute. Printers that support Paid Imaging Services SHOULD also return the "charge-info-message" (section 6.1.1) operation attribute. Clients determine whether to include the "job-authorization-uri" operation attribute by querying for the value of the "job-authorization-uri-supported" (section 6.4.3) Printer attribute.

Deleted: <#>printer-dns-sd-name (name(63))
 <#>This REQUIRED attribute provides the current DNS-SD service name for the Printer. For example, if the Printer registers "Example Make and Model._ipp._tcp._print.local.", this attribute would contain "Example Make and Model".
 <#>Printers that support changing the value using the Set-Printer-Attributes operation MUST list "printer-dns-sd-name" in the "printer-settable-attributes-supported" Printer attribute [RFC3380]. When a new name is set, the Printer MUST re-register all DNS-SD services associated with it. However, if the new name causes a collision with other network devices, the Printer MUST replace the value set with a non-conflicting name as required by multicast DNS, typically by appending a unique number to the provided name.
 <#>Note: Changing the DNS-SD service name can prevent Clients from resolving the Printer's services if those Clients use a statically configured name for the Printer.
 <#>printer-kind (1setOf type2 keyword | name(MAX))
 <#>This REQUIRED attribute lists the categories of printing that are supported by the Printer. This information is typically used to conveniently determine whether a Printer supports the kind of printing required by the Client software. Name values define site- or vendor-specific categories while keywords define standard categories. The following keywords are defined:
 <#>'disc': the Printer supports printing on optical discs such as printable CD-Rs and DVD-Rs
 <#>'document': the Printer supports regular document printing on standard cut sheet media such as US Letter, US Legal, US Tabloid, ISO A4, and ISO A3 media
 <#>'envelope': the Printer supports printing on envelopes
 <#>'label': the Printer supports printing on cut labels
 <#>'large-format': the Printer supports printing on cut sheet sizes and roll media larger than ISO A3
 <#>'photo': the Printer supports printing with photographic print quality
 <#>'postcard': the Printer supports printing on postcards
 <#>'receipt': the Printer supports printing receipts on continuous rolls

Commented [MRS1]: Changed to SHOULD since the point of this specification is to provide a way to support transactions.

976 **7.2 Validate-Job**

977 The Validate-Job operation is used to validate access to the Printer, validate and resolve
978 any conflicts in the Job Template attributes that will be used in a subsequent Create-Job or
979 Print-Job request, and determine the optimal raster parameters for printing.

980 **7.2.1 Validate-Job Request**

981 Printers SHOULD accept the "job-impressions-estimated" (section 6.1.3) operation attribute.

982 **7.2.2 Validate-Job Response**

983 Printers SHOULD return the "charge-info-message" (section 6.1.1) and "job-authorization-
984 uri" (section 6.1.2) operation attributes.

985

Deleted: Printers that support the "printer-icc-profiles" Printer attribute MUST return the "profile-uri-actual" (section 6.1.4) operation attribute in the Validate-Job response, which contains one of the "profile-uri" member attribute values contained in the "printer-icc-profiles" Printer attribute....

995 8. Additional Values for Existing Attributes

996 8.1 job-state-reasons (1setOf type2 keyword)

997 This specification defines the following new values for the “job-state-reasons” [STD92] [Job](#)
998 [Status](#) attribute:

- 999 ‘account-authorization-failed’: The “job-authorization-uri” attribute was not supplied
1000 the value supplied is not valid, or the value supplied has expired.
- 1001 ‘account-closed’: The requesting user’s account has been closed.
- 1002 ‘account-info-needed’: Additional information is required, such as a “job-account-id”
1003 or “job-accounting-user-id” value.
- 1004 ‘account-limit-reached’: The requesting user’s account has reached its limit and/or
1005 exhausted any balance on the account.
- 1006 ‘job-held-for-review’: The Job has been held for review.

1007 8.2 Status Codes

1008 This specification defines the following new status codes that can be returned by the Create-
1009 Job, Print-Job, Print-URI, or Validate-Job operations:

- 1010 client-error-account-info-needed (0x41C); The request is missing required account
1011 information such as the “requesting-user-name”, “requesting-user-uri”, “job-account-
1012 id”, or “job-accounting-user-id”.
- 1013 client-error-account-closed (0x41D); The requesting user’s account has been
1014 closed.
- 1015 client-error-account-limit-reached (0x41E); The requesting user’s account has
1016 reached its limit or exhausted any remaining balance.
- 1017 client-error-account-authorization-failed (0x41F); The [Job Creation Request](#) is
1018 missing the “job-authorization-uri” operation attribute, the supplied value is not valid,
1019 or the value supplied has expired.
- 1020

Deleted: ‘conflicting-attributes’:
The Job Template or Document
Template attributes contain
conflicting values.¶

Deleted: ‘job-release-wait’: The
Job is held until released for
printing on a particular output
device.¶
Deleted: ‘unsupported-attributes-or-values’:
The Job Template or Document-
Template attributes contain
unsupported attributes or values.¶

Deleted: print j

Deleted: creation

Deleted: request

1036 9. Conformance Requirements

1037 This section summarizes the Conformance Requirements detailed in the definitions in this
1038 document for Clients and Printers.

1039 9.1 Conformance Requirements for Clients

1040 In order for a Client to claim conformance to this specification, a Client MUST support the
1041 following:

- 1042 [5. The internationalization considerations in section 10;](#) and
1043 1. [The security consideration in section 11.](#)

1044 9.2 Conformance Requirements for Printers

1045 In order for a Printer to claim conformance to this specification, a Printer MUST support:

- 1046 [2. The internationalization considerations in section 10;](#) and
1047 3. [The security consideration in section 11.](#)

1048 Printers that conform to HTTP Digest Access Authentication [RFC7616] and/or the HTTP
1049 'Basic' Authentication Scheme [RFC7617] MUST support the "username" attribute in the
1050 "WWW-Authenticate" header (section 5).

1051 To claim conformance for the **RECOMMENDED** "job-authorization-uri" (section 6.1.2)
1052 operation attribute, Printers MUST support the "job-authorization-uri-supported" (section
1053 6.4.3) Printer attribute.

1054 10. Internationalization Considerations

1055 For interoperability and basic support for multiple languages, conforming implementations
1056 MUST support:

- 1057 1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8)
1058 [STD63] encoding of Unicode [UNICODE] [ISO10646]; and
1059 2. The Unicode Format for Network Interchange [RFC5198] which requires
1060 transmission of well-formed UTF-8 strings and recommends transmission of
1061 normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

1062 Unicode NFC is defined as the result of performing Canonical Decomposition (into base
1063 characters and combining marks) followed by Canonical Composition (into canonical
1064 composed characters wherever Unicode has assigned them).

1065 WARNING – Performing normalization on UTF-8 strings received from Clients and
1066 subsequently storing the results (e.g., in Job objects) could cause false negatives in Client

Deleted: The "print-scaling" (section 6.2.2) Job Template attribute
The "print-scaling-default" (section 6.4.9) and "print-scaling-supported" (section 6.4.10) Printer attributes

Deleted: The "print-scaling" (section 6.2.2) Job Template attribute
The "print-scaling-default" (section 6.4.9) and "print-scaling-supported" (section 6.4.10) Printer attributes
The "printer-dns-sd-name" (section 6.4.11) Printer attribute
The "printer-kind" (section 6.4.12) Printer attribute

Deleted: OPTIONAL

Deleted: Printers that support the "printer-icc-profiles" Printer attribute MUST support the "profile-uri-actual" (section 6.1.4) operation attribute.
Printers that conform to the JPEG File Interchange Format Version 1.02 [JFIF] MUST support:
The "jpeg-k-octets-supported" (section 6.4.4) Printer attribute
The "jpeg-x-dimension-supported" (section 6.4.5) Printer attribute
The "jpeg-y-dimension-supported" (section 6.4.6) Printer attribute
Printers that conform to the Document management -- Portable document format -- Part 1: PDF 1.7 [ISO32000] MUST support:
The "pdf-k-octets-supported" (section 6.4.7) Printer attribute
The "pdf-versions-supported" (section 6.4.8) Printer attribute

1107 searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now
1108 'hidden').

1109 Implementations of this specification SHOULD conform to the following standards on
1110 processing of human-readable Unicode text strings, see:

1111 Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

1112 Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

1113 Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

1114 Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

1115 Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

1116 Unicode Collation Algorithm [UTS10] – sorting

1117 Unicode Locale Data Markup Language [UTS35] – locale databases

1118 Implementations of this specification are advised to also review the following informational
1119 documents on processing of human-readable Unicode text strings:

1120 Unicode Character Encoding Model [UTR17] – multi-layer character model

1121 Unicode Character Property Model [UTR23] – character properties

1122 Unicode Conformance Model [UTR33] – Unicode conformance basis

1123 **11. Security Considerations**

1124 The IPP extensions defined in this document require the same security considerations as
1125 defined in the Internet Printing Protocol/1.1 [STD92].

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

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

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

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

1132 12. IANA Considerations

1133 12.1 Attribute Registrations

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

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

1137 The registry entries will contain the following information:

1138	Operation attributes:	Reference
1139	-----	-----
1140	charge-info-message (text)	[PWG5100.16]
1141	job-authorization-uri (uri)	[PWG5100.16]
1142	job-impressions-estimated (integer(1:MAX))	[PWG5100.16]
1143		
1144	▼ Job Status attributes:	Reference
1145	-----	-----
1146	job-charge-info (text)	[PWG5100.16]
1147		
1148	Job Template attributes:	Reference
1149	-----	-----
1150	job-account-type (type2 keyword name(MAX))	[PWG5100.16]
1151		
1152	▼ Printer Description attributes:	Reference
1153	-----	-----
1154	job-account-type-default (type2 keyword name(MAX))	[PWG5100.16]
1155	job-account-type-supported (1setOf (type2 keyword name(MAX))	[PWG5100.16]
1156		[PWG5100.16]
1157	job-authorization-uri-supported (boolean)	[PWG5100.16]
1158	printer-charge-info (text (MAX))	[PWG5100.16]
1159	printer-charge-info-uri (uri)	[PWG5100.16]
1160	printer-mandatory-job-attributes (1setOf keyword)	[PWG5100.16]
1161	printer-requested-job-attributes (1setOf keyword)	[PWG5100.16]

Deleted: profile-uri-actual (uri) → [PWG5100.16] ¶

Deleted: print-scaling (type2 keyword) → [PWG5100.16] ¶

Deleted: jpeg-k-octets-supported (rangeOfInteger(0:MAX)) → [PWG5100.16] ¶
 jpeg-x-dimension-supported (rangeOfInteger(0:65535)) → [PWG5100.16] ¶
 jpeg-y-dimension-supported (rangeOfInteger(1:65535)) → [PWG5100.16] ¶
 pdf-k-octets-supported (rangeOfInteger(0:MAX)) → [PWG5100.16] ¶
 pdf-versions-supported (1setOf type2 keyword) → [PWG5100.16] ¶
 print-scaling-default (type2 keyword) → [PWG5100.16] ¶
 print-scaling-supported (1setOf type2 keyword) → [PWG5100.16] ¶

Deleted: printer-dns-sd-name (name(63)) → [PWG5100.16] ¶
 printer-kind (1setOf type2 keyword) → [PWG5100.16] ¶

1162 12.2 Type2 keyword Registrations

1163 The keyword values defined in this specification will be published by IANA according to the
1164 procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

1165 <http://www.iana.org/assignments/ipp-registrations>

1166 The registry entries will contain the following information:

1167	Attributes (attribute syntax)	Reference
1168	Keyword Attribute Value	-----
1169	-----	-----
1170	job-account-type (type2 keyword name(MAX))	[PWG5100.16]
1171	general	[PWG5100.16]
1172	group	[PWG5100.16]

1205	none	[PWG5100.16]
1206	job-account-type (type2 keyword name(MAX))	[PWG5100.16]
1207	< any "job-account-type" value >	[PWG5100.16]
1208	job-account-type (1setOf (type2 keyword name(MAX)))	[PWG5100.16]
1209	< any "job-account-type" value >	[PWG5100.16]
1210		
1211	job-state-reasons (1setOf type2 keyword)	[STD92]
1212	account-authorization-failed	[PWG5100.16]
1213	account-closed	[PWG5100.16]
1214	account-info-needed	[PWG5100.16]
1215	account-limit-reached	[PWG5100.16]
1216	job-held-for-review	[PWG5100.16]

Deleted: conflicting-attributes→[PWG5100.16]

12.3 Operation Registrations

The operations defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

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

The registry entries will contain the following information:

1222	Operation Name	Reference
1223	-----	-----
1224	Create-Job (extension)	[PWG5100.16]
1225	Print-Job (extension)	[PWG5100.16]
1226	Print-URI (extension)	[PWG5100.16]
1227	Validate-Job (extension)	[PWG5100.16]

Deleted: job-release-wait→[PWG5100.16]
 unsupported-attributes-or-values→[PWG5100.16]
 pdf-versions-supported (1setOf type2 keyword)→[PWG5100.16]
 adobe-1.3→[PWG5100.16]
 adobe-1.4→[PWG5100.16]
 adobe-1.5→[PWG5100.16]
 adobe-1.6→[PWG5100.16]
 iso-15930-1_2001→[PWG5100.16]
 iso-15930-3_2002→[PWG5100.16]
 iso-15930-4_2003→[PWG5100.16]
 iso-15930-6_2003→[PWG5100.16]
 iso-15930-7_2010→[PWG5100.16]
 iso-15930-8_2010→[PWG5100.16]
 iso-16612-2_2010→[PWG5100.16]
 iso-19005-1_2005→[PWG5100.16]
 iso-19005-2_2011→[PWG5100.16]
 iso-19005-3_2012→[PWG5100.16]
 iso-32000-1_2008→[PWG5100.16]
 none→[PWG5100.16]
 pwg-5102.3→[PWG5100.16]

12.4 Status Code Registrations

The status codes defined in this specification will be published by IANA according to the procedures in the Internet Printing Protocol/1.1 [STD92] in the following file:

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

The registry entries will contain the following information:

1233	Value	Status Code Name	Reference
1234	-----	-----	-----
1235	0x0400:0x04FF	- Client Error:	
1236	0x041C	client-error-account-info-needed	[PWG5100.16]
1237	0x041D	client-error-account-closed	[PWG5100.16]
1238	0x041E	client-error-account-limit-reached	[PWG5100.16]
1239	0x041F	client-error-account-authorization-failed	[PWG5100.16]

1279 13. Overview of Changes

1280 13.1 IPP Transaction-Based Printing Extensions v1.1

1281 The following changes were made to the previous version of this specification
1282 [PWG5100.16-2013]:

- 1283 • The RECOMMENDED "printer-charge-info" and "printer-charge-info-uri" Printer
1284 Description attributes were added from [PWG5100.13-2012];
- 1285 • The RECOMMENDED "printer-mandatory-job-attributes" Printer Description attribute
1286 was added from [PWG5100.11-2010];
- 1287 • The RECOMMENDED "printer-requested-job-attributes" Printer Description attribute
1288 was added;
- 1289 • The "profile-uri" operation attribute was moved to the IPP Driverless Printing
1290 Extensions v2.0 (NODRIVER);
- 1291 • The "print-scaling" Job Template attribute was moved to the IPP Driverless Printing
1292 Extensions v2.0 (NODRIVER);
- 1293 • The "jpeg-k-octets-supported", "jpeg-x-dimension-supported", "jpeg-y-dimension-
1294 supported", "pdf-k-octets-supported", "pdf-versions-supported", "print-scaling-
1295 default", "print-scaling-supported", "printer-dns-sd-name", and "printer-kind" Printer
1296 Description attributes were moved to the IPP Driverless Printing Extensions v2.0
1297 (NODRIVER);
- 1298 • The 'conflicting-attributes', 'job-release-wait', and 'unsupported-attributes-or-values'
1299 keywords for the "job-state-reasons" Job Status attribute were moved to the IPP
1300 Enterprise Printing Extensions v2.0 (EPX); and
- 1301 • The required state for Jobs submitted to release printing services was relaxed.
1302

1303 **14. References**1304 **14.1 Normative References**

- 1305 [BCP14] S. Bradner, "Key words for use in RFCs to Indicate Requirement
1306 Levels", RFC 2119/BCP 14, March 1997,
1307 <https://tools.ietf.org/html/bcp14>
- 1308 [ISO10646] "Information technology -- Universal Coded Character Set (UCS)",
1309 ISO/IEC 10646:2011
- 1310 [PWG5100.7] M. Sweet, "IPP Job Extensions v2.0 (JOBEXT)", PWG 5100.7-2019,
1311 August 2019, [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext20-
1312 20190816-5100.7.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext20-20190816-5100.7.pdf)
- 1313 [PWG5100.12] R. Bergman, H. Lewis, I. McDonald, M. Sweet, "IPP 2.0, 2.1, and 2.2",
1314 PWG 5100.12-2015, October 2015,
1315 [https://www.pwg.org/pub/pwg/standards/std-ipp20-20151030-
1316 5100.12.pdf](https://www.pwg.org/pub/pwg/standards/std-ipp20-20151030-5100.12.pdf)
- 1317 [PWG5100.14] M. Sweet, I. McDonald, ~~A. Mitchell, J. Hutchings~~, "IPP Everywhere",
1318 PWG 5100.14-~~2013, January 2013~~,
1319 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippeve10-20130128-
1320 5100.14.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippeve10-20130128-5100.14.pdf)
- 1321 [RFC3380] T. Hastings, R. Herriot, C. Kugler, H. Lewis, "Internet Printing
1322 Protocols (IPP): Job and Printer Set Operations", RFC 3380,
1323 September 2002, <https://tools.ietf.org/html/rfc3380>
- 1324 [RFC5198] J. Klensin, M. Padlipsky, "Unicode Format for Network Interchange",
1325 RFC 5198, March 2008, <https://tools.ietf.org/html/rfc5198>
- 1326 [RFC7230] R. Fielding, J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1):
1327 Message Syntax and Routing", RFC 7230, June 2014,
1328 <https://tools.ietf.org/html/rfc7230>
- 1329 [RFC7616] R. Shekh-Yusef, D. Ahrens, S. Bremer, "HTTP Digest Access
1330 Authentication", RFC 7616, September 2015,
1331 <https://tools.ietf.org/html/rfc7616>
- 1332 [RFC7617] J. Reschke, "The 'Basic' HTTP Authentication Scheme", RFC 7617,
1333 September 2015, <https://tools.ietf.org/html/rfc7617>
- 1334 [STD63] F. Yergeau, "UTF-8, a transformation format of ISO 10646", RFC
1335 3629/STD 63, November 2003, <https://tools.ietf.org/html/std63>

Deleted: [ISO15930-1] → "Graphic technology -- Prepress digital data exchange -- Use of PDF -- Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)", ISO 15930-1:2001, 2001
[ISO15930-3] → "Graphic technology -- Prepress digital data exchange -- Use of PDF -- Part 3: Complete exchange suitable for colour-managed workflows (PDF/X-3)", ISO 15930-3:2002
[ISO15930-4] → "Graphic technology -- Prepress digital data exchange using PDF -- Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)", ISO 15930-4:2003
[ISO15930-6] → "Graphic technology -- Prepress digital data exchange using PDF -- Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3)", ISO 15930-6:2003
[ISO15930-7] → "Graphic technology -- Prepress digital data exchange using PDF -- Part 7: Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile ... [4]

Deleted: [PWG5100.11] → S. Kennedy, "IPP Enterprise Printing Extensions v2.0 (EPX)", PWG 5100.11-YYYY, Month YYYY, <https://ftp.pwg.org/pub/pwg/ftp>

Deleted: [PWG5100.13] → S. Kennedy, "IPP Driverless Printing Extensions v2.0", PWG 5100.13-YYYY, Month YYYY, <https://ftp.pwg.org/pub/pwg/ftp>

Deleted: v1.1

Deleted: YYYY

Deleted: Month YYYY

Deleted: <https://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippeve11-20190827.pdf>

Field Code Changed

Deleted: [RFC6763] → S. Cheshire, M. Krocmaal, "DNS-Based Service Discovery", RFC 6763, February 2013, <https://tools.ietf.org/html/rfc6763>

- 1500 [STD92] M. Sweet, I. McDonald, "Internet Printing Protocol/1.1", STD 92, June
1501 2018, <https://tools.ietf.org/html/std92>
- 1502 [UAX9] Unicode Consortium, "Unicode Bidirectional Algorithm", UAX#9,
1503 February 2019, <https://www.unicode.org/reports/tr9>
- 1504 [UAX14] Unicode Consortium, "Unicode Line Breaking Algorithm", UAX#14,
1505 February 2019, <https://www.unicode.org/reports/tr14>
- 1506 [UAX15] M. Davis, M. Duerst, "Unicode Normalization Forms", Unicode
1507 Standard Annex 15, February 2019,
1508 <https://www.unicode.org/reports/tr15>
- 1509 [UAX29] Unicode Consortium, "Unicode Text Segmentation", UAX#29,
1510 February 2019, <https://www.unicode.org/reports/tr29>
- 1511 [UAX31] Unicode Consortium, "Unicode Identifier and Pattern Syntax",
1512 UAX#31, February 2019, <https://www.unicode.org/reports/tr31>
- 1513 [UNICODE] Unicode Consortium, "Unicode Standard", Version 12.0.0, March
1514 2019, <https://www.unicode.org/versions/Unicode12.0.0/>
- 1515 [UTS10] Unicode Consortium, "Unicode Collation Algorithm", UTS#10, April
1516 2019, <https://www.unicode.org/reports/tr10>
- 1517 [UTS35] Unicode Consortium, "Unicode Locale Data Markup Language",
1518 UTS#35, March 2019, <https://www.unicode.org/reports/tr35>
- 1519 [UTS39] Unicode Consortium, "Unicode Security Mechanisms", UTS#39, May
1520 2019, <https://www.unicode.org/reports/tr39>

1521 14.2 Informative References

- 1522 [PrintTalk] CIP4, "Print Talk Specification Version 2.0", October 2019,
1523 <https://confluence.cip4.org/display/PUB/PrintTalk>
- 1524 [\[PWG5100.11-2010\]](#)
1525 [T. Hastings, D. Fullman, "IPP Job and Printer Extensions - Set 2](#)
1526 [\(JPS2\)", PWG 5100.11-2010, October 2010,](#)
1527 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-20101030-5100.11.pdf)
1528 [20101030-5100.11.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-20101030-5100.11.pdf)
- 1529 [PWG5100.13-2012]
1530 M. Sweet, I. McDonald, "IPP: Job and Printer Extensions - Set 3
1531 (JPS3)", PWG 5100.13-2012, July 2012,
1532 [https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-5100.13.pdf)
1533 [20120727-5100.13.pdf](https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-5100.13.pdf)

Deleted: [BONJOUR] Apple Inc., "Bonjour Printing Specification Version 1.2.1", February 2015, <https://developer.apple.com/bonjour/printing-specification/bonjourprinting-1.2.1.pdf>

- 1542 [PWG5100.16-2013]
1543 M. Sweet, "IPP Transaction-Based Printing Extensions", PWG
1544 5100.16-2013, November 2013,
1545 <https://ftp.pwg.org/pub/pwg/candidates/cs-ipptrans10-20131108-5100.16.pdf>
1546
- 1547 [UTR17] Unicode Consortium "Unicode Character Encoding Model", UTR#17,
1548 November 2008, <https://www.unicode.org/reports/tr17>
- 1549 [UTR23] Unicode Consortium "Unicode Character Property Model", UTR#23,
1550 May 2015, <https://www.unicode.org/reports/tr23>
- 1551 [UTR33] Unicode Consortium "Unicode Conformance Model", UTR#33,
1552 November 2008, <https://www.unicode.org/reports/tr33>
- 1553 [UNISECFAQ] Unicode Consortium "Unicode Security FAQ", November 2016,
1554 <https://www.unicode.org/faq/security.html>

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1564 16. Change History

1565 This section will be removed when this document is published.

1566 16.1 February 20, 2020

- 1567 • Abstract: Removed PIN and Release Printing
- 1568 • Removed "jpeg-xxx", "pdf-xxx", "print-scaling", "printer-dns-sd-name", and "printer-kind" attributes (these will now live in the updated PWG 5100.13)
- 1569
- 1570 • Updated references to point to published documents rather than the current working drafts
- 1571
- 1572 • Section 2.3: Fixed spelling mistake in definition of Release Printing
- 1573 • Section 3.1: Fixed typo
- 1574 • Sections 4.2 and 4.3: Job Status attributes
- 1575 • Section 4.3: Capitalize defined terms
- 1576 • Section 6.2.2: Remove mention of OpenXPS
- 1577 • Moved "printer-mandatory-job-attributes" from PWG 5100.11 to this specification
- 1578 • Moved "jpeg-k-octets-supported", "jpeg-x-dimension-supported", "jpeg-y-dimension-supported", "pdf-k-octets-supported", "pdf-versions-supported", "print-scaling", "print-scaling-default", "print-scaling-supported", "printer-dns-sd-name", "printer-kind", and "profile-uri" to NODRIVER
- 1579
- 1580
- 1581
- 1582 • Moved 'conflicting-attributes', 'job-release-wait', and 'unsupported-attributes-or-values' keywords to EPX
- 1583

1584 16.2 January 30, 2020

- 1585 • Section 4: Changed title to "IPP Model"
- 1586 • Section 6.4: Added printer-requested-job-attributes attribute from the Job Accounting draft.
- 1587
- 1588 • Section 7.1: Broke up SHOULDs into two separate sentences.

1589 **16.3 January 28, 2020**

- 1590 • Status: Stable
- 1591 • Added line numbers
- 1592 • Global: Reviewed all usage of MAY, replaced with "can" or "SHOULD" as appropriate
- 1593 • Global: Paid Imaging Service is a defined term, use it
- 1594 • Global: PIN Printing is a defined term, use it
- 1595 • Section 4.3: Fixed some editorial issues suggested in the December 19, 2019 concall

1596 **16.4 December 16, 2019**

1597 Initial revision.

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