Printer Working Group (PWG)

Overview of the
PWG Semantic Model

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1 Model Overview

The Printer Working Group (PWG) has defined a simplified printing model. It represents printing in either a client/server print paradigm or a peer-to-peer print paradigm. The PWG model describes the device as a Printer object. A Printer object may represent one or more physical Printers. The other main object is the Job. A Printer can contain zero or more Jobs and a Job is contained in only one Printer. The PWG model contains methods that act upon these objects.

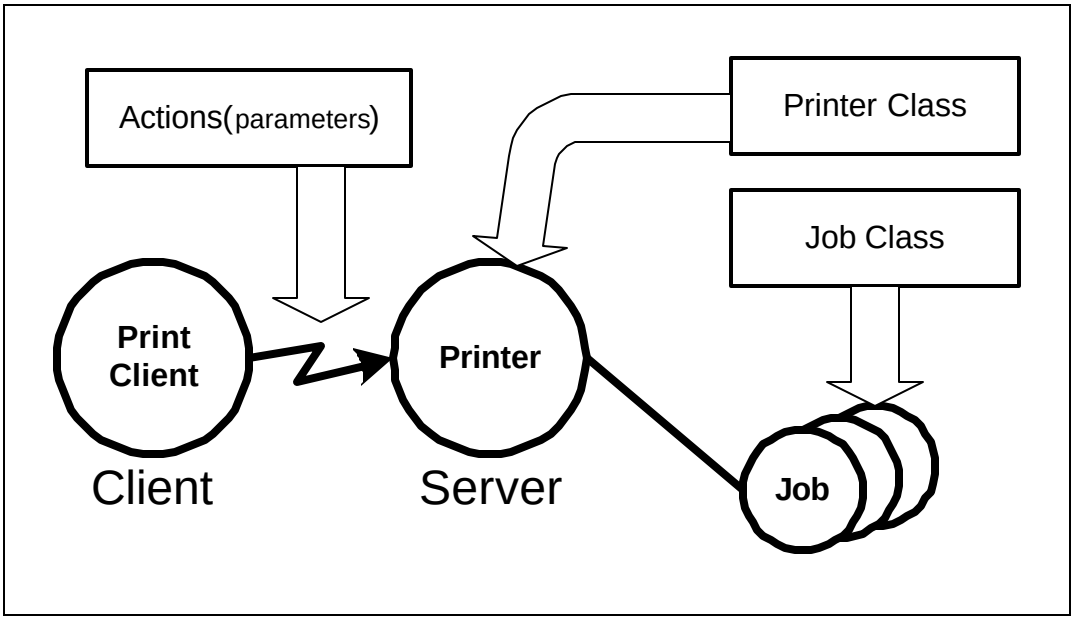

Figure 1 Model Overview

The objects are represented in the semantic model as data classes. The methods are represented as a set of actions that act upon those data classes. The actions permit the creation and control of Jobs as well as the submission of a Job's document content or URL reference to the document content. Other actions allow the control of the Job or Printer. There are also actions to query a Printer or Job to access their attributes or to obtain a list of jobs.

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

MediaSheet: A sheet of paper, or other material, used for printing.

Impression: Everything printed on a single side of a media.

Page: A logical entity that represents the information contained on a single side of a sheet of media. Note that this the electronic form and that multiple pages can be rendered into a single impression through N-Up printing.

2 Data Classes

This section describes the data classes in the PWG semantic model. Some of the classes are taken from the model and semantics of IPP [rfc2911].

2.1 Printer Object Class

The Printer class is represented by a collection of attributes as shown in Figure 2 Printer Class. The Printer Description Attributes are presented in detail in Table 5 - Printer Description Attributes

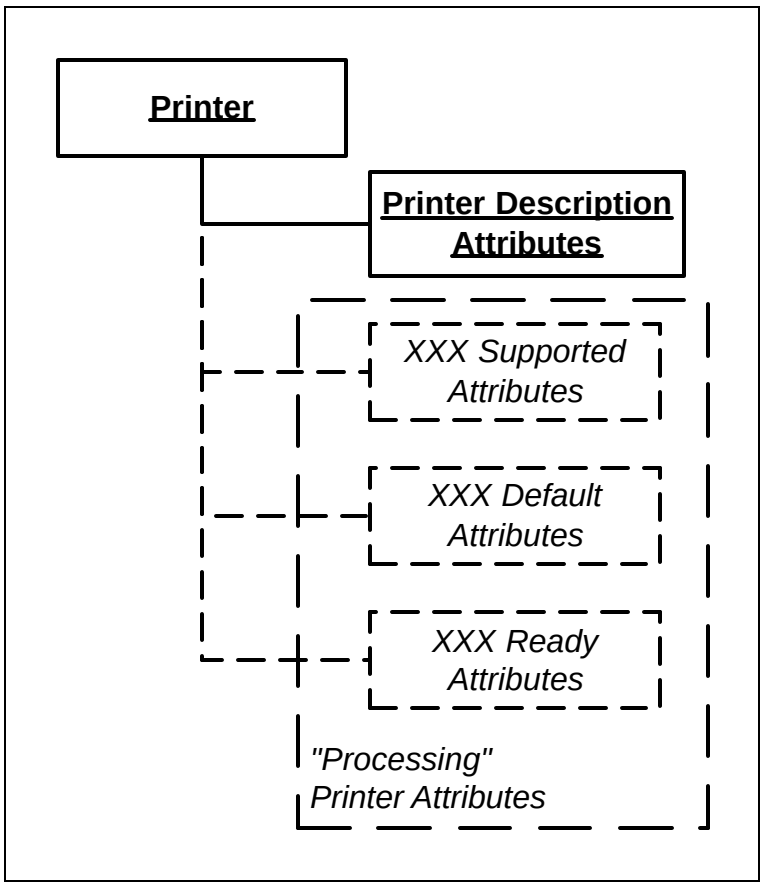

Figure 2 Printer Class

2.1.1 Printer Description Attributes

Figure 3 shows the Printer Description Attributes. These attributes represent the processing state of the printer and information that describes the printer such as its make, where it's located and its speed. It also contains the Printer attributes that describe attribute values the client can supply in action requests. The semantics of the attributes are summarized in Table 5 - Printer Description Attributes

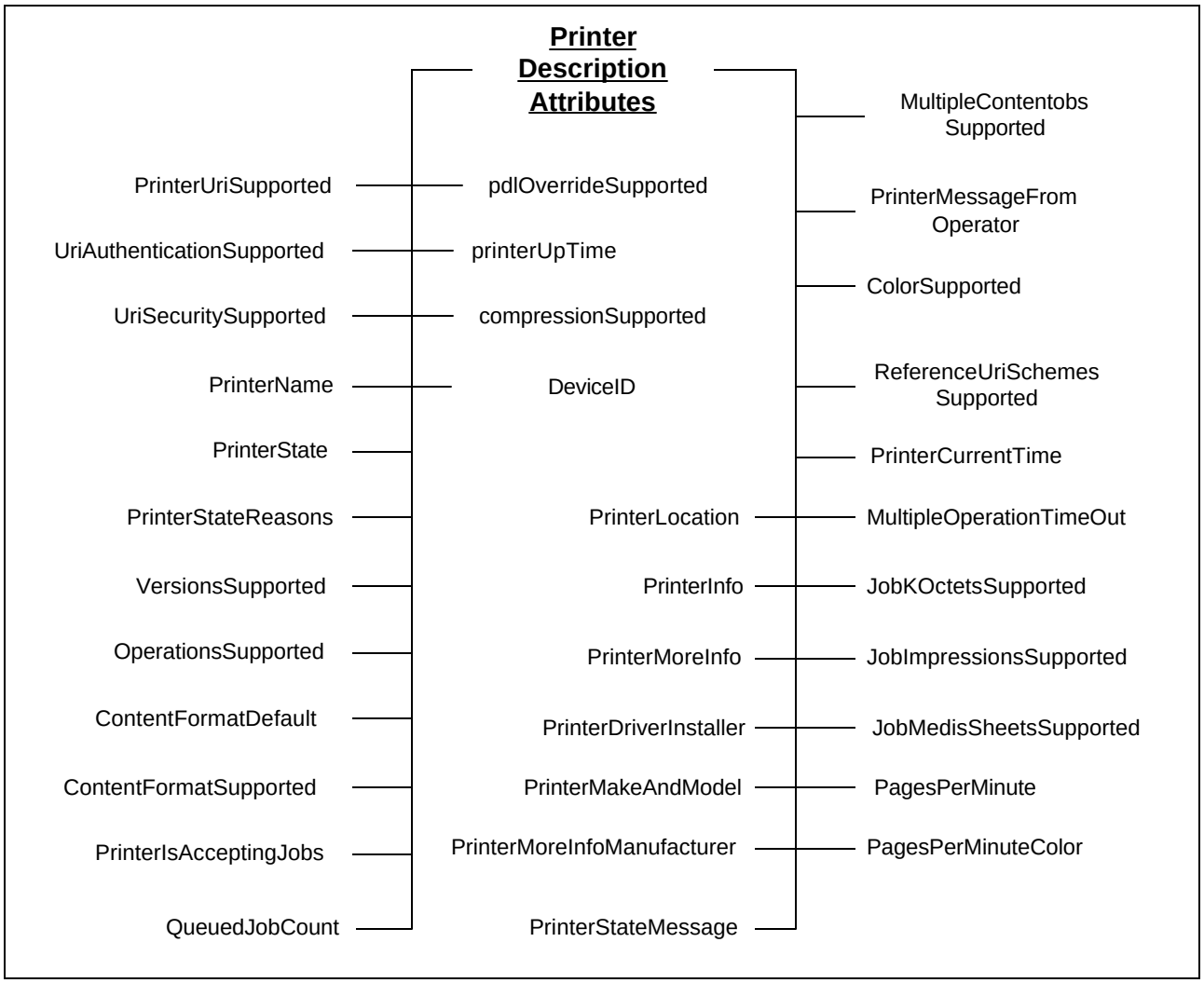

Figure 3 Printer Description Attributes

2.1.2 The "PrinterState" attribute and the Printer Life Cycle

The "PrinterState" attribute is one of the most important Printer Description attributes Figure 4**Error! Reference source not found.** shows the values of the "PrinterState" attribute and the Printer life cycle as affected by actions on the Printer and job processing.

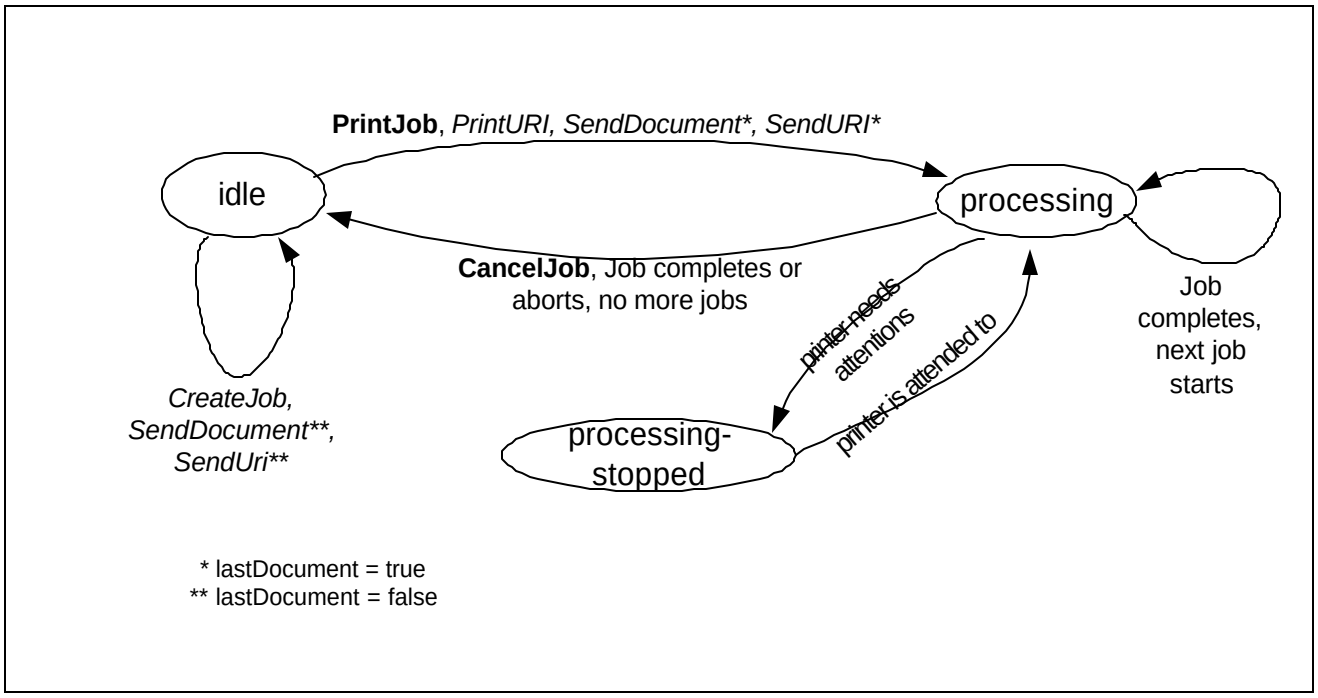

Figure 4 - The "PrinterState" attribute and the Printer Life Cycle

2.1.3 "Job Processing" Printer Attributes

See section 2.2.1 below for the attributes that may comprise this group. If a Job Processing attribute (e.g. Media) is supported, the Printer must have an associated xxxSupported (e.g. MediaSupported) and xxxDefault (e.g. MediaDefault) "Job Processing" Printer attribute. There may be an associated xxxReady (e.g. MediaReady) "Job Processing" Printer attribute. By retrieving the "Job Processing" Printer attributes, a Client can determine all the attributes and their values that may be used in constructing a Job Creation action.

2.1.3.1 xxxSupported Attributes

These attributes list all the currently configured valid values for the "xxx" Job Processing Attributes. Though the Printer is configured to support the feature, human intervention may be required to process the job (e.g. selected paper may have to be loaded into a tray). The syntax for xxxSupported is multi-valued when an "xxx" attribute is a string. When "xxx" is an integer, the syntax of the corresponding "xxxSupported" attribute is usually RangeOfInteger which indicates the minimum and maximum values supported by the Printer. However, there are some exceptions as indicated in **Error! Reference source not found.**.

Table 1-Integer syntaxes whose "xxxSupported" 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)

164

165 **2.1.3.2 xxxDefault Attributes**

166 These attributes give the default value for the associated production instruction if the Job
167 Processing Attribute of the job and the instructions embedded in the PDL are not supplied. The
168 syntax for the "xxxDefault" attribute is the same as the corresponding "xxx" Job Processing
169 Attribute. The only exception is that the PageRanges attribute does not have a PageRangesDefault
170 attribute.

171 **2.1.3.3 xxxReady Attributes**

172 These attributes give the features available without human intervention. The syntax for a
173 "xxxReady" attribute is the same as the corresponding "xxx" Job Processing Attribute.

174 *2.2 Job Object Class*

175 The Job object class is represented by a collection of attributes divided into three groups as shown
176 in Figure 5 Job data Class:

177 Processing Attributes - shown in Table 2 - Processing Attributes

178 Job Attributes - shown in Table 3- Job Attributes.

179 Content Attributes – shown in Table 4 – Content Attributes

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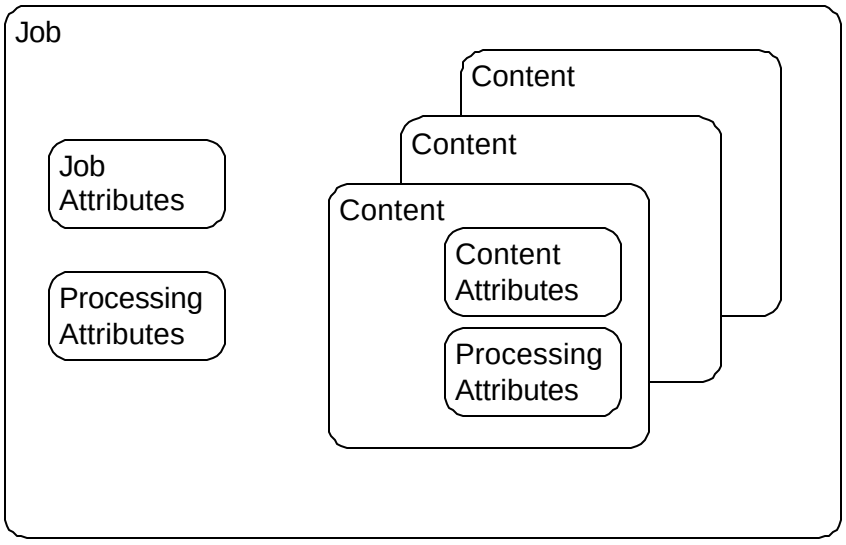

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182 **Figure 5 Job data Class**

2.2.1 Processing Attributes

Figure 7 Processing Attributes

shows the Processing Attributes. The Processing attributes are split into three groups:

1) Rendering Attributes identify the different rendering attributes that determine the quality and resolution of how marks are made on the page.
2) Finishing Attributes define how multiple physical sheets are manipulated to create final output products. The output could be a job, document or page depending on the defined solution interface.
3) Imposition Attributes identify how the logical pages look on the MediaSheet.

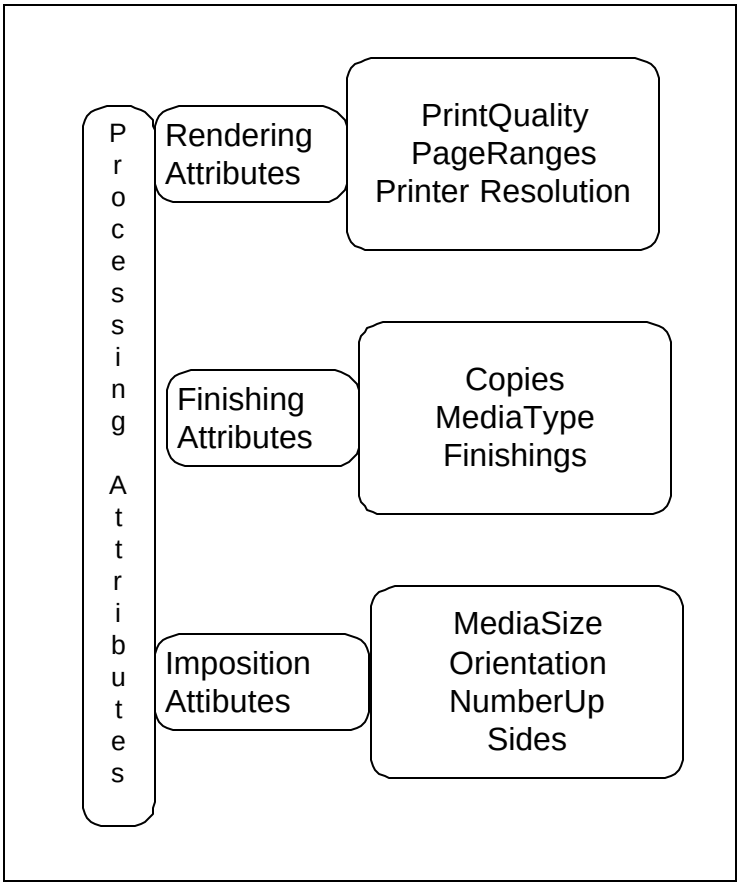

Figure 6 - Processing Categories

An interface will support the processing attributes that are required for its application. The semantics of the attributes are summarized in along with a brief description of each attribute.

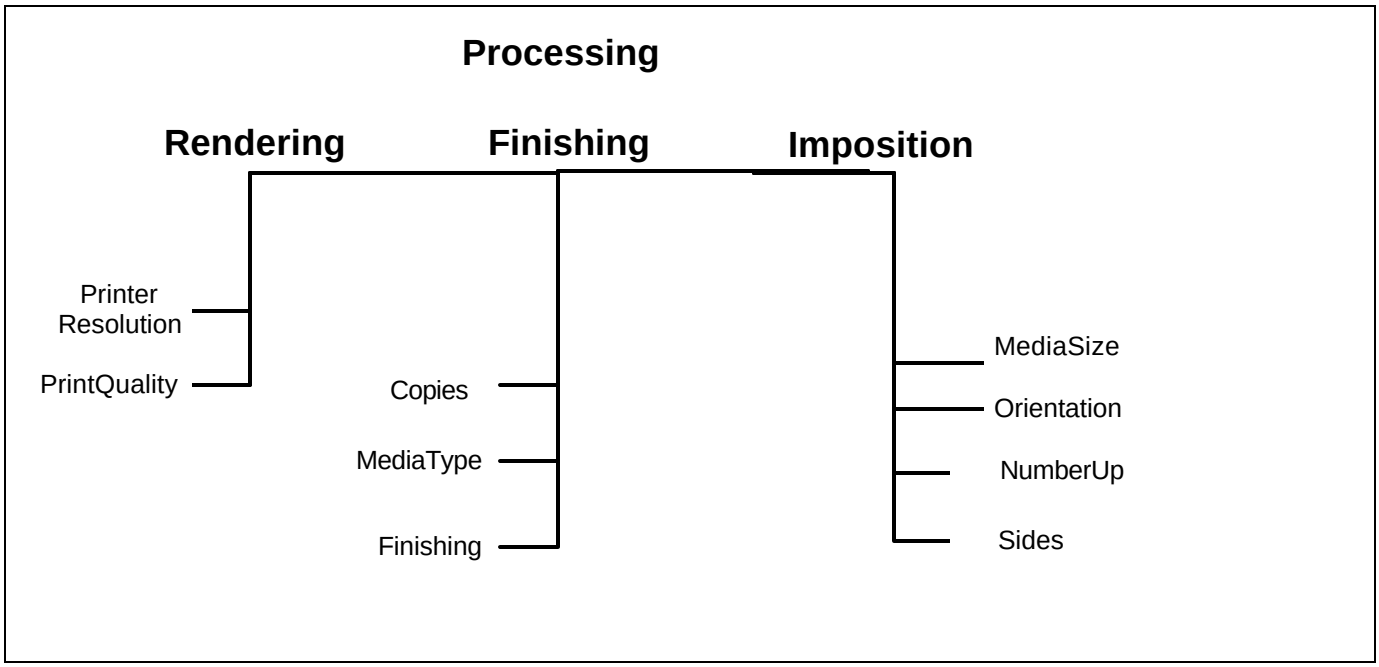

Figure 7 Processing Attributes

2.2.2 Job Attributes

Figure 8 shows the Job Attributes. The semantics of the attributes are summarized in**Table 3- Job Attributes**.

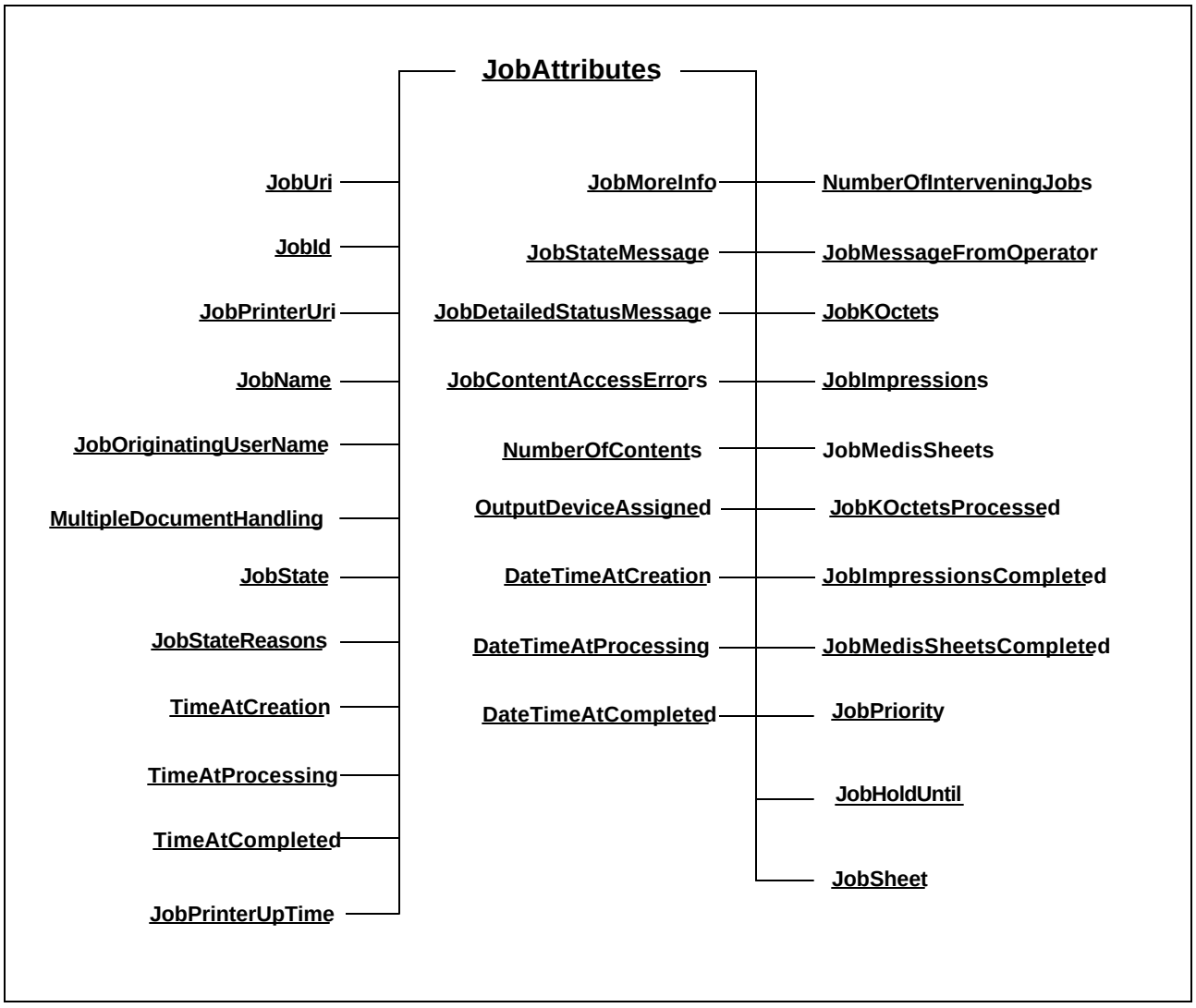

Figure 8 Job Attributes

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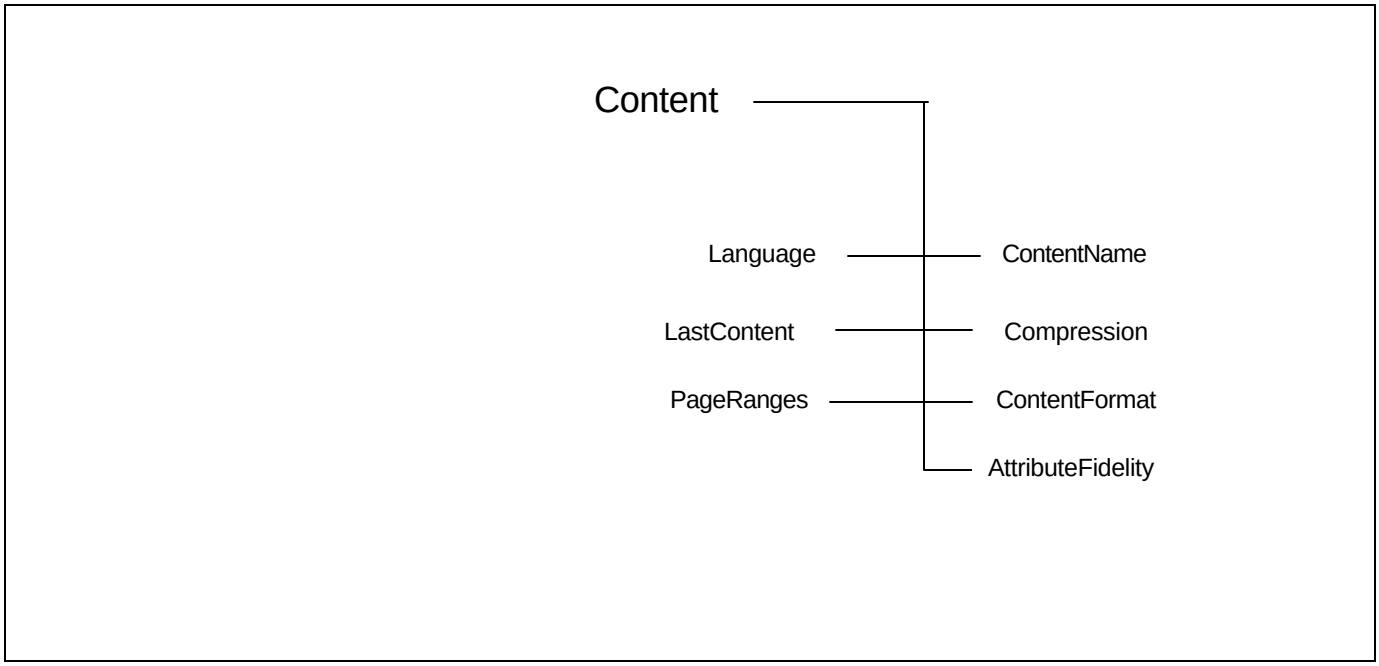
210 2.2.3 Content Attributes

211 Figure 9 shows the Content Attributes. A Printer should support each Content Attribute that
212 represents a feature of the Printer. The semantics of the attributes are summarized in Table 4 –
213 Content Attributes



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215

216 **Figure 9 Content Attributes**

2.2.4 The "JobState" attribute and the Job Life Cycle

The "JobState" attribute is one of the most important Job attributes. Figure 10 shows the values of the "JobState" attribute and the Job life cycle as affected by actions on the Job, Printer, and job processing.

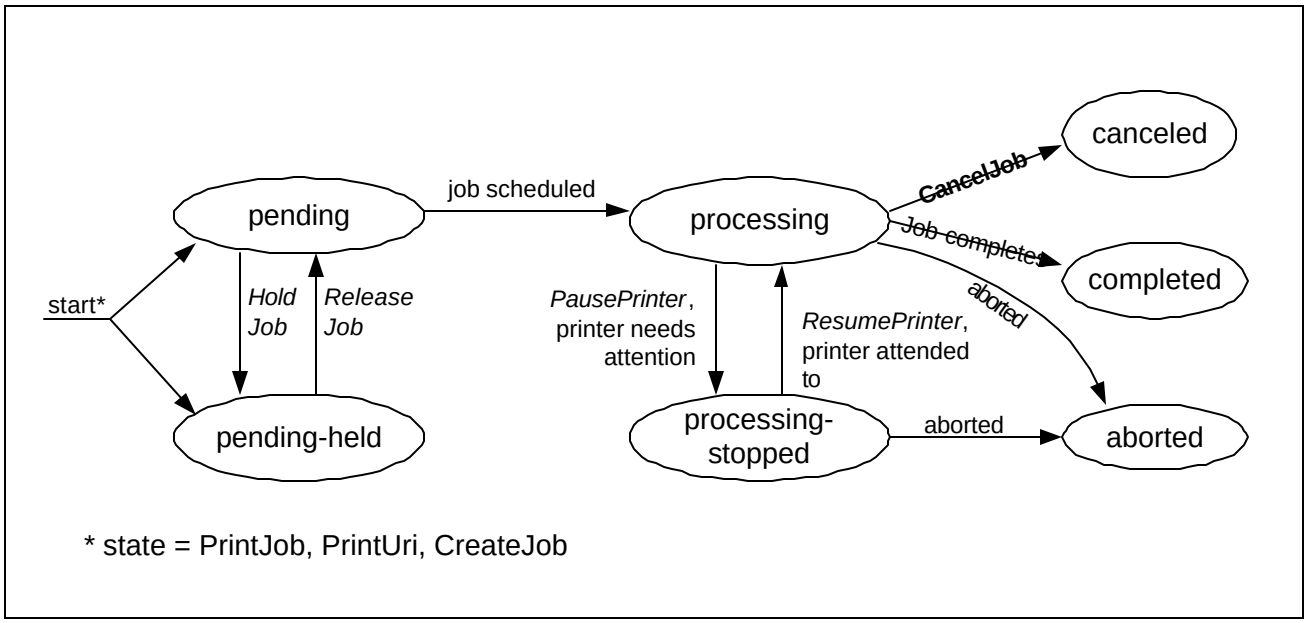

Figure 10 The "JobState" Job Attribute and the Job object life Cycle

2.3 Summary of Job and Printer object attributes

This appendix summarizes the attributes for the Job and Printer objects. For each attribute, the tables contain the attribute name, whether the attribute is multi-valued, its syntax, constraints (MAX = 2**31-1, MIN = -2**31, and Maxlength = number of octets for strings), and a reference to the Content where the semantics of the attribute is completely specified:

2.3.1 Processing Attributes

Table 2 - Processing Attributes

Attribute Name	Multivalued	Syntax	constraint	reference
	Description (values)			
Copies		Integer	1:MAX	[rfc2911] §4.2.5
	The number of copies of the Output Content(s) to be printed.			
Sides		String	type2 keyword	[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)			
NumberUp		Integer	1:MAX	[rfc2911] §4.2.9

Attribute Name	Multivalued	Syntax	constraint	reference
	Description (values)			
	Indicates the number of pages in an impression.			
Orientation		String	type2 keyword	[rfc2911] §4.2.10
	The desired orientation for printed pages. (keywords: portrait, landscape, reverse-landscape, reverse-portrait)			
Media		String	type3 keyword	[rfc2911] §4.2.11
	The medium that the Printer uses for all impressions of the Job. (example: “na_letter_8.5x11in”. See [pwg5101.1])			
MediaSize		String	Type3 keword	Need UPnP ref
	The medium size that the Printer uses for all impressions of the Job. (example: “na_letter_8.5x11in”. See [pwg5101.1] §5)			
MediaType		String		
	The medium type that the Printer uses for all impressions of the Job. (example: “stationery”, “transparency”. See [pwg5101.1] §3)			
PrinterResolution		resolution		
	The resolution that Printer uses for the Job in cross-feed and feed direction in units of dpi or dpc.			
PrintQuality		String		
	The print quality that the Printer uses for the Job. (keyword: draft, normal, high)			
Finishing	Yes	String	Type2 keyword	[rfc2911] §4.2.6
	Identifies the finishing that the Printer uses for each copy of each printed Output Content in the Job (example: 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)			

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231 2.3.2 Job Attributes

232 **Table 3- Job Attributes**

Attribute Name	Multivalued	Syntax	constraint	reference
	Description (values)			
JobUri		String	uri	[rfc2911] §4.3.1
	The Printer sets this to the URI for the job. (example: ipp://www.company.com/printer/jobs/22)			
JobId		Integer	1:MAX	[rfc2911] §4.3.2
	The Printer sets this to the ID of the job that is unique for the Printer.			

Attribute Name	Multivalued	Syntax	constraint	reference
Description (values)				
JobPrinterUri		String	uri	[rfc2911] §4.3.3
The Printer set this to the URI of Printer that created this Job. (example: ipp://www.company.com/printer)				
JobName		String	Maxlength=127	[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	[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”)				
JobState		String	Type1 keyword	[rfc2911] §4.3.7
The current state of the job (see section 2.2.4). See also JobStateReasons attribute below. (keywords: pending, pending-held, processing, processing-stopped, canceled, aborted, completed)				
JobStateReasons	Yes	String	type2 keyword	[rfc2911] §4.3.8
Provides additional information about the job's current state. (keywords: none, job-incoming, job-data-insufficient, Content-access-error, submission-interrupted, job-outgoing, job-hold-until-specified, resources-are-not-ready, printer-stopped-partly, printer-stopped, job-interpreting, job-queued, job-transforming, job-queued-for-marker, job-printing, job-canceled-by-user, job-canceled-by-operator, job-canceled-at-device, aborted-by-system, unsupported-compression, compression-error, unsupported-Content-format, Content-format-error, processing-to-stop-point, service-off-line, job-completed-successfully, job-completed-with-warnings, job-completed-with-errors, job-restartable, queued-in-device))				
TimeAtCreation		Integer	MIN:MAX	[rfc2911] §4.3.14.1
The time at which the Job was created in “PrinterUpTime” seconds.				
TimeAtProcessing		Integer	MIN:MAX	[rfc2911] §4.3.14.2
The time at which the Job first began processing.				
TimeAtCompleted		Integer	MIN:MAX	[rfc2911] §4.3.14.3
The time at which the Job completed.				
JobPrinterUpTime		Integer	1:MAX	[rfc2911] §4.3.14.4
The amount of time (in seconds) that the Printer has been up and running. See Printer attribute “PrinterUpTime”				
JobMoreInfo		String	uri	[rfc2911] §4.3.4
URI used to obtain information intended for end user consumption about this specific Job. (example: “http://www.company.com/printer/embededjobpage”)				

Attribute Name	Multivalued	Syntax	constraint	reference
Description (values)				
JobStateMessage		String	Maxlength=127	[rfc2911] §4.3.6
Specifies information about the "JobState" and "jobStateReasons" attributes in human readable text. (example: “Job completed successfully with warnings")				
JobDetailedStatusMessage	Yes	String	Maxlength=1023	[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”)				
JobContentAccessErrors	Yes	String	Maxlength=1023	[rfc2911] §4.3.11
Information about each Content access error for this job encountered by the Printer. (example: “(404) http://www.company.com/pub/fileToPrint.pdf ”)				
NumberOfContents		Integer	0:MAX	[rfc2911] §4.3.12
The number of Contents in the job.				
OutputDeviceAssigned		String	Maxlength=127	[rfc2911] §4.3.13
Identifies the output device to which the Printer has assigned this job (example: “Pete’s Printer”)				
DateTimeAtCreation		String	DateTime [rfc1123]	[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]	[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]	[rfc2911] §4.3.14.7
Indicates the date and time at which the Job completed. (example: Fri, 03 May 2002 08:49:37 GMT)				
NumberOfInterveningJobs		Integer	0:MAX	[rfc2911] §4.3.15
The number of jobs that are "ahead" of this job assuming the current scheduled order.				
JobMessageFromOperator		String	Maxlength=127	[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”)				
JobKOctets		Integer	0:MAX	[rfc2911] §4.3.17.1
The total size of the Job’s Content(s) in integral units of 1024 octets.				
jobImpressions		Integer	0:MAX	[rfc2911] §4.3.17.2
The total size in number of impressions in all the Job’s Content(s).				

Attribute Name	Multivalued	Syntax	constraint	reference
	Description (values)			
JobMediaSheets		Integer	0:MAX	[rfc2911] §4.3.17.3
	The total number of media sheets to be produced for this job.			
JobKOctetsProcessed		Integer	0:MAX	[rfc2911] §4.3.18.1
	the total number of octets processed in integral units of 1024 octets so far.			
jobImpressionsCompleted		Integer	0:MAX	[rfc2911] §4.3.18.2
	The number of impressions completed for the job so far.			
MultipleContentHandling		String	type2 keyword	[rfc2911] §4.2.4
	Controls whether Input Content in multi-Content jobs are combined into a single Output Content or are kept as separate Output Content (see section **Error! Reference source not found.**). Useful for application of Finishings and the placement of one or more print-stream pages into impressions and onto media sheets for multi-Content Jobs. (keywords: single-Content, separate-Content-uncollated-Copies, separate-Content-collated-Copies, single-Content-new-sheet)			
JobMediaSheetsCompleted		Integer	0:MAX	[rfc2911] §4.3.18.3
	The media-sheets completed marking and stacking for the entire job so far.			
JobPriority		Integer	**1:100**	[rfc2911] §4.2.1
	Priority for scheduling the Job. A higher value specifies a higher priority.			
JobHoldUntil		String	Type3 keyword	[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)			
JobSheets		String	type3 keyword	[rfc2911] §4.2.3
	Specifies which job start/end sheet(s), will be printed with a job.. (example: none, standard)			

2.3.3 Content Attributes

Table 4 – Content Attributes

Attribute Name	Multivalued	Syntax	constraint	reference
	Description (values)			
ContentName		String	Maxlength=127	[rfc2911] §4.?.?
	Name for the Content to be used in an implementation specific manner.			
Compression		String		
	Compression algorithm used on the Content Data, if any.			

Attribute Name	Multivalued	Syntax	constraint	reference
Description (values)				
ContentFormat		String	MimeMediaType [rfc2046], [rfc2048]	[rfc2911] §4.?.?
The Content format (i.e. PDL) for the Content. 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 Content. (examples: “application/octet-stream”, “application/postscript”, “application/vnd.hp-PCL”, “text/plain; charset=utf-8”)				
LastContent		Boolean		[rfc2911] §4.?.?
‘true’ if this is the last Input Content for the job. Default = ‘false’.				
PageRanges		String		
Identifies the range(s) of pages that are to be printed by the Printer for each copy of each Output Content.				
Language		String		
Identifies the Natural Language of the Content				
AttributeFidelity		Boolean		
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’				

2.3.4 Printer Description Attributes

Table 5 - Printer Description Attributes

Attribute Name	Multivalued	Syntax	constraint	reference
Description (values)				
PrinterUriSupported	Yes	String	uri	[rfc2911] §4.4.1
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)				
UriAuthenticationSupported	Yes	String	type2 keyword	[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	[rfc2911] §4.4.3

Attribute Name	Multivalued	Syntax	constraint	reference
Description (values)				
Identifies the security mechanisms used for accessing the Printer object. See PrinterUriSupported for additiona information. (keywords: none, ssl3, tls)				
PrinterName		String	Maxlength=127	[rfc2911] §4.4.4
The end-user friendly name of the Printer object. (example: “Pete’s Printer”)				
PrinterState		String	type1 keyword	[rfc2911] §4.4.11
Identifies the current state of the device (see section 2.1.2). See “PrinterStateReasons” below. (keywords: idle, processing, stopped)				
PrinterStateReasons	Yes	String	type2 keyword	[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)				
OperationsSupported	Yes	String	type2 keyword	[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).				
DocumentFormatDefault		String	MimeMediaType [rfc2046], [rfc2048]	[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”)				
DeviceId		String		

Attribute Name	Multivalued	Syntax	constraint	reference
Description (values)				
The value of this variable MUST exactly match the IEEE 1284-2000 Device ID string, except the length field MUST not be specified.. The value is assigned by the Printer vendor and MUST NOT be localized by the Print Service. *The IEEE 1284-2000 Device ID is a length field followed by a case-sensitive string of ASCII characters defining peripheral characteristics and/or capabilities. For the purposes of this specification, the length bytes MUST NOT be included. The Device ID sequence is composed of a series of keys and values of the form:* `key: value {,value} repeated for each key` *As indicated, each key will have one value, and MAY have more than one value. The minimum necessary keys (case-sensitive) are MANUFACTURER, COMMAND SET, and MODEL. (These keys MAY be abbreviated as MFG, CMD, and MDL respectively.) Each implementation MUST supply these three keys and possibly additional ones as well. Each key (and each value) is a string of characters. Any characters except colon (:), comma (,), and semi-colon (;) MAY be included as part of the key (or value) string. Any leading or trailing white space (SPACE[x'20'], TAB[x'09'], VTAB[x'0B'], CR[x'0D'], NL[x'0A'], or FF[x'0C']) in the string is ignored by the parsing program (but is still counted as part of the overall length of the sequence).* *An example ID String, showing optional comment and active command set keys and their associated values (the text is actually all on one line):* `MANUFACTURER:ACME Manufacturing;` `COMMAND SET:PCL,PJL,PS,XHTML-Print+xml;` **MODEL:LaserBeam 9;** `COMMENT:Anything you like;` `ACTIVE COMMAND SET:PCL;` *(See IEEE 1284-2000 clause 7.6)* *Note: One of the purposes of the DeviceId variable is to select a printer driver for those clients that need a printer driver. The values of the COMMAND SET key are interpreted by the printer driver provided by the vendor and so are vendor-defined, rather than being standardized.*				
ContentFormatSupported	YES	String	**MimeMediaType**	
Identifies both the Content and Image formats supported by the Printer. Specifies the set of Content 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.				
PrinterIsAcceptingJobs		Boolean		[rfc2911] §4.4.23
Indicates whether the printer is currently able to accept jobs.				
QueuedJobCount		integer	0:MAX	[rfc2911] §4.4.24

Attribute Name	Multivalued	Syntax	constraint	reference
	Description (values)			
	The number of jobs that the Printer has accepted but has not yet completed.			
PdlOverrideSupported		String	type2 keyword	[rfc2911] §4.4.28
	Expresses the ability of a Printer to either attempt to override a Content's production instructions with Job Processing Attributes or not. (keywords: attempted, not-attempted)			
PrinterUpTime		integer	1:MAX	[rfc2911] §4.4.29
	The amount of time (in seconds) that a Printer has been up and running			
CompressionSupported	Yes	String	Type3 keyword	[rfc2911] §4.4.32
	Identifies the set of supported Compression algorithms for Content content. (keywords: none, deflate, gzip, compress)			
PrinterLocation		String	Maxlength=127	[rfc2911] §4.4.5
	Identifies the location of the device. (example: Pete's Office)			
PrinterInfo		String	Maxlength=127	[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")			
PrinterMoreInfo		String	uri	[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")			
PrinterDriverInstaller		String	Uri	[rfc2911] §4.4.8
	Intended for consumption by automata to locate the driver installer for this Printer object. Note: This attribute has not been used by any known implementation. (example: "http://www.company.com/printer/installerProgram"			
PrinterMakeAndModel		String	Maxlength=127	[rfc2911] §4.4.9
	Identifies the make and model of the device. (example: "Xerox Phaser 7700", "HP LaserJet 1000", "Lexmark Optra Color 45")			
PrinterMoreInfoManufacturer		String	uri	[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")			
PrinterStateMessage		String	Maxlength=1023	[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")			
MultipleContentJobsSupported		boolean		[rfc2911] §4.4.16

Attribute Name	Multivalued	Syntax	constraint	reference
	Description (values)			
	Indicates whether the Printer supports more than one Content per job, i.e., more than one SendContent and/or SendUri request per job. A multi-Content per job Printer must implement this attribute and have a value of 'true'. A single Content per job Printer may either not support this attribute or support it with a value of 'false'.			
PrinterMessageFromOperator		String	Maxlength=127	[rfc2911] §4.4.25
	End user information for the printer. (example: "printer unavailable until 1pm due to preventive mainanance")			
ColorSupported		boolean		[rfc2911] §4.4.26
	Indicates if the device is capable of any type of color printing at all, including highlight color.			
ReferenceUriSchemesSupported	Yes	String	UriScheme	[rfc2911] §4.4.27
	Which URI schemes are supported by the printer to retrieve Content This attribute must be supported if the Printer is capable of print by reference. (example: ftp, http)			
PrinterCurrentTime		String	DateTime [rfc1123]	[rfc2911] §4.4.30
	Indicates the current date and time. (example: Fri, 03 May 2002 08:49:37 GMT)			
MultipleOperationTimeOut		Integer	1:MAX	[rfc2911] §4.4.31
	Identifies the minimum time (in seconds) that a multi-Content per job Printer must wait between actions on an open job. The actions can add Content to the open Job or close the Job. Timeouts are handled in an implementation specific manner. Multi-Content per job PrinterS must implement this attribute. The recommended value is greater than 60 and less than 240.			
JobKOctetsSupported		RangOfInteger	0:MAX	[rfc2911] §4.4.33
	Specifies the allowable upper and lower bounds of the total size per job in integral units of 1024 octets.			
JobImpressionsSupported		RangOfInteger	0:MAX	[rfc2911] §4.4.34
	Specifies the upper and lower bounds for the number of impressions allowed per job.			
JobMediaSheetsSupported		RangOfInteger	0:MAX	[rfc2911] §4.4.35
	Specifies the upper and lower bounds for the number of media sheets allowed per job.			
PagesPerMinute		Integer	0:MAX	[rfc2911] §4.4.36
	Specifies the nominal number of pages per minute which may be generated by this printer.			
PagesPerMinuteColor		Integer	**0:MAX**	[rfc2911] §4.4.37
	Specifies the nominal number of pages per minute which may be generated by this printer when printing color.			

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3 Actions

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

3.1 Action Summary

This table summarizes the actions defined for the Job and Printer. See section 3 for more details.

Job Creation and Document submission	Job Control	Status and Information access	Printer Control
PrintJob	CancelJob	GetJobs	PausePrinter
PrintUri	HoldJob	GetPrinterAttributes	ResumePrinter
CreateJob	ReleaseJob	GetJobAttributes	PurgeJobs
SendDocument	RestartJob		
SendURI			
ValidateJob			

Table 6 - Summary of Actions

3.2 Job Creation and document submission Actions

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

Production instructions contained in the arguments of the Job Creation action is combined with Printer supplied information to create a Job instance.

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

A concept that is important in the PWG model is a set of production instructions that can be applied to a print job. Examples of these instructions include the number of Copies and the media to use. These instructions are often referred to as a Job Ticket. The Job Ticket is made up of the Job Attributes (see section 2.2.2), the “Processing” attributes (see section 2.2.1), and Document Attributes in a Job Creation operation.

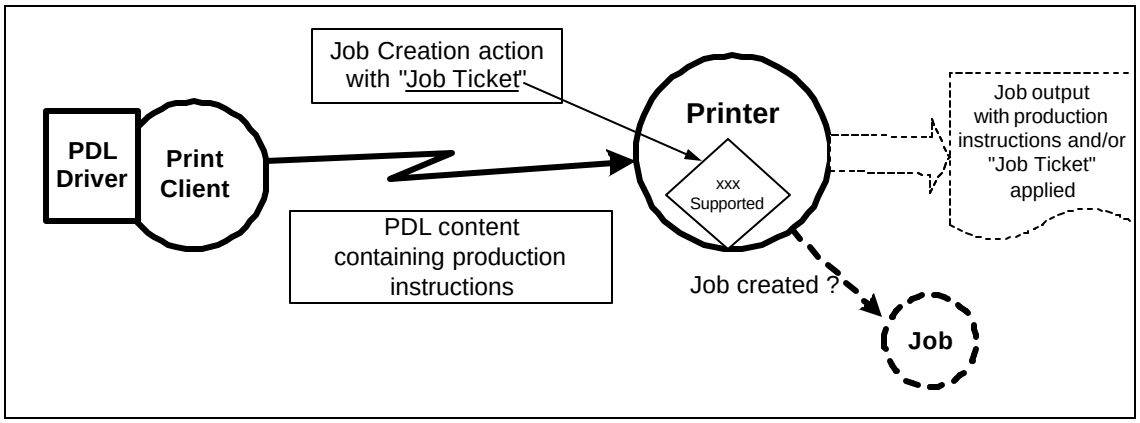

Figure 11 Production Instruction Processing

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

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

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

3.2.1 PrintJob

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

3.2.2 PrintUri

([rfc2911] §3.2.2) Identical to the PrintJob operation (see section 3.2.1) except that a client supplies a URI reference to the document data.

3.2.3 CreateJob

([rfc2911] §3.2.4) Similar to the PrintJob operation (see section 3.2.1), except that in the CreateJob request the Client does not supply Document Data. The client supplies a single set of Job Processing attributes that the Printer applies to the Output Document(s) of the job. The "MultipleDocumentHandling" Job Processing attribute controls whether the Printer produces separate Output Documents or combines the Input Documents into a single Output Document (see section **Error! Reference source not found.**).

3.2.3.1 The "MultipleDocumentHandling" Job Processing attribute

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

3.2.4 SendDocument

([rfc2911] §3.3.1) Submits the entire Document Content for the next Input Document of a job created by a previous CreateJob action (see section 3.2.3).

3.2.5 SendUri

([rfc2911] §3.3.2) Identical to the SendDocument operation (see section 3.2.4) except that a client supplies a URI reference to the Document Content data, instead of supplying the document content.

3.2.6 ValidateJob

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

3.3 Job Control Actions

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

3.3.1 CancelJob

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

3.3.2 HoldJob

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

3.3.3 ReleaseJob

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

3.3.4 RestartJob

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

3.4 Status and information Actions

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

3.4.1 GetJobs

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

3.4.2 GetPrinterAttributes

([rfc2911] §3.2.5) Returns the values of the requested attributes and/or attribute groups of a Printer.

3.4.3 GetJobAttributes

([rfc2911] §3.3.4) Returns the values of the requested attributes and/or attribute groups of a Job.

3.5 Printer Control Actions

This section describes actions which allow a client to control a Printer and may require operator credentials: PausePrinter, ResumePrinter, and PurgeJobs.

3.5.1 PausePrinter

([rfc2911] §3.2.7) Stops the Printer object from scheduling jobs.

3.5.2 ResumePrinter

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

3.5.3 PurgeJobs

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

4 Status Codes

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

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

successful-ok - Action succeeded and no requested attribute were substituted or ignored.
successful-ok-ignored-or-substituted-attributes - Action succeeded but some unsupported attributes were ignored or substituted.
successful-ok-conflicting-attributes - Action succeeded but some attributes were conflicting and have been substituted or ignored.

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

client-error-bad-request - malformed syntax or constraint exceeded.
client-error-forbidden - The Printer understood the request, but is refusing to fulfill it for authentication and/or authorization reasons. The client should not try again even with credentials.
client-error-not-authenticated - The request requires user authentication. The client may try again with suitable authentication.
client-error-not-authorized - The requester is not authorized to perform the request. The Client should not try again.
client-error-not-possible - The action cannot be performed, because of the state of the target object.
client-error-timeout - The client did not produce a subsequent request within the time that the Printer was prepared to wait.
client-error-not-found - The target object was not found.
client-error-gone - The target object is no longer available.
client-error-request-entity-too-large - The request and/or the Document Content is too large.
client-error-request-value-too-long - A attribute value in the request is longer than the Printer supports.
client-error-document-format-not-supported - The document format is not supported.
client-error-attributes-or-values-not-supported - An attribute and/or value is not supported and must be in order to carry out the request. The Printer must return the unsupported attributes or values in the Unsupported Attributes group.
client-error-uri-scheme-not-supported - The URI scheme is not supported.
client-error-charset-not-supported - The charset is not supported.
client-error-conflicting-attributes - Some supplied attributes are conflicting. The Printer must return them in the Unsupported Attributes group.
client-error-compression-not-supported - The compression of the Document Content is not supported.
client-error-compression-error - An error occurred when uncompressing the Document Content.

client-error-document-format-error - An error occurred when interpreting the Document Content.
client-error-document-access-error - An error occurred when the Printer attempted to access the Document Content through the URI supplied.

The following status codes are returned when the Printer rejects the action indicating some error on the part of the Printer:

server-error-internal-error - An unexpected internal error occurred.
server-error-operation-not-supported - The Printer does not support the requested action.
server-error-service-unavailable - The Printer is unable to service the request at this time due to overloading or maintenance. The client should try again later as per the "message" Operation attribute.
server-error-version-not-supported - The Printer doesn't support the requested major version of the protocol and returns the closest version that it does support.
server-error-device-error - The Printer encountered a device error that causes it to be unable to accept a new request. For example, a paper jam for a Printer that doesn't spool and so cannot accept a new job submission until the jam is fixed.
server-error-temporary-error - A temporary error such as a buffer full write error, a memory overflow, or a disk full condition.
server-error-not-accepting-jobs - The Printer is not currently accepting jobs. Its "PrinterIsAcceptingJobs" Printer Description attribute is 'false'.
server-error-busy - A temporary error indicating that the Printer is too busy processing jobs and/or other requests. A Client should try again later.
server-error-job-canceled - The job has been canceled by an operator or aborted by the system. For example, while the Client is transmitting the Document Content to the Printer.
server-error-multiple-document-jobs-not-supported - The Printer doesn't support multiple document jobs and the client attempted to supply a second SendDocument or SendUri request. The Printer's "MultipleDocumentJobsSupported" Printer Description attribute is 'false'.

5 Change Log

5/16/02	PJZ	original draft
5/23/02	TH	re-organize draft with comments from Melinda Grant
5/26/02	TH	detailed review of the draft
5/29/02	PJZ	Incorporated comments prior to initial release
6/4/02	SAA	Modified to split the Job Attributes into 3 categories:

1) Processing Attributes
2) Content Attributes
3) Job Attributes

The Processing Attributes were further split into 3 subcategories:

1) Rendering attributes
2) Imposition Attributes
3) Finishing Attributes

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

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

Modified Printer Description Attributes with the following:

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

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

6 References

[rfc2911] RFC 2566 “Internet Printing Protocol/1.0 Model and Semantics”, March 1999 and RFC 2911 “Internet Printing Protocol/1.1 Model and Semantics”, September 2000, T. Hastings, R. Herriot, R. Debry, S. Isaacson, P. Powell

[PWG5101.1] IEEE-ISTO 5101.1-2001 Media Standardized Names <work in progress>, ftp://ftp.pwg.org/pub/pwg/standards/pwg5101.1.pdf, .doc, .rtf for standardized names

[rfc2046] RFC 2046 "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types", November 1996, Freed, N. and N. Borenstein

[rfc2048] RFC 2048 "Multipurpose Internet Mail Extension (MIME) Part Four: Registration Procedures", November 1996, Freed, N., Klensin, J. and J. Postel

[rfc1123] RFC 1123 " Requirements for Internet Hosts -- Application and Support ", October 1989, Branden, R.

7 Appendix – IPP Mapping

7.1 Action Parameter Overview

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

7.2 Job Creation Actions

7.2.1 PrintJob

([rfc2911] §3.2.1)

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

Operation Attributes:

PrinterUri(uri): The target printer for the job

[Document Attributes)]: **[requestingUserName], [JobName], [DocumentFormat],** *[JobKOctets]*, *[jobImpressions]*, *[JobMediaSheets]*: see section 2.2.2.

[Job Processing Attributes]:

Any Job Processing Attribute (see section 2.2.1) or vendor/site specific extension.

[Job Describtion Attributes]:

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

[Job Finishing Attributes]:

Any Job Finishing Attribute (see section 2.2.1) or vendor/site specific extension.

[Document Attributes]:

Any Document Attributes for the single document sent (see section 2.2.1) or vendor/site specific extension.

Document data: The document to print.

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

Operation Attributes *:*

statusCode: Results of the action (see Appendix section 7.6).

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

[detailedStatusMessage]: Text for detailed and technical information about the job.

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

Job Attributes:

JobUri, JobId, JobState, JobStateReasons, *[JobStateMessage], [NumberOfInterveningJobs]* See section *2.2.2*.

7.2.2 PrintUri

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

7.2.3 CreateJob

([rfc2911] §3.2.4) Similar to the PrintJob operation (see section 7.2), except that in the CreateJob request the Client does not supply Document Data. The client supplies a single set of Job Processing attributes that the Printer applies to the Output Document(s) of the job.

7.2.4 SendDocument

([rfc2911] §3.3.1) Submits the entire Document Content for the next Input Document of a job created by a previous CreateJob action (see section 7.2.3).

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

Operation Attributes:

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

[requestingUserName]: see section 2.2.2.

[Document Attributes]:

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

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

Operation Attributes *:*

statusCode: Results of the action (see Appendix section 7.6).

[statusMessage]: Localized text description of the status code

[detailedStatusMessage]: Text for detailed and technical information.

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

Job Attributes:

JobUri, JobId, JobState, JobStateReasons, *[JobStateMessage],*
[NumberOfInterveningJobs] See section .

7.2.5 SendUri

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

7.2.6 ValidateJob

([rfc2911] §3.2.3) The calling sequence is similar to PrintJob (see section 7.2) except the request does not contain the Document Data and the response does not contain the Job Attributes.

7.3 Job Control Actions

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

7.3.1 CancelJob

([rfc2911] §3.3.3)

CancelJobRequest(Operation Attributes)

Operation Attributes:

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

[requestingUserName]: see section 2.2.2.

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

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

Operation Attributes *:*

statusCode: Results of the action (see Appendix section 7.6).

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

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

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

7.3.2 HoldJob

([rfc2911] §3.3.5) The request calling sequence is similar to CancelJob (see section 7.3.1) except that the "jobHoldUntil" attribute may be in the "Operation Attributes". The response sequence is the same as CancelJob.

7.3.3 ReleaseJob

([rfc2911] §3.3.6) The calling sequence is the same as CancelJob (see section 7.3.1).

7.3.4 RestartJob

([rfc2911] §3.3.7) The request calling sequence is similar to CancelJob except that the "jobHoldUntil" attribute may be in the "Operation Attributes". The response sequence is the same as CancelJob (see section 7.3.1).

7.4 Status and information Actions

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

7.4.1 GetJobs

([rfc2911] §3.3.4)

GetJobsRequest(Operation Attributes)

Operation Attributes:

PrinterUri(uri): The target printer containing the jobs

[requestingUserName]: see section 2.2.2.

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

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

[myJobs(boolean)]: Allows user to restrict jobs returned to just the user's jobs or all jobs. Default = 'false'.

[limit(integer)]: Sets maximum number of jobs to return. Default = no limit.

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

Operation Attributes *:*

statusCode: Results of the action (see Appendix section 7.6).

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

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

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

Job Attributes*(sequence of requested attributes/values (multivalued)):* A list of jobs each containing the requested attributes

7.4.2 GetPrinterAttributes

([rfc2911] §3.2.5)

GetPrinterAttributesRequest(Operation Attributes)

Operation Attributes:

PrinterUri(uri): The target printer

[requestingUserName]: see section 2.2.2.

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

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

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

Operation Attributes *:*

statusCode: Results of the action (see Appendix section 7.6).

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

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

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

Printer Attributes(requested attributes/values (multivalued)): The requested attributes

7.4.3 GetJobAttributes

([rfc2911] §3.3.4) .

GetJobAttributesRequest(Operation Attributes)

Operation Attributes:

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

[requestingUserName]: see section 2.2.2.

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

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

Operation Attributes *:*

statusCode: Results of the action (see Appendix section 7.6).

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

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

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

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

7.5 Printer Control Actions

This section describes actions which allow a client to control a Printer and may require operator credentials: PausePrinter, ResumePrinter, and PurgeJobs.

7.5.1 PausePrinter

([rfc2911] §3.2.7)

PausePrinterRequest(Operation Attributes)

Operation Attributes:

PrinterUri(uri): The target printer for the job

[requestingUserName]: see section 2.2.2.

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

Operational Attributes *:*

statusCode: Results of the action (see Appendix section 7.6).

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

[detailedStatusMessage]: Text for detailed and technical information.

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

7.5.2 ResumePrinter

([rfc2911] §3.2.8) The calling sequence is the same as PausePrinter (see section 7.5.1).

7.5.3 PurgeJobs

([rfc2911] §3.2.9) The calling sequence is the same as PausePrinter (see section 7.5.1).

7.6 Changes to remove some IPP specific aspects

This section lists some changes to remove some IPP specific aspects from the PWG Semantic Model. Any attribute name containing “ipp” has had the “ipp” removed. The IPP operation names have the hyphens removed to be the PWG action names and the operations supported are mixed keywords, not integer enum values. All attributes names have had the first letter capitalized and the ‘-‘ character removed and the character following the ‘-‘ has been capitalized. The keyword attribute values defined remain unchanged and are all lower case, except for the ones that specify other attributes names (which are changed to be the mixed case without hyphens). ISSUE 03:

What about the case and hyphens in status code names (and removing the integer values)? The term “object” is sometimes changed to “data class”. ISSUE 04: Why? and Why not done consistently? The term “operation” has been changed to “action” to use the term more frequently used with XML.

The aspects of the model that deal with globalization (i.e. character set & language) have been removed. Globalization will be addressed in a protocol specific binding of this semantic model. The Printer globalization attributes are charsetConfigured, charsetSupported, naturalLanguageConfigured, naturalLanguageSupported and generatedNaturalLanguageSupported.

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