



A Project of the PWG-IPP Working Group

Printer Working Group (PWG): Semantic Model

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Abstract

This document is a high level overview of the Semantic Model defined by the PWG. This document briefly describes the semantic elements defined in various PWG documents and PWG documents submitted to the IETF. The Semantic Model also incorporates additions made by other groups addressing print systems. With every semantic element included a reference is provided to the document and section that details the semantic definition.

The Semantic Model contains a high level description of the Actions that operate on the objects and attributes in the model. This document does not describe the mapping of the semantics onto a specific protocol or network environment.

PWG Semantic Model

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172

173 **1 Introduction**

174

175 This document is a high level overview of the Semantic Model defined by the PWG. This
176 document briefly describes the semantic elements defined in various PWG documents and PWG
177 documents submitted to the IETF. The Semantic Model also incorporates additions made by other
178 groups addressing print systems. With every semantic element included a reference is provided to
179 the document and section that details the semantic definition.

180 The Semantic Model contains a high level description of the Actions that operate on the objects and
181 attributes in the model. This document does not describe the mapping of the semantics onto a
182 specific protocol or network environment.

183 **2 Terminology**

Action	A request that a Print Client makes to an object to perform some activity. The object returns a response to the Print Client that contains some information about the effect of the action on the object.
Data Class	A template for data describing an object and representing its state. Each attribute in the data class represents a semantic element of the associated object.
Document	An object containing descriptive and state information for a logical unit of information to be printed. The object may contain processing information. The document content is represented by a single data (e.g. PDL, image) file and contains Pages.
Document Processing Attributes	Document Attributes supplied by the Print Client to direct the printing of a Document that the Printer copies to the Document. Examples: Copies, Finishings, Media, NumberUp.
End User	A print client that has no special rights on the printer. The End User typically submits jobs. The End User is allowed to query the printer, jobs and documents and control jobs based on policy.
Impression	Everything printed on a single side of a media
Job	An object that represents the submission of work for the printer. It contains descriptive and state information as well as default Document Processing Attributes. Jobs contain one or more Documents
Job Description Attributes	Job Attributes supplied by the Print Client to describe the Job. Examples: JobName, RequestingUserName, JobRecipient
Job Processing Attributes	Job Attributes supplied by the Print Client to direct the printing of the Job as a whole that the Printer copies to the Job. Examples: JobHoldUntil, JobPriority, JobCopies, JobFinishings.
Object	A entity that instantiates a data class and implements the appropriate actions.
Operator	A print client that has special rights on the printer. The Operator typically oversees the printer. The Operator is allowed to query and control the printer, jobs and documents based on site policy.
MediaSheet	A sheet of paper, or other material, used for printing
Page	A logical entity that represents the information contained on a single side of a sheet of media. Note that this is the electronic form and that multiple pages can be rendered into a single impression through N-Up printing

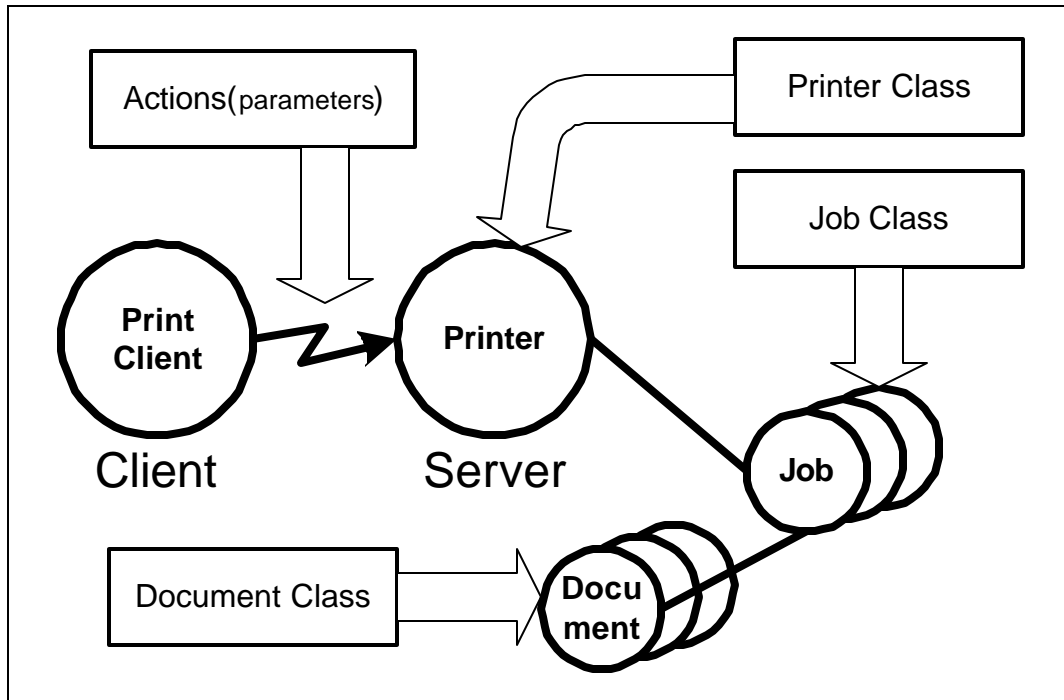
PWG Semantic Model

PDL	(Page Description Language) A language that describes the content to be printed and how it will be laid out on a page (e.g. Adobe PostScript®, Hewlett Packard PCL®).
Print Client	An application or network entity that performs actions
Printer	An object that represents a printing device, set of printing devices, or a printing service and contains zero or more Jobs
Type 1 keyword	All the values are defined in the specification. Additional values require a new specification.
Type 2 keyword	An initial set of values is defined in the specification. This working group registers additional values after review. The initial versions of the specification will contain the values registered so far. After the specification is approved, this working group will register additional values after approval.
Type 3 keyword	An initial set of values is defined in the specification. Additional values are registered without working group review. The initial versions of the specification contain the values registered so far. After the specification is approved, this working group will register additional values without approval.

184

185 **3 Model Overview**

186 The Printer Working Group (PWG) has defined a simplified printing model. It represents printing
 187 in either a client/server print paradigm or a peer-to-peer print paradigm. The PWG model describes
 188 the device as a Printer object. A Printer object may represent one or more physical Printers.
 189 Another object is the Job. A Printer can contain zero or more Jobs and a Job is contained in only
 190 one Printer. Each Job can contain zero or more documents. A Job can contain zero or more
 191 Documents and a Document is contained in only one Printer. The PWG model contains methods
 192 that act upon these objects.



193

194

Figure 1 Model Overview

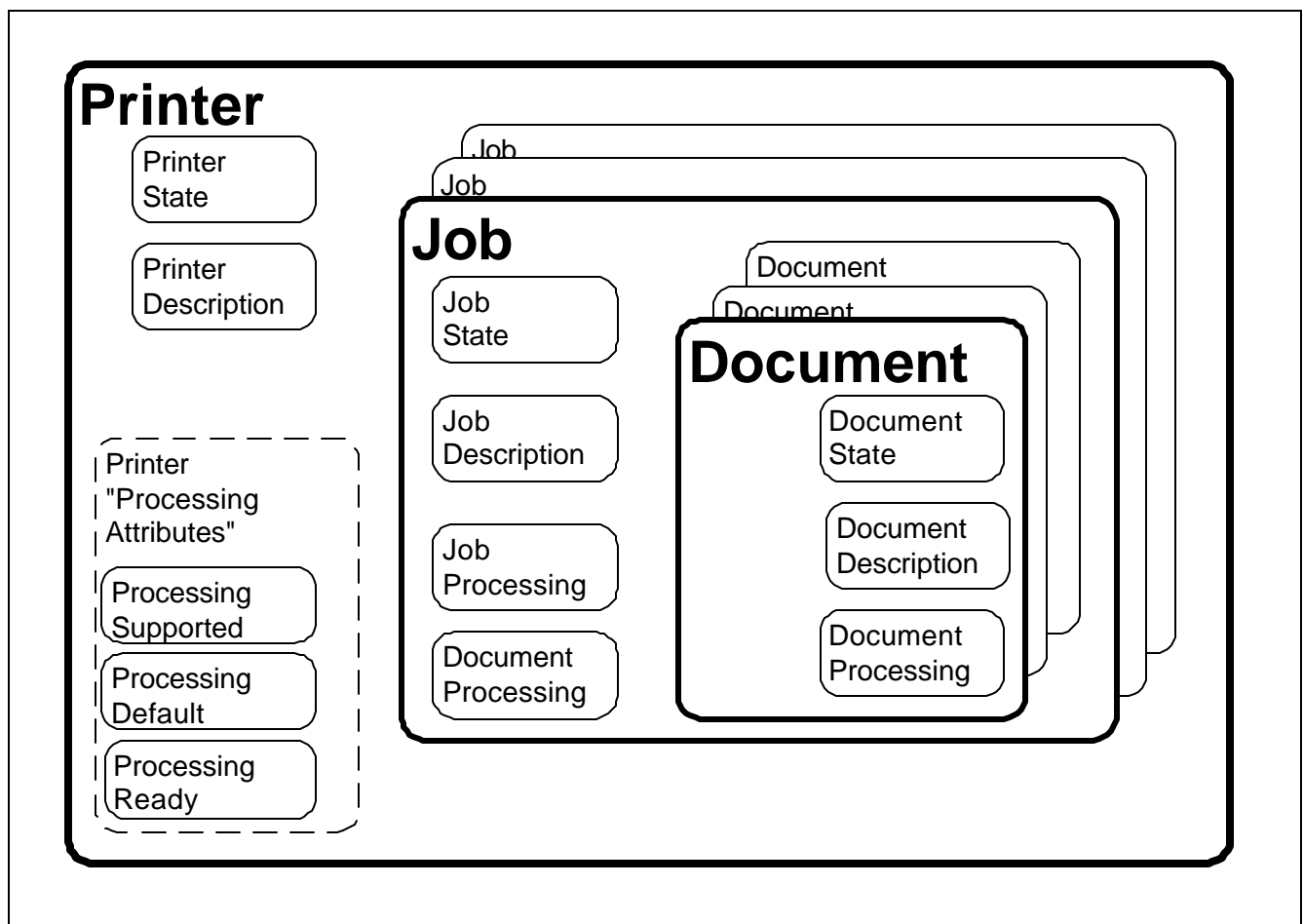
PWG Semantic Model

195 The objects are represented in the semantic model as data classes. The methods are represented as a
196 set of actions that act upon those data classes. The actions permit the creation and control of Jobs
197 and documents as well as the submission of Document data. The content of a Document is
198 included in the submission or can be accessed via a URL reference. There are also actions to query
199 a Printer, Job or Document to access their attributes or to list their contained objects.

200 The model uses a number of terms with specific meaning for a printer.

201 4 Data Classes

202 This section describes the data classes in the PWG semantic model. Some of the classes are taken
203 from the model and semantics of IPP [rfc2911]. Figure 2 Shows the data classes, their attribute
204 groups and the containment relationship between the classes



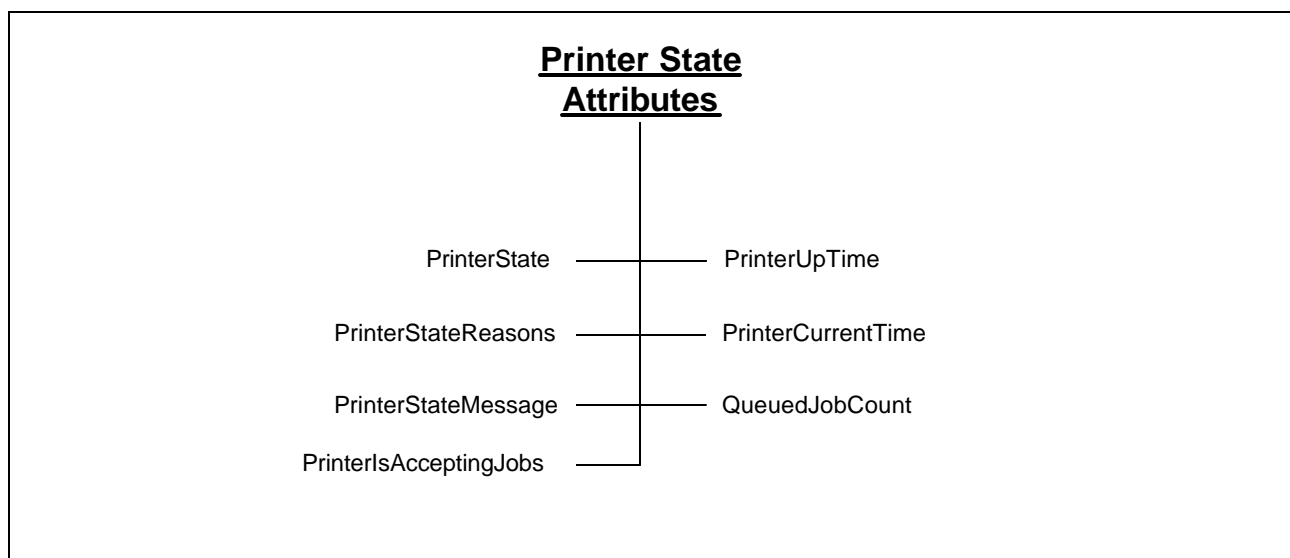
205
206
Figure 2 Data Classes

207 **4.1 Printer Object Class**

208 The Printer class is represented by a collection of attributes as shown in Figure 2. The Printer
209 Attributes are presented in detail in Table 6. The printer object also contains attributes that
210 describe the valid processing attribute values. (See section 4.3.2 for processing attributes) The
211 Printer class is the container for Jobs.

212 **4.1.1 Printer State Attributes**

213 Figure 3 below shows the Printer State Attributes. These attributes represent the state of the printer
214 such as the number of jobs or existing error conditions. The values of th attributes in this group are
215 changed by automata. End Users cannot directly modify their values. The End User can affect the
216 values of these attributes through actions (e.g. PausePrinter can change the value of
217 PrinterIsAcceptingJobs”). The semantics of the attributes are summarized in Table 6.



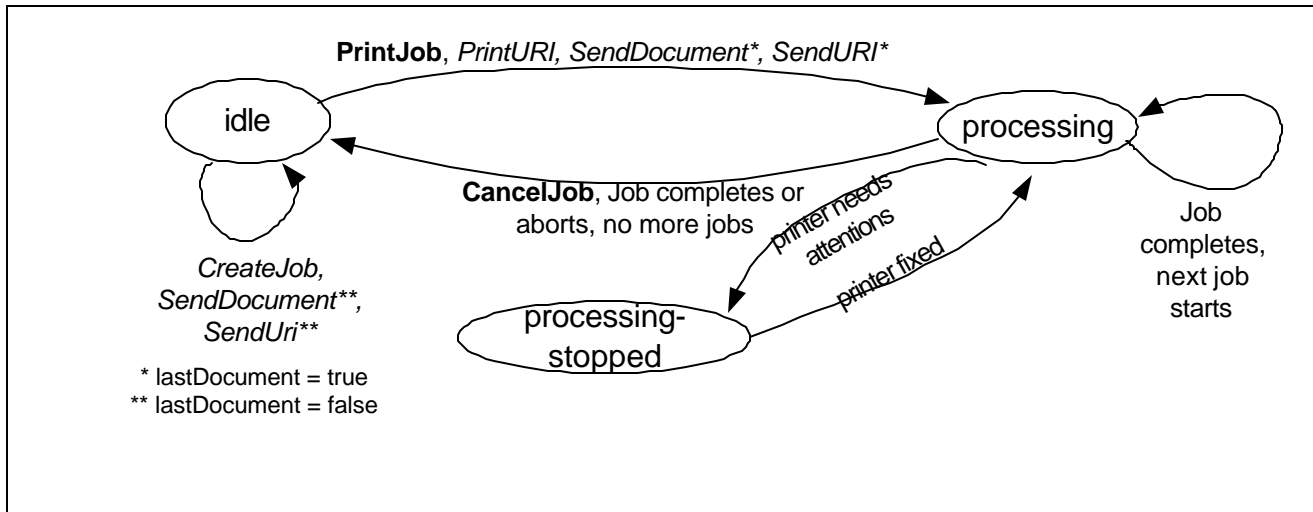
218
219

Figure 3 Printer State Attributes

220 **4.1.1.1 The Printer Life Cycle**

221 The “PrinterState” attribute is one of the most important Printer Description attributes. Figure 4
222 shows the values of the “PrinterState” attribute and the Printer life cycle as affected by actions on
223 the Printer and job processing.

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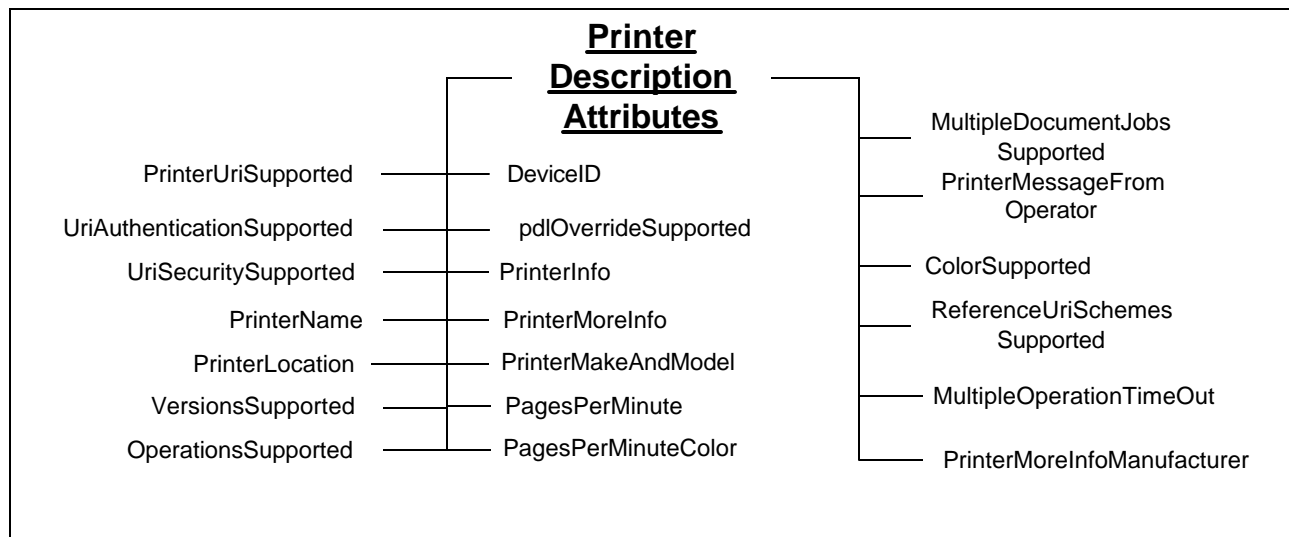
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225

226

Figure 4 - The "PrinterState" attribute and the Printer Life Cycle

227 4.1.2 Printer Description Attributes

228 Figure 5 below shows the Printer Description Attributes. These attributes contain information that
 229 describes the printer such as its make, where it's located and its speed. An automaton controls
 230 some of the attributes in this group (e.g. "PagesPerMinute"). Others attributes in this group can be
 231 modified by Operators or Administrators (e.g. "PrinterName"). The semantics of the attributes are
 232 summarized in Table 6.



233
234

Figure 5 Printer Description Attributes

235 4.1.3 Printer Defaults, Supported and Ready Processing Attributes

236 See section 4.3.2 below for the attributes that may comprise these groups. Processing Attributes
 237 are the union of Job Processing Attributes and Document Processing Attributes. If a Processing
 238 attribute (e.g. Media) is supported, the Printer must have an associated Processing Supported
 239 Attribute (e.g. MediaSupported) and Processing Default Attribute (e.g. MediaDefault) Printer

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240 attribute. There may be an associated Processing Ready Attribute (e.g. MediaReady) Printer
241 attribute. By retrieving the Printer Processing attributes, a Client can determine all the Job and
242 Document Processing attributes and values that may be used in creating Jobs and Documents.

243 4.1.3.1 Processing Supported Attributes

244 These attributes list all the currently configured valid values for each Job Processing Attribute and
245 Document Processing Attribute. Though the Printer is configured to support the feature, human
246 intervention may be required to process the job (e.g. selected paper may have to be loaded into a
247 tray). The syntax for Processing Attributes Supported is multi-valued when the associated
248 processing attribute is a string. When syntax of the processing attribute is an integer, the syntax of
249 the corresponding Processing Supported Attribute is usually RangeOfInteger which indicates the
250 minimum and maximum values supported by the Printer. However, there are some exceptions as
251 indicated in Table 1.

252 **Table 1-Integer syntaxes whose ProcessingAttributeSupported syntax isn't RangeOfInteger**

"xxx" attribute name	"xxx" syntax	"xxxSupported" syntax
JobPriority	Integer	Integer (Max value)
Copies	Integer	Integer (Max value)
PageRanges	RangeOfInteger (multivalued)	Boolean (are PageRanges supported)

253 4.1.3.2 Processing Default Attributes

254 These attributes give the default value for the associated processing instruction if the Processing
255 Attribute of the job and document are not supplied and the instructions is not embedded in the
256 PDL. The syntax for the Processing Default Attributes is the same as the corresponding Processing
257 Attribute. The only exception is that the PageRanges attribute does not have a PageRangesDefault
258 attribute.

259 4.1.3.3 Processing Ready Attributes

260 These attributes give the features available without human intervention. The syntax for a
261 Processing Ready Attribute is the same as the corresponding Processing Attribute.

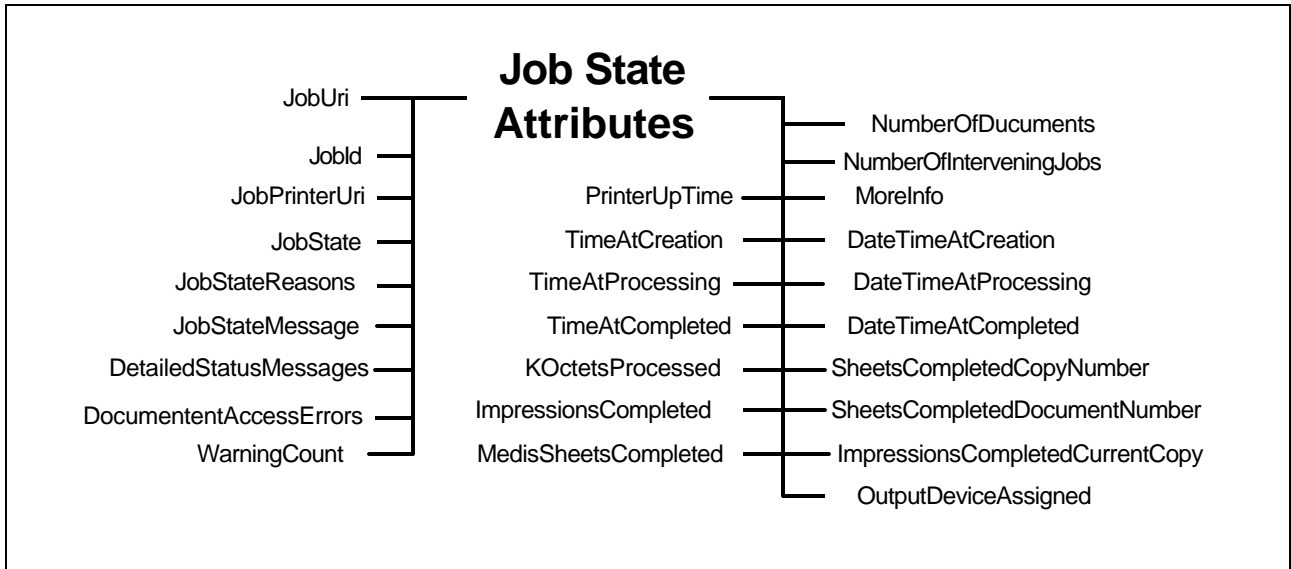
262 4.2 Job Object Class

263 The Job object class is represented by a collection of attributes divided into four groups as shown
264 in Figure 2. The Job class also contains the document class

- 265 Job State Attributes – See Section 4.2.1
- 266 Job Description Attributes – See section 4.2.2.
- 267 Job Processing Attributes – See section 4.4.1
- 268 Document Processing Attributes – See section 4.4.2

269 **4.2.1 Job State Attributes**

270 Figure 6 below shows the Job State Attributes. Automata primarily control the attributes in this
 271 group. End Users cannot directly modify their values. The End User can affect the values of these
 272 attributes through actions (e.g. CancelJob can change the value of JobStateReasons”). The
 273 semantics of the attributes are summarized in Table 4.

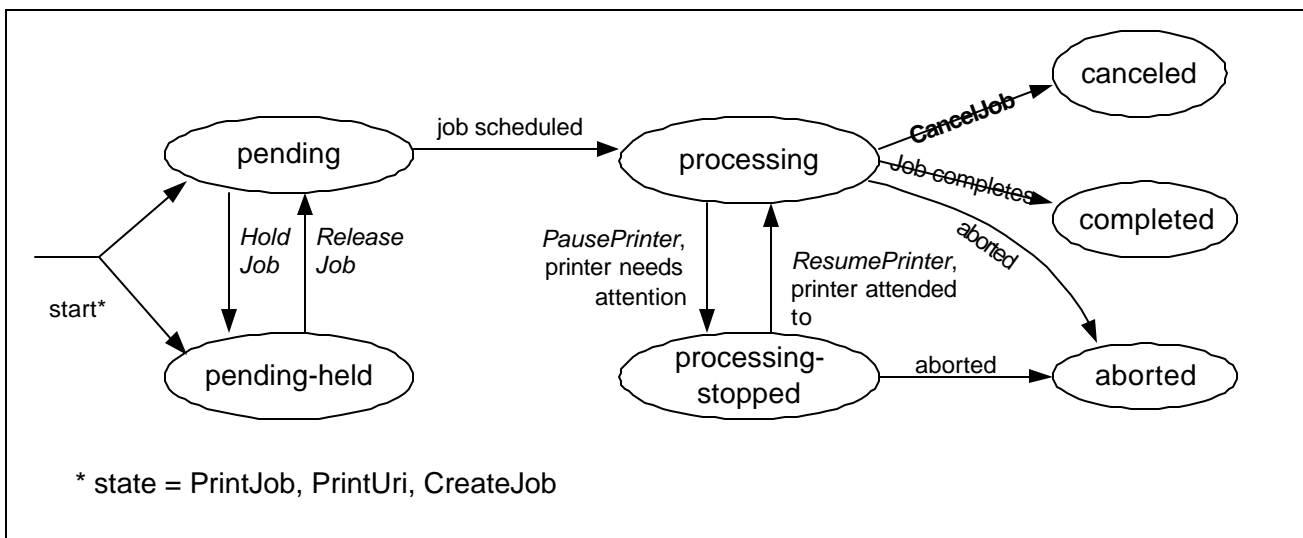


274
 275

276 **Figure 6 Job State Attributes**

277 **4.2.1.1 The Job Life Cycle**

278 The “JobState” attribute is one of the most important Job State attributes. Figure 7 shows the
 279 values of the “JobState” attribute and the Job life cycle as affected by actions on the Job, Printer,
 280 and job processing.

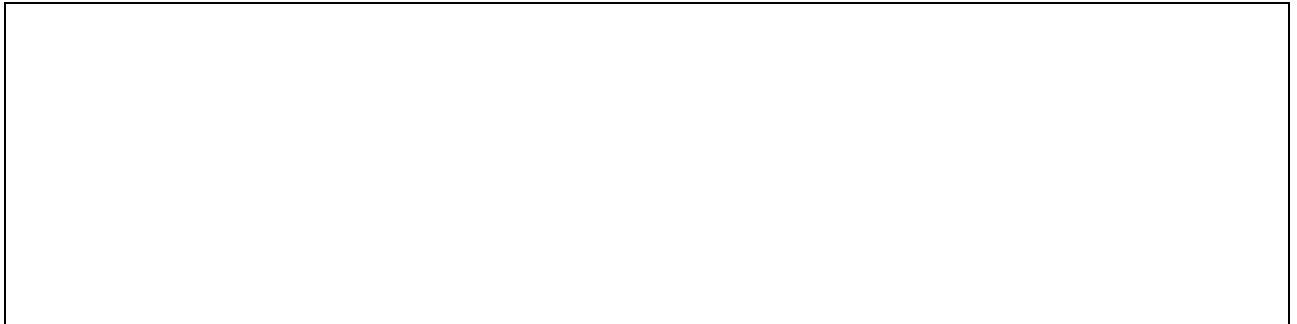


281
 282

Figure 7 The "JobState" Job Attribute and the Job object life Cycle

283 **4.2.2 Job Description Attributes**

284 **Figure 8** below shows the Job Attributes. These attributes contain information from the End User
285 at Job creation that describes the Job such as its name. Automaton may modify the value of some
286 of the attributes in this group (e.g. “KOctets”) if more reliable data is obtained. The semantics of
287 the attributes are summarized in Table 4.



288

289

Figure 8 Job Description Attributes

290 **4.3 Document Object Class**

291 The Document object class is represented by a collection of attributes divided into Three groups as
292 shown in Figure 2. The Document class contains the document class

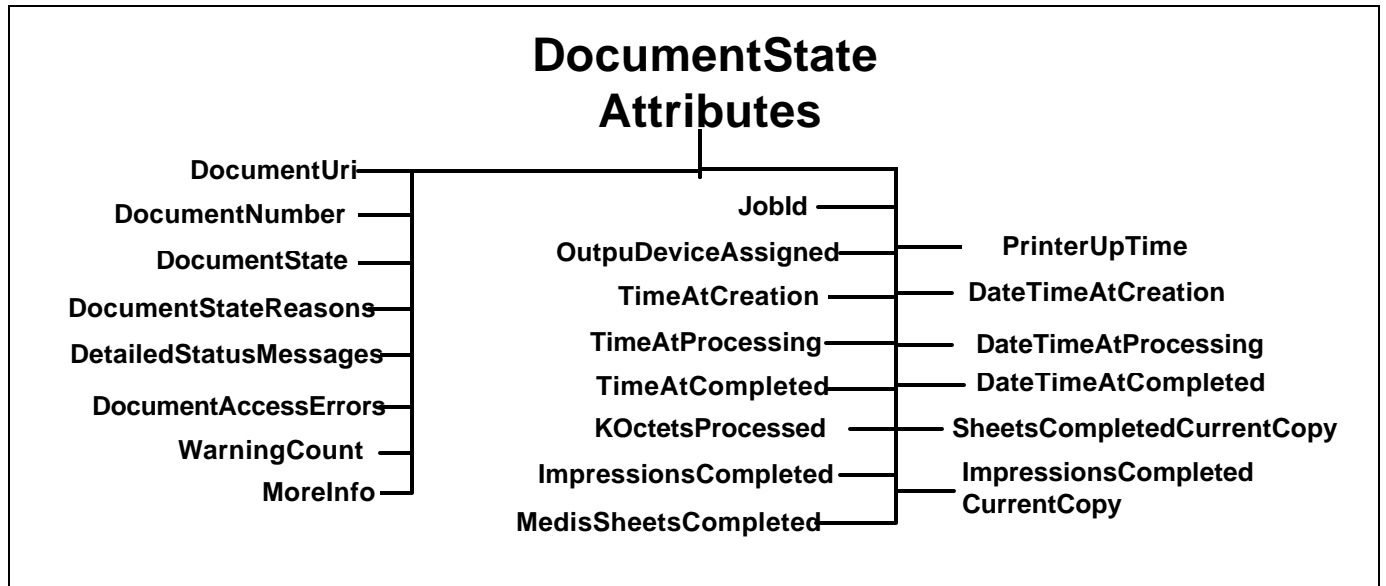
293 Document State Attributes – See Section 4.3.1.

294 Document Description Attributes – See section 4.3.2.

295 Document Processing Attributes – See section 4.4.2

296 **4.3.1 Document State Attributes**

297 Figure 9 shows the Document State Attributes. Automata primarily control the attributes in this
298 group. End Users cannot directly modify their values. The End User can affect the values of these
299 attributes through actions (e.g. CancelDocument can change the value of DocumentsState”). The
300 semantics of the attributes are summarized Table 5

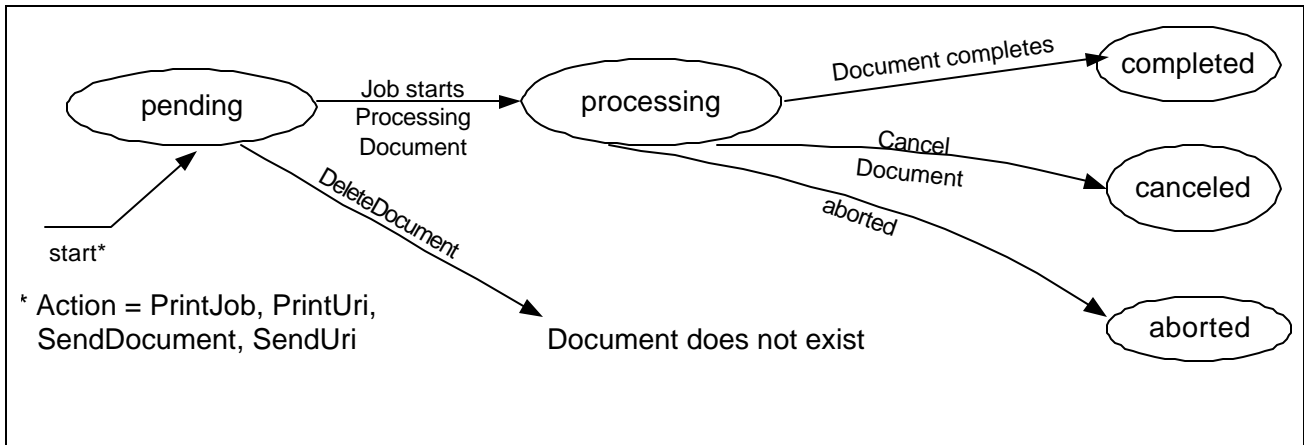


301
302

Figure 9 Document State Attributes

303 **4.3.1.1 The Document Life Cycle**

304 The “DocumentState” attribute is one of the most important Document State Attributes. Figure 10
 305 shows the values of the “DocumentState” attribute and the Document life cycle as affected by
 306 Actions and job processing. Documents are not active objects and their life cycle is closely tied to
 307 the lifecycle of a Job. Documents basically have three states. The first is waiting to be processed
 308 by a Job (i.e. pending). The second state is from the time the Job first starts processing the
 309 Document(i.e processing) and until it reaches its terminating state. The last state for a Document is
 310 its terminal state (i.e. completed, canceled, aborted)



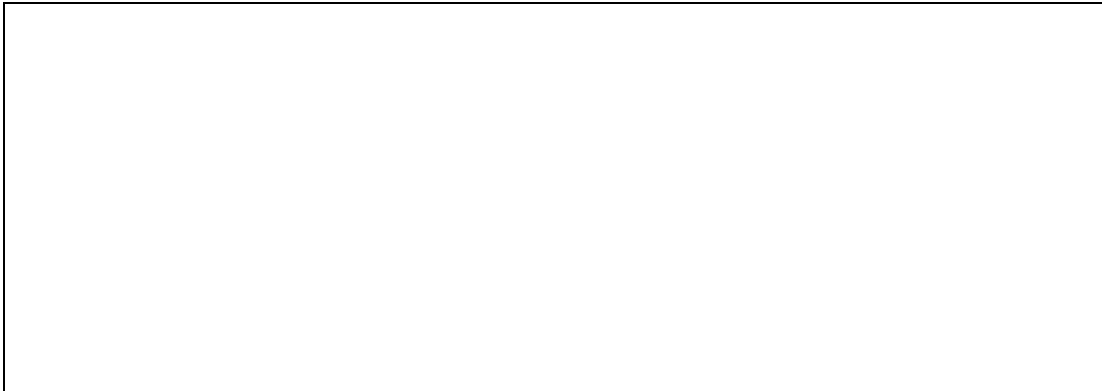
311
312

Figure 10 "DocumentState" Attribute and Document object life Cycle

314 **4.3.2 Document Description Attributes**

315 Figure 9 shows the Document Description Attributes. These attributes contain information from
 316 the End User at Document creation that describes the document such as its size. Automaton may

317 modify the value of some of the attributes in this group (e.g. “KOctets”) if more reliable data is
318 obtained. The semantics of the attributes are summarized in **Table 5**



319

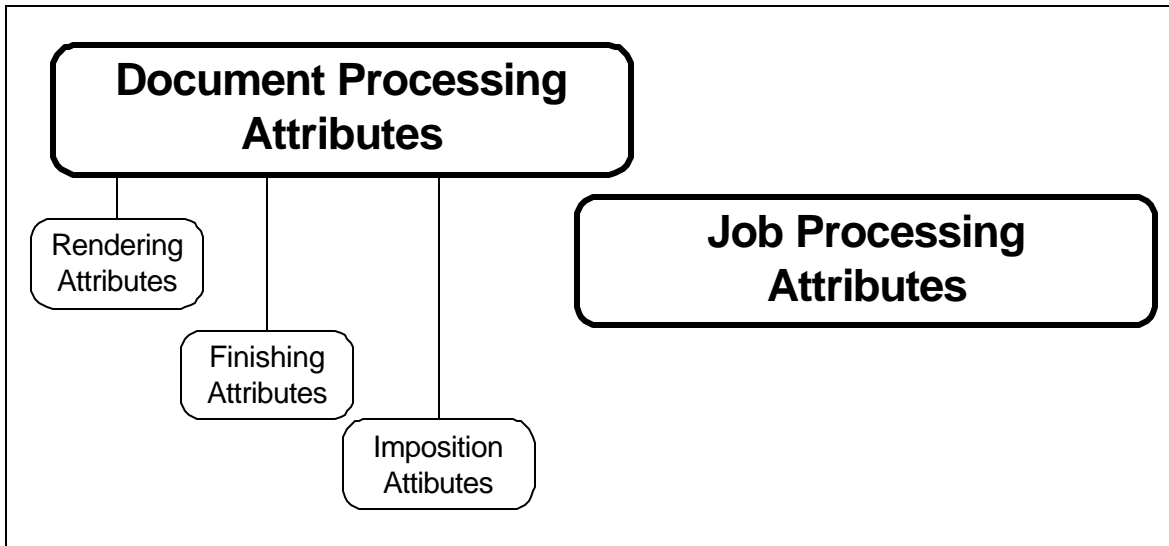
320

Figure 11 Document DescriptionAttributes

321 **4.4 Processing Attributes**

322 Processing attributes are instructions to be applied to jobs and documents. They indicate such
323 things as the priority for scheduling a job or the number of copies for a document. A Printer should
324 support each Processing Attribute that represents a feature of the Printer. The Processing attributes
325 are split into two groups. One groups applies to Jobs and the other to Documents. The Document
326 Processing group contains three sub-groups. (See Figure 12)

- 327 1) Job Processing Attributes are processing instructions applied the Job level. See section
328 4.4.1.
- 329 2) Document Processing Attributes are specific to documents. See section 4.4.2.



330

331

Figure 12 - Processing Attribute Groups

332 **4.4.1 Job Processing Attributes**

333 Figure 13 shows the Job Processing Attributes. These attributes apply to the job as a whole as
334 opposed to each document in the job. The semantics of the attributes are summarized in Table 3
335 along with a brief description of each attribute.



336

337

Figure 13 Job Processing Attributes

338 **4.4.2 Document Processing Attributes**

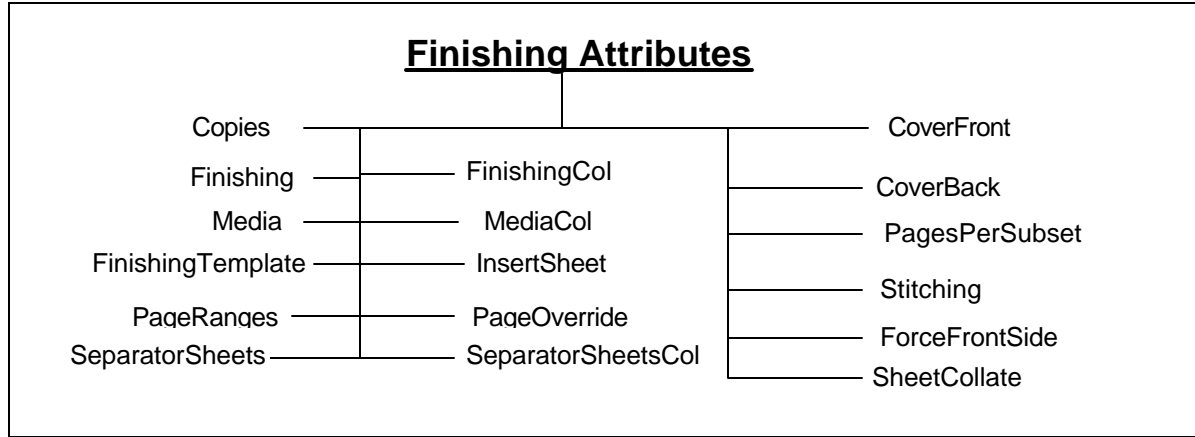
339 Document Processing Attributes are attributes that are applied to documents (e.g. “copies”). The
340 Document Processing Attributes can be applied at the Job or Document level. If the attributes are
341 applied at the Job level they are the default values for all the Documents in the Job. If the attributes
342 are applied at the Document level they apply only to that Document. The semantics of the
343 Processing attributes are summarized in Table 3. The Document Processing attributes are split into
344 three groups as shown in Figure 12:

- 345 1) Finishing Attributes define how multiple physical sheets are manipulated to create final
346 output products. See section 4.4.2.1.
- 347 2) Imposition Attributes identify how the logical pages look on the output media. See section
348 4.4.2.2.
- 349 3) Rendering Attributes determine the quality and resolution of how marks are made on the
350 page. See section 4.4.2.3.

351 **4.4.2.1 Finishing Attributes**

352 Figure 14 shows the Finishing Attributes. Finishing Attributes define how multiple physical sheets
353 are manipulated to create final output products. See Table 3 for summary of attribute semantics.

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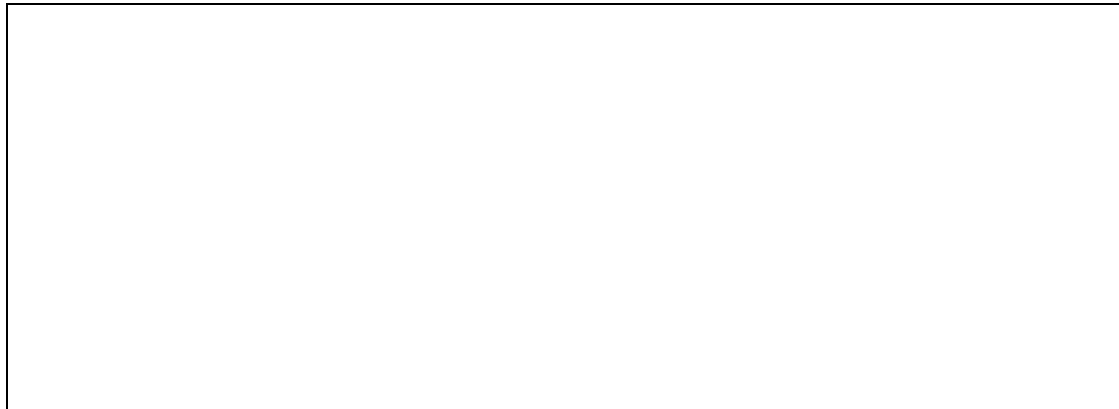
354

355

Figure 14 Finishing Attributes

356 4.4.2.2 Imposition Attributes

357 Figure 15 shows the Imposition Attributes. Imposition Attributes identify how the logical pages
358 look on the output media. See Table 3 for summary of attribute semantics.



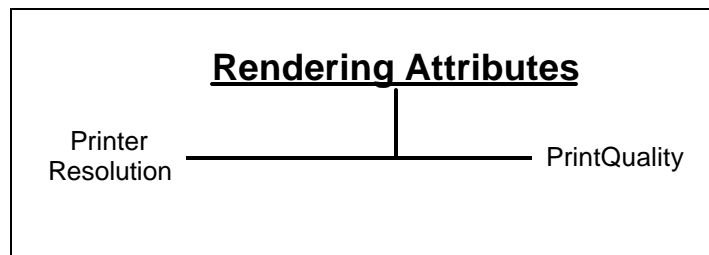
359

360

Figure 15 Imposition Attributes

361 4.4.2.3 Rendering Attributes

362 Figure 16 shows the Rendering Attributes. Rendering Attributes determine the quality and
363 resolution of how marks are made on the page. See Table 3 for summary of attribute semantics.



364

365

366

Figure 16 Rendering Attributes

367 **5 Actions**

368 The PWG has defined a number of operations that affect Printers, Jobs and their document. Below
 369 is a description of the semantics of these Actions. Naturally different protocol bindings will use
 370 differing subsets of the Actions or define new ones. Another difference will be the precise
 371 parameters to the Actions. Below is an abstract definition of the Actions. Action Summary

372 This table summarizes the actions defined for the Job and Printer. See section 4.4.2 for more
 373 details.

Job Creation and Document submission	Job and Document Control	Status and Information access	Printer Control
PrintJob	CancelJob	GetJobs	PausePrinter
PrintUri	HoldJob	GetPrinterAttributes	ResumePrinter
CreateJob	ReleaseJob	GetJobAttributes	PurgeJobs
SendDocument	RestartJob	GetDocuments	DisablePrinter
SendURI	SetJobAttributes	GetDocumentAttributes	EnablePrinter
ValidateJob	SetDocumentAttributes	GetPrinterSupportedValues	SetPrinterAttributes
ValidateDocument	CancelDocument		
	DeleteDocument		

374 **Table 2 - Summary of Actions**

375 **5.1 Job Creation and document submission Actions**

376 This section describes the Job Creation actions that create a Job and the ones that create add
 377 Document to a Job. The Job Creation actions are: PrintJob, PrintUri, and CreateJob. The PrintJob
 378 action also submits the Document. The PrintUri action submits a URI reference to the Document
 379 which the Printer then retrieves when needed at a later time. The CreateJob action only creates the
 380 job and the Client must issue subsequent SendDocument and SendUri actions in order to submit
 381 document content or a URI reference, respectively, for a job.

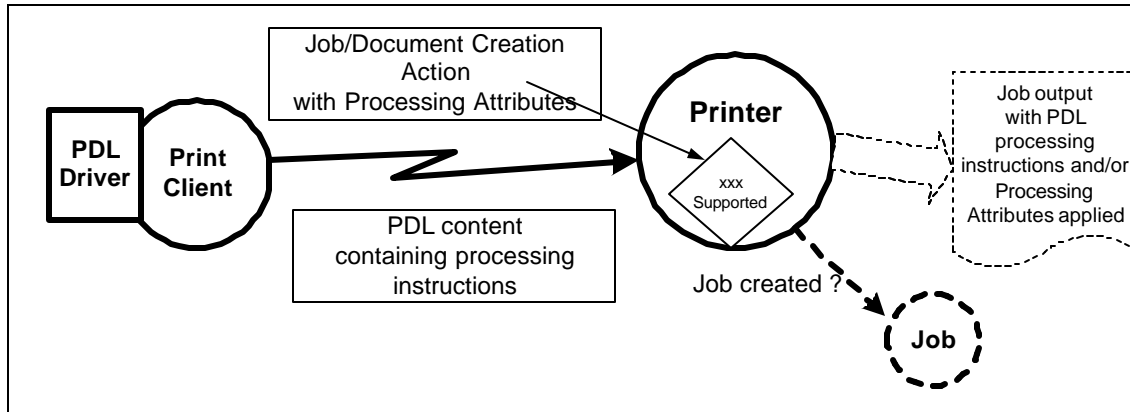
382 Processing instructions and descriptive information contained in the arguments of the Job Creation
 383 action are combined with Printer supplied information to create a Job instance.

384 The last action in this section is ValidateJob. This operation allows a Client to send a request with
 385 all the information to create a Job, except the document content. The Printer does not create a Job
 386 but informs the client whether a CreateJob, PrintJob or PrintUri with the same information would
 387 have succeeded. This is useful for allowing a Client to verify the processing instructions before
 388 sending a large PrintJob request.

389 A concept that is important in the PWG model is a set of instructions that can be applied to a print
 390 job. Examples of these instructions include the number of copies and the media to use. These
 391 instructions are referred to as Processing Attributes. The Processing Attributes are made up of the

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392 Job Processing Attributes (see section 4.4.1) and the Document Processing Attributes (see section
393 4.4.2) sent in a Job or Document Creation Action.



394

395

Figure 17 Processing Instruction Processing

396 In the real world, processing instructions are also contained in the document content for a job.
397 Page Description Languages (PDL) such as PostScript® and PCL® often contain processing
398 instructions. Some environments use a printer specific driver to generate the PDL stream based on
399 feature selections made through a user interface. Given that processing instructions can occur in
400 both the PDL and in an associated Job, the PWG model allows a Printer to declare its capability to
401 resolve this conflict. The Printer’s attribute “PdlOverride” declares if an attempt will be made to
402 override the instructions in the PDL with the instructions in the Job.

403 There is a wide variety of capabilities in Printers. An instance of a Printer is to subject to changes
404 in its configured capabilities. An example would be an administrative change in the media the
405 Printer supports or disabling two-sided printing. Clients need not check the capabilities of a Printer
406 before creating their Job Processing Attributes and submitting a job. Since this is a client/server
407 paradigm, it is always possible that the capabilities could change after checking a Printer’s
408 capabilities and before a Job is submitted. On the other hand, a client may use the Printer’s
409 configured capabilities to create their Job Processing Attributes and submit a job.

410 The PWG model allows a client to control the Printer’s acceptance of a job submission based on
411 the job request and the Printer’s current configured capabilities as follows. When the client
412 supplies a ‘true’ value for the “AttributeFidelity” Job Processing attribute, the Printer must reject
413 the job unless the Printer supports *all* of the supplied Job Processing attributes and values. When
414 the client supplies a ‘false’ value or omits the attribute, the Printer must accept the job submission
415 and ignore or substitute attributes and values, respectively, that it does not support. Note that the
416 “AttributeFidelity” Job Processing attribute covers only the creation of the Job. It is
417 implementation specific how a Printer handles processing a job when the Printer encounters
418 unsupported processing instructions in the document content.

419 5.1.1 PrintJob

420 ([rfc2911] §3.2.1) Submit a print job with only one document and supply the document content
421 data. If the Printer accepts the job, it creates the Job object and returns a unique “JobId” attribute
422 for the Printer and a globally unique “JobUri” attribute. The Printer also sets the corresponding Job
423 attributes with these values.

424 **5.1.2 PrintUri**

425 ([rfc2911] §3.2.2) Identical to the PrintJob operation (see section 5.1.1) except that a client
426 supplies a URI reference to the document data.

427 **5.1.3 CreateJob**

428 ([rfc2911] §3.2.4) Similar to the PrintJob operation (see section 5.1.1), except that in the CreateJob
429 request the Client does not supply Document Data. The client supplies a single set of Job
430 Processing attributes that the Printer applies to the Output Document(s) of the job. The
431 “MultipleDocumentHandling” Job Processing attribute controls whether the Printer produces
432 separate Output Documents or combines the Input Documents into a single Output Document (see
433 section 21).

434 **5.1.3.1 The “MultipleDocumentHandling” Job Processing attribute**

435 When a client submits a job with more than one Input Document, the
436 “MultipleDocumentHandling” Job attribute allows the client to specify whether the Printer is to (1)
437 produce corresponding separate Output Documents or (2) combine the Input Documents into a
438 single Output Document. For example, the ‘single-document’ and ‘single-document-new-sheet’
439 values allow the client to staple all of the Input Documents into a single Output Document, with the
440 latter value forcing each Input Document to start on a new sheet (useful when doing two-sided
441 printing). When requesting multiple Copies, the ‘separate-document-uncollated-Copies’ value
442 results in the Copies of each Input Document being together in an Output set, while the ‘separate-
443 document-collated-Copies’ value keeps a copy of each Input Document together in an Output set.
444 For example, a job with Input Documents A, B, C and “Copies” = 2 will result in A, A, B, B, C, C
445 or A, B, C, A, B, C, respectively. If the Printer supports multiple documents per job, the Printer
446 must support this Job Processing attribute with at least one value.

447 **5.1.4 SendDocument**

448 ([rfc2911] §3.3.1) Submits the entire Document Content for the next Input Document of a job
449 created by a previous CreateJob action (see section 5.1.3).

450 **5.1.5 SendUri**

451 ([rfc2911] §3.3.2) Identical to the SendDocument operation (see section 5.1.4) except that a client
452 supplies a URI reference to the Document Content data, instead of supplying the document content.

453 **5.1.6 ValidateJob**

454 ([rfc2911] §3.2.3) This operation is used only to verify capabilities of a Printer object against
455 whatever attributes are supplied by the client in the ValidateJob request. By using the ValidateJob
456 action a client can validate that an identical PrintJob, PrintUri or CreateJob would be accepted.

457 **5.2 Job Control Actions**

458 This section describes the actions that allow a client to control a Job after it has been submitted:
459 CancelJob, HoldJob, ReleaseJob, and RestartJob.

460 **5.2.1 CancelJob**

461 ([rfc2911] §3.3.3) Allows a client to cancel a Print Job from the time the Job is created up to the
462 time it is completed, canceled, or aborted.

463 **5.2.2 HoldJob**

464 ([rfc2911] §3.3.5) Allows a client to hold a pending Job in the Printer so that it is not eligible for
465 scheduling.

466 **5.2.3 ReleaseJob**

467 ([rfc2911] §3.3.6) Release a previously held Job so that it is again eligible for scheduling.

468 **5.2.4 RestartJob**

469 ([rfc2911] §3.3.7) Restart a job that is retained in the Printer after processing has completed.

470 **5.3 Status and information Actions**

471 This section describes the actions that allow a client to obtain status and attributes of Jobs and
472 Printers: GetJobs, GetPrinterAttributes, GetJobAttributes and GetPrinterSupportedValues.

473 **5.3.1 GetJobs**

474 ([rfc2911] §3.3.4) Retrieve the list of Jobs belonging to the Printer. The Client may supply some
475 simple filters (e.g. “MyJobs, “Limit) to control which jobs will be returned. The Client may supply
476 a list of Job attribute and/or attribute group names to be returned in the response (See 5.3.3). A
477 group of Job attributes will be returned for each returned Job.

478 **5.3.2 GetPrinterAttributes**

479 ([rfc2911] §3.2.5) Returns the values of the requested printer attributes and/or attribute groups of a
480 Printer (i.e. Printer State, Printer Description, Processing Supported, Processing Default,
481 Processing Ready).

482 **5.3.3 GetJobAttributes**

483 ([rfc2911] §3.3.4) Returns the values of the requested job attributes and/or attribute groups of a
484 Job (i.e Job Description, Job State, Job Processing and Document Processing).

485 **5.3.4 SetJobAttributes**

486 ([set-ops] §4.2) Set the values of the supplied Job Processing and Job Description attributes of the
487 indicated Job.

488 **5.3.5 GetPrinterSupportedValues**

489 ([set-ops] §4.3) Returns the possible values of the Printer Processing and Printer Description
490 attributes that may be set with the SetPrinterAttributes action.

491 **5.3.6 GetDocuments**

492 ([doc-obj] §3) Returns the requested Document attributes or attribute groups in all Documents in
493 the indicated Job.

494 **5.3.7 GetDocumentAttributes**

495 ([doc-obj] §3) Returns the requested Document attributes or attribute groups in the indicated
496 Document in the indicated Job.

497 **5.3.8 SetDocumentAttributes**

498 ([doc-obj] §3) Set the values of the supplied Document Processing and Document Description
499 attributes in the indicated Document in the indicated Job.

500 **5.4 Printer Control Actions**

501 This section describes actions which allow a client to control a Printer and may require operator
502 credentials: PausePrinter, ResumePrinter, PurgeJobs , DisablePrinter, EnablePrinter, and
503 SetPrinterAttributes.

504 **5.4.1 PausePrinter**

505 ([rfc2911] §3.2.7) Stops the Printer object from scheduling jobs. Job processing should also cease.

506 **5.4.2 ResumePrinter**

507 ([rfc2911] §3.2.8) Resume the processing and scheduling of Jobs in the Printer.

508 **5.4.3 PurgeJobs**

509 ([rfc2911] §3.2.9) Removes all jobs from the Printer, regardless of their state.

510 **5.4.4 DisablePrinter**

511 ([adm-ops] §3.1.1) Prevents the Printer from accepting any more Job Creation operations. The
512 Printer sets the PrinterIsAcceptingJobs Printer State attribute to 'false'.

513 **5.4.5 EnablePrinter**

514 ([adm-ops] §3.1.2) Allows the Printer to start accepting Job Creation operations. The Printer sets
515 the PrinterIsAcceptingJobs Printer State attribute to 'true'.

516 **5.4.6 SetPrinterAttributes**

517 ([set-ops] §4.1) Set the values of the supplied Printer Processing and Printer Description attributes.

518 **6 Summary of attributes**

519 This section summarizes the attributes for the Document, Job and Printer objects. Included in the
520 definition are the processing attributes that can be applied at either the Job or Document level.

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521 For each attribute, the tables contain the attribute name, whether the attribute is multi-valued, its
 522 syntax, constraints, a short description and a reference to the Document where the semantics of the
 523 attribute is completely specified. The basic syntax types are “Boolean”, “String” and “Integer”.
 524 “Complex” types are a container for attributes of any type. Members are listed in the description
 525 field. “RangeOfInteger” is a complex type that contains “Upperbound” and “Lowerbound”
 526 integer value members. “Resolution” is a complex type that contains “CrossFeedDir” and
 527 “FeedDir” integer value members and a “Units” string value member.

528 **6.1 Processing Attributes (Job and Document)**

529 * Group key: J=Job Processing Attributes, D=Document Processing Attributes

530 Table 3 - Processing Attributes (Job and Document)

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
AttributeFidelity		Boolean		J	[rfc2911] §15.1
	Allows a user to control the Printer’s acceptance of the job submission based on whether or not the Printer supports all the supplied job Processing attributes and values. Default = ‘false’ NOTE: Deprecated in favor of “JobMandatoryAttributes”.				
Compression		String	Type2 keyword	D	[rfc2911] §4.4.32
	Compression algorithm used on the Document Data, if any. (keywords: none, deflate, gzip, compress)				
Copies		Integer	1:MAX	D	[rfc2911] §4.2.5
	The number of copies of the Output Document(s) to be printed.				
CoverBack		<i>complex</i>		D	[PWG5100.3] §3.1
	The back cover to apply to document or job. (<i>Includes Media/MediaCol, CoverType</i>)				
CoverFront		<i>complex</i>		D	[PWG5100.3] §3.1
	The front cover to apply to document or job. (<i>Includes Media/MediaCol, CoverType</i>)				
CoverType		String	Type2 keyword	D	[PWG5100.3] §3.1.2
	Indicates if covers are requested and which sides will contain print stream pages. (Keywords: no-cover, print-none, print-front, print-back, print-both)				
DocumentCopies	Yes	RangeOfInteger		J	[PWG5100.4] §5.1.3
	Specifies the output document copies for override processing. NOTE: Deprecated in favor of “Copies”				
DocumentFormat		String	MimeMediaType [rfc2046], [rfc2048]	D	[rfc2911] §3.2.1.1

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Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
	The Document format (i.e. PDL) for the Document. The value “application/octet-stream” has a special meaning. This value is used to indicate that a Printer is capable of auto-sensing the format of the Document. (examples: application/octet-stream, application/postscript, application/vnd.hp-PCL, “text/plain; charset=utf-8”)				
DocumentOverride		complex		J	[PWG5100.4] §5.1
	Provides for the overriding of processing instructions on a document basis. Applied to job, see PageOverride for overrides supplied at the document level. (<i>Includes InputDocuments/OutputDocuments, DocumentCopies, DocumentFormat, DocumentName, Compression, DocumentNaturalLanguage, PageRanges, and any other processing attribute that affects documents</i>) <i>NOTE: Deprecated in favor of supporting and using the Document Object</i>				
Finishings	Yes	String	Type2 keyword	D	[rfc2911] §4.2.6 [PWG5100.1] §2
	Identifies the finishings that the Printer uses for each copy of each printed Output Document (Keywords: none, staple, punch, cover, bind, saddle-stitch, edge-stitch, staple-top-left, staple-bottom-left, staple-top-right, staple-bottom-right, edge-stitch-left, edge-stitch-top, edge-stitch-right, edge-stitch-bottom, staple-dual-left, staple-dual-top, staple-dual-right, staple-dual-bottom)				
FinishingCol		complex		D	[PWG5100.3] §3.2
	Enables an end user to specify detailed finishing options not possible with the “Finishings” attribute (<i>Includes FinishingTemplate, Stitching</i>)				
FinishingTemplate		String	Maxlength=1023	D	[PWG5100.3] §3.1
	A string specifying some particular finishing operation.				
ForceFrontSide	yes	Integer		D	[PWG5100.3] §3.3
	Forces the specified pages to be printed on the front side of a sheet of media. The pages of the output document start at 1.				
ImpositionTemplate		String	Type2 keyword	D	[PWG5100.3] §3.4
	Specifies imposition method for laying out finished page images onto the surface of output media. (Keywords: none, signature)				
InputDocuments	Yes	RangeOfInteger		D	[PWG5100.4] §5.1.1
	Specifies the input documents for override processing. <i>NOTE: Deprecated since PageOverrides are applied explicitly to documents and DocumentOverrides are themselves deprecated.</i>				
InsertAfterPageNumber		Integer		D	[PWG5100.3] §3.5.1
	Specifies the input page after which the Insert Sheet will be placed.				
InsertAfterPageNumber		Integer		D	[PWG5100.3] §3.5.2

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Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
Specifies the number of Insert Sheet to insert.					
InsertSheet	Yes	complex		D	[PWG5100.3] §3.5
Specifies how Insert Sheets are to be inserted into the sequence of media sheets that are produced for each copy of the documents. (<i>Includes InsertAfterPageNumber, InsertCount, Media/MediaCol</i>)					
JobAccountingOutputBin		String	Type3 keyword	J	[PWG5100.3] §3.8.3
Specifies the output bin where the accounting sheet is to be placed. (keywords: top, middle, bottom, side, left, right, center, rear, face-up, face-down large-capacity, my-mailbox, stacker-N, mailbox-N, tray-N *Note:N is replaced by a cardinal number, *Note: See [PWG5100.2 §2.1 for description of keywords)					
JobAccountingSheet		complex		J	[PWG5100.3] §3.8
Specifies the accounting sheet for a job. (<i>Includes JobAccountingSheetType, Media/ MediaCol, JobAccountingOutputBin</i>).					
JobAccountingSheetType		String	Type3 keyword	J	[PWG5100.3] §3.8.1
Specifies the accounting sheet format for a job. (keywords: none, standard)					
JobCopies		Integer	1:MAX	J	[rfc2911] §4.2.5
The number of copies of the Job to be printed. NOTE: New attribute to differentiate job and document level copies.					
JobErrorSheet		complex		J	[PWG5100.3] §3.9
Specifies the error sheet for a job. (<i>Includes JobErrorSheetType, JobErrorSheetWhen, Media/MediaCo</i>).					
JobErrorSheetType		String	Type3 keyword	J	[PWG5100.3] §3.9.1
Specifies the error sheet format for a job. (keywords: none, standard)					
JobErrorSheetWhen		String	Type2 keyword	J	[PWG5100.3] §3.9.2
Specifies the accounting sheet format for a job. (keywords: on-error, always)					
JobFinishings	Yes	String	Type2 keyword	J	[rfc2911] §4.2.6
Identifies the finishing that the Printer uses for each job copy of the Job (Keywords: none, staple, punch, cover, bind, saddle-stitch, edge-stitch, staple-top-left, staple-bottom-left, staple-top-right, staple-bottom-right, edge-stitch-left, edge-stitch-top, edge-stitch-right, edge-stitch-bottom, staple-dual-left, staple-dual-top, staple-dual-right, staple-dual-bottom) NOTE: New attribute to differentiate job and document level finishing.					
JobFinishingCol		complex		J	[PWG5100.3] §3.2

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Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
	Enables an end user to specify detailed finishing options not possible with the “JobFinishings” attribute (<i>Includes FinishingTemplate, Stitching</i>) NOTE: New attribute to differentiate job and document level finishing.				
JobHoldUntil		String	Type3 keyword	J	[rfc2911] §4.2.2
	Specifies the named time period during which the Job must become a candidate for printing. (keywords: no-hold, indefinite, day-time, evening, night, weekend, second-shift, third-shift)				
JobMandatoryAttributes	Yes	String	Type3 keyword	J	Need reference
	Lists the attributes for fidelity processing. (See [rfc2911] §15.1) (keywords: Any Processing attribute name) NOTE: New attribute to align fidelity with FSG work.				
JobPriority		Integer	1:100	J	[rfc2911] §4.2.1
	Priority for scheduling the Job. A higher value specifies a higher priority.				
JobSheets		String	type3 keyword	J	[rfc2911] §4.2.3
	Specifies which job start/end sheet(s), will be printed with a job.. (Keywords: none, standard)				
JobSheetsCol		complex		J	[PWG5100.3] §3.11
	Augments the “JobSheets” attribute. (<i>Includes JobSheets, Media/MediaCol</i>)				
JobSheetMessage		String	Maxlength=1023	J	[PWG5100.3] §3.12
	Conveys a message that is delivered with the job.				
Media		String	type3 keyword	D	[rfc2911] §4.2.11
	The medium that the Printer uses for all impressions of the Job. (Keywords: na_letter_8.5x11in. See [pwg5101.1])				
MediaCol		complex		D	[PWG5100.3] §3.13
	Enables a client end user to submit a list of media characteristics to the Printer as a way to more completely specify the media to be used.. (<i>Includes MediaKey, MediaType, MediaInfo, MediaColor, MediaPreprinted, MediaHoleCount, MediaOrderCount, MediaSize, MediaWeightMetric, MediaBackCoating, MediaFrontCoating, MediaRecycled</i>).				
MediaBackCoating		String	Type3 keyword	D	[PWG5100.3] §3.13.10
	Indicates the pre-process coating applied to the back of the media. (Keywords: none, glossy, high-gloss, semi-gloss, satin, matte)				
MediaColor		String	Type3 keyword	D	[PWG5100.3] §3.13.4
	Indicates the desired color of the media being specified. . (Keywords: no-color, white, pink, yellow, blue, green, buff, goldenrod, red, gray, ivory, orange)				
MediaFrontCoating		String	Type3 keyword	D	[PWG5100.3] §3.13.10

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Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
		Indicates the pre-process coating applied to the front of the media. (Keywords: none, glossy, high-gloss, semi-gloss, satin, matte)			
MediaHoleCount		Integer		D	[PWG5100.3] §3.13.6
	Indicates the number of pre-drilled holes in the desired media.				
MediaInfo		String	Maxlength=255	D	[PWG5100.3] §3.13.3
	Specifies information that helps describe the media instance. Intended for human consumption.				
MediaInputTrayCheck		String	Type3 keyword	D	[PWG5100.3] §3.13.14
	Indicates that the characteristics of the media in the identified input tray must match the characteristics of the media identified by the "media" or "media-col" attribute. (keywords: top, middle, bottom, side, large-capacity, envelope, main, manual. See [RFC2911] Appendix C)				
MediaKey		String	Type3 keyword	D	[PWG5100.3] §3.13.1
	The name of the media represented as a keyword.				
MediaOrderCount		Integer		D	[PWG5100.3] §3.13.7
	Indicates the number of sheets, within an ordered sequence of sheets; after which the sequence begins to repeat..				
MediaPrePrinted		String	Type3 keyword	D	[PWG5100.3] §3.13.11
	Indicates the pre-printed characteristics of the desired media. (Keywords: blank, pre-printed, letter-head)				
MediaRecycled		String	Type3 keyword	D	[PWG5100.3] §3.13.10
	Indicates the recycled characteristics of the media. (Keywords: none, standard)				
MediaSize		Complex		D	[PWG5100.3] §3.13.8
	Explicitly specifies the numerical media width and height dimensions. (<i>Includes XDimension, YDimension</i>)				
<i>XDimension</i>		Integer		D	[PWG5100.3] §3.13.8.1
	Size of the media in hundredths of a millimeter along the bottom edge.				
<i>YDimension</i>		Integer		D	[PWG5100.3] §3.13.8.2
	Size of the media in hundredths of a millimeter along the left edge.				
MediaSize		String	Type3 keyword	D	Need UPnP ref
	The medium size that the Printer uses for all impressions of the Job. (Keywords: na_letter_8.5x11in. See [pwg5101.1] §5) ISSUE3: Resolve definition of media size (string(UpnP) vs. xy(PWG) vs. xy&unit(?))				
MediaType		String	Type3 keyword	D	[PWG5100.3] §3.13.2

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Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
	The medium type that the Printer uses for all impressions of the Job. (Keywords: stationery, transparency envelope, envelope-plain, envelope-window, continuous, continuous-long, continuous-short, tab-stock, pre-cut-tabs, full-cut-tabs, multi-part-forms, labels, multi-layer, screen, screen-paged, photographic, cardstock, other See also [pwg5101.1] §3)				
MediaWeightMetric		Integer		D	[PWG5100.3] §3.13.9
	Indicates the weight of the desired media rounded to the nearest whole number of grams per square meter.				
MultipleDocumentHandling		String	type2 keyword	J	[rfc2911] §4.2.4
	Controls whether Input Document in multi-Document jobs are combined into a single Output Document or are kept as separate Output Document Useful for application of Finishings and the placement of one or more print-stream pages into impressions and onto media sheets for multi-Document Jobs. (keywords: single-Document, separate-Document-uncollated-Copies, separate-Document-collated-Copies, single-Document-new-sheet)				
NumberUp		Integer	1:MAX	D	[rfc2911] §4.2.9
	Indicates the number of pages in an impression.				
OrientationRequested		String	type2 keyword	D	[rfc2911] §4.2.10
	The desired orientation for printed pages. (keywords: portrait, landscape, reverse-landscape, reverse-portrait)				
OutputBin		String	Type2 keyword	J	[PWG5100.2] §2.1
	Specifies the output bin where the job is to be delivered. (keywords: top, middle, bottom, side, left, right, center, rear, face-up, face-down large-capacity, my-mailbox, stacker-N*, mailbox-N*, tray-N*. *Note: N is replaced by a cardinal number)				
OutputDocuments	Yes	RangeOfInteger		D	[PWG5100.4] §5.1.2
	Specifies the output documents for override processing. NOTE: Deprecated since PageOverrides are applied explicitly to documents and DocumentOverrides are themselves deprecated.				
PageDelivery		String	Type2 keyword	D	[PWG5100.3] §3.15
	Indicates if the pages of the job are to be delivered to the output bin or finisher in the same page order as the original document and, if the pages are delivered face up or face down. (keywords: same-order-face-up, same-order-face-down, reverse-order-face-up, reverse-order-face-down, system-specified)				
PageOverride	Yes	complex		D	[PWG5100.4] §5.2
	Provides for the overriding of processing instructions on a page basis. (Includes <i>InputDocuments/OutputDocuments, DocumentCopies, Page, Sides, media and any other processing attribute that affects pages</i>) ISSUE4: Check FSG definition of PageOverride				
Pages	yes	RangeOfInteger		D	[PWG5100.4] §5.2.4

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Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
Specifies a range of pages in the document data. NOTE: Deprecated in favor of "PageRanges"					
PagesPerSubset	yes	RangeOfInteger		D	[PWG5100.4] §5.3
Partitions one or more Input-Documents into contiguous subsets of Input-Pages. Each subset is defined to be an Output-Document.					
PageRanges	yes	RangeOfInteger		D	[RFC2911] §4.2.7
Specifies a range of pages in the document data.					
PresentationDirectionNumberUp		String	Type2 keyword	D	[PWG5100.3] §3.17
Specifies the placement order of the page images on a Finished-Page Image with the "number-up" attribute. (keywords: toright-tobottom, tobottom-toright, toleft-tobottom, tobottom-toleft, toright-totop, totop-toright, toleft-totop)					
PrintQuality		String	type2 keyword	D	
The print quality that the Printer uses for the Job. (keyword: draft, normal, high)					
PrinterResolution		resolution		D	[RFC2911] §4.2.12
The resolution that Printer uses for the Job in cross-feed and feed direction in units of dpi or dpcm.					
Sides		String	type2 keyword	D	[rfc2911] §4.2.8
Indicates how an impression is to be placed upon the side(s) of the media (keyword: one-sided, two-sided-long-edge, two-sided-short-edge, two-sided-long-edge, tumble)					
SeparatorSheets		complex		D	[PWG5100.3] §3.18
Specifies the separator sheets to be printed with the Document. (<i>Includes SeparatorSheetType, Media/MediaCol</i>)					
SeparatorSheetsType		String	Type3 keyword	D	[PWG5100.3] §3.18.1
Specifies the separator sheets type. (keywords: none, slip-sheets, start-sheet, end-sheet, both-sheets)					
SheetCollate		String	Type2 keyword	D	[job-prog] §3.1
Specifies if the media sheets of each copy of each printed document in a job are to be in sequence. (keywords: uncollated, collated)					
Stitching		complex		D	[PWG5100.3] §3.2.2
Provides detailed stitching parameters. (<i>Includes StitchingReferenceEdge, StitchingOffset, StitchingLocations</i>)					
StitchingLocations	yes	Integer		D	[PWG5100.3] §3.2.2.3
The distance along the stitching axis where a stitch will be placed in hundredths of a millimeter.					

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Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
StitchingOffset		Integer		D	[PWG5100.3] §3.2.2.2
	The perpendicular distance from the reference edge to the stitching axis in hundredths of a millimeter.				
StitchingReferenceEdge		String	type2 keyword	D	[PWG5100.3] §3.2.2.1
	Specifies the stitching reference edge of the output media. (keyword: bottom, top, left, right)				
XImagePosition		String	type2 keyword	D	[PWG5100.3] §3.19.2
	Causes the specified point of the Finished-Page Image to be positioned at a specified location. (keyword: none, center, left, right)				
XImageShift		Integer		D	[PWG5100.3] §3.19.3
	Causes the Finished-Page Image to be shifted in position with respect to the x-axis of the media. The unit of measure for this attribute is hundredths of a millimeter. The sign of the value indicates the direction of the shift.				
Xside1ImageShift		Integer		D	[PWG5100.3] §3.19.4
	Causes each Finished-Page Image that would be placed on the front side of a sheet to be shifted in position with respect to the x-axis of the media. The unit of measure for this attribute is hundredths of a millimeter. The sign of the value indicates the direction of the shift.				
Xside2ImageShift		Integer		D	[PWG5100.3] §3.19.5
	Causes each Finished-Page Image that would be placed on the back side of a sheet to be shifted in position with respect to the x-axis of the media. The unit of measure for this attribute is hundredths of a millimeter. The sign of the value indicates the direction of the shift.				
YImagePosition		String	type2 keyword	D	[PWG5100.3] §3.19.6
	Causes the specified point of the Finished-Page Image to be positioned at a specified location. (keyword: none, center, top, bottom)				
YImageShift		Integer		D	[PWG5100.3] §3.19.7
	Causes the Finished-Page Image to be shifted in position with respect to the y-axis of the media. The unit of measure for this attribute is hundredths of a millimeter. The sign of the value indicates the direction of the shift.				
Yside1ImageShift		Integer		D	[PWG5100.3] §3.19.8
	Causes each Finished-Page Image that would be placed on the front side of a sheet to be shifted in position with respect to the y-axis of the media. The unit of measure for this attribute is hundredths of a millimeter. The sign of the value indicates the direction of the shift.				
Yside2ImageShift		Integer		D	[PWG5100.3] §3.19.9

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
Causes each Finished-Page Image that would be placed on the back side of a sheet to be shifted in position with respect to the y-axis of the media. The unit of measure for this attribute is hundredths of a millimeter. The sign of the value indicates the direction of the shift.					

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532 **6.2 Job Attributes (State and Description)**

533 * Group Key: S=State, D=Description

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Table 4- Job Attributes (State and Description)

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
DateTimeAtCreation		String	DateTime [rfc1123]	S	[rfc2911] §4.3.14.5
Indicates the date and time at which the Job was created . (example: Fri, 03 May 2002 08:49:37 GMT)					
DateTimeAtProcessing		String	DateTime [rfc1123]	S	[rfc2911] §4.3.14.6
Indicates the date and time at which the Job first began processing. (example: Fri, 03 May 2002 08:49:37 GMT)					
DateTimeAtCompleted		String	DateTime [rfc1123]	S	[rfc2911] §4.3.14.7
Indicates the date and time at which the Job completed. (example: Fri, 03 May 2002 08:49:37 GMT)					
DetailedStatusMessage	Yes	String	Maxlength=1023	S	[rfc2911] §4.3.10
Specifies additional detailed and technical information about the job. Intended for use by the system administrator or other experienced technical persons. (example: "PostScript error: stack overflow") (Was JobDetailedStatusMessage)					
DocumentAccessErrors	Yes	String	Maxlength=1023	S	[rfc2911] §4.3.11
Information about each Document access error for this job encountered by the Printer. (example: "(404) http://www.company.com/pub/fileToPrint.pdf ") (Was JobDocumentAccessErrors)					
DocumentState		String	Type1 keyword	S	TBD
The current state of the job (see section 4.2.1.1). See also DocumentStateReasons attribute below. (keywords: pending, processing, canceled, aborted, completed)					
DocumentStateMessage		String	Maxlength=127	S	TBD
Specifies information about the "DocumentState" and "DocumentStateReasons" attributes in human readable text. (example: "Document completed successfully with warnings")					

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
DocumentStateReasons	Yes	String	type2 keyword	S	TBD
	Provides additional information about the Document's current state. (keywords: none, incoming, data-insufficient, document-access-error, submission-interrupted, outgoing, resources-are-not-ready, interpreting, queued, transforming, queued-for-marker, printing, canceled-by-user, canceled-by-operator, canceled-at-device, aborted-by-system, unsupported-compression, compression-error, unsupported-Document-format, Document-format-error, completed-successfully, completed-with-warnings, completed-with-errors, restartable, queued-in-device))				
Impressions		Integer	0:MAX	D	[rfc2911] §4.3.17.2
	The total size in number of impressions in all the Job's Document(s). (Was JobImpressions)				
ImpressionsCompleted		Integer	0:MAX	S	[rfc2911] §4.3.18.2
	The number of impressions completed for the job so far. (Was JobImpressionsCompleted)				
ImpressionsCompletedCurrentCopy		Integer	0:MAX	S	[job-prog] §4.4
	The number of impressions completed for the current iteration of the job so far.				
JobAccountId		String	Maxlength=1023	D	[PWG5100.3] §3.6
	Account associated with the job.				
JobAccountingUserID		String	Maxlength=1023	D	[PWG5100.3] §3.7
	Specifies the User ID associated with the "JobAccountId".				
JobId		Integer	1:MAX	S	[rfc2911] §4.3.2
	The Printer sets this to the ID of the job that is unique for the Printer.				
JobMessageFromOperator		String	Maxlength=127	D	[rfc2911] §4.3.16
	Message to the end user indicating the reasons for any management action taken on a job. (example: "Job canceled due to length", "Pick job up in mailbox")				
JobMessageToOperator		String	Maxlength=127	D	[PWG5100.3] §3.10
	Message from the end user to indicate something about the processing of the job. (example: "Call 555-1234 before running this job")				
JobName		String	Maxlength=127	D	[rfc2911] §4.3.5
	The Printer sets this to the client-supplied end-user friendly name for the Job, else the Printer must generate a name from other information. (example: "license agreement memo")				
JobOriginatingUserName		String	Maxlength=1023	D	[rfc2911] §4.3.6
	The Printer sets this attribute to the most authenticated printable name that it can obtain (example: "John Doe", \authDomain\John Doe")				
JobPrinterUri		String	uri	S	[rfc2911] §4.3.3

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
	The Printer set this to the URI of Printer that created this Job. (example: ipp://www.company.com/printer)				
JobState		String	Type1 keyword	S	[rfc2911] §4.3.7
	The current state of the job (see section 4.2.1.1). See also JobStateReasons attribute below. (keywords: pending, pending-held, processing, processing-stopped, canceled, aborted, completed)				
JobStateMessage		String	Maxlength=127	S	[rfc2911] §4.3.6
	Specifies information about the "JobState" and "jobStateReasons" attributes in human readable text. (example: "Job completed successfully with warnings")				
JobStateReasons	Yes	String	type2 keyword	S	[rfc2911] §4.3.8
	Provides additional information about the job's current state. (keywords: none, incoming, data-insufficient, Document-access-error, submission-interrupted, outgoing, job-hold-until-specified, resources-are-not-ready, printer-stopped-partly, printer-stopped, interpreting, queued, transforming, queued-for-marker, printing, canceled-by-user, canceled-by-operator, canceled-at-device, aborted-by-system, unsupported-compression, compression-error, unsupported-Document-format, Document-format-error, processing-to-stop-point, service-off-line, completed-successfully, completed-with-warnings, completed-with-errors, restartable, queued-in-device))				
JobUri		String	uri	S	[rfc2911] §4.3.1
	The Printer sets this to the URI for the job. (example: ipp://www.company.com/printer/jobs/22) The URI is globally unique.				
KOctets		Integer	0:MAX	D	[rfc2911] §4.3.17.1
	The total size of the Job's Document(s) in integral units of 1024 octets. (Was JobKOctets)				
KOctetsProcessed		Integer	0:MAX	S	[rfc2911] §4.3.18.1
	the total number of octets processed in integral units of 1024 octets so far. (Was JobKOctetsProcessed)				
MediaSheets		Integer	0:MAX	D	[rfc2911] §4.3.17.3
	The total number of media sheets to be produced for this job. . (Was JobMediaSheets)				
MediaSheetsCompleted		Integer	0:MAX	S	[rfc2911] §4.3.18.3
	The media-sheets completed marking and stacking for the entire job so far. (Was JobMediaSheetsCompleted)				
MoreInfo		String	uri	S	[rfc2911] §4.3.4
	URI used to obtain information intended for end user consumption about this specific Job. (example: " http://www.company.com/printer/embeddedjobpage ") . (Was JobMoreInfo)				
NumberOfDocuments		Integer	0:MAX	S	[rfc2911] §4.3.12

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
					The number of Documents in the job.
NumberOfInterveningJobs		Integer	0:MAX	S	[rfc2911] §4.3.15
					The number of jobs that are "ahead" of this job assuming the current scheduled order.
OutputDeviceAssigned		String	Maxlength=127	S	[rfc2911] §4.3.13
					Identifies the output device to which the Printer has assigned this job (example: "Pete's Printer")
PrinterUpTime		Integer	1:MAX	S	[rfc2911] §4.3.14.4
					The amount of time (in seconds) that the Printer has been up and running. See Printer attribute "PrinterUpTime" (Was JobPrinterUpTime)
SheetsCompletedCopyNumber		Integer	0:MAX	S	[job-prog] §4.2
					Number of the copy being stacked for the current document.
SheetsCompletedDocumentNumber		Integer	0:MAX	S	[job-prog] §4.3
					Number of the document in the job currently being stacked.
TimeAtCreation		Integer	MIN:MAX	S	[rfc2911] §4.3.14.1
					The time at which the Job was created in "PrinterUpTime" seconds.
TimeAtProcessing		Integer	MIN:MAX	S	[rfc2911] §4.3.14.2
					The time at which the Job first began processing.
TimeAtCompleted		Integer	MIN:MAX	S	[rfc2911] §4.3.14.3
					The time at which the Job completed.
WarningCount		Integer	MIN:MAX	S	[PWG5100.4] §6.1
					total number of warnings that a Printer has generated while processing and printing the Job.. (Was JobWarningCount)

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536 **6.3 Document Attributes (State and Description)**

537 * Group Key: S=State, D=Description

538 **Table 5 – Document Attributes (State and Description)**

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
Compression		String	Type2 keyword	D	[rfc2911] §4.4.32

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
					Compression algorithm used on the Document Data, if any. (keywords: none, deflate, gzip, compress)
CurrentPageOrder		String	Type2 keyword	S	[PWG5100.3] §4.1
					Specifies the page order of the pages in the document data. Initially set to PageOrderReceived and updated if data is transformed. (keywords: 1-to-n-order, n-to-1-order)
DateTimeAtCreation		String	DateTime [rfc1123]	S	[rfc2911] §4.3.14.5
					Indicates the date and time at which the Document was created . (example: Fri, 03 May 2002 08:49:37 GMT)
DateTimeAtProcessing		String	DateTime [rfc1123]	S	[rfc2911] §4.3.14.6
					Indicates the date and time at which the Document first began processing. (example: Fri, 03 May 2002 08:49:37 GMT)
DateTimeAtCompleted		String	DateTime [rfc1123]	S	[rfc2911] §4.3.14.7
					Indicates the date and time at which the Document completed. (example: Fri, 03 May 2002 08:49:37 GMT)
DetailedStatusMessage	Yes	String	Maxlength=1023	S	[rfc2911] §4.3.10
					Specifies additional detailed and technical information about the job. Intended for use by the system administrator or other experienced technical persons. (example: "PostScript error: stack overflow") (Was JobDetailedStatusMessage)
DocumentAccessErrors	Yes	String	Maxlength=1023	S	[rfc2911] §4.3.11
					Information about each Document access error for this job encountered by the Printer. (example: "(404) http://www.company.com/pub/fileToPrint.pdf ") (Was JobDocumentAccessErrors)
DocumentName		String	Maxlength=127	D	[rfc2911] §3.2.1.1
					Name for the Document to be used in an implementation specific manner.
DocumentNaturalLanguage		String	Maxlength=127	D	[rfc2911] §3.2.1.1
					Identifies the Natural Language of the Document
DocumentNumber		integer		S	[PWG5100.4] §9.2
					The order of the document within a job starting at a base of 1.
DocumentState		String	Type1 keyword	S	ISSUE5: New
					The current state of the document. See also DocumentStateReasons attribute below. (keywords: pending, processing, canceled, aborted, completed)
DocumentStateMessage		String	Maxlength=127	S	ISSUE6: New
					Specifies information about the "DocumentState" and "DocumentStateReasons" attributes in human readable text. (example: "Documentcompleted successfully with warnings")

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
DocumentStateReasons	Yes	String	type2 keyword	S	ISSUE7: New
	Provides additional information about the document state. (keywords: none, incoming, document-access-error, submission-interrupted, outgoing, resources-are-not-ready, interpreting, transforming, warnings-detected, queued-for-marker, printing, canceled-by-user, canceled-by-operator, canceled-at-device, aborted-by-system, unsupported-compression, compression-error, unsupported-Document-format, Document-format-error, completed-successfully, completed-with-warnings, completed-with-errors, queued-in-device)				
DocumentUri		String	Maxlength=1023	S	[rfc2911] §3.2.2
	Reference to document to be printed (Print by reference)				
Impressions		Integer	0:MAX	D	[rfc2911] §4.3.17.2
	The total size in number of impressions in the Document. (Was JobImpressions)				
ImpressionsCompleted		Integer	0:MAX	S	[rfc2911] §4.3.18.2
	The number of impressions completed for the document so far. (Was JobImpressionsCompleted)				
ImpressionsCompletedCurrentCopy		Integer	0:MAX	S	[job-prog] §4.4
	The number of impressions completed for the current iteration of the document so far.				
JobId		Integer	1:MAX	S	[rfc2911] §4.3.2
	The Printer sets this to the ID of the job containing this document. The ID is unique for the Printer.				
JobUri		String	uri	S	[rfc2911] §4.3.1
	The Printer sets this to the URI for the job. (example: ipp://www.company.com/printer/jobs/22) The URI is globally unique.				
KOctets		Integer	0:MAX	D	[rfc2911] §4.3.17.1
	The total size of the Document in integral units of 1024 octets. (Was JobKOctets)				
KOctetsProcessed		Integer	0:MAX	S	[rfc2911] §4.3.18.1
	the total number of octets processed in integral units of 1024 octets so far. (Was JobKOctetsProcessed)				
LastDocument		Boolean		D	[rfc2911] §4.?.?
	'true' if this is the last Input Document for the job. Default = 'false'.				
MediaSheets		Integer	0:MAX	D	[rfc2911] §4.3.17.3
	The total number of media sheets to be produced for this document. (ISSUE3q: was JobMediaSheets)				
MediaSheetsCompleted		Integer	0:MAX	S	[rfc2911] §4.3.18.3

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	Reference
Description (values)					
	The media-sheets completed marking and stacking for the document so far. (Was JobMediaSheetsCompleted)				
MoreInfo		String	uri	S	[rfc2911] §4.3.4
	URI used to obtain information intended for end user consumption about this specific Job. (example: " http://www.company.com/printer/embeddedjobpage "). (Was JobMoreInfo)				
PageOrderReceived		String	Type2 keyword	D	[PWG5100.3] §3.16
	Represents the order of pages in the document data as supplied with the job. (keywords: 1-to-n-order, n-to-1-order)				
PrinterUpTime		Integer	1:MAX	S	[rfc2911] §4.3.14.4
	The amount of time (in seconds) that the Printer has been up and running. See Printer attribute "PrinterUpTime" (Was JobPrinterUpTime)				
SheetsCompletedCopyNumber		Integer	0:MAX	S	[job-prog] §4.2
	Number of the copy being stacked for the current document.				
TimeAtCreation		Integer	MIN:MAX	S	[rfc2911] §4.3.14.1
	The time at which the Document was created in "PrinterUpTime" seconds.				
TimeAtProcessing		Integer	MIN:MAX	S	[rfc2911] §4.3.14.2
	The time at which the Document first began processing.				
TimeAtCompleted		Integer	MIN:MAX	S	[rfc2911] §4.3.14.3
	The time at which the Document completed.				
WarningCount		Integer	MIN:MAX	S	[PWG5100.4] §6.1
	total number of warnings that a Printer has generated while processing and printing the Document. (Was Job WarningCount)				

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540 **6.4 Printer Attributes (State and Description)**

541 **Table 6 - Printer Attributes (State and Description)**

Attribute Name	Multivalued	Syntax	Constraint	Group*	reference
Description (values)					
ColorSupported		boolean		D	[rfc2911] §4.4.26
	Indicates if the device is capable of any type of color printing at all, including highlight color.				
CompressionSupported	Yes	String	Type3 keyword	D	[rfc2911] §4.4.32

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	reference
Description (values)					
	Identifies the set of supported Compression algorithms for Document content. (keywords: none, deflate, gzip, compress)				
DeviceId		String		D	See Appendix 10.1
	An identifier based on IEEE1284 to identify the device. Often used to load an appropriate driver on the client device. (example: "MANUFACTURER:ACME;COMMAND SET:PCL,PJL,PS,XHTML-Print+xml;MODEL:LaserBeam 9;COMMENT:example;ACTIVE COMMAND SET:PCL;")				
DocumentFormatDefault		String	MimeMediaType [rfc2046], [rfc2048]	D	[rfc2911] §4.4.21
	The document format (i.e. PDL) that the Printer has been configured to assume if the client does not specify a document format in any of the actions that supply document content for a Job. The value "application/octet-stream" has a special meaning. This value is used to indicate that a Printer is capable of auto-sensing the format of the document. (examples: application/octet-stream, application/postscript, application/vnd.hp-PCL, "text/plain; charset=utf-8")				
DocumentFormatSupported	YES	String	MimeMediaType	D	
	Identifies both the Document and Image formats supported by the Printer. Specifies the set of Document formats that the Printer supports. (examples: application/octet-stream, application/postscript, application/vnd.hp-PCL, "text/plain; charset=utf-8"). Also specifies the set of Image formats that the Printer supports. (examples: 'image/jpeg' which is a registered MIME Media Type with IANA.				
JobImpressionsSupported		RangOfInteger	0:MAX	D	[rfc2911] §4.4.34
	Specifies the upper and lower bounds for the number of impressions allowed per job.				
JobKOctetsSupported		RangOfInteger	0:MAX	D	[rfc2911] §4.4.33
	Specifies the allowable upper and lower bounds of the total size per job in integral units of 1024 octets.				
JobMediaSheetsSupported		RangOfInteger	0:MAX	D	[rfc2911] §4.4.35
	Specifies the upper and lower bounds for the number of media sheets allowed per job.				
MultipleDocumentJobsSupported		boolean		D	[rfc2911] §4.4.16
	Indicates whether the Printer supports more than one Document per job, i.e., more than one SendDocument and/or SendUri request per job. A multi-Documents per job Printer must implement this attribute and have a value of 'true'. A single Document per job Printer may either not support this attribute or support it with a value of 'false'.				
MultipleOperationTimeOut		Integer	1:MAX	D	[rfc2911] §4.4.31

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	reference
	Description (values)				
	Identifies the minimum time (in seconds) that a multi-Document per job Printer must wait between actions on an open job. The actions can add Document to the open Job or close the Job. Timeouts are handled in an implementation specific manner. Multi-Document per job PrinterS must implement this attribute. The recommended value is greater than 60 and less than 240.				
OperationsSupported	Yes	String	type2 keyword	D	[rfc2911] §4.4.15
	The set of supported actions for the Printer and Job. (keywords: PrintJob, PrintUri, ValidateJob, CreateJob, SendDocument, SendUri, CancelJob, GetJobAttributes, GetJobs, GetPrinterAttributes, HoldJob, ReleaseJob, RestartJob, PausePrinter, ResumePrinter, PurgeJobs).				
PagesPerMinute		Integer	0:MAX	D	[rfc2911] §4.4.36
	Specifies the nominal number of pages per minute which may be generated by this printer.				
PagesPerMinuteColor		Integer	0:MAX	D	[rfc2911] §4.4.37
	Specifies the nominal number of pages per minute which may be generated by this printer when printing color.				
PdloverrideSupported		String	type2 keyword	D	[rfc2911] §4.4.28
	Expresses the ability of a Printer to either attempt to override a Document's processing instructions with Job Processing Attributes or not. (keywords: attempted, not-attempted)				
PrinterCurrentTime		String	DateTime [rfc1123]	S	[rfc2911] §4.4.30
	Indicates the current date and time. (example: Fri, 03 May 2002 08:49:37 GMT)				
PrinterDriverInstaller		String	Uri	D	[rfc2911] §4.4.8
	Intended for consumption by automata to locate the driver installer for this Printer object. (example: " http://www.company.com/printer/installerProgram ") Note: This attribute has not been used by any known implementation and is therefore deprecated.				
PrinterInfo		String	Maxlength=127	D	[rfc2911] §4.4.6
	Descriptive information about this Printer object.(example: "Out of courtesy for others, please print only small (1-5 page) jobs at this printer")				
PrinterIsAcceptingJobs		Boolean		S	[rfc2911] §4.4.23
	Indicates whether the printer is currently able to accept jobs.				
PrinterLocation		String	Maxlength=127	D	[rfc2911] §4.4.5
	Identifies the location of the device. (example: Pete's Office)				
PrinterMakeAndModel		String	Maxlength=127	D	[rfc2911] §4.4.9
	Identifies the make and model of the device. (example: "Xerox Phaser 7700", "HP LaserJet 1000", "Lexmark Optra Color 45")				
PrinterMessageFromOperator		String	Maxlength=127	D	[rfc2911] §4.4.25

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	reference
	Description (values)				
	End user information for the printer. (example: “printer unavailable until 1pm due to preventive mainanance”)				
PrinterMoreInfo		String	uri	D	[rfc2911] §4.4.7
	URI used to obtain information intended for end user consumption about this specific Printer. (example: “ http://www.company.com/printer/embeddedwebpage ”)				
PrinterMoreInfoManufacturer		String	uri	D	[rfc2911] §4.4.10
	URI used to obtain more information for end user consumption about this type of device. (example: “ http://www.xerox.com/go/xrx/template/012.jsp?Xcntry=USA&Xlang=en_US&prodID=7700 ”, “ http://www.lexmark.com/US/products/overview/0,1224,MjQ5fDE=,00.html ”)				
PrinterName		String	Maxlength=127	D	[rfc2911] §4.4.4
	The end-user friendly name of the Printer object. (example: “Pete’s Printer”)				
PrinterState		String	type1 keyword	S	[rfc2911] §4.4.11
	Identifies the current state of the device (see section4.1.1.1). See “PrinterStateReasons” below. (keywords: idle, processing, stopped)				
PrinterStateMessage		String	Maxlength=1023	S	[rfc2911] §4.4.13
	Information about the "printer- state" and "printer-state-reasons" attributes in human readable text. (example: “Printer stopped due to paper jam”)				
PrinterStateReasons	Yes	String	type2 keyword	S	[rfc2911] §4.4.12
	Augments the "printer-state" attribute to give more detailed information about the Printer state. Each keyword value may have a suffix to indicate its level of severity. The three suffixes (levels) are: “Report” (least severe), “Warning”, and “Error” (most severe). Keywords without suffixes are assumed to be “Error” (most severe). See reference sor semantics of defined keywords. (keywords: other, none, media-needed, media-jam, moving-to-paused, paused, shutdown, connecting-to-device, timed-out, stopping, stopped-partly, toner-low, toner-empty, spool-area-full, cover-open, interlock-open, door-open, input-tray-missing, media-low, media-empty, output-tray-missing, output-area-almost- full, output-area- full, marker-supply- low, marker-supply-empty, marker-waste-almost- full, marker-waste- full, fuser-over-temp, fuser- under-temp, opc- near-eol, opc-life-over, developer-low, developer-empty, interpreter-resource-unavailabl)				
PrinterUpTime		integer	1:MAX	S	[rfc2911] §4.4.29
	The amount of time (in seconds) that a Printer has been up and running				
PrinterUriSupported	Yes	String	uri	D	[rfc2911] §4.4.1

PWG Semantic Model

Attribute Name	Multivalued	Syntax	Constraint	Group*	reference
Description (values)					
Contains at least one URI for the Printer object. The PrinterUriSupported, UriAuthenticationSupported and the UriSecuritySupported are parallel attributes. Each of these attributes must have the same cardinality. The “i”th value of each of these attributes describes the URI for the printer, the authentication mechanism used and the security method used. (example: ipp://www.company.com/printer)					
QueuedJobCount		integer	0:MAX	S	[rfc2911] §4.4.24
The number of jobs that the Printer has accepted but has not yet completed.					
ReferenceUriSchemesSupported	Yes	String	UriScheme	D	[rfc2911] §4.4.27
Which URI schemes are supported by the printer to retrieve Document This attribute must be supported if the Printer is capable of print by reference. (example: ftp, http)					
UriAuthenticationSupported	Yes	String	type2 keyword	D	[rfc2911] §4.4.2
The Client authentication mechanism that the Printer object uses to identify the user. See PrinterUriSupported for additiona information. (keywords: none, requesting-user-name, basic, digest and certificate)					
UriSecuritySupported	Yes	String	type2 keyword	D	[rfc2911] §4.4.3
Identifies the security mechanisms used for accessing the Printer object. See PrinterUriSupported for additiona information. (keywords: none, ssl3, tls)					

542

543 **7 Status Strings**

544 This Appendix lists the status strings that the Printer returns in each action response.

545 The following status strings are returned when the Printer accepts the action request and indicates
546 some degree of success:

547 successful-ok - Action succeeded and no requested attribute were substituted or ignored.

548 successful-ok-ignored-or-substituted-attributes - Action succeeded but some unsupported attributes
549 were ignored or substituted.

550 successful-ok-conflicting-attributes - Action succeeded but some attributes were conflicting and
551 have been substituted or ignored.

552

553 The following status strings are returned when the Printer rejects the action indicating some error
554 on the part of the Client:

555 client-error-bad-request - malformed syntax or constraint exceeded.

556 client-error-forbidden - The Printer understood the request, but is refusing to fulfill it for
557 authentication and/or authorization reasons. The client should not try again even with
558 credentials.

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- 559 client-error-not-authenticated - The request requires user authentication. The client may try again
560 with suitable authentication.
- 561 client-error-not-authorized - The requester is not authorized to perform the request. The Client
562 should not try again.
- 563 client-error-not-possible - The action cannot be performed, because of the state of the target object.
- 564 client-error-timeout - The client did not produce a subsequent request within the time that the
565 Printer was prepared to wait.
- 566 client-error-not-found - The target object was not found.
- 567 client-error-gone - The target object is no longer available.
- 568 client-error-request-entity-too-large - The request and/or the Document Content is too large.
- 569 client-error-request-value-too-long - A attribute value in the request is longer than the Printer
570 supports.
- 571 client-error-document-format-not-supported - The document format is not supported.
- 572 client-error-attributes-or-values-not-supported - An attribute and/or value is not supported and must
573 be in order to carry out the request. The Printer must return the unsupported attributes or
574 values in the Unsupported Attributes group.
- 575 client-error-uri-scheme-not-supported - The URI scheme is not supported.
- 576 client-error-charset-not-supported - The charset is not supported.
- 577 client-error-conflicting-attributes - Some supplied attributes are conflicting. The Printer must
578 return them in the Unsupported Attributes group.
- 579 client-error-compression-not-supported - The compression of the Document Content is not
580 supported.
- 581 client-error-compression-error - An error occurred when uncompressing the Document Content.
- 582 client-error-document-format-error - An error occurred when interpreting the Document Content.
- 583 client-error-document-access-error - An error occurred when the Printer attempted to access the
584 Document Content through the URI supplied.
- 585 client-error-attributes-not-settable - The supplied attribute(s) are not settable
586
- 587 The following status strings are returned when the Printer rejects the action indicating some error
588 on the part of the Printer:
- 589 server-error-internal-error - An unexpected internal error occurred.
- 590 server-error-operation-not-supported - The Printer does not support the requested action.
- 591 server-error-service-unavailable - The Printer is unable to service the request at this time due to
592 overloading or maintenance. The client should try again later as per the “message”
593 Operation attribute.
- 594 server-error-version-not-supported - The Printer doesn’t support the requested major version of the
595 protocol and returns the closest version that it does support.
- 596 server-error-device-error - The Printer encountered a device error that causes it to be unable to
597 accept a new request. For example, a paper jam for a Printer that doesn’t spool and so
598 cannot accept a new job submission until the jam is fixed.
- 599 server-error-temporary-error - A temporary error such as a buffer full write error, a memory
600 overflow, or a disk full condition.
- 601 server-error-not-accepting-jobs - The Printer is not currently accepting jobs. Its
602 “PrinterIsAcceptingJobs” Printer Description attribute is ‘false’.
- 603 server-error-busy - A temporary error indicating that the Printer is too busy processing jobs and/or
604 other requests. A Client should try again later.

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605 server-error-job-canceled - The job has been canceled by an operator or aborted by the system. For
606 example, while the Client is transmitting the Document Content to the Printer.
607 server-error-multiple-document-jobs-not-supported - The Printer doesn't support multiple
608 document jobs and the client attempted to supply a second SendDocument or SendUri
609 request. The Printer's "MultipleDocumentJobsSupported" Printer Description attribute is
610 'false'.
611

612 **8 Change Log**

613 5/16/02 PJZ original draft
614 5/23/02 TH re-organize draft with comments from Melinda Grant
615 5/26/02 TH detailed review of the draft
616 5/29/02 PJZ Incorporated comments prior to initial release
617 6/4/02 SAA Modified to split the Job Attributes into 3 categories:
618 1) Processing Attributes
619 2) Content Attributes
620 3) Job Attributes
621

622 The Processing Attributes were further split into 3 subcategories:

623 1) Rendering attributes
624 2) Imposition Attributes
625 3) Finishing Attributes

626 Added attributes from UPnP Print Basic service template: MediaSize, MediaType,
627 DeviceId attributes.

628 Removed references to Mandatory vs. Optional since a semantic model should not
629 dictate what is used or not used by the future solutions targeted at specific markets.
630 For example, UPnP picked specific attributes for the SOHO market and did not need
631 all of the Mandatory IPP attributes.

632 Modified Printer Description Attributes with the following:

633 1) Added in DeviceId.
634 2) Changed Document* to Content*.
635 3) Removed VersionsSupported and OperationsSupported since these are
636 dependent on the interface used in specific solutions.

637 6/17/02 PJZ Added high level description of PWG Action semantics and Printer state
638 transitions. Returned VersionsSupported and OperationsSupported.

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- 639 8/16/02 PJZ Changed Content back to document, Added PWG5100.1, PWG5100.2,
640 PWG5100.3, PWG5100.4, job-progress to model. Filled out document object, added "Job Level"
641 subcategory to Processing attributes
- 642 9/1/02 PJZ Changes from email input and PWG meeting. Printer/Job/Document
643 Attribute groups broken out into State and Description groups
- 644 9/9/02 PJZ Final edits to ready document for review. Updated all figures and added
645 highlighting of sections to review.
- 646 9/16/02 PJZ Added more definitions and document actions. Incorporated comments from
647 teleconference and TH mail note. Updated references.

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696 PWG Semantic Model Web Page: <http://www.pwg.org/sm/>
697 PWG Semantic Model Mailing List: sm@pwg.org
698

699 To subscribe to the sm mailing list, send the following email:
700 1) send it to majordomo@pwg.org
701 2) leave the subject line blank
702 3) put the following two lines in the message body:
703 `subscribe sm`
704 `end`
705

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

709

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711

712 **10 Appendix A – UPnP Definitions**

713 **10.1 DeviceID**

714 The value of this variable **MUST** exactly match the IEEE 1284-2000 Device ID string, except the
 715 length field **MUST** not be specified.. The value is assigned by the Printer vendor and **MUST NOT**
 716 be localized by the Print Service.

717 The IEEE 1284-2000 Device ID is a length field followed by a case-sensitive string of ASCII
 718 characters defining peripheral characteristics and/or capabilities. For the purposes of this
 719 specification, the length bytes **MUST NOT** be included. The Device ID sequence is composed of a
 720 series of keys and values of the form:

721 key: value {,value} repeated for each key

722 As indicated, each key will have one value, and **MAY** have more than one value. The minimum
 723 necessary keys (case-sensitive) are MANUFACTURER, COMMAND SET, and MODEL. (These
 724 keys **MAY** be abbreviated as MFG, CMD, and MDL respectively.) Each implementation **MUST**
 725 supply these three keys and possibly additional ones as well. Each key (and each value) is a string
 726 of characters. Any characters except colon (:), comma (,), and semi-colon (;) **MAY** be included as
 727 part of the key (or value) string. Any leading or trailing white space (SPACE[x'20'], TAB[x'09'],
 728 VTAB[x'0B'], CR[x'0D'], NL[x'0A'], or FF[x'0C']) in the string is ignored by the parsing program
 729 (but is still counted as part of the overall length of the sequence).

730 An example ID String, showing optional comment and active command set keys and their
 731 associated values (the text is actually all on one line):

732

```
733 MANUFACTURER:ACME Manufacturing;  

734 COMMAND SET:PCL,PJL,PS,XHTML-Print+xml;  

735 MODEL:LaserBeam 9;  

736 COMMENT:Anything you like;  

737 ACTIVE COMMAND SET:PCL;
```

738

739 (See IEEE 1284-2000 clause 7.6)

740 Note: One of the purposes of the DeviceId variable is to select a printer driver for those clients that
 741 need a printer driver. The values of the COMMAND SET key are interpreted by the printer driver
 742 provided by the vendor and so are vendor-defined, rather than being standardized.

743 **11 Appendix B – IPP Mapping**

744 This section summarizes the IPP operations using PWG semantics. Parameters inside square
 745 brackets ([]) indicate that the IPP Client may omit in a request or the Printer may omit in a
 746 response.

747

748 **11.1 Action Parameter Overview**

749 IPP Actions may contain a number of parameters. The first parameter is always the Operation
 750 Attributes for the Action. The Operation Attributes contains common information such as the
 751 target of the action (Job or Printer), a version number, or a sequence id to tie the request and
 752 response together. Other information is Action-specific such as the name of the Job to be created
 753 or a filter that controls the information to be returned in a query. The sections below describe the
 754 Operation Attributes and any other Action specific parameters.

755 **11.2 Job Creation Actions**

756 In the Job Creation actions (PrintJob, PrinURI, and CreateJob), the IPP Operation attributes
 757 correspond to the PWG Job Description attributes (e.g., JobName, RequestingUserName) and the
 758 IPP Job Template attributes correspond to a mixture of PWG Job Processing attributes (e.g.,
 759 JobPriority, JobHoldUntil) and Document Processing attributes (Finishing, Copies, Media,
 760 NumberUp) supplied at the job level as Document defaults.

761

762 **11.2.1 PrintJob**

763 ([rfc2911] §3.2.1)

764 **PrintJobRequest(**Operation Attributes, [**Job Processing Attributes**], [**Job Finishing**
 765 **Attributes**], [**Document Attributes**],**Document Data**)

766 **Operation Attributes:**

767 **PrinterUri(uri):** The target printer for the job

768 [**Document Attributes**]: [**requestingUserName**], [**JobName**],

769 [**DocumentFormat**], [**JobKOctets**], [**jobImpressions**], [**JobMediaSheets**]:

770 see section 4.2.1.

771 [**Job Processing Attributes**]:

772 Any Job Processing Attribute (see section 4.3.2) or vendor/site specific extension.

773 [**Job Description Attributes**]:

774 Any Job Description Attribute (see section 3.2.2) or vendor/site specific extension.

775

776 [**Job Finishing Attributes**]:

777 Any Job Finishing Attribute (see section 4.3.2) or vendor/site specific extension.

778 [**Document Attributes**]:

779 Any Document Attributes for the single document sent (see section 4.3.2) or
 780 vendor/site specific extension.

781

782 **Document data:** The document to print.

783

784 **PrintJobResponse(**Operation Attributes, [**Unsupported Attributes**], **Job Attributes**)

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785 **Operation Attributes :**
786 **statusCode:** Results of the action (see Appendix section 11.5.4).
787 *[statusMessage]: Localized text description of the status code.*
788 *[detailedStatusMessage]: Text for detailed and technical information about the job.*
789 **[Unsupported Attributes]:** any unsupported or conflicting attributes and or attribute
790 values. May be returned on success or failure.
791 **Job Attributes:**
792 **JobUri, JobId, JobState, JobStateReasons , [JobStateMessage],**
793 *[NumberOfInterveningJobs]* See section 4.2.1.

794 **11.2.2 PrintUri**

795 ([rfc2911] §3.2.2) The calling sequence is the same as PrintJob () except that the Operation
796 Attributes in the request contains the “documentUri” attribute and the Document Data is omitted.

797 **11.2.3 CreateJob**

798 ([rfc2911] §3.2.4) Similar to the PrintJob operation (see section 11.2), except that in the CreateJob
799 request the Client does not supply Document Data. The client supplies a single set of Job
800 Processing attributes that the Printer applies to the Output Document(s) of the job.

801 **11.2.4 SendDocument**

802 ([rfc2911] §3.3.1 and [doc-obj] §3) Submits the entire Document Content for the next Input
803 Document of a job created by a previous CreateJob action (see section 11.2.3).). The IPP
804 Operation attributes correspond to the PWG Document Description attributes and the Document
805 Template attributes correspond to the PWG Document Processing attributes.

806 **SendDocumentRequest(Operation Attributes, Document Data)**

807 **Operation Attributes:**

808 **JobUri(uri) or (PrinterUri(uri) and jobId(integer)):** The target job.

809 **[requestingUserName]:** see section 4.2.1.

810 **[Document Attributes]:**

811 **Document data:** The document to print.

812
813 **SendDocumentResponse(Operation Attributes, [Unsupported Attributes], Job Attributes)**

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814 **Operation Attributes :**
815 **statusCode:** Results of the action (see Appendix section 11.5.4).
816 *[statusMessage]:* Localized text description of the status code
817 *[detailedStatusMessage]:* Text for detailed and technical information.
818 **[Unsupported Attributes]:** any unsupported or conflicting attributes and or attribute
819 values. May be returned on success or failure.
820 **Job Attributes:**
821 **JobUri, JobId, JobState, JobStateReasons , [JobStateMessage],**
822 *[NumberOfInterveningJobs]* See section .

823 **11.2.5 SendUri**

824 ([rfc2911] §3.3.2) The calling sequence is the same as SendDocument () except that the Document
825 Data is omitted and the Operation Attributes in the request contains the “documentUri” attribute.

826 **11.2.6 ValidateJob**

827 ([rfc2911] §3.2.3) The calling sequence is similar to PrintJob (see section 11.2) except the request
828 does not contain the Document Data and the response does not contain the Job Attributes.

829 **11.3 Job Control Actions**

830 This section describes the actions that allow a client to control a Job after it has been submitted:
831 CancelJob, HoldJob, ReleaseJob, RestartJob, SetJobAttributes, and SetDocumentAttributes.

832 **11.3.1 CancelJob**

833 ([rfc2911] §3.3.3)

834 **CancelJobRequest(Operation Attributes)**

835 **Operation Attributes:**

836 **JobUri(uri)** or (**PrinterUri(uri)** and **JobId(integer)**): The target job.

837 **[requestingUserName]:** see section 4.2.1.

838 *[message(string)]:* Message from the Client to the Printer Operator. Utilized in an
839 implementation specific manner.

840

841 **CancelJobResponse(Operation Attributes, [Unsupported Attributes])**

842 **Operation Attributes :**
843 **statusCode:** Results of the action (see Appendix section 11.5.4).
844 *[statusMessage]: Localized text description of the status code.*
845 *[detailedstatusMessage]: Text for detailed and technical information about the job*
846 **[Unsupported Attributes]:** any unsupported or conflicting attributes and or attribute
847 values. May be returned on success or failure.

848 **11.3.2 HoldJob**

849 ([rfc2911] §3.3.5) The request calling sequence is similar to CancelJob (see section 11.3.1) except
850 that the “jobHoldUntil” attribute may be in the “Operation Attributes”. The response sequence is
851 the same as CancelJob.

852 **11.3.3 ReleaseJob**

853 ([rfc2911] §3.3.6) The calling sequence is the same as CancelJob (see section 11.3.1).

854 **11.3.4 RestartJob**

855 ([rfc2911] §3.3.7) The request calling sequence is similar to CancelJob except that the
856 “jobHoldUntil” attribute may be in the “Operation Attributes”. The response sequence is the same
857 as CancelJob (see section 11.3.1).

858 **11.3.5 SetJobAttributes**

859 ([set-ops] §4.2) **SetJobAttributesRequest(Operation Attributes)**

860 **Operation Attributes:**
861 **JobUri(uri) or (PrinterUri(uri) and JobId(integer)):** The target job
862 **[requestingUserName]:** see section 4.2.1.
863 **[AttributesToBeSet]:** set of Job Attribute to be set for each Job.
864 **Job Attributes (attributes/values):** The supplied attributes and their values to be set.

865
866 **SetJobAttributesResponse(Operation Attributes, [Unsupported Attributes])**

867 **Operation Attributes :**
868 **statusCode:** Results of the action (see Appendix section 11.5.4).
869 *[statusMessage]: Localized text description of the status code.*
870 *[detailedstatusMessage]: Text for detailed and technical information about the job.*
871 **[Unsupported Attributes]:** any unsupported or conflicting attributes and or attribute
872 values. May be returned on success or failure.

873 **11.3.6 SetDocumentAttributes**

874 ([set-ops] §4.2) **SetDocumentAttributesRequest(Operation Attributes)**

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875 **Operation Attributes:**
876 **JobUri(uri)** or (**PrinterUri(uri)** and **JobId(integer)**) and **DocumentNumber**:
877 The target job and document.
878 **[RequestingUserName]**: see section 4.2.1.
879 **[AttributesToBeSet]**: set of Document Attribute to be set for the Document.
880 **Job Attributes (attributes/values)**: The supplied attributes and their values to be set.

881
882 **SetDocumentAttributesResponse(Operation Attributes, [Unsupported Attributes])**

883 **Operation Attributes :**
884 **statusCode**: Results of the action (see Appendix section 11.5.4).
885 *[statusMessage]*: Localized text description of the status code.
886 *[detailedstatusMessage]*: Text for detailed and technical information about the job.
887 **[Unsupported Attributes]**: any unsupported or conflicting attributes and or attribute
888 values. May be returned on success or failure.

889 **11.4 Status and information Actions**

890 This section describes the actions that allow a client to obtain status and attributes of Jobs and
891 PrinterS: GetJobs, GetPrinterAttributes, and GetJobAttributes.

892 **11.4.1 GetJobs**

893 ([rfc2911] §3.3.4)

894 **GetJobsRequest(Operation Attributes)**

895 **Operation Attributes:**
896 **PrinterUri(uri)**: The target printer containing the jobs
897 **[requestingUserName]**: see section 4.2.1.
898 **[requestedAttributes (string(multivalued))]**: set of Job Attribute and/or Attribute
899 Group names to be returned for each Job. Default = 'JobUri' and 'JobId'.
900 **[whichJobs(string)]**: Allows user to restrict jobs returned to completed or
901 active/queued states. (keywords: completed, not-completed (Default)).
902 **[myJobs(boolean)]**: Allows user to restrict jobs returned to just the user's jobs or
903 all jobs. Default = 'false'.
904 **[limit(integer)]**: Sets maximum number of jobs to return. Default = no limit.

905 **GetJobsResponse(Operation Attributes, [Unsupported Attributes], Job Attributes)**

906 **Operation Attributes :**
907 **statusCode**: Results of the action (see Appendix section 11.5.4).
908 *[statusMessage]*: Localized text description of the status code.
909 *[detailedstatusMessage]*: Text for detailed and technical information about the job.
910 **Unsupported Attributes**: any unsupported or conflicting attributes and or attribute values.
911 May be returned on success or failure.
912 **Job Attributes(sequence of requested attributes/values)**: A list of jobs each containing the
913 requested attributes with their values.

914 **11.4.2 GetPrinterAttributes**

915 ([rfc2911] §3.2.5)

916 **GetPrinterAttributesRequest(Operation Attributes)**

917 **Operation Attributes:**

918 **PrinterUri(uri)**: The target printer

919 **[requestingUserName]**: see section 4.2.1.

920 **[requestedAttributes (string(multivalued))]**: set of Printer Attribute and/or
921 Attribute Group names to be returned. Default = 'all'.

922 **[DocumentFormat(string)]**: Since some capabilities can be PDL specific, this
923 optional attributes allows the Printer to return capabilities based on PDL if
924 known to the Printer.

925 **GetPrinterAttributesResponse(Operation Attributes, [Unsupported Attributes], Printer
926 Attributes)**

927 **Operation Attributes :**

928 **statusCode**: Results of the action (see Appendix section 11.5.4).

929 *[statusMessage]*: Localized text description of the status code.

930 *[detailedstatusMessage]*: Text for detailed and technical information about the
931 Printer.

932 **[Unsupported Attributes]**: any unsupported or conflicting attributes and or attribute
933 values. May be returned on success or failure.

934 **Printer Attributes(requested attributes/values)**: The requested attributes and their values.

935 **11.4.3 GetJobAttributes**

936 ([rfc2911] §3.3.4) .

937 **GetJobAttributesRequest(Operation Attributes)**

938 **Operation Attributes:**

939 **JobUri(uri) or (PrinterUri(uri) and JobId(integer))**: The target job

940 **[requestingUserName]**: see section 4.2.1.

941 **[requested-attributes (string(multivalued))]**: set of Job Attribute and/or Attribute
942 Group names to be returned for each Job. Default = 'all'.

943 **GetJobAttributesResponse(Operation Attributes, [Unsupported Attributes], Job Attributes)**

944 **Operation Attributes :**

945 **statusCode**: Results of the action (see Appendix section 11.5.4).

946 *[statusMessage]*: Localized text description of the status code.

947 *[detailedstatusMessage]*: Text for detailed and technical information about the job.

948 **[Unsupported Attributes]**: any unsupported or conflicting attributes and or attribute
949 values. May be returned on success or failure.

950 **Job Attributes(requested attribute/values)**: The requested attributes and their values)

951 **11.4.4 GetPrinterSupportedValues**

952 ([set-ops] §4.3) Has the same calling sequence as the GetPrinterAttributes operation, except that
 953 only XxxSupported Printer Description attributes are returned.

954 **11.4.5 GetDocuments**

955 ([doc-obj] §3)

956 **GetDocumentsRequest(Operation Attributes)**

957 **Operation Attributes:**

958 **PrinterUri(uri):** The target printer containing the jobs

959 **[requestingUserName]:** see section 4.2.1.

960 **[requestedAttributes (string(multivalued))]:** set of Job Attribute and/or Attribute
 961 Group names to be returned for each Job. Default = 'JobUri' and 'JobId'.

962 **[whichDocuments(string)]:** Allows user to restrict jobs returned to completed or
 963 active/queued states. (keywords: completed, not-completed, all (Default)).

964 **[limit(integer)]:** Sets maximum number of Documents to return. Default = no
 965 limit.

966 **GetDocumentsResponse(Operation Attributes, [Unsupported Attributes], Document
 967 Attributes)**

968 **Operation Attributes :**

969 **statusCode:** Results of the action (see Appendix section 11.5.4).

970 *[statusMessage]: Localized text description of the status code.*

971 *[detailedstatusMessage]: Text for detailed and technical information about the job.*

972 **Unsupported Attributes:** any unsupported or conflicting attributes and or attribute values.
 973 May be returned on success or failure.

974 **Document Attributes(sequence of requested attributes/values):** A list of Documents each
 975 containing the requested attributes with their values.

976 **11.4.6 GetDocumentAttributes**

977 ([doc-obj] §3)

978 **GetDocumentAttributesRequest(Operation Attributes)**

979 **Operation Attributes:**

980 **JobUri(uri) or (PrinterUri(uri) and JobId(integer)):** The target Job

981 **DocumentNumber:** The target Document within the Job

982 **[requestingUserName]:** see section 4.2.1.

983 **[requested-attributes (string(multivalued))]:** set of Document Attribute and/or
 984 Attribute Group names to be returned for each Document. Default = 'all'.

985 **GetDocumentAttributesResponse(Operation Attributes, [Unsupported Attributes],
 986 Document Attributes)**

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987 **Operation Attributes :**
988 **statusCode:** Results of the action (see Appendix section 11.5.4).
989 *[statusMessage]: Localized text description of the status code.*
990 *[detailedstatusMessage]: Text for detailed and technical information about the job.*
991 **[Unsupported Attributes]:** any unsupported or conflicting attributes and or attribute
992 values. May be returned on success or failure.
993 **Document Attributes(requested attribute/values):** The requested attributes and their
994 values).

995 **11.5 Printer Control Actions**

996 This section describes actions which allow a client to control a Printer and may require operator
997 credentials: PausePrinter, ResumePrinter, PurgeJobs, DisablePrinter, EnablePrinter, and
998 SetPrinterAttributes.

999 **11.5.1 PausePrinter**

1000 ([rfc2911] §3.2.7)

1001 **PausePrinterRequest(Operation Attributes)**

1002 **Operation Attributes:**

1003 **PrinterUri(uri):** The target printer for the job

1004 **[requestingUserName]:** see section 4.2.1.

1005 **PausePrinterResponse(Operation Attributes, [Unsupported Attributes])**

1006 **Operational Attributes :**

1007 **statusCode:** Results of the action (see Appendix section 11.5.4).

1008 *[statusMessage]: Localized text description of the status code.*

1009 *[detailedStatusMessage]: Text for detailed and technical information.*

1010 **[Unsupported Attributes]:** any unsupported or conflicting attributes and or attribute
1011 values. May be returned on success or failure.

1012 **11.5.2 ResumePrinter**

1013 ([rfc2911] §3.2.8) The calling sequence is the same as PausePrinter (see section 11.5.1).

1014 **11.5.3 PurgeJobs**

1015 ([rfc2911] §3.2.9) The calling sequence is the same as PausePrinter (see section 11.5.1).

1016 **11.5.4 DisablePrinter**

1017 ([adm-ops] §3.1.1) The calling sequence is the same as PausePrinter (see section 11.5.1).

1018 **11.5.5 EnablePrinter**

1019 ([adm-ops] §3.1.2) The calling sequence is the same as PausePrinter (see section 11.5.1).

1020 **11.5.6 SetPrinterAttributes**

1021 ([set-ops] §4.1)

1022 **SetPrinterAttributesRequest(Operation Attributes, Printer Attributes)**

1023 **Operation Attributes:**

1024 **PrinterUri(uri):** The target printer

1025 **[requestingUserName]:** see section 4.2.1.

1026 **Printer Attributes:**

1027 **Printer Description Attributes and values to be set**

1028 **SetPrinterAttributesResponse(Operation Attributes, [Unsupported Attributes])**

1029 **Operation Attributes :**

1030 **statusCode:** Results of the action (see Appendix section 11.5.4).

1031 *[statusMessage]: Localized text description of the status code.*

1032 *[detailedstatusMessage]: Text for detailed and technical information about the*
1033 *Printer.*

1034 **[Unsupported Attributes]:** any unsupported or conflicting attributes and or attribute
1035 values. May be returned on success or failure.

1036 **11.6 Changes to remove some IPP specific aspects**

1037 This section lists some changes to remove some IPP specific aspects from the PWG Semantic
1038 Model. Any attribute name containing “ipp” has had the “ipp” removed. The IPP operation names
1039 have the hyphens removed to be the PWG action names and the operations supported are mixed
1040 keywords, not integer enum values. All attributes names have had the first letter capitalized and
1041 the ‘-‘ character removed and the character following the ‘-‘ has been capitalized. The keyword
1042 attribute values defined remain unchanged and are all lower case, except for the ones that specify
1043 other attributes names (which are changed to be the mixed case without hyphens). The term “object”
1044 is sometimes changed to “data class”. The term “operation” has been changed to “action” to use
1045 the term more frequently used with XML.

1046 The aspects of the model that deal with globalization (i.e. character set & language) have been
1047 removed. **ISSUE9: Should this be described generically in this document** Globalization will be
1048 addressed in a protocol specific binding of this semantic model. The Printer globalization attributes
1049 are charsetConfigured, charsetSupported, naturalLanguageConfigured, naturalLanguageSupported
1050 and generatedNaturalLanguageSupported.

1051 The types of the attributes have been simplified. All keyword, text, name, DateTime, uri,
1052 UriScheme, enum and mimeType are represented by the simple string type. The term
1053 “keyword” continues to be used for string values enumerated as part of the PWG Model. The
1054 integer enums values are replaced by their associated keyword. The “1setOf X” types are
1055 represented as the base type and the “Multivalued” field in the tables below set to “Yes”. Integers
1056 and Boolean types remain the same. Any applicable constraints placed on the attribute values has
1057 been noted in the tables below.

1058 The following IPP attributes are not included: operation-id, attributes-charset, attributes-natural-
1059 language, page-overrides, request-id, version-number