

1 Internet-Draft

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23 **NOTE: This document still has many rough spots**
24 **which will need further editing. At this time, the**
25 **reader should read it for major concepts.**

27 **NOTE: This version (Ver. 0.91) contains changes**
28 **(over Ver. 0.9) in the following sections: Abstract -**
29 **minor wording changes; Intro. - minor wording**
30 **changes; Section 2: Simplified, removed redundant**
31 **paragraphs; Added Section 3: Old section 2**
32 **paragraphs about IPP objects, fixed old section 2.2.2**
33 **on Jobs and 2.2.4 on Job Templates; Added Section**
34 **4: on naming and directory schemas; Deleted Old**
35 **section 3 and 4; Section 5: Fixed User Operations**
36 **(including deletion of empty table rows), Section 6:**
37 **Major modifications on Object Attributes; All other**
38 **sections: minor changes, some fixes to security**
39 **section.**

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58 Abstract

59 This Internet-Draft specifies an Internet Printing Protocol (IPP).
60 This protocol is heavily influence by the semantic operations and
61 attributes defined in ISO/IEC 10175 Document Printing Application
62 (DPA) parts 1 and 3. It also incorporates some of the
63 implementation and interoperability lessons learned from other
64 printing related standards such as POSIX System Administration -
65 Part 4 (POSIX 1378.4) and X/Open A Printing System
66 Interoperability Specification(PSIS).

67 IPP is defined as a set of abstract data types and operations. The
68 operations are implemented using a simple request and response
69 mechanism built on top of HTTP. The abstract data types are
70 encoded as simple ASCII text strings.

71 The IPP protocol initially covers only end user operations on
72 basic print service objects. Future versions of the protocol will
73 cover operator and administrator operations. Authentication is
74 relized by mechanisms outside the scope of the protocol, but the
75 protocol does introduce some access control functionality so that
76 only authorized end users are allowed to submit print jobs to
77 devices with access control. Also, the Cancel Job operation
78 requires some authentication and authorization so that jobs can
79 only be canceled by authorized end-users. Extended monitoring and
80 management is possible through other protocols such as the SNMP
81 Printer MIB [1].. In the areas where there are no existing
82 standards, some proposed and emerging standards are being worked
83 (management, security, etc.). As these services become more
84 stable, this document (and hence the protocol) can be updated to
85 reflect the integration and relationships with these other
86 standards.

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148	completion, completed-with-warnings, completed-with-errors,	
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255 1. Introduction

256 The Internet Printing Protocol (IPP) is an application level
 257 protocol that can be used for distributed printing on the
 258 Internet. The protocol is heavily influenced by the printing model
 259 introduced in the Document Printing Application (ISO/IEC 10175
 260 DPA) standard, which describes a distributed printing service. DPA
 261 identifies the end-user and administrative roles associated with a
 262 distributed printing service, and defines the set of operations
 263 supported by the service. This IPP specification deals initially
 264 only with the end user role. These ideas and concepts, when
 265 unified with other Internet protocols and services, realize a
 266 distributed print service for the Internet.

267 2. Distributed Printing

268 This document assumes a distributed computing environment where
 269 requesters of print services (clients, applications, PC drivers,
 270 etc.) cooperate and interact with print service providers.
 271 Although the underlying configuration may be a complex n-tier
 272 client/server system, an important simplifying step in this

273 protocol is that the only object the requester of the print
274 service ever sees is a "printer". It is important, however, to
275 understand that in a real system, other components of a print
276 service exist.

277 2.1 Generic Print System Components

278 Every distributed print service, including those using the
279 Internet Printing Protocol, includes elements from the following
280 list.

281 - End-Users: End Users are humans (or agents who work on behalf
282 of a human) who submit print jobs.

283 - Print clients: Print clients are computer network nodes with
284 which humans interact in order to manipulate the distributed
285 print service. A print client uses some protocol to invoke
286 print service operations on another node. Each operation has
287 arguments and results associated with it. The print client
288 provides arguments which add information about the operation
289 requested, and receives results which describe the status and
290 outcome of the operation.

291 - Print servers: Printer servers may be embedded in an output
292 device or implemented in a separate system which is associated
293 with an output device. The print server receives requests from
294 the print client and send back results which describe the
295 status and outcome of the operation requested. A print server
296 normally provides queuing, job management, and device
297 management functions.

298 - Queues. Print jobs may be queued or stored on a spool prior to
299 printing. This allows a print service provider to accept one or
300 more print jobs while the printer (or printers) is busy
301 processing another job. Queues, if present, may be implemented
302 in the client, in the server, in the output device, or in some
303 combination of the three.

304 - Output Devices. Output devices interpret the print data and
305 generate some form of output. In the case of a laser printer,
306 for example, this normally means rasterizing the print data and
307 putting the resulting marks on paper. An output device may
308 receive print data directly from a client or through a Print
309 server.

310 A specific implementation of a print service may not include all
311 of the elements described here, and the physical packaging of
312 elements is up to the implementation. For example, an output
313 device may include a queue or a print server may include a
314 rasterizer.

315 2.2 IPP Components

316 The print model defined by the Internet Printing Protocol
317 simplifies the user's view of the system components described in
318 the previous section by encapsulating the important elements of
319 the system into three simple objects:

- 320 - Printers (section xxx)
- 321 - Print Jobs (section xxx)
- 322 - Job Templates (section xxx)

323

324 These objects are not encapsulations of both data and behavior as
325 in other object oriented models, but are simple collections of
326 attribute/value pairs. [We may try to fix this in our new design,
327 but it's not high priority.]

328 Clients interact with these using the following operations:

- 329 - Print (section xxx)
- 330 - Cancel Job (section xxx)
- 331 - Get Attributes(section xxx)
- 332 - Get Jobs (section xxx)

333

334 3. IPP Objects

335 This section describes the IPP objects.

336 3.1 Printer

337 One of the most significant objects in the IPP model is the
338 Printer. To the end-user, the Printer object represents the
339 functionality of the actual output device along with the queuing,
340 job management, and device management functions often associated
341 with a print server. An IPP Printer object implements the
342 Internet Printing Protocol. Using the protocol, end-users may
343 query the attributes of the Printer, submit jobs to the Printer,
344 determine subsequent states of submitted and queued jobs and state
345 of the Printer, and cancel their own print jobs. The realization
346 of a Printer object may take on different forms for any given
347 configuration of real components. However, the details of the
348 configuration of real components must be transparent to the end-
349 user.

350 Some examples of an IPP Printer object include:

- 351 - An output device, with a no spooling capabilities, supporting
352 IPP
- 353 - An output device, with a built-in spooler, supporting IPP
- 354 - A print server with one or more associated output devices with
355 the print server supporting IPP.
 - 356 - The associated output devices may or may not be capable of
357 spooling jobs
 - 358 - The associated output devices may or may not support IPP
- 359 - A print server with one or more downstream print servers
360 and/or output devices where the upstream print server supports
361 IPP

362

363 See the following figures for some examples on how to view IPP
364 Printer objects on top of other printing system models:

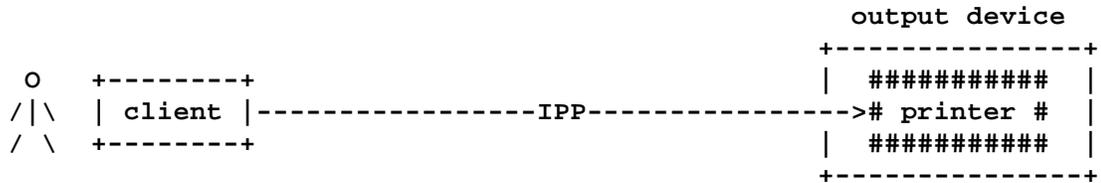
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Legend:

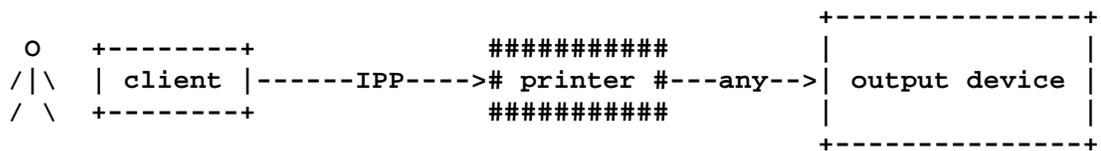
indicates an IPP printer object which is either embedded in an output device or is hosted in a server. An IPP printer object may or may not queue/spool.

any indicates any network protocol or direct connect, including IPP

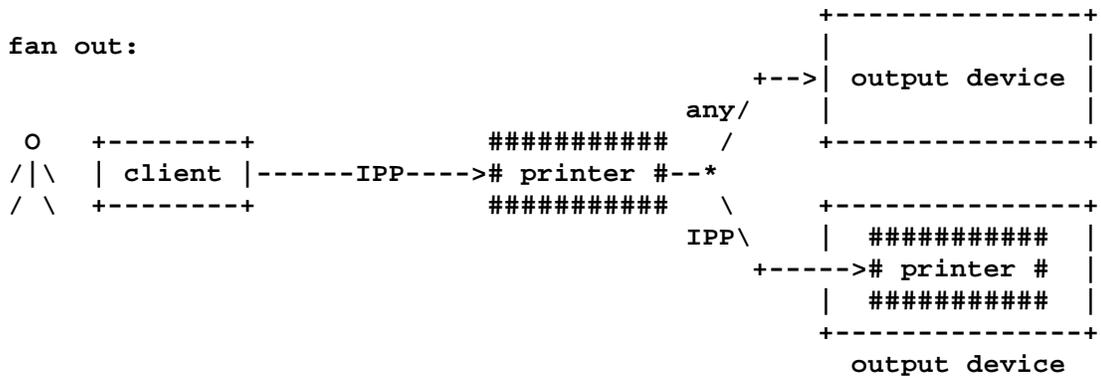
embedded printer:



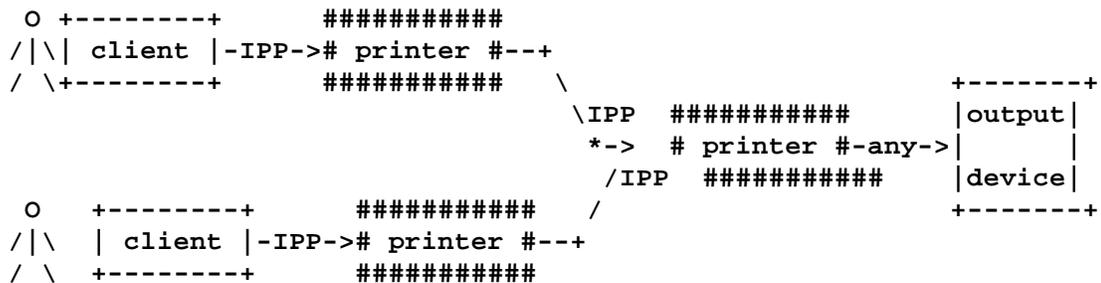
hosted printer:



fan out:



fan in:



419 3.2 Job

420 A Job object is used to model a job. A job can consist of one or
 421 more documents. However, there are no separate document objects.
 422 The impact of this is that there are no attributes that pertain to
 423 one document in a job but not to others, except for a single
 424 attribute that specifies the document data, its location, and its
 425 format. Note: In future versions, documents may become separate
 426 objects with attributes whose scope and application are different
 427 from the corresponding job attributes.

428
 429 Job attributes provide information to

- 430 - identify the print job(section xxx)
- 431 - assist in selecting the Printer (section xxx)
- 432 - report job status (section xxx)
- 433 - assist in scheduling and processing (section xxx)
- 434 - describe the documents in the job (section xxx)
- 435 - produce the document (section xxx)

436
437 3.3 Job Template

438 A Job Template object is used to model job defaults. A Job
 439 Template is essentially a set of job attributes that a client
 440 references to initialize a newly created job object. Attributes
 441 which are sent along with the job at the time the job is submitted
 442 override the attributes in the Job Template object.

443
444 3.4 Object Relationships

445 Instances of objects within the system have relationships which
 446 must be maintained persistently along with the persistent storage
 447 of the objects themselves. A Printer can contain zero, or more
 448 Job objects. A Job object contains one or more Documents. A
 449 Printer object is associated with one or more Job Template
 450 objects.

451 3.5 Object Identity

452 All instances of all objects have an identifier attribute that
 453 makes them unique so that they can be unambiguously referenced.
 454 In the object-oriented model, these are the globally unique object
 455 references which are created by factories or constructors.

456 The following objects have the following mandatory identifier
 457 attributes:

458 Object	Identifier	Containing Object
459 Printer	printer-name	None
460 Job	job-identifier	Printer
461		
462 Job Template	job-template-name	None

463
464 4. Naming

465
 466 Clients identify Printer objects by using an HTTP type URL. For
 467 example, a URL for a Printer object named "printer-1" whose
 468 network node's domain name is "some.domain.com", might look like:

469 `http://some.domain.com/printer-1`

470 In this case, the URL identifies the use of the HTTP protocol.
471 The Printer is located at the node identified by the DNS name
472 "some.domain.com" and "printer-1" is the name of the Printer.

473 Another example is the following URL:

474 `http://1.2.3.4:3042/printer-2`

475 In this case, the URL identifies the use of the HTTP protocol.
476 The Printer is located at the node identified by the IP address of
477 "1.2.3.4" using port 3042 for the HTTP server, and "printer-2" is
478 the name of the Printer.

479 It is not necessary to expose the Job Template objects that might
480 be associated with a given printer as separate objects. They can
481 be exposed in two ways through URL naming.

482 - The Job Template can be hidden from the end user by a URL that
483 represents just Job Template name (but does not expose the
484 Printer object name) as the two URLs 1)
485 `http://some.domain.com/two-sided-printer` and 2)
486 `http://some.domain.com/draft-printer`. These look like two
487 different locations, but underneath they represent the same
488 Printer object but using two different Job Template default
489 attribute sets.

490 - The Job Template can be exposed along with the name of the
491 Printer object directly in the URL as in:
492 `http://some.domain.com/hr-printer/resumes`. In this case there
493 is a "resumes" Job Template associated with the "hr-printer"
494 Printer.

495 4.1 Directory Services

496 IPP does not require any specific directory service. However,
497 this specification does define a generic schema that can be used
498 for any specific instance of a directory service. That is, some
499 of the attributes from the Printer object are called out as
500 attributes that may be added to a directory entry which represents
501 that Printer. This allows directory users to find and locate IPP
502 Printers by either a simple name look up or by some filtered
503 attribute search.

504

505

506 4.2 Directory Entry Schema

507 The following attributes define the generic directory entry
508 schema. All directories entries for IPP Printers in all types of
509 directories should support at least these attributes.

510

511 4.2.1 Status

512 [Such a dynamic value seem like it could be a problem in some
513 name service entries.]

514 The printer status field in the directory entry is really a
515 "summary" attribute of the true printer state. The following
516 mapping takes place between the Printer Status attribute in the
517 directory entry and the printer-state attribute in the Printer
518 object:

```
519
520     "Not Connected"
521         STATE_NOT_CONNECTED
522         STATE_PAUSED_NOT_CONNECTED
523     "Shutdown"
524         STATE_SHUTDOWN
525     "Active"
526         STATE_IDLE
527         STATE_PAUSED
528         STATE_PRINTING
529     "Stopped"
530         STATE_STOPPED
531         STATE_PAUSED_STOPPED
532
```

533 Even though the Printer may not be up and running, the directory
534 entry still exists in the directory. In this case, the directory
535 entry represents the fact that it may begin running at some future
536 time.

537 4.2.2 Resolution

538 This is a single valued, maximum resolution in either the
539 horizontal or vertical direction of the print device in dpi.

540 4.2.3 Color Supported

541 This is a BOOLEAN for either yes, color printing is supported, or
542 no color printing is not supported.

543 4.2.4 Maximum Speed

544 This is the maximum speed of the printer in the units defined in
545 Maximum Speed Units

546 4.2.5 Maximum Speed Units

547 This is the units of the maximum speed rating of the print device.
548 This can be: pages per minute, sheets per minutes, characters per
549 second, etc.

550 4.2.6 Plug and Play Device Id

551 This attribute can be used for automatic driver download and other
552 automatic configuration tasks.

553 4.2.7 Model

554 This is a simple text string defined by the manufacturer.

555 4.2.8 Manufacturer

556 This is a simple text string defined by the manufacturer. There
 557 is no registration, and there is a possibility of overlap, but the
 558 goal is to keep this simple, not too complex.

559 4.2.9 Type

560 This is the printing mechanism of the print device: laser, ink
 561 jet, thermal, etc.

562 4.2.10 PDLs Supported

563 This is a list of all of the page description languages (PDLs)
 564 that the printer and/or its interpreter(s) support.

565 4.2.11 Sides Supported

566 This is either a 1 or a 2 to indicate the maximum number of sides
 567 on which the printer can automatically print.

568 5. IPP Operations

569 IPP defines the following end user operations:

570 The following symbols are used in the tables below:

571
 572 P perform the operation directly
 573 PF perform the operation; forward to Output Device sometimes
 574 UA unsupported in an Output Device unless it supports queuing
 575 U unsupported operation
 576
 577

Operation	Print Server	Output Device
Print	PF	P
Cancel Job	PF	P
Get Attributes	PF	P
Get Jobs	PF	P

578

579

580

581 5.1 Print Operation

582 When an end-user uses GUI to submit a job, the GUI client gets an
 583 HTML form from the default printer. If the end-user changes the
 584 selected printer, the GUI client gets the HTML form from that
 585 printer. The HTML form comes with the values supported by the
 586 printer and it is initialized by the values from the job template
 587 associated with the named printer.

588 [Further work needs to done to define the above concept.]

589 5.1.1 Print Request

590 The following abstract data types are part of the Print Request:

Printer Name	Note: I don't think that this is needed
Job and Document Attributes	A set of Job object and Document attributes as defined in section xxx
Document Contents	Note: What if there are multiple documents and each has a different size? How does this map on top of the HTTP header that has one size? Does it require multiple HTTP operations?

591

592

593

5.1.2 Print Response

594

The following abstract data types are part of the Print Response:

595

Job Id	Used for all other operations on this Job.
Job Status	Job state information
Printer State	Optional Printer state information
Message	Optional message Note: Is this needed?
Errors	Optional Error Information

596

597

598

5.2 Cancel Job Operation

599

5.2.1 Cancel Job Request

600

The following abstract data types are part of the Cancel Job Request:

601

602

Job Id	The identifier of the job to be canceled
Document Number	Optional document number of the document to
Message	Optional message to the operator.

603

604

5.2.2 Cancel Job Reponse

605

The following abstract data types are part of the Cancel Job Response:

606

607

Job Status	Optional Job status information
Errors	Optional Error Information

608

609

5.3 Get Attributes Operations

610

5.3.1 Get Attributes Request

611

The following abstract data types are part of the Get Attributes Request:

612

Selector A Job Id or Printer Name URL

Requested A set of attributes in which the requestor is
Attributes interested

613

614

5.3.2 Get Attributes Response

615

The following abstract data types are part of the Get Attributes
Response:

616

Result The requested attributes of the object

Attributes

Errors

Optional error information

617

618

5.4 Get Jobs Operation

619

Get Jobs Request

620

5.4.1 Get Jobs Request

621

The following abstract data types are part of the Get Jobs
Request:

622

623

Filtering A lightweight filtering mechanism, such as all
jobs versus a particular user's jobs.

Requested A set of job attributes in which the requestor
Attributes is interested

624

625

626

5.4.2 Get Jobs Response

627

The following abstract data types are part of the Get Jobs
Response:

628

629

Result Attribute set containing the returned results.

Attributes

Errors

Optional Error Information

630

631

6. Object Attributes

632

This section describes the attributes, syntaxes, and values that
are part of IPP. The sections below show the objects and their
associated attributes which are included within the scope of this
protocol. The text in these sections has been heavily influenced
by the ISO/IEC 10175 DPA (Final, June 1996).

633

634

635

636

637

638

639

640

6.1 Attribute Syntaxes

641

**NOTE: This is what Tom has
submitted:**

642

643

Each attribute shall be in one of the following data syntaxes:

644 string - arbitrary ASCII strings, no control characters,
645 except <SPACE>.
646 string pair - strings separated by ":"
647 name - arbitrary ASCII strings, no control characters, and
648 no <SPACE> characters.
649 type 1 enum - standard names, must revise the standard to add
650 a new name. No private names are allowed.
651 type 2 enum - standard names, but an implementor can add new
652 by proposing them to the PWG for registration
653 (or an IANA-appointed registry advisor after the
654 PWG is no longer certified) anytime. IANA keeps
655 the registry.
656 Implementors can add private (un-registered)
657 with a suitable distinguishing prefix, such as
658 -xxx- where xxx is the company name
659 registered with IANA.
660 type 3 enum - standard names, but an implementor can add new
661 names by submitting a registration request directly
662 to IANA, no PWG or IANA-appointed registry advisor
663 review is required.
664 Implementors can add private (un-registered) names
665 with a suitable distinguishing prefix, such as
666 -xxx- where xxx is the company name registered with
667 IANA.
668 type 3 pair - two type 3 enum names separated by ":".
669 cardinal - 0 .. n represented as ASCII digits
670 ordinal - 1 .. n represented as ASCII digits
671 ordinal pair - two ordinals separated by ":"
672 boolean - tokens: yes, y, true, or t and no, n, false, or f.
673 date/time - date/time in ??? format
674 url - Universal Resource Locator
675 octet string - arbitrary binary octets
676 string units - ordinal followed by type 2 enum units
677
678

679 **NOTE: This is what Bob has**
680 **submitted:**

681 The sections below reference the following syntax items:

682 string: TBD
683 stringPair: string ":" string
684 stringState: string state
685 name: TBD
686 URL: TBD
687 dateTime: TBD
688 deltaTime: [hours ":"] minutes
689 cardinal: TBD
690 type1Enum: TBD
691 type2Enum: TBD
692 type3Enum: TBD
693 type2EnumState: type2Enum state
694 type3EnumState: type3Enum state
695 state: TBD
696 Boolean: TBD
697 positiveInteger: TBD

698 positiveIntegerCross: positiveInteger ["x" positiveInteger]
 699 positiveIntegerCrossState: positiveIntegerCross state
 700 positiveIntegerRange: positiveInteger ":" positiveInteger
 701 positiveIntegerUnits: positiveInteger units
 702 positiveIntegerState: positiveInteger state
 703 units: "ppm" | "ipm" | "spm" | "cps" | "lpm"
 704 type3Locale: type3Country ":" type3Language ":" type3CodeSet
 705 type3Country: type3Enum
 706 type3Language: type3Enum
 707 type3CodeSet: type3Enum
 708 type2Format: name ["/" version]
 709 version: name
 710 type3LocaleState: type3Locale state
 711

712 6.2 Job Attributes

713 A job object contains a set of job attributes and one or more
 714 documents. A client shall create a job and send it to a server
 715 using the Print operation. A client may use a job template
 716 associated with the selected printer in order to initialize the
 717 job.

718 Each section heading below contains the name of an attribute and
 719 its syntax in parentheses using the rules of RFC 822.

720

721

722 6.2.1 Job Informational Attributes Set by a Client

723

724 The client may specify these attributes in the Print operation to
 725 provide information to identify a print -job.

726 The client may also specify these attributes in the operations:
 727 Get-Attributes, and Get-Jobs.

728 6.2.1.1 job-name (string)

729

730 This attribute supplies a human readable string for naming the
 731 print-job.

732 This attribute is intended for to be printed on a start sheet,
 733 returned in a Get-Jobs result, or used in notification messages.

734 If the client does not specify this attribute, a Printer shall set
 735 it to the name of the file of the first document in the job.

736 6.2.2 Job Informational Attributes Set by a Printer

737

738 The Print shall add all of these attributes to a job to provide
 739 information to identify a print -job.

740 The client may specify these attributes in the operations: Get-
 741 Attributes and Get-Jobs, but not in Print.

742

743 6.2.2.1 job-identifier (string)

744 This attribute provides the job -identifier for this job on the
745 Printer. The Printer shall generate a job -identifier value that
746 is unique on that Printer, but need not be unique across the
747 distributed environment.

748 The value of the job -identifier attribute shall be returned by the
749 Printer as part of the PrintResult in the Print operation.

750

751 6.2.2.2 job-originator (name)

752 This attribute specifies the name of the person submitting the
753 print job. The Printer shall set this attribute to the most
754 authentic name that it can obtain from the client. The operation-
755 user-name attribute is intended to be a source of the most
756 authentic name.

757

758 6.2.2.3 job-originating-host (name)

759 This attribute identifies the originating host of the job. The
760 Printer shall set this attribute to the value of the operation-
761 host-name which is intended to be the most authentic host name of
762 the client.

763 6.2.2.4 notification-address (name)

764 This address specifies the email address of the client. The client
765 specifies this attribute in the operation-attribute which the
766 Printer in turn uses to set this attribute.

767 The Printer shall use this attribute as the address for sending
768 messages to a job submitter when an event occurs that the user has
769 registered an interest in or when certain other events occur, such
770 as Cancel-Job.

771 Note: The only type of notification is email.

772 ISSUE: can the email address be inferred with job-originator and
773 the originating-host.

774 6.2.2.5 job-locale (type3Locale)

775 This attribute identifies the locale of the job. The Printer sets
776 this attribute from the value of the operation-locale.

777 The Printer shall use this attribute to determine the locale for
778 notification messages that it sends.

779 The type3EnumTrip consists of 3 colon separated type 3 enums. The
780 first is the country. The second is the language. The third is the
781 code-set.

782 ISSUE: is there a more standard syntax for locale?

783
784
785
786
787
788

6.2.3 Printer Selection Attributes

789 The client shall specify this attribute to select a particular
790 Printer.

791 The client may also specify these attributes in the operations:
792 Get-Attributes, and Get-Jobs.

793 **Issue:** this attribute may be implicit in the specified URL in the
794 Print operation.

795 6.2.3.1 printer-name-requested (URL)

796 This attribute identifies the printer that the client requests
797 for printing the job.

798 6.2.4 Job Status Attributes

799 The Printer shall add these attributes to a job when a client
800 submits a job, and the Printer shall assign appropriate values to
801 each such job -status attribute.
802

803 The Printer uses these attributes to specify the job status
804 before, during and after the processing of the print -job by the
805 Printer.

806 The client may specify job -status attributes in: Get-Attributes
807 and Get-Jobs, but not Print.

808 6.2.4.1 current-job-state (typeName)

810 This attribute identifies the current state of the job with the
811 following values: unknown, pre-processing, pending, processing,
812 printing, held, terminating, retained, completed.

813 The IPP protocol supports all values for job states, but Printers
814 are need only support those states which are appropriate for the
815 particular implementation.

816 6.2.4.2 printer-assigned (name)

817 This attribute identifies the Output Device to which the Printer
818 has assigned this job.

819 If an Output Device implements a Printer, the Printer does not set
820 this attribute.

821 If a Print Server implements a Printer, the value shall be empty
822 until the Printer assigns an Output Device to the job..

823 **ISSUE:** Is this attribute appropriate for a model in which we are
824 hiding the downstream Printer. The printers -assigned value shall
825 not be the same as the printer requested by the user.

826 The value of the job's printer -assigned attribute shall remain
827 after the job has completed, so that users can determine the
828 Output Device on which the job was printed.

829 6.2.4.3 submission-time (dateTime)

830 This attribute indicates the time at which the this job was
831 accepted by the Printer. If the Printer does not support the
832 notion of time, the attribute is not stored as part of the job
833 object.

834 6.2.4.4 job-message-from-administrator (string)

835 This attribute provides a message from an operator, system
836 administrator or 'intelligent' process to indicate to the user the
837 reasons for modification or other management action taken on a
838 job.

839 6.2.4.5 completion-time (dateTime)

840 This attribute indicates the time at which this job completed.
841 This time is useful for jobs which are retained after printing.

842 6.2.4.6 job-state-reasons (1#type2Enum)

843 This attribute identifies the reason or reasons that the job is in
844 the state that it is in (e.g., held, terminating, retained,
845 completed, etc.). The printer shall indicate the particular
846 reason(s) by setting the value of the job -state-reasons attribute.
847 It is valid for the printer to set the value of the
848 job-state-reasons attribute to the empty set.

849 6.2.4.7 The following standard values are defined: documents -needed,
850 job-hold-set, job-print-after-specified, job-off-peak-specified,
851 required-resources-not-ready, successful completion,
852 completed-with-warnings, completed -with-errors, cancelled -by-user,
853 cancelled-by-operator, aborted -by-system, logfile -pending,
854 logfile-transferringimpressions-completed (cardinal)

855 This attribute contains the number of impressions that the Printer
856 has completed printing. If the Printer cannot report this number,
857 the Printer leaves this attribute unspecified.

858 6.2.4.8 media-sheets-completed (cardinal)

859 This attribute contains the number of media-sheets that the
860 Printer has completed printing. If the Printer cannot report this
861 number, the Printer leaves this attribute unspecified.

862 6.2.5 Job Sheet Attributes

863 The client shall specify these attributes to control the printing
864 of of job sheets.

865 The client may also specify job sheet attributes in: Get-
866 Attributes and Get-Jobs.

867 job-sheets (type3Enum) This attribute determines what type of job-
868 sheets the Printer shall print with the job.

869 The standard values are: none, and default-sheet.

870 The value 'None' means that the Printer shall print no job sheets.
871 The value 'Default' means that the Printer shall print the job
872 sheets defined by an administrator.

873 6.2.6 Notification Attributes

874 The client shall specify these attributes to indicate events that
875 the client is interested in.

876 The client may also specify notification attributes in: Get-
877 Attributes and Get-Jobs.

878 6.2.6.1 notification-events (#type1Enum)

879 This attribute specifies the events about which the user want to
880 be notified.

881 This attribute will support three events classes: job-completion,
882 job-problems and printer-problems., If attribute contains no
883 values, then the client is requesting no notification.

884 This attribute will support only one delivery method, namely
885 email. The attribute notification-address specifies the email
886 address.

887 If this attribute contains the event job-completion, the Printer
888 shall notify the client when the job containing this attribute
889 completes.

890 If this attribute contains the event job-problem, the Printer
891 shall notify the client when the job containing this attribute has
892 a problem while the job is printing. Problems include: paper jam
893 and out-of-paper.

894 If this attribute contains the event printer-problem, the Printer
895 shall notify the client when the job containing this attribute has
896 a problem while the job is printing or waiting to print. Problems
897 include: paper jam and out-of-paper.

898 **ISSUE:** is there a problem with an attribute with an empty value
899 being different from no attribute. Otherwise, we need a special
900 value of 'none'. 'none', unlike other values should not be
901 combined with other values. This particular case does not seem
902 like a case where an administrator wants to prevent the use of
903 'none', so empty seems like a good solution.

904 **ISSUE:** Email is quite deficient for timely notification to an end-
905 user who receives a lot of email, but there are no other choices.
906 The internet community needs to solve this problem, perhaps with
907 an extremely-urgent email.

908 6.2.7 Job Scheduling Attributes

909 The client shall specify these attributes to provide the Printer
910 with information for the scheduling a print -job.

911 The client may also specify these attributes in: Get-Attributes
912 and Get-Jobs.

913
914 job-hold (Boolean) This attribute specifies whether the print -job
915 is a candidate for scheduling for printing or not, when the
916 Printer would otherwise place the job in the pending or
917 processing states

918 When the value is FALSE, the Printer shall not hold the job from
919 being scheduled for printing, unless there are other reasons (see
920 the current -job-state and the job -state-reasons job -status
921 attributes).

922 When the value is TRUE, the Printer shall place the job in the
923 held state and add the job -hold-set value to the job's
924 job-state-reasons attribute and shall not schedule the print -job
925 for printing. If the job enters the held state because its
926 job-hold attribute was TRUE, a client shall reset the job's
927 job-hold attribute to FALSE by means of the ModifyJob operation
928 before the printer can schedule the job for printing. When the
929 value is set to FALSE as a result of the ModifyJob operation, the
930 printer shall remove the job -hold-set value from the
931 job-state-reasons attribute and, if no other reasons remain, shall
932 change the job's current -job-state to pending so that the job
933 becomes a candidate for being scheduled on printer(s).

934 ISSUE: the above few sentences assume a ModifyJob operation, which
935 is not in version 1.0. But without this operation, the job-hold
936 operation is not very useful. **Perhaps we should remove job-hold.**

937 6.2.7.1 job-priority (typeName)

938 This attribute specifies a priority for scheduling the print -job.
939 Printers that employ a priority -based scheduling algorithm use
940 this attribute.

941 There are three standard values: high, medium, and low. Among
942 those jobs that are ready to print, a Printer shall print all such
943 jobs with a high priority before printing those with a medium or
944 low priority, and a Printer shall print all such jobs with a
945 medium priority before printing those with a low priority.

946 If the client does not specify this attribute, the Printer assumes
947 that the user places no constraints concerning priority on the
948 scheduling of the print -job, and it has a priority value of the
949 value of the Printer's maximum-end-user-priority attribute. If
950 that attribute is unspecified, the Printer uses the value of
951 'high'.

952 An operator can modify a job to have any priority. An end-user is
953 restricted to the value of printer attribute maximum-end-user-
954 priority.

955 6.2.7.2 job-print-after (dateTime)

956 This attribute specifies the calendar date and time of day after
957 which the print-job shall become a candidate for printing.

958 If the value of this attribute is in the future, the Printer shall
959 set the value of the job's **current-job-state** to **held** and add the
960 **job-print-after-specified** value to the job's **job-state-reasons**
961 attribute and shall not schedule the print-job for printing until
962 the specified date and time has passed. When the specified date
963 and time arrives, the Printer shall remove the **job-print-after-**
964 **specified** value from the job's **job-state-reason** attribute and, if
965 no other reasons remain, shall change the job's **current-job-state**
966 to **pending** so that the job becomes a candidate for being scheduled
967 to print.

968 If this attribute is unspecified or the value is in the past, the
969 job shall be a candidate for scheduling immediately.

970
971 6.2.7.3 job-print-off-peak (type3Enum)

972 This attribute specifies the off-peak period during which the
973 print-job shall become a candidate for printing.
974

975 If this attribute is specified, it contains a value with which an
976 administrator has associated allowable print times. An
977 administrator is encouraged to pick names that suggest the type of
978 off-peak period, such as 'night', 'weekend', 'thirdShift'.

979 If this attribute is unspecified, the job shall be a candidate for
980 scheduling immediately.

981 6.2.7.4 job-retention-period (deltaTime)

982 The retention time is expressed in hours and minutes, e.g. 6:00 (6
983 hours), or 20 (20 minutes).

984 This attribute specifies the minimum period of time following the
985 completion of job processing and printing that the server shall
986 keep job attributes and document data. The Printer may keep these
987 attributes and data longer than the value of the
988 job-retention-period attribute.

989
990
991
992
993

6.2.8 Job Production Attributes

994 The client shall specify these attributes to affect the rendering,
995 production and finishing of the document.. Similar types of
996 instructions may also be contained in the document to be printed.

997 If there is a conflict between the value of one of these
998 attributes, and a corresponding instruction in the document

999 (either implicit or explicit), the value of the attribute shall
1000 take precedence over the document instruction.

1001 After the information from these attributes has been folded into
1002 the document data (possibly during a translation process of the
1003 document data), these attributes are no longer relevant and can
1004 be discarded from a job. Instead, the resource attributes specify
1005 the resources needed to print the job as modified by the job
1006 production attributes. Note: until companies that supply
1007 interpreters for PDL's, such as PostScript and PCL allow a way to
1008 specify overrides for internal job production instructions, a
1009 Printer may not be able to implement these attributes for some
1010 PDL's. The client may also specify document production -instruction
1011 attributes in: Get-Attributes and GetJobs.

1012
1013 medium-select (type2Enum) This attribute identifies the medium
1014 that the Printer shall use for all pages of the document
1015 regardless of what media are specified within the document.

1016 The values for medium include medium-names, medium-sizes, input-
1017 trays and electronic forms so that one attribute specifies the
1018 media.

1019 Standard values are defined: TBD

1020 6.2.8.1 number-up (positiveInteger)

1021 This attribute specifies the number of source page -images to
1022 impose upon a single instance of a selected medium. .

1023 In general, only certain numeric values are valid for this
1024 attribute, depending upon the Printer implementation to which the
1025 print-request is directed. Typical supported values are 2 and 4.
1026 If this attribute is unspecified or has a value of 1, then the
1027 Printer does not apply any number-up transformation to the pages.

1028 This attribute primarily controls the translation, scaling and
1029 rotation of page images, but a site may choose to add embellishments,
1030 such as borders to each logical page. ISSUE: should there be a
1031 separate attribute to control embellishments, especially for the 1-up
1032 case. finishing (type2Enum) This attribute identifies the finishing
1033 operation that the Printer should apply to each copy of the printed
1034 document. Examples include stapling, saddle -stitching,
1035 hole-drilling, binding with tape, etc.
1036 Standard values for this attribute are include:TBD.

1037 6.2.8.2 sides (type2Enum)

1038 This attribute specifies whether the document should be printed in
1039 one of three ways: 1-sided (simplex), 2-sided- long-edge (duplex),
1040 2-sided- short-edge (tumble).
1041 The standard values are: 1-sided, 2-sided-long-edge, 2-sided-
1042 short-edge.

1043 6.2.8.3 copies (positiveInteger)

1044 This attribute specifies the number of copies of the job to be
1045 printed. If this attribute is unspecified, its default value is 1
1046 copy.

1047

1048 6.2.8.4 printer-resolution-select (positiveIntegerCross)

1049 This attribute specifies the resolution that the Printer should
1050 use.

1051 The syntax allows a single integer to specify the resolution or a
1052 pair of integers to specify the resolution when the x and y
1053 dimensions differ. When two integers are specified, the first is
1054 in the paper feed direction.

1055 6.2.8.5 print-quality (type2Enum)

1056 This attribute specifies the print quality that the Printer should
1057 use.

1058 The standard values are: TBD.

1059 6.2.8.6 page-select (positiveIntegerRange)

1060 This attribute specifies the pages in the document that the
1061 Printer shall use. This attribute is unlikely to be useful for
1062 jobs with more than one document or in Job Templates. If this
1063 attribute is unspecified, then the Printer prints all pages in a
1064 document.

1065 6.2.8.7 files-are-one-document (Boolean)

1066 This attribute is relevant only if a job consists of two or more
1067 documents. It controls finishing operations, job-sheet placement,
1068 and the order of documents when the copies attribute exceeds 1.

1069 If the files for the job are a and b and this attribute is **true**,
1070 then files a and b are treated as a single document for finishing
1071 operations. Also, there will be no slip sheets between files a and
1072 b. If more than one copy is made, the ordering must be a, b, a,
1073 b, The attribute **files-are-interleaved** is ignored.

1074 If the files for the job are a and b and this attribute is **false**
1075 **or unspecified**, then each file is treated as a single document for
1076 finishing operations. Also, a client may specify that a slip sheet
1077 be between files a and b. If more than one copy is made, and the
1078 attribute **files-are-interleaved** false or unspecified, the ordering
1079 is a, a, b, b, If more than one copy is made, and the attribute
1080 **files-are-interleaved** true, the ordering is a, b, a, b,

1081 6.2.8.8 files-are-interleaved (Boolean)

1082 This attribute is used in conjunction with **files-are-one-document**
1083 (q.v.).

1084 6.2.9 Attributes for Conversion of Text Files

1085 The client shall specify these attributes to control formatting
1086 for text documents or HTML documents. If the client does not
1087 specify any of these attributes, a Printer shall use its own
1088 defaults.

1089 A client need not specify these attributes for other types of
1090 documents, such as PostScript or PCL.

1091 6.2.9.1 width (cardinalUnits)

1092 This attribute specifies the media width for the document.

1093 6.2.9.2 length (cardinalUnits)

1094 This attribute specifies the media length for the document.

1095 6.2.9.3 left-margin (cardinalUnits)

1096 This attribute specifies the left-margin for the document.

1097 6.2.9.4 right-margin (cardinalUnits)

1098 This attribute specifies the right-margin for the document.

1099 6.2.9.5 top-margin (cardinalUnits)

1100 This attribute specifies the top-margin for the document.

1101 6.2.9.6 bottom-margin (cardinalUnits)

1102 This attribute specifies the bottom-margin for the document.
1103

1104 6.2.9.7 repeated-tab-stops (cardinalUnits)

1105 This attribute specifies the tab stops for the document.

1106 6.2.9.8 header-text (string)

1107 This attribute specifies the header text for the document.

1108 6.2.9.9 footer-text (string)

1109 This attribute specifies the footer text for the document.

1110 6.2.9.10 number-pages (Boolean)

1111 This attribute specifies that the pages should be numbered in the
1112 document.

1113 default-font (string) This attribute specifies the font to use for
1114 all text in the document.

1115 6.2.9.11 default-code-set (type3Enum)

1116 This attribute specifies the code-set in which the document is
1117 encoded.

1118 6.2.9.12 content-orientation (type2Enum)

1119 This attribute specifies the orientation of the document.

1120 The standard values are: landscape or portrait.

1121 6.2.10 Job Resource Attributes

1122 A program described below shall add these attributes, which
1123 describe the resources needed to print the job.

1124 A Printer may use these attributes to validate and schedule the
1125 print-job without interpreting the contents of the document. This
1126 provides the opportunity for a Printer to support a broad set of
1127 document formats yet still support fast efficient scheduling and
1128 validation of each job.

1129
1130 The client shall not specify these attributes. Instead, it is the
1131 duty of the program that translates the document to the printer's
1132 PDL (or analyzes it) to add these attributes and their values to
1133 the job. If any of these attributes is unspecified, the Printer
1134 shall assume that the all resources required by the document of
1135 the type specified by the missing attributes are ready. These
1136 attributes may be unspecified if the translation program fails to
1137 provide such values, or if no translation occurs (e.g. the
1138 document is a PostScript document).

1139 Note: The Printer does not use these attributes during the actual
1140 printing of a document.

1141 Note: these attributes allow more than one value wherever it is
1142 possible for a job to specify more than one value of the
1143 corresponding job attribute, possibly by embedded instructions.

1144 The client may specify these attributes in: Get-Attributes and
1145 Get-Jobs.

1146
1147
1148 document-format-used (1#type2Format) This attribute identifies the
1149 document format needed to print this job.

1150
1151 A format consists of two elements, a name and a version. The
1152 latter element is optional.

1153 The syntax is for type2Format:

1154 name ["/" version]

1155 Examples include: PostScript, PostScript/2.0 and PCL/5e

1156 ISSUE: do we want the version to be optional?

1157 X
1158
1159 6.2.10.1 fonts-used (1#string)

1160 This attribute identifies the font resources used in the job.

1161 6.2.10.2 code-sets-used (1#type3Enum)

1162 This attribute identifies the code-sets used in the document. This
1163 attribute is relevant only for files that are not in ASCII, such
1164 as text files and possibly PCL files. PostScript files are always
1165 ASCII. Normally there is at most 1 code-set.

1166 Standard values are defined in the section on default-fonts.

1167 6.2.10.3 media-used (1#type2Enum)

1168 This attribute identifies the media, media-sizes, input-trays or
1169 electronic forms needed to print the job.

1170 Standard values for this attribute are defined in the section on
1171 medium-select.

1172
1173 6.2.10.4 sides-used (type2Enum)

1174 This attribute specifies whether a job needs one-sided, two-sided-
1175 long-edge, or two-sided-short-edge printing.

1176 Standard values for this attribute are defined in the section on
1177 sides.

1178
1179 6.2.10.5 print-quality-used (type2Enum)

1180 This attribute specifies what print quality the job needs.

1181
1182 Standard values for this attribute are defined in the section on
1183 print-quality.

1184 6.2.10.6 finishing-used (type2Enum)

1185 This attribute specifies what finishing the job needs.

1186 Standard values for this attribute are defined in the section on
1187 finishing.

1188 6.2.10.7 printer-resolution-used (positiveIntegerCrossState)

1189 This attribute specifies what resolution the job needs.

1190 6.2.10.8 total-job-octets (positiveInteger)

1191 This attribute specifies the total size of the job in octets. This
1192 attribute is the first of three that a translation program can use
1193 to specify the size of a job.

- 1194 6.2.10.9 job-impression-count (positiveInteger)
- 1195 This attribute specifies the total size of the job in impressions.
- 1196 6.2.10.10 job-media-sheet-count (positiveInteger)
- 1197 This attribute specifies the total size of the job in media-
- 1198 sheets.
- 1199 6.2.11 Number of Documents
- 1200 This group contains a single attribute which specifies the number
- 1201 of documents in the job.
- 1202
- 1203 The client shall specify this attribute in Print and may specify
- 1204 this attribute in: Get-Attributes and Get-Jobs.
- 1205 6.2.11.1 number-of-documents (positiveInteger)
- 1206 This attribute specifies the number of documents in the job. Each
- 1207 document shall contain its own set of document content attributes
- 1208 described below.
- 1209 6.2.12 Document Data
- 1210 This group of attributes describes the document data for the job.
- 1211 These attributes also include the document data or reference it.
- 1212 All job attributes in other sections of this document occur only
- 1213 once per job and apply to all documents in a job.
- 1214 The client may specify document -data attributes in Print. The
- 1215 client must specify either the document-URL or document-path in
- 1216 Print.
- 1217 Except for document-content, the client may specify document -data
- 1218 attributes in: Get-Attributes, and Get-Jobs.
- 1219
- 1220
- 1221
- 1222
- 1223 6.2.12.1 document-format (type2Format)
- 1224 This attribute identifies the document format of this document.
- 1225 If the client does not specify this attribute, then the Printer
- 1226 shall attempt to determine the format in order to decide if the
- 1227 document data needs to be translated.
- 1228 ISSUE: do we want the version to be optional?
- 1229 6.2.12.2 document-name (name)
- 1230 This attribute contains the name of the document used by the
- 1231 client to initially identify the document.

1232

1233 6.2.12.3 document-URL (name)

1234 This attribute contains the URL of the document if the client
1235 specified the document with a URL.

1236 If this attribute is specified, then document-content and
1237 document-path shall be unspecified.

1238 6.2.12.4 document-content (octetString)

1239 This attribute contains the actual contents of the document.

1240 If this attribute is specified, then document-path and document-
1241 URL shall be unspecified.

1242 This attribute shall be used during the transmission of the Print
1243 operation over a network. A Printer shall save the document data
1244 to a file and reference it with the document-URL or document-path
1245 attribute. A Get-Attribute or Get-Jobs operation shall always find
1246 that this attribute is unspecified.

1247 6.2.12.5 document-path (name)

1248 This attribute contains a path which references a file containing
1249 the document.

1250 If this attribute is specified, then document-content and
1251 document-URL shall be unspecified.

1252

1253 This attribute shall not be used during the transmission of the
1254 Print operation over a network. It is intended to reference the
1255 file when document data is on the printer.

1256 ISSUE: is this attribute necessary or is document-URL sufficient?

1257

1258 6.3 Operation Attributes

1259

1260 The client shall set these attributes and associate them with an
1261 operation rather than an object.

1262 It is intended that a client program rather than an end-user has
1263 control over the setting of these values so that they cannot be
1264 easily forged.

1265 6.3.1 operation-locale (type3Locale)

1266 This attribute identifies the locale of the client. The Printer
1267 uses this attribute to determine the locale of messages in the
1268 result of the operation or in errors returned by the operation.

1269 The type3EnumTrip consists of 3 colon separated type 3 enums. The
1270 first is the country. The second is the language. The third is the
1271 code-set.

1272 If an operation does not specify this attribute, the Printer shall
1273 assume that the operation has the same locale as the Printer.

1274 6.3.2 operation-notification-address (name)

1275 This attribute identifies the email-address of the client. The
1276 Printer uses this attribute to determine the email address for any
1277 notifications that occur in the Printer.

1278 ISSUE: can this address be determined from the next two
1279 attributes: operation-user-name and operation-host-name?

1280 6.3.3 operation-user-name (name)

1281 This attribute identifies the most authenticated user name that
1282 the client can supply. This name identifies the user performing
1283 the operation.

1284 This value shall be set by the system rather than the end-user in
1285 order to minimize the chance of forgery.

1286 6.3.4 operation-host-name (name)

1287 This attribute identifies the most authenticated host name that
1288 the client can supply. This name identifies the host from which
1289 the operation comes.

1290 This value shall be set by the system rather than the end-user in
1291 order to minimize the chance of forgery.

1292 6.4 Printer Attributes

1293 A printer object may be realized in either a Print Server or
1294 Output Device .

1295 A Printer Object in an Output Device contains a set of printer
1296 object attributes that represent an Output Device capable of
1297 rendering a document in visible form. Examples include electronic
1298 and electro-mechanical printers such as laser printers, ink -jet
1299 printers, and various kinds of impact printers, but may include
1300 other types of output devices such as microfiche imagers and
1301 plotters as well.

1302 A Printer Object in a Print Server contains a set of printer
1303 object attributes that are the union of the Printer objects in the
1304 downstream Output Devices. This object extends the capabilities
1305 of an Output Device. For example, an administrator might define a
1306 single Print Server to represent all of the Output Devices of the
1307 same type and capability in a single location, associated with a
1308 particular server. A user/client would normally send a print -job
1309 to a Print Server , and allow the Print Server to assign the job
1310 to a particular Output Device based on the relative load and
1311 availability of the printers under its control, thus providing a
1312 load balancing service. However, nothing precludes an
1313 administrator from configuring a print system so that a
1314 user/client can send a print -job directly to an Output Device .

1315 A Print Server, in the most common case, controls exactly one
1316 downstream Output Device. The Print Server's Printer object has
1317 attributes whose values are the same as those of the Printer
1318 object in the downstream Output Device.

1319 The attributes defined in this section provide information about
1320 a particular Printer.

1321 6.4.1 printer-name (name)

1322 This attribute uniquely identifies the printer on its host.

1323 6.4.2 printer-location text (string)

1324 This attribute identifies the location of this printer.

1325 6.4.3 printer-model (string)

1326 This attribute identifies the make and model of the printer.

1327 6.4.4 printer-types (type2Enum)

1328 This attribute identifies the marking technology of the printer.

1329 The value for this attribute are the descriptive names specified
1330 by ISO DPA. These values are: other, unknown, electrophotographic-
1331 LED, electrophotographic-laser, electrophotographic-other, impact-
1332 moving-head-dot-matrix-9-pin, impact-moving-head-dot-matrix-24-
1333 pin, impact-moving-head, dot-matrix-other, impact-moving-head-
1334 fully-formed, impact-band, impact-other, inkjet-aqueous, inkjet-
1335 solid, inkjet-other, pen, thermal-transfer, thermal-sensitive,
1336 thermal-diffusion, thermal-other, electro, erosion, electro-
1337 static, photographic-microfiche, photographic-imagesetter,
1338 photographic-other, ion-deposition, E-beam, typesetter.

1339 **ISSUE:** Should they be from the printer MIB instead. In the printer
1340 MIB hyphens do not exist. Instead the first letter after a hyphen
1341 is upper case.

1342 6.4.5 printer-state (type1Enum)

1343 This attribute identifies the current state of the printer. The
1344 protocol support all values for printer states, however a Printer
1345 shall only generate the printer states which are appropriate for
1346 the particular implementation.

1347 The following standard values are defined: unknown, idle,
1348 printing, needs -attention, paused, shutdown, job -start-wait,
1349 job-end-wait, job -password -wait,
1350 needs-key-operator,connecting -to-printer,state -timed-out

1351 6.4.6 printer-state-message (string)

1352 This attributes specifies a message that gives further information
1353 about the current printer state. .

1354 6.4.7 message (string)

1355 This attribute provides a message from an operator, system
1356 administrator or 'intelligent' process to indicate to the user the
1357 reasons for modification or other management action taken on a
1358 job.

1359 6.4.8 locale (type3Locale)

1360 This attribute specifies the locale that the Printer operates in.
1361 The standard values are defined in the section on the job-locale
1362 attribute.

1363 6.4.9 notification-events (#type2Enum)

1364 This attribute specifies the events on whose occurrence the
1365 Printer should notify those addresses specified by the
1366 notification-addresses attribute.

1367 If the attribute is unspecified or empty, the Printer does not
1368 perform notification, though the Printer still checks the jobs'
1369 notification-events attribute.

1370 In this attribute, job-problem and printer-problem have the same
1371 meaning.

1372 The standard values are defined in the section on the job's
1373 notification-events attribute.

1374 6.4.10 notification-addresses (#name)

1375 This attribute specifies the email addresses to which the Printer
1376 should send messages when events specified by the notification-
1377 events attribute occur.

1378 If the attribute is unspecified or empty, the Printer does not
1379 perform notification, though the Printer still checks the jobs'
1380 notification-events attribute.

1381 6.4.11 end-user-acl (#name)

1382 This attribute specifies the users who are allowed to print on the
1383 Printer.

1384 If the attribute is unspecified or empty, the Printer allows
1385 anyone to print.

1386 ISSUE: this does not fully solve the internet authorization
1387 problem because of authentication issues.

1388 6.4.12 maximum-printer-speed (positiveIntegerUnits)

1389 This attribute indicates the maximum printer speed of the Printer.
1390 A job cannot control a Printer's speed, but a Printer Browser can
1391 use printer speed as a criteria.

1392 The standard units are a type2Enum and are: ppm, ipm, spm, lpm,
1393 cps.

1394 6.4.13 fonts-substitutions (#stringPair)

1395 This attribute specifies an appropriate substitute for a font that
1396 is advertised as supported in the fonts-supported attribute, even
1397 though the Printer doesn't actually have the font available.

1398 This attribute consists of a set of font pairs: a font name and
1399 the font to use instead.

1400 6.4.14 fonts-supported (1#stringState)

1401 This attribute identifies the font resources supported by this
1402 printer and indicates the state of readiness for each font.

1403 The standard names are defined in the section on default-font.

1404 Each item in the list contains the pair consisting of a font name
1405 and a state indicating the font's readiness state.

1406 6.4.15 media-supported (1#nameState)

1408 This attribute identifies the media, media-sizes, input trays, and
1409 electronic forms supported by this printer, and indicates the
1410 state of readiness for each medium resource.

1411 There may be just two states: ready and needs-installing, or there
1412 may be a third state: needs-purchasing.

1413 The standard names are defined in the section on the section on
1414 the medium-select.

1415 6.4.16 document-formats-supported (1#type2FormatState)

1416 This attribute identifies the document -formats, including the
1417 document -format -versions, supported by the Printer. This set
1418 includes both the formats that are native to the Printer and
1419 those formats that the Printer can translate to one that is
1420 native to the Printer. From the client's point of view, this set
1421 contains all formats in which documents can be submitted to this
1422 Printer.
1423

1424 Proprietary document format identifiers, and versions are assigned
1425 by the owners of those formats.

1426 The state of readiness for each format is also included, though
1427 all formats should normally always be ready.

1428 6.4.17 numbers-up-supported (1#positiveIntegerState)

1429 This attribute identifies the number -up values supported by this
1430 printer..

1431 The state of readiness for each number-up value is also included,
1432 though all number-up conversions should always be ready.

1433 6.4.18 finishings-supported (#type2EnumState)

1434 This attribute identifies the per -document finishing operations
1435 supported by this Printer and states of readiness for each
1436 finishing.

1437 The standard finishing objects are defined in the section on the
1438 finishing attribute.

1439

1440 6.4.19 sides-supported (1#type2EnumState)

1441 This attribute indicates the values of the sides attribute
1442 supported by this printer and the states of readiness of each
1443 value.

1444 The standard values are defined in the section on the sides
1445 attribute.

1446 6.4.20 print-qualities-supported (1#type2EnumState)

1447 This attribute indicates the values of the printer-quality
1448 attribute supported by this printer and the states of readiness
1449 for each print-quality value.

1450 The standard values are defined in the printer-quality attribute.

1451 6.4.21 printer-resolutions-supported (1#positiveIntegerCrossState)

1452 This attribute indicates the values of the printer-resolution-
1453 select attribute supported by this printer and their states of
1454 readiness.

1455 The state of readiness for each printer resolution is also
1456 included, though normally all printer-resolutions should always be
1457 ready.

1458 The syntax is discussed in the section on the printer-resolution-
1459 select attribute.

1460 6.4.22 code-sets-supported (1#type3EnumState)

1461 This attribute indicates the values of the default-code-set
1462 attribute supported by this printer and the states of readiness
1463 for each code-set.

1464 The standard values are defined in the default-code-set attribute.

1465 6.4.23 off-peak-times-supported (#type3EnumState)

1466 This attribute indicates the values of the job-print-off-peak
1467 attribute supported by this printer and the states of readiness
1468 for each value.

1469 If this attribute is unspecified, then the Printer has no off-peak
1470 periods.

1471 The standard values are defined in the section on the job-print-
1472 off-peak attribute.

1473 Note: this document does not define how an administrator
1474 associates the off-peak names with actual time periods.

1475 6.4.24 events-supported (#type2EnumState)

1476 This attribute indicates the values of the job and printer
1477 notification-events attribute supported by this Printer and the
1478 states of readiness for each value.

1479 If this attribute is unspecified, then the Printer does not
1480 support notification.

1481 The standard values are defined in the section on the
1482 notification-events attribute.

1483 6.4.25 locales-supported (1#type3LocaleState)

1484 This attribute indicates the values of the job-locale attribute
1485 supported by this Printer and the states of readiness for each
1486 value.

1487 The standard values are defined in the section on the job-locale
1488 attribute.

1489 6.4.26 job-sheets-supported (#type3EnumState)

1490 This attribute identifies the job-sheet values supported by this
1491 printer, and the state of readiness for each job-sheet.

1492 To allow no job sheets, the system administrator shall include the
1493 value none as a value for this attribute. The client specifies
1494 that there are no job sheets by using the value none as the value
1495 of the job-sheets attribute.

1496 If the job-sheets attribute is not specified or contains a value
1497 which the Printer does not support, then the server shall select
1498 from among the values of this attribute. The server shall not
1499 select the value none unless it is the only value specified for
1500 the job-sheets-supported attribute.

1501 NOTE - It is preferable for the server to produce some job
1502 jobsheet, even if not the desired one, rather than produce none at
1503 all or reject the job.

1504 1505 6.4.27 maximum-copies (positiveInteger)

1506 This attribute indicates the maximum number of copies of a
1507 document that can be rendered by this printer in a single
1508 print-job.
1509

1510

1511 If the attribute is unspecified or has a value of 0, there is no
1512 limit on the maximum number of copies for this Printer.

1513 6.4.28 maximum-job-octets (positiveInteger)

1514 This attribute indicates that the Printer shall accept a job only
1515 if its size in octets is less than the value specified by this
1516 attribute.

1517 If the attribute is unspecified or has a value of 0, there is no
1518 limit on the size of a job in octets.

1519 6.4.29 maximum-impressions (positiveInteger)

1520 This attribute indicates that the Printer shall accept a job only
1521 if its size in impression is less than the value specified by this
1522 attribute.

1523 If the attribute is unspecified or has a value of 0, there is no
1524 limit on the size of a job in impressions.

1525 6.4.30 maximum-media-sheets (positiveInteger)

1526 This attribute indicates that the Printer shall accept a job only
1527 if its size in media-sheets is less than the value specified by
1528 this attribute.

1529 If the attribute is unspecified or has a value of 0, there is no
1530 limit on the size of a job in media-sheets.

1531 6.4.31 maximum-job-retention-period (deltaTime)

1532 This attribute indicates that when the Printer accepts a job, the
1533 retention period must not exceed the value of this attribute.
1534 Otherwise, the Printer sets the job's retention-period to the
1535 value of this attribute.

1536 If this attribute is unspecified, then the Printer places no limit
1537 on the retention time.

1538 6.4.32 maximum-end-user-priority (typeEnum)

1539 This attribute indicates that when the Printer accepts a job, the
1540 job-priority must not exceed the value of this attribute.
1541 Otherwise, the Printer sets the job's job-priority to the value of
1542 this attribute.

1543 If this attribute is unspecified, then the Printer places no limit
1544 on the job-priority time.

1545 The standard values are defined in the section on the job-priority
1546 attribute.

1547
1548
1549

1550 6.5 Job Templates

1551 The attributes for a Job Template can be any of the Job object
1552 attributes defined in the sections:

1553 Job Sheet Attributes
1554 Notification Attributes
1555 Job Scheduling Attributes
1556 (except job-print-after)
1557 Job Production Attributes
1558 (except page-select)
1559 Attributes for Conversion of Text Files

1560

1561

1562 6.6 Conformance

1563

1564

1565 A conforming implementation shall implement all operations,
1566 objects and attributes defined in this document. IPP is explicitly
1567 designed to be extensible. This means that in addition to the
1568 attributes defined in this specification, specific implementation
1569 instances may support not only the basic protocol as defined in
1570 this specification, but might add vendor specific extensions.

1571 Also, for the core set of attributes listed in this specification,
1572 it is not required that a conforming server support all (standard)
1573 values of all supported attributes. For example, it is not
1574 required that a printer implement all finishing methods indicated
1575 by the standard values.

1576 The explicit requirement of the term "supported", with respect to
1577 one of the attributes that deal with printer functions or
1578 resources, is that the server shall recognize the attribute and
1579 those values that are supported, and shall be able to respond to a
1580 query about which values that printer does, in fact, support.

1581

1582

1583 7. Security Considerations

1584 This protocol does not identify any new authentication mechanisms.
1585 The authentication mechanisms built into HTTP (such as SSL and
1586 HTTPS) are recommended.

1587 This protocol does define a simple authorization mechanism by
1588 introducing the "end-user-acl" attribute as part of the Printer
1589 object. This ACL attribute is a multi-valued list of all of the
1590 authenticated names of end-users. This protocol does not specify
1591 what the domain is for names in this ACL attribute

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1699

1700 10. Appendix A: Extended Operations

1701 The following symbols are used in the tables below:

- 1702 P perform the operation directly
- 1703 PF perform the operation; forward to Output Device sometimes
- 1704 UA unsupported in an Output Device unless it supports queuing
- 1705 U unsupported operation

1706 Lower priority end user operations are:

Operation	Print Server	Output Device
- Modify Job	P	UA
- Resubmit Job	P	UA

1708
1709

Management operations are:

Operation	Print Server	Output Device
- Clean Queue	PF	UA
- Disallow Queuing	P	UA
- Allow Queuing	P	UA
- Pause Printing	P	P
- Resume Printing	P	P
- Promote Job	PF	UA
- Shutdown Printer	P	P
- Startup Printer	P	P
- Create Printer	P	U
- Delete Printer	P	U
- Set Attribute	P	P

1710
1711
1712

10.1 Modify Job Operation

1713 10.1.1 Modify Job Argument

1714 The following abstract data types are part of the Modify Job
1715 Argument (the attributes that can be modified may be severely
1716 restricted):

Job Id	Which job to modify. [There are no document attributes to modify.]
Job Attributes	Attribute set for Job attributes. Only replacement is possible; the GUI fetches the value and then sets a new one.
Message	Optional Message.
Common Arguments	

1717
1718

10.1.2 Modify Job Result

1719 The following abstract data types are part of the Modify Job
1720 Result:

Modify Status	Modify result attributes.
Errors	Optional Error Information

1721

1722

1723 10.2 Resubmit Job Operation

1724 10.2.1 Resubmit Job Argument **Error! Bookmark not defined.**

1725 The following abstract data types are part of the Resubmit
1726 Argument:

	.
Destination Printer Name	Optional name of the destination printer.
Operation	MOVE or COPY
Job Set	A set of jobs to move or copy. Each entry in the set has: Job Id, Document Number, Job attributes, and Document attributes.
Message	Optional Message
Common Arguments	

1727

1728

1729 10.2.2 Resubmit Job Result

1730 The following abstract data types are part of the Resubmit Job
1731 Result:

Resubmit Job Set	A set of jobs that were resubmitted. Each element in the set has: Old Job Id, New Job Id, and an attribute set with info about the results of the move or copy.
Errors	Optional Error Information

1732

1733