INTERNET-DRAFT   Roger deBry
                                                    IBM Corporation
                                                        T. Hastings
                                                   Xerox Corporation
                                                         R. Herriot
                                                    Sun Microsystems
                                                      Scott Isaacson
                                                        Novell, Inc.
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          Internet Printing Protocol/1.0: MIME Encoding — IPP/1.0
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     Abstract

     This Internet-Draft specifies an Internet Printing Protocol (IPP)that
     is intended to be version 1.0. This protocol is heavily influence by
     the semantic operations and attributes defined in ISO/IEC 10175
     Document Printing Application (DPA) parts 1 and 3. It also
     incorporates some of the implementation and interoperability lessons
     learned from other printing related standards such as POSIX System
     Administration - Part 4 (POSIX 1378.4) and X/Open A Printing System
     Interoperability Specification(PSIS).

     IPP is defined as a set of abstract data types and operations. The
     operations are implemented using a simple request and response

46   mechanism built on top of HTTP. The abstract data types are encoded
47   as simple ASCII text strings.

48   The IPP protocol covers only end user operations on basic print
49   service objects. Authentication is realized by mechanisms outside the
50   scope of the protocol, but the protocol does introduce some access
51   control functionality so that only authorized end users are allowed
52   to submit print jobs to printers whose implementation and site policy
53   support access control. Also, the Cancel Job operation requires some
54   authentication so that jobs can only be canceled by the end user who
55   submitted the job. Extended monitoring and management is possible
56   through other protocols such as the SNMP Printer MIB. In the areas
57   where there are no existing standards, some proposed and emerging
58   standards are being worked (management, security, etc.). As these
59   services become more stable, this document (and hence the protocol)
60   can be updated to reflect the integration and relationships with
61   these other standards.

62   Table of Contents

202

203 1. Introduction

204   The Internet Printing Protocol (IPP) is an application level protocol
205   that can be used for distributed printing on the Internet. The
206   protocol is heavily influenced by the printing model introduced in
207   the Document Printing Application (ISO/IEC 10175 DPA) standard, which
208   describes a distributed printing service. DPA identifies the end user
209   and administrative roles associated with a distributed printing
210   service, and defines the set of operations supported by the service.
211   This IPP specification (version 1.0) deals only with the end user
212   role. These ideas and concepts, when unified with other Internet
213   protocols and services, realize a distributed print service for the
214   Internet.

215   This specification uses the verbs: "shall", "should", "may", and
216   "need not" to specify conformance requirements as follows:

217   -   "shall": indicates an action that the subject of the sentence
218   must implement in order to claim conformance to this specification

219   -   "may": indicates an action that the subject of the sentence does
220   not have to implement in order to claim conformance to this
221   specification, in other words that action is an implementation
222   option

223   -   "need not": indicates an action that the subject of the sentence
224   does not have to implement in order to claim conformance to this
225   specification. The verb "need not" is used instead of "may not",
226   since "may not" sounds like a prohibition.

227   -   "should": indicates an action that is recommended for the subject
228   of the sentence to implement, but is not required, in order to
229   claim conformance to this specification.

230 2. Distributed Printing

231   This document assumes a distributed computing environment where
232   requesters of print services (clients, applications, PC drivers,
233   etc.) cooperate and interact with print service providers. Although
234   the underlying configuration may be a complex n-tier client/server
235   system, an important simplifying step in this protocol is that the
236   only object the requester of the print service ever sees is a
237   "printer". It is important, however, to understand that in a real
238   system, other components of a print service exist.

239 1.1 Generic Print System Components

240   Every distributed print service, including those using the Internet
241   Printing Protocol, includes elements from the following list.

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

244   - Print clients: Print clients are computer network nodes with
245   which humans interact in order to manipulate the distributed print
246   service. A print client uses some protocol to invoke print service
247   operations on another node. Each operation has arguments and
248   results associated with it. The print client provides arguments
249   which add information about the operation requested, and receives
250   results which describe the status and outcome of the operation.

251   - Print servers: Print servers may be embedded in an output device
252   or implemented in a separate system which is associated with an
253   output device. The print server receives requests from the print
254   client and sends back results which describe the status and
255   outcome of the operation requested. A print server normally
256   provides queuing, job management, and device management functions.

257   - Queues: Print jobs may be queued or stored on a spool prior to
258   printing. This allows a print service provider to accept one or
259   more print jobs while the printer (or printers) is busy processing
260   another job. Queues, if present, may be implemented in the client,
261   in the server, in the output device, or in some combination of the
262   three.

263   - Output Devices: Output devices interpret the print data and
264   generate some form of output. In the case of a laser printer, for
265   example, this normally means rasterizing the print data and
266   putting the resulting marks on paper. An output device may
267   receive print data directly from a client or through a Print
268   server.

269   A specific implementation of a print service may not include all of
270   the elements described here, and the physical packaging of elements
271   is up to the implementation. For example, an output device may
272   include a queue or a print server may include a rasterizer.

273   1.1 IPP Components

274   The print model defined by the Internet Printing Protocol simplifies
275   the user's view of the system components described in the previous
276   section by encapsulating the important elements of the system into
277   five simple objects:

278   - End Users (no specific object definition via attributes)
279   - Clients (no specific object definition via attributes)
280   - Printers (section 6.4)
281   - Print Jobs (section 6.2)
282   - Job Templates (section 6.5)
283
284   Clients use the following operations:

285   Print (section 5.4.1)
286   Cancel Job (section 5.4.2)
287   Get Attributes (section 5.4.3)
288   Get Jobs (section 5.4.4)
289
290   2. IPP Objects

291   This section describes the IPP objects.

292   1.1 Printer

293   One of the most significant objects in the IPP model is the Printer.
294   To the end user, the Printer object represents the functionality of
295   the actual output device along with the queuing, job management, and
296   device management functions often associated with a print server. An
297   IPP Printer object implements the Internet Printing Protocol. Using
298   the protocol, end users may query the attributes of the Printer,
299   submit jobs to the Printer, determine subsequent states of submitted
300   and queued jobs and state of the Printer, and cancel their own print
301   jobs. The realization of a Printer object may take on different forms
302   for any given configuration of real components. However, the details
303   of the configuration of real components must be transparent to the
304   end user.

305   In addition, a Printer is an abstraction for any document Output
306   Device. This means that a Printer could be used to represent any
307   real or virtual device which can support the Printer operations and
308   interfaces. For example, a Printer could be used to front end a fax
309   out device, any kind of imager, or even a CD writer.

310   Some examples of configurations containing IPP Printer object
311   include:

312   An output device, with no spooling capabilities, supporting IPP
313   An output device, with a built-in spooler, supporting IPP
314
315
316   A print server with one or more associated output devices with
317   the print server supporting IPP.
318   The associated output devices may or may not be capable of
319   spooling jobs
320   The associated output devices may or may not support IPP
321
322   See the following figures for some examples on how to view IPP
323   Printer objects on top of other printing system models:

```
324      Legend:
325
326      ##### indicates an IPP Printer object which is
327      ------  either embedded in an output device or is
328      ------  hosted in a server.  An IPP Printer object
329      ------  may or may not queue/spool.
330
331      any   indicates any network protocol or direct
332      ------  connect, including IPP
333
334
335      embedded printer:
336      ----------------------------------------------  output device
337      ----------------------------------------+---------------+
338       O     +          +                     | ########### |
339      /|\    | client  |        IPP           >#  Printer  # |
340      / \    +          +                     | ########### |
341      ----------------------------------------+---------------+
342
343
344      hosted printer:
345      ----------------------------------------+---------------+
346       O     +          +       ###########   |               |
347      /|\    | client  |  IPP  >#  Printer # any >| output device |
348      / \    +          +       ###########   |               |
349      ----------------------------------------+---------------+
350
351
352      ----------------------------------------+---------------+
353      fan out:                                |               |
354      ----------------------------------+  >| output device |
355                                any/       |               |
356       O     +          +    ###########  /  ----------------
357      /|\    | client  | IPP >#  Printer # *
358      / \    +          +    ###########  \  ----------------
359                                any\       |               |
360      ----------------------------------+  >| output device |
361      ----------------------------------------+               |
362      ----------------------------------------+---------------+
363
364
365      ----
366  ----
367  1.1 Job
368      A Job object is used to model a job.  A job can contain  one or more
369      documents.  However, there are no separate document objects.  The
370      impact of this is that there are no attributes that pertain to one
```

371   document in a job but not to others, except for a single attribute
372   that specifies the document data, its location, and its format. Note:
373   In future versions, documents may become separate objects with
374   attributes whose scope and application are different from the
375   corresponding job attributes.

376   Job attributes are broken up into the following groups:

377   — Job Informational (sections 6.2.1, 6.2.2)
378   — Job Status (section 6.2.3)
379   — Job Sheet (section 6.2.4)
380   — Notification (section 6.2.5)
381   — Job Scheduling (section 6.2.6)
382   — Job Production (section 6.2.7)
383   — Conversion of Text Files (section 6.2.8)
384   — Job Resources (section 6.2.9)
385   — Number of Documents (section 6.2.10)
386   — Document Attributes (6.2.11)

388 1.1 Job Template

389   A Job Template object is used to model job defaults. A Job Template
390   is essentially a set of job attributes that initialize a newly
391   created job object.

392   Issue: The notion of Job Template needs more work.

393 1.1 Object Relationships

394   Instances of objects within the system have relationships which must
395   be maintained persistently along with the persistent storage of the
396   objects themselves. A Printer can contain zero or more Job objects.
397   Therefore, a job object is contained in exactly one Printer object.
398   A Job object contains one or more Documents.

399   A Printer object is associated with zero or more Job Template
400   objects.

401 1.1 Object Identity

402   All instances of all objects have an identifier attribute that makes
403   them unique so that they can be unambiguously referenced.

404   The following objects have the following mandatory identifier
405   attributes:

Object	Identifier	Containing Object
Printer	printer name	None
Job	job identifier	Printer
Job Template	job-template-name	None

406
407 2. Naming

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

411 http://some.domain.com/printer-1

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

415 Another example is the following URL:

416 http://1.2.3.4:nnn/printer-2

417 In this case, the URL identifies the use of the HTTP protocol. The
418 Printer is located at the node identified by the IP address of
419 "1.2.3.4" using port nnn for the HTTP server, and "printer 2" is the
420 name of the Printer. (The actual value of nnn is to be assigned by
421 IANA as part of this standards project).

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

425 - The Job Template can be hidden from the end user by a URL that
426   represents just the Job Template name (but does not expose the
427   Printer object name) as the two URLS

428   1) http://some.domain.com/two-sided-printer, and
429   1) http://some.domain.com/draft-printer.
430
431   These look like two different Printers , but underneath they
432   represent the same Printer object, but that Printer object has two
433   associated Job Templates and each is exposed through a different
434   URL for the same Printer object. Each one of the Job Templates
435   specified by a URL would contain a different Job Template default
436   attribute set. One Job Template would contain the defaults for
437   two-sides printing and the other would contain the defaults for
438   draft printing.

439 - The Job Template can be exposed along with the name of the Printer
440   object directly in the URL as in:

441   1) http://some.domain.com/hr-printer/resumes
442   1) http://some.domain.com/hr-printer/1040forms

443   In this case there are "resumes" and "1040forms" Job Templates
444   associated with the "hr-printer" Printer.

445   This specification establishes, through IANA, a new well known port,
446   port nnn, for the use of IPP over HTTP. The purpose of this new well
447   known port would be to distinguish printing from non printing
448   content. While any acceptable HTTP content could be inter mixed over
449   HTTP well known port 80, only IPP printing would be acceptable on
450   port nnn.

451 1.1 Directory Services

452   IPP does not require any specific directory service. However, this
453   specification does define a generic schema that can be used for any
454   specific instance of a directory service. That is, some of the
455   attributes from the Printer object are called out as attributes that
456   may be added to a directory entry which represents that Printer.
457   This allows directory users to find and locate IPP Printers by either
458   a simple name look up or by some filtered attribute search.
459
460
461 1.1 Directory Entry Schema

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

465   Issue: The use of "objective" attributes vs. "subjective" attributes
466   still needs to be resolved. For example, for Maximum Print Quality
467   is it better to have values like "high", "medium", "low" or to have
468   explicit, quantified, measurable values? Some of the issues are: end
469   users don't often know what explicit objective values are or what
470   they really mean and they want to depend on an administrator to
471   define what is "high" quality printing and what is "low" quality,
472   especially since today's objective values that equate to "high" are
473   tomorrow's objective values that equate to "medium". On the other
474   hand, some end users demand the control and power explicit values can
475   give them when they do filtered searching. For example, they know
476   and appreciate the difference between 20 ppm printers and 23 ppm
477   printers.

478   Issue: We must specify which attributes are "mandatory" and which are
479   "optional". LDAP uses the terms "must" and "may" to identify
480   attributes that "must" appear and attributes that "may" appear in a
481   given entry in the directory.

482 1.1.1 Name

483   This directory attribute is the printers name. It is a URL so it
484   contains sufficient information to not only name, but to address the
485   printer using IPP as well.

486 1.1.1 Description

487   This directory attribute is a free form string that can contain any
488   site specific descriptive information about this printer.

489 1.1.1 Location

490   This directory attribute is a free form string that can contain any
491   site specific location information.

492   In order for filtered searches to be more effective, a given site may
493   use some regular structuring within the string values such as
494   "SITE:USA San Jose,BUILDING:A1,FLOOR:2,ROOM:555" or "department5-
495   2ndFloor-A5-IndianHills-Chicago-IL-USA".

496 1.1.1 Maximum Print Quality

497   This directory attribute indicates a somewhat subjective evaluation
498   of the overall printing quality. The syntax and values shall be the
499   same as for the print quality Job attribute.

500 1.1.1 Cost

501   This directory attribute indicates a somewhat subjective evaluation
502   of the overall cost of printing at this printer: "high", "medium", or
503   "low".

504 1.1.1 Resolution

505   This directory attribute is the maximum resolution of the Printer in
506   dpi.

507   The syntax and semantics shall be the same as for the printer-
508   resolution select job attribute.

509 1.1.1 Color Supported

510   This directory attribute specifies whether the Printer supports color
511   and, if so, what type. The values are a type2Enum (see section 6).
512   Standard values are: "none", "highlight", "three color (CMY)", "four
513   color (CMYK)", "monochromatic".

514 1.1.1 Fonts Supported

515   This directory attribute takes on a list of fonts that are supported
516   by the printer. The syntax and values shall be the same as for the
517   fonts-used job attribute..

518 1.1.1 Maximum Speed

519   This directory attribute is the maximum speed of the printer ppm,
520   ipm, spm, lpm, or cps. The syntax and values shall be the same as
521   for the maximum printer speed Printer attribute.

522 1.1.1 Device Id

523   This directory attribute can be used for automatic driver download,
524   database access, or other automatic configuration tasks. It might be
525   used to generate a platform specific id such as the Windows Plug and
526   Play id.

527   Issue: Is this the IEEE 1284-1994 device id, the Object Identifier as
528   used in the Host Resource MIB hrDeviceId object, or some other
529   identifier?

530 1.1.1 Make and Model

531   This directory attribute is a simple text string defined by the
532   manufacturer that contains some reference to the make and model of
533   the entity being represented to the end-user by this Printer object.
534   The syntax shall be:

535   vendor name "/" model name

536   where the vendor name is the same as that registered with IANA for
537   use in domain names.

538   For example: "vendor-x/super-duper-printer".

539 1.1.1 Marker Type

540   This directory attribute is the printing mechanism of the print
541   device: electrophotographic laser, inkjet aqueous, thermal transfer,
542   etc. The syntax and values shall be the same as for the printer-
543   types Printer attribute, except the value of the Marker Type
544   directory attribute shall be single-valued

545 1.1.1 Document Formats Supported

546   This directory attribute is a list of all of the document formats
547   that the printer and/or its interpreter(s) support. The syntax and
548   values shall be the same as for the document-format Job attribute.

549 1.1.1 Sides Supported

550   This directory attribute specifies the capabilities of the Printer
551   for marking on sides of the medium. The syntax and values shall be
552   the same as the sides Job attribute.

553   1.1.1 Finishings Supported

554   This directory attribute identifies the finishing operations
555   supported by the Printer. The syntax and values shall be the same as
556   the finishing job attribute.

557   1.1 Directory Entries Using LDAP

558   To allow directory users to locate an IPP Printer, a corresponding
559   entry must be defined within a directory. This section describes how
560   this is done using the Lightweight Directory Access Protocol (LDAP).

561   The LDAP directory entry includes the name of the entry and the
562   attributes as defined in "4.2 Directory Entry Schema". The following
563   is an example of how to define a directory entry for a Printer object
564   using LDAP. It is given to assist the reader's understanding of this
565   specification.

566   To create a Printer object directory entry using LDAP:

567   1. An administrator uses a program to create an entry for the Printer
568   object on a directory server that supports LDAP. The administrator
569   defines the Distinguished Name (dn) and the default subjective
570   attributes for the Printer object directory entry.

571   Issue: Should the administrator also define default objective
572   attributes or wait for the Printer object itself to initialize these
573   attributes?

574   2. The Printer object invokes the ldap_open API to open a connection
575   to the directory server:

576   Example: ld=ldap_open ("dir.host.name", LDAP_PORT)

577   where ld is the connection handle for subsequent LDAP APIs.

578   3. The Printer object invokes an ldap "bind" API to authenticate with
579   the directory server.

580   Example: ldap_simple_bind_s (ld, dn, NULL) (which does a simple
581   authentication without a password).

582   4. The Printer object invokes the ldap_modify or ldap_modify_s API to
583   define the objective attributes for the Printer object entry as
584   identified by its Distinguished Name (dn).

585   Example: ldap_modify_s (ld, dn, mods) (where mods is a NULL
586   terminated array of objective attributes and values to add or modify
587   in the directory entry)

588   5. The Printer object invokes the ldap_unbind API to close the
589   connection to the directory server.

590   Example: ldap_unbind (ld)

591   When one or more objective attributes are modified for a Printer
592   object, the Printer object repeats steps 2-5 to update the modified
593   objective attributes in its directory entry.

594   To locate a Printer object entry using LDAP, a program can use the
595   ldap_search or ldap_search APIs or a user can specify an LDAP URL.

596   For example, to locate all Printer objects that support duplex, a
597   user can specify URL:

598   ldap:///dir.host.name???(&(objectClass=printer)
599   (sides-supported=2-sided-long-edge))
600
601   Issue: Is it allowed to filter the search based on the object class
602   itself, in this case the object class of Printer? We need to define
603   this new object class. How do we do this? One proposal is to
604   subclass the device class defined in X.500:

605   printer OBJECT CLASS ::= {
606   SUBCLASS OF {device}
607   MUST CONTAIN {<list of mandatory attributes>}
608   MAY CONTAIN {<list of optional attributes>}
609
610
611 2. IPP Operations

612   This section introduces the IPP operations. Since IPP specifies the
613   use of HTTP as the underlying communication protocol, the mapping of
614   IPP operations on top of HTTP methods is also shown.

615 2.1 HTTP Overview

616   IPP is based on the existing HTTP standard. IPP is a lightweight
617   application-level protocol designed with the Internet in mind. It is
618   a generic, stateless, object-oriented protocol which can be used for
619   any task through extension of its request methods (commands).

620   HTTP allows an open-ended set of methods to be used to indicate the
621   purpose of a request. It builds on the discipline of reference
622   provided by the Uniform Resource Location (URL) and message formats
623   similar to those used by Internet Mail and the Multipurpose Internet
624   Mail Extensions (MIME).

625   HTTP is based on a request-response paradigm. A requesting program (a
626   client) establishes a connection with a receiving program (a server)
627   and sends a request to the server in the form of a request method, a
628   URL, and protocol version, followed by a MIME-like message containing

629   request modifiers, client information, and possibly print data. The
630   server responds with a status line, including its protocol version,
631   and a success or failure code, followed by a MIME-like message
632   containing server information, entity meta-information, and possibly
633   some content.

634   Current practice requires that the connection be established by the
635   client prior to each request and closed by the server after sending
636   the response. Both clients and servers shall be capable of handling
637   cases where either party closes the connection prematurely, due to
638   user action, automated time out, or program failure.

639 2.2 IPP Operation Encoding

640   IPP messages consist of requests from client to server and responses
641   from server to client.

642   IPP MESSAGE = Request | Response
643
644   Requests and responses use the generic message format of RFC 822 for
645   transferring entities. Both messages may include optional header
646   fields and an entity body. The entity body is separated from the
647   headers by a null line (a line with nothing preceding the CRLF).

648   Request = Request-line
649   * (General-Header
650 | Request-Header
651 | Entity-Header)
652   CRLF
653   [Entity-Body]
654
655   Response = Status-line
656   * (General-Header
657 | Request-Header
658 | Entity-Header)
659   CRLF
660   [Entity-Body]
661
662   All IPP headers conform to the syntax

663   IPP-Header = field-name ":" [field-value] CRLF.
664
665   IPP/1.0 defines the octet sequence CRLF as the end-of-line marker for
666   all protocol elements except the entity-body.

667   Note that HTTP 1.1 defines a slightly different syntax, allowing for
668   dynamically generated messages to be transmitted. This would be
669   required for cases such as PC driver generated Print Operations.
670   HTTP 1.1 defines a message header which specifies a transfer encoding
671   called "chunks".

672   IPP messages are contained within HTTP methods. The HTTP POST method
673   is used for the Print operation and the Cancel Job operation. The
674   HTTP GET method is used for the Get Attributes operation and the Get
675   Jobs operation (section 5.4).

676 2.2.1 HTTP Request-Header Fields

677   HTTP request header fields allow the client to pass additional
678   information about the request, and about the client itself, to the
679   server. All header fields are optional and when used it is assumed
680   that IPP would use these headers in a standard way. IPP requests
681   will be completely encapsulated within the entity body of an HTTP
682   request. The HTTP Entity-Header has the form

683
684   HTTP-Entity-Header =   Content-Encoding
685 | Content-Length
686 | Content-Type
687 | extension-header
688
689   The Content-Length field must always be a valid length, This means
690   that for any Print Operations based on HTTP 1.0, the entire content
691   must be generated before this header can be built. HTTP 1.1 provides
692   the notion of "chunks" which will allow the content to be generated
693   dynamically as the data is sent.

694
695   Content-Type will always be "Application/IPP".

696 2.2.1.1 IPP Request-Line

697   The first line of the entity body in an IPP operation is the IPP
698   Request-Line. The Request-Line defines the Operation and the IPP
699   Version.
700
701   IPP-Request-Line = Operation-token IPP/1.0 CRLF
702
703   Operation-token = Print | Cancel-Job |
704   Get-Attributes | Get-Jobs
705

706 2.2.2 HTTP Response-Header Fields

707   HTTP response fields allow the server to pass additional information
708   about the response back to the client. IPP will use these headers in
709   a standard way. IPP responses will be completely encapsulated within
710   the entity body of an HTTP response.

711   2.2.2.1 IPP Status-Line

712   The first line of the entity body in an IPP response is the IPP
713   Status-Line. The status-line consists of a protocol version followed
714   by a numeric status-code and an associated text message.
715
716   IPP-Status-Line = IPP/1.0 Status-Code Reason-Phrase CRLF

717   2.3 The Print Job

718   In section 5.4.1, the Print Operation is described. In order to
719   understand that operation better, we first present the notion of a
720   Print Job. The entity body of a print operation request will contain
721   a Print Job, as defined below. The headers defined here are IPP
722   headers, but follow the same syntax as the basic HTTP headers.

723
724   Print-Job = Print-Job-Object-Header ;section (5.3.1)
725   [Job-Attributes]   ;section (5.3.4)
726   *(Documents)
727
728   Document =   Document-Header   ;section (5.3.2)
729   [Document-attributes] ;section (5.3.5)
730   [Content-Header   ;section (5.3.3)
731   content]
732
733   2.3.1 Print Job Object Header

734   Print-Job-Object Header = Content-Encoding
735 | Content-Length
736 | Content-Type
737 | extension-header
738
739   Content-Type is always "IPP Print Object". Other header fields are as
740   defined for HTTP 1.0.

741   2.3.2 Document Header

742   The document header allows the insertion of multiple documents within
743   a job. At this point only a limited number of document attributes are
744   defined. However, this structure allows the addition of other
745   attributes which can be specified on a document boundary.

746   Document-Header = Content-Encoding
747 | Content-Length
748 | Content-Type
749 | extension-header
750
751   Content type is always "IPP Document". Other header fields are as
752   defined in HTTP 1.0.

753 2.3.3 Document-Content Header

754 The document-content-header provides additional meta-information
755 about the document. The document content header is an optional field
756 and would not be present if the document was pointed to by a document
757 URL attribute. It is composed of a number of document header fields
758 as follows:

759   Document-Content-Header =   Content-Encoding
760 | Content-Length
761 | Content-Type
762 | extension-header
763
764 Content-Type is defined as :

765   Content-Type = Data-Stream-Format "/" Version
766
767 Thus, for example, if the document to be printed was a Postscript
768 Level 2 document, the Content-Type would be specified as:

769   Content-Type: Postscript/2.0
770
771 Other header fields are as defined by HTTP 1.0.

772 2.3.4 Job Attributes

773 Job attributes are defined in section 6.2. Attributes will always be
774 sent as

775   Job-Attribute = Attr-name ":" Attr-value   CRLF
776
777   Attr-value = 1#Value
778
779 In the above example, "1#Value" means one or more "," separated
780 values.

781 2.3.5 Document Attributes

782 Document attributes are defined in section 6.2.11. The syntax for a
783 document attribute is

784   Document-Attribute = Attr-Name ":" Attr-Value   CRLF
785
786   Attr-Value = 1#Value
787
788 In the above example, "1#Value" means one or more "," separated
789 values.

790 2.4 Operation Semantics

791 In this section the four IPP operations are described in terms of
792 their contents and semantics.

793   2.3.6 Print Operation

794   When an end user submits a job, the client submits a Print Request
795   and receives a Print Response.

796   Note that the Printer name is not needed since it is the target of
797   the entire operation. A Print Job contains the information needed by
798   the Printer object to print a document or set of documents. When the
799   print operation is invoked, the Entity-Body in the HTTP request
800   includes an IPP Print Job. The concrete syntax of the Print Job is
801   defined in section 5.3.

802   Each Printer object has an associated Job Template object assigned by
803   the Administrator. When accepting a Print operation, the Printer
804   shall use the corresponding value of an attribute from the Printer's
805   Job Template as the default value for any job attribute that the
806   submitting client omits from the Print operation.

807   If neither the client nor the Printer's Job Template supplies a value
808   for a job attribute, then the output device shall supply its own
809   default value for that job attribute, if necessary, in order to
810   produce output.

811
812   2.3.5.1 Print Request

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

        Job and   A set of Job object and Document attributes as
        Document   defined in section 6.2
        Attributes

        Requested   A set of attributes without values in whose
        Attributes   values the requester is interested.

        Document   Document content is optional and shall not be
        Contents   included when a URL is provided in the document-
                          URL attribute which points to the content.
814
815
816   2.3.5.1 Print Response

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

818
        Job-Identifier   A URL Used for all other operations on this Job.

        Job Status   Current job state

        Printer State   Printer-state

        Result   The requested attributes with their current
        Attributes   values, if the requester supplied any Requested
                            Attributes

        Message   Optional message

        Errors   Optional Error Information

819

820

821   2.3.6 Cancel Job Operation

822   This operation allows a user to cancel one specific Print Job any
823   time after the print job has been established on the Printer Object.
824   Some pages may be printed before a job is terminated if printing has
825   already started when the Cancel Job operation is received. Only the
826   end-user who is also the job originator (job-originator Job
827   attribute) can cancel the job.

828   The Cancel HTTP request will be sent to the URL identifying the job
829   to be canceled.

830   2.3.5.1 Cancel Job Request

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

832
        Message   Optional message to the operator.

        job retention   The number (cardinal) of minutes that that job
        period   is to be retained after the job has been
                            canceled. This parameter updates the value of
                            the job-retention-period that may have been
                            submitted by the submitter in the Print
                            operation.

833

834   2.3.5.1 Cancel Job Response

835   The following abstract data types are part of the Cancel Job
836   Response:
837
        Job Status   Optional Job status information

        Errors   Optional Error Information

838

839   2.3.6 Get Attributes Operation

840   This operation allows an end user to obtain information from the
841   Print object concerning jobs, printers, and print queues, based on
842   ISO 10175. The entity-body of the Get Attributes operation contains

843   the set of attributes that the requester is interested in. The
844   requester should not supply values in the Requested Attributes input
845   parameter; the Printer shall ignore the values of any supplied by the
846   requester. The attribute list is returned in the response with the
847   appropriate attribute values filled in. If no attribute list is
848   supplied, then all attributes defined for that object are returned.

849   2.3.5.1 Get-Attributes Request

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

            Selector   Job-Identifier (URL) or
                                Printer URL or
                                Job Template URL

            Requested   A set of attributes without values in whose
            Attributes   values the requester is interested

852
853   2.3.5.1 Get Attributes Response

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

            Result   The requested attributes of the object with
            Attributes   their current values, if the requester supplied
                                any Requested Attributes

            Errors   Optional error information

856

857   2.3.6 Get Jobs Operation

858   This operation allows a client to retrieve a list of print jobs
859   belonging to the target Printer object. A list of attributes the
860   client is interested in seeing may be appended to the request. If no
861   attributes are asked for the default set of job-name and total-job-
862   octets is returned for each job along with the job identifier. Jobs
863   will be returned in the order in which they are scheduled to print.

864   2.3.5.1 Get-Jobs Request

865   The following abstract data types are part of the Get Jobs Request:
866
            selector   Indicates which jobs the requester seeks. The
                                    values are type2Enum (see section 6). Standard
                                    values are: "
                                    all-jobs" - including completed jobs

> "pending" – all jobs which are pending and processing

> "my-jobs" – my jobs that are pending or processing

> Requested   A set of attributes without values in whose
> Attributes   values the requester is interested.

867
868
869   2.3.5.1 Get Jobs Response

870   The following abstract data types are part of the Get Jobs Response:
871

> Jobs   A list of Job URLs is returned. The list is in
>   "scheduled" order. The job-identifier attribute
>   shall be returned as the first attribute of each
>   job to mark the beginning of the set of
>   attributes for the next job.

> Result   In addition to the job-identifier attribute
> Attributes   which is always returned, either the Requested
>   Attributes are returned or the following
>   attributes by default, if the requester did not
>   supply any Requested Attributes: job-total-
>   octets and number-of-intervening-job. This last
>   attribute is necessary since an end user may
>   request just their own jobs and they need some
>   relative position indicator if there are other
>   jobs interspersed in the waiting list which are
>   not returned in the response or cannot be
>   because of site security policy restrictions.

> Errors   Optional Error Information

872
873   3. Object Attributes

874   This section describes the attributes, syntaxes, and values that are
875   part of IPP. The sections below show the objects and their associated
876   attributes which are included within the scope of this protocol. The
877   text in these sections has been heavily influenced by the ISO/IEC
878   10175 DPA (Final, June 1996).

879   2.4 Attribute Syntaxes

880   The syntax for attribute values is specified using the notation of
881   RFC 822.

882 The special syntax State is used to form other syntaxes for xxx-
883 supported attributes of the Printer object that indicate job
884 attributes that the Printer supports. Such support may include
885 operator intervention, delivery of an order that the provider has
886 previously placed, or may require that the provider place a special
887 order. The syntax for State is itself a type2Enum. The standard
888 values are: [":not-ready" / ":on-order" / ":special-order"]

889 An attribute value with an empty State means that the indicated value
890 is ready to be used without human intervention.

891 An attribute value with a ":not-ready" State means that operator
892 intervention is required.

893 An attribute value with a ":on-order" State means that the provider
894 has placed an order for the indicated value and that the operator
895 must wait until the resource is delivered before the job can be
896 printed. However, an end-user may submit a job that requires such a
897 resource and the Printer shall accept such a job.

898 An attribute value with a ":special-order" State means that the
899 provider shall make a special order for the resource, when a job is
900 submitted that needs such a resource. However, an end user may
901 submit a job that requires such a resource and the Printer shall
902 accept such a job.

903 For example, the media-supported printer attribute might contain the
904 following values:

905   media supported = na letter white, na letter transparent,
906   b:not-ready
907
908 Meaning that na-letter-white and na-letter-transparent are loaded
909 into the two trays of the output device and that b is supported, but
910 requires the operator to change the trays.

911 The sections below reference the following syntax items:

         string   arbitrary ASCII strings, no control
                                   characters, except <SPACE>.
         StringPair   string ":" string
         stringState   string State
         name   arbitrary ASCII strings, no control
                                   characters, and no <SPACE>
                                   characters.
         Url   Universal Resource Locator
         dateTime   date and time in RFC 822 format
         deltaTime   [hours ":"] minutes
         cardinal   0 .. n represented as ASCII digits
         type1Enum   standard names, must revise the IPP
                                   standard to add a new name. No
                                   private names are allowed.

type2Enum	standard names, but an implementor can, at any time, add new values by proposing them to the PWG for registration (or an IANA appointed registry advisor after the PWG is no longer certified) where they are reviewed for approvoal.. IANA keeps the registry. Implementors can support private (un registered) with a suitable distinguishing prefix, such as -xxx- where xxx is the company name registered with IANA for use in domain names.
Type3Enum	standard names, but an implementor can add new values by submitting a registration request directly to IANA, no PWG or IANA-appointed registry advisor review is required. Implementors can support private (un-registered) names with a suitable distinguishing prefix, such as -xxx- where xxx is the company name registered with IANA for use in domain names.
type2EnumState	type2Enum State
type3EnumState	type3Enum State
boolean	tokens: yes, y, true, or t and no, n, false, or f.
positiveInteger	1 .. n represented as ASCII digits
positiveIntegerCross	positiveInteger ["x" positiveInteger]
positiveIntegerCrossState	positiveIntegerCross State
positiveIntegerRange	positiveInteger ":" positiveInteger
positiveIntegerUnits	positiveInteger units
positiveIntegerState	positiveInteger State
units	"ppm"	"ipm"	"spm"	"cps"	"lpm"
type3Locale	type3Country ":" type3Language ":" type3CodeSet
type3Country	type3Enum - Standard values are the two character country codes from ISO 639.
type3Language	type3Enum - Standard values are the two-character language codes from ISO 3166.
type3CodeSet	type3Enum - Standard values are from the IANA Code Set registry.
type2Format	name ["/" version]
version	name
type3LocaleState	type3Locale State

912

913   Also, the following conventions (from RFC 822) are used:

        "1#" in front of a data   means one or more values separated
        syntax   by ",".
914

915   NOTE - For consistency, no Job (or Job Template) or Printer attribute
916   has the syntax # meaning zero or more values separated by ",".
917   Instead, a distinguished value, such as "none", is used to indicate
918   no value. For the Printer Object, the omission of the attribute
919   entirely, is also used to indicate no value. In all such cases for
920   the Printer object where a conforming implementation may omit the
921   attribute all together, an explicit sentence indicates the meaning of
922   the Printer attribute when the attribute is unspecified.

923   2.4 Job Attributes

924   A job object contains a set of job attributes and one or more
925   documents. A client shall create a job and send it to a server using
926   the Print operation. When accepting a Print operation, the Printer
927   shall use the corresponding value of an attribute from the Printer's
928   Job Template as the default value for any job attribute that the
929   submitting client omits from the Print operation.

930   A client may use a job template associated with the selected printer
931   in order to initialize the job. To do so, the client uses the Get-
932   Attributes operation to get the URLs of the Printer's Job Templates.
933   Then the client may get the default attributes from the Printer's
934   default Job Template in order to initialize a display to the end user
935   with the Printer's defaults. See the printer-job-templates Printer
936   attribute. However, a client need not access the Job Template in
937   order to issue a Print operation; the client can depend on the
938   Printer to supply the default job object attribute values as part of
939   the Print operation.

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

942   2.3.6 Job Informational Attributes (Set by a Client/End User)

943   The client may specify these attributes in the Print operation to
944   provide information to identify a print job.

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

947   2.3.5.1 job-name (string)

948   This attribute supplies a human readable string for naming the print
949   job.

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

952 If the client does not specify this attribute, a Printer shall set it
953 to the value of the document name attribute of the first document in
954 the job.

955 2.3.6 Job Informational Attributes (Set by a Printer)

956 The Print shall add all of these attributes to a job to provide
957 information to identify a print job.

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

960 2.3.5.1 job-identifier (url)

961 This attribute provides the job-identifier for this job on the
962 Printer. The Printer shall generate a job identifier value as a URL.

963 The value of the job identifier attribute shall be returned by the
964 Printer as part of the PrintResult in the Print operation.

965 2.3.5.1 job-originator (name)

966 This attribute specifies the name of the person submitting the print
967 job. The Printer shall set this attribute to the most authentic name
968 that it can obtain from the client. The operation user name attribute
969 is intended to be a source of the most authentic name.

970 2.3.5.1 job-originating-host (name)

971 This attribute identifies the originating host of the job. The
972 Printer shall set this attribute to the value of the operation host
973 name which is intended to be the most authentic host name of the
974 client.

975 2.3.5.1 job-locale (type3Locale)

976 This attribute identifies the locale of the job, i.e, the country,
977 language, and coded character set. The Printer sets this attribute
978 from the value of the operation locale.

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

981 Issue: Is there a more standard syntax for locale?

982   2.3.6 Job Status Attributes (Set by Printer)

983   The Printer shall add these attributes to a job when a client submits
984   a job, and the Printer shall assign appropriate values to each such
985   job status attribute.

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

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

990   2.3.5.1 current job state (type1Enum)

991   This attribute identifies the current state of the job. Standard
992   values are:

Unknown	The job state is not known, or is indeterminate.
held	The job is waiting to be released for scheduling for any number of reasons as specified by the value of the job's job-state-reasons attribute.
pending	The job is waiting to start processing on a printer.
processing	The server is processing the job, or has made the job ready for printing, but the output device is not yet printing it, either because the job hasn't reached the output device or because the job is queued in the output device or some other spooler, awaiting the output device to print it. Or The server has completed processing the job and the output device is currently printing the job. That is, an output device is either printing pages of the job, or failing in its attempt to print pages of the job because of some wait state, such as, start-wait, end-wait, needs-attention, etc. The complete job state includes the detailed status represented in the printer's printer state attribute.
paused	The job has been paused
Interrupted	The job has been interrupted by some intervening job, and shall resume processing automatically once the intervening job has completed.

Terminating   The job has been canceled by a Cancel-Job
                request or aborted by the server and is in the
                process of terminating. The job's job state
                reasons attribute contains the reasons that
                the job is being terminated.
Retained   The job is being retained at the server as a
                result of the job's job-retention-period being
                non zero. The job has (1) completed
                successfully or with warnings or errors, (2)
                been aborted while printing by the server, or
                (3) been canceled by the Cancel-Job request
                before or during processing. The job's job-
                state reasons attribute contains the reasons
                that the job has been retained.
                While in the retained state, all of the job's
                document data (and resources, if any) shall be
                retained by the server; thus a job in the
                retained state could be reprinted, using some
                means outside the scope of IPP V1.0.
Completed   The job has:

                    (1) completed successfully or with
                warnings or errors,
                    (2) been aborted by the server while
                printing, or
                    (3) been canceled by the Cancel-Job
                request,

                AND the job's:
                    (1) job-retention-period was zero or has
                expired, or
                    (2) job discard time has arrived.
                The job's job-state-reasons attribute contains
                the reason(s) that the job has been completed.
                While in the completed state, a job's document
                data (and resources if any) need not be
                retained by the server; thus a job in the
                completed state could not be reprinted. The
                length of time that a job may be in this
                state, before transitioning to unknown, is
                implementation dependent. However, servers
                that implement the completed job state shall
                retain, as a minimum, the following attributes
                for any job in the completed state: job-
                identifier, job-originator, job-name, current
                job state, output device assigned, and job
                state reasons.

993

994   The IPP protocol supports all values for job states, but Printers
995   need only support those states which are appropriate for the
996   particular implementation.

997   2.3.5.1 output device assigned (name)

998   This attribute identifies the Output Device to which the Printer has
999   assigned this job.

1000 If an Output Device implements a Printer, the Printer need not set
1001 this attribute.

1002 If a Print Server implements a Printer, the value shall be empty
1003 until the Printer assigns an Output Device to the job.

1004 The value of the job's output-device-assigned attribute shall remain
1005 after the job has completed, so that end users can determine the
1006 Output Device on which the job was printed.

1007 2.3.5.1 submission time (dateTime)

1008 This attribute indicates the time at which this job was accepted by
1009 the Printer. If the Printer does not support the notion of time, the
1010 attribute need not be stored as part of the job object.

1011 2.3.5.1 number of intervening jobs (cardinal)

1012 This attribute indicates the number of jobs that are "ahead" of this
1013 job in the current scheduled order. For efficiency, it is only
1014 necessary to calculate this value when an operation if performed that
1015 requests this attribute.

1016 NOTE   This attribute is necessary since an end user may request just
1017 their own jobs and they need some relative position indicator if
1018 there are other jobs interspersed in the waiting list which are not
1019 returned in the response or cannot be because of site security policy
1020 restrictions.

1021 2.3.5.1 job message from operator (string)

1022 This attribute provides a message from an operator, system
1023 administrator or "intelligent" process to indicate to the end user
1024 the reasons for modification or other management action taken on a
1025 job.

1026 2.3.5.1 completion time (dateTime)

1027 This attribute indicates the time at which this job completed. This
1028 time is useful for jobs which are retained after printing. If the
1029 Printer does not support the notion of time, the attribute is not
1030 stored as part of the Job object.

1031   2.3.5.1 job-state-reasons (1#type2Enum)

1032   This attribute identifies the reason or reasons that the job is in
1033   the state that it is in (e.g., held, terminating, retained,
1034   completed, etc.). The printer shall indicate the particular
1035   reason(s) by setting the value of the job-state-reasons attribute.

1036   The following standard values are defined:

          none   There are not reasons associated with
                                   the job's current state.
          documents needed   The complete job has been accepted by
                                   the server, but the server is waiting
                                   for its files to be transferred before
                                   the job can be scheduled to be printed.
          job hold set   The value of the job's job hold
                                   attribute is TRUE.
          job-print-after-   The value of the job's job-print-after
          specified   or print-off-peak attributes have
                                   specified a time specification that has
                                   not yet occurred.
          Required resources   At least one of the resources needed by
          not-ready   the job, such as media, fonts, resource
                                   objects, etc., is not ready on any of
                                   the physical printer's for which the job
                                   is a candidate.
          Successful completion   The job completed successfully.
          Completed-with-   The job completed with warnings.
          warnings
          Completed-with-errors   The job completed with errors (and
                                   possibly warnings too).
          Cancelled by user   The job was cancelled by the user using
                                   the CancelJob request.
          Cancelled-by-operator   The job was cancelled by the operator
                                   using the CancelJob request.
          Aborted by system   The job was aborted by the system.
          Logfile pending   The job's logfile is pending file
                                   transfer.
          Logfile-transferring   The job's logfile is being transferred.
1037

1038   2.3.5.1 impressions completed (cardinal)

1039   This attribute contains the number of impressions that the Printer
1040   has completed printing. If the Printer cannot report this number,
1041   the Printer leaves this attribute unspecified.

1042   2.3.5.1 media-sheets-completed (cardinal)

1043   This attribute contains the number of media sheets that the Printer
1044   has completed printing. If the Printer cannot report this number,
1045   the Printer leaves this attribute unspecified.

1046 2.3.6 Job Sheet Attributes (Set by Client/End User)

1047   The client shall specify these attributes to control the printing of
1048   job sheets.

1049   The client may also specify job sheet attributes in: Get Attributes
1050   and Get-Jobs.

1051 2.3.5.1 job-sheets (type3Enum)

1052   This attribute determines what type of job-sheets the Printer shall
1053   print with the job.

1054   The standard values are: none, and default sheet.

1055   The value "none" means that the Printer shall print no job sheets.
1056   The value "default-sheet" means that the Printer shall print the job
1057   sheets defined by an administrator. If the administrator's policy is
1058   not to support none, the Printer shall use the default sheet value if
1059   the client supplies the "none" value.

1060   NOTE - The effect of this attribute on jobs and documents is
1061   controlled by the files-are-one-document and files-are-interleaved
1062   job attributes.

1063 2.3.6 Notification Attributes (Set by a Client/End User)

1064   The client shall specify these attributes to indicate events that the
1065   client is interested in, along with the notification address and
1066   method for performing the notification.

1067   The client may also specify notification attributes in: Get-
1068   Attributes and Get Jobs.

1069 2.3.5.1 notification events (1#type2Enum)

1070   This attribute specifies the events about which the end user want to
1071   be notified.

1072   Standard values are: none, job-completion, job-problems and printer-
1073   problems.

1074   If this attribute contains the event none, the Printer shall not
1075   notify. This value is useful if an administrator has set up a
1076   notification Printer default but the end user does not want
1077   notification. If the none value and other values are supplied, the
1078   Printer shall ignore the none value.

1079   If this attribute contains the value: job completion, the Printer
1080   shall notify the client when the job containing this attribute

1081   completes with or without errors or is cancelled by the end-user or
1082   the operator.

1083   If this attribute contains the value: job problems, the Printer
1084   shall notify the client when this job has a problem while this job is
1085   printing. Problems include: paper jam and out-of-paper.

1086   If this attribute contains the value: printer-problems, the Printer
1087   shall notify the client when any job, including this job, has a
1088   problem while this job is waiting to print or printing. Problems
1089   include: paper jam and out of paper.

1090   2.3.5.1 notification-address (url)

1091   This address specifies both the address and mechanism for delivery of
1092   notification events to the client. The client specifies this
1093   attribute in the operation notification address attribute which the
1094   Printer in turn uses to set this attribute.

1095   The Printer shall use this attribute as the address for sending
1096   messages to a job submitter when an event occurs that the end user
1097   has registered an interest in or when certain other events occur,
1098   such as Cancel Job.

1099   If the URL has a "mailto:" scheme, then email is used and the rest of
1100   the URL is used as the email address. If the URL has a "http:"
1101   scheme, then an HTTP method is used to add HTML formatted events to
1102   the end of the specified HTML file.

1103   2.3.6 Job Scheduling Attributes (Set by Client/End User)

1104   The client shall specify these attributes to provide the Printer with
1105   information for the scheduling a print-job.

1106   The client may also specify these attributes in: Get-Attributes and
1107   Get-Jobs.

1108   2.3.5.1 job priority (type1Enum)

1109   This attribute specifies a priority for scheduling the print job.
1110   Printers that employ a priority-based scheduling algorithm use this
1111   attribute.

1112   There are three standard values: high, default, and low. Among those
1113   jobs that are ready to print, a Printer shall print all such jobs
1114   with a high priority before printing those with a default or low
1115   priority, and a Printer shall print all such jobs with a default
1116   priority before printing those with a low priority.

1117   If the client does not specify this attribute, the Printer assumes
1118   that the end user places no constraints concerning priority on the
1119   scheduling of the print job, and it has a priority value of default.

1120   An operator can modify a job to have any priority. An end user is
1121   restricted by the value of the maximum-end-user-priority Printer
1122   attribute.

1123   2.3.5.1 job-print-after (dateTime)

1124   This attribute specifies the calendar date and time of day after
1125   which the print job shall become a candidate for printing.

1126   If the value of this attribute is in the future, the Printer shall
1127   set the value of the job's current-job-state to held and add the job-
1128   print-after-specified value to the job's job-state-reasons attribute
1129   and shall not schedule the print job for printing until the specified
1130   date and time has passed. When the specified date and time arrives,
1131   the Printer shall remove the job-print-after-specified value from the
1132   job's job-state-reason attribute and, if no other reasons remain,
1133   shall change the job's current-job-state to pending so that the job
1134   becomes a candidate for being scheduled to print.

1135   If this attribute is unspecified or the value is in the past, the job
1136   shall be a candidate for scheduling immediately.

1137   2.3.5.1 job-print-off-peak (type3Enum)

1138   This attribute specifies the off-peak period during which the print
1139   job shall become a candidate for printing.

1140   Standard values are: "evening", "night", "weekend", "second shift",
1141   "third-shift".

1142   If this attribute is specified, it contains a value with which an
1143   administrator has associated allowable print times. An administrator
1144   is encouraged to pick names that suggest the type of off peak period.

1145   If the value of this attribute is in the future, the Printer shall
1146   set the value of the job's current-job-state to held and add the job-
1147   print-after-specified value to the job's job-state-reasons attribute
1148   and shall not schedule the print-job for printing until the specified
1149   date and time has passed. When the specified date and time arrives,
1150   the Printer shall remove the job print after specified value from the
1151   job's job-state-reason attribute and, if no other reasons remain,
1152   shall change the job's current-job-state to pending so that the job
1153   becomes a candidate for being scheduled to print.

1154   If this attribute is unspecified, the job shall be a candidate for
1155   scheduling immediately.

1156 | 2.3.5.1 job-retention-period (deltaTime)

1157 | The retention time is expressed in hours and minutes, e.g. 6:00 (6
1158 | hours), or 20 (20 minutes).

1159 | This attribute specifies the minimum period of time following the
1160 | completion of job processing and printing that the server shall keep
1161 | job attributes and document data. The Printer may keep these
1162 | attributes and data longer than the value of the job-retention-period
1163 | attribute.

1164 | NOTE   the requester may change this job attribute using the input
1165 | parameter to the Cancel-Job operation.

1166 | 2.3.6 Job Production Attributes (Set by Client/End User)

1167 | The client shall specify these attributes to affect the rendering,
1168 | production and finishing of the documents in the job. Similar types
1169 | of instructions may also be contained in the document to be printed.

1170 | If there is a conflict between the value of one of these attributes,
1171 | and a corresponding instruction in the document (either implicit or
1172 | explicit), the value of the attribute shall take precedence over the
1173 | document instruction.

1174 | Job Production and Resource Attributes each address a similar set of
1175 | features but they have different uses.

1176 | A job production attribute provides a client with a way to request
1177 | some feature at print time that may not have been embedded within
1178 | the document data when the document was created. A job production
1179 | attribute also provides a client with a way to override a feature at
1180 | print time that was embedded within the document data when the
1181 | document was created.

1182 | Note: until companies that supply interpreters for PDL's, such as
1183 | PostScript and PCL allow a way to specify overrides for internal job
1184 | production instructions, a Printer may not be able to implement these
1185 | attributes for some PDL's.

1186 | A job resource attribute tells a Printer what features the job needs.
1187 | A program that translates document data to a Printer's PDL, and/or
1188 | merges production attributes into the document data should add job
1189 | resource attributes to a job.

1190 | For example, a job production attribute medium-select with the value
1191 | of "letter" requests that a job be printed on letter paper, but gives
1192 | no information about what resources the job needs. For example, a job
1193 | resource attribute media used with the values of "letter" and
1194 | "ledger" tell a Printer that the job needs letter and ledger paper,
1195 | but gives no information about which pages use each medium.

1196   The client may also specify job production-instruction attributes in:
1197   Get-Attributes and GetJobs.

1198 2.3.5.1 medium select (type2Enum)

1199   This attribute identifies the medium that the Printer shall use for
1200   all pages of the document regardless of what media are specified
1201   within the document.

1202   The values for medium include medium-names, medium-sizes, input-trays
1203   and electronic forms so that one attribute specifies the media.

1204   Standard values are (taken from ISO DPA and the Printer MIB):

         default   The default medium for the output
                               device
         iso-a4-white   Specifies the ISO A4 white medium
         iso a4 colored   Specifies the ISO A4 coloured medium
         iso a4 transparent   Specifies the ISO A4 transparent
                               medium
         iso-a3-white   Specifies the ISO A3 white medium
         iso-a3-colored   Specifies the ISO A3 coloured medium
         iso a5 white   Specifies the ISO A5 white medium
         iso a5 colored   Specifies the ISO A5 coloured medium
         iso-b4-white   Specifies the ISO B4 white medium
         iso-b4-colored   Specifies the ISO B4 coloured medium
         iso-b5-white   Specifies the ISO B5 white medium
         iso b5 colored   Specifies the ISO B5 coloured medium
         jis b4 white   Specifies the JIS B4 white medium
         jis-b4-colored   Specifies the JIS B4 coloured medium
         jis-b5-white   Specifies the JIS B5 white medium
         jis-b5-colored   Specifies the JIS B5 coloured medium
1205

1206   The following standard values are defined for North American media:

         na-letter-white   Specifies the North American letter
                               white medium
         na-letter-colored   Specifies the North American letter
                               coloured medium
         na letter   Specifies the North American letter
         transparent   transparent medium
         na-legal-white   Specifies the North American legal
                               white medium
         na legal colored   Specifies the North American legal
                               coloured medium
1207

1208   The following standard values are defined for envelopes:

         iso-b4-envelope   Specifies the ISO B4 envelope medium
         iso b5 envelope   Specifies the ISO B5 envelope medium

iso-c3-envelope   Specifies the ISO C3 envelope medium
iso-c4-envelope   Specifies the ISO C4 envelope medium
iso-c5-envelope   Specifies the ISO C5 envelope medium
iso-c6-envelope   Specifies the ISO C6 envelope medium
iso-designated-   Specifies the ISO Designated Long
long-envelope   envelope medium
na-10x13-envelope   Specifies the North American 10x13
                       envelope medium
na-9x12-envelope   Specifies the North American 9x12
                       envelope medium
monarch-envelope   Specifies the Monarch envelope
na-number-10-   Specifies the North American number
envelope   10 business envelope medium
na-7x9-envelope   Specifies the North American 7x9 inch
                       envelope
na-9x11-envelope   Specifies the North American 9x11
                       inch envelope
na-10x14-envelope   Specifies the North American 10x14
                       inch envelope
na-number-9-   Specifies the North American number 9
envelope   business envelope
na-6x9-envelope   Specifies the North American 6x9 inch
                       envelope
na-10x15-envelope   Specifies the North American 10x15
                       inch envelope

1209

1210   The following standard values are defined for the less commonly used
1211   media (white only):

executive-white   Specifies the white executive medium
folio-white   Specifies the folio white medium
invoice-white   Specifies the white invoice medium
ledger-white   Specifies the white ledger medium
quarto-white   Specified the white quarto medium
iso-a0-white   Specifies the ISO A0 white medium
iso-a1-white   Specifies the ISO A1 white medium
iso-a2-white   Specifies the ISO A2 white medium
iso-a6-white   Specifies the ISO A6 white medium
iso-a7-white   Specifies the ISO A7 white medium
iso-a8-white   Specifies the ISO A8 white medium
iso-a9-white   Specifies the ISO A9 white medium
iso-10-white   Specifies the ISO A10 white medium
iso-b0-white   Specifies the ISO B0 white medium
iso-b1-white   Specifies the ISO B1 white medium
iso-b2-white   Specifies the ISO B2 white medium
iso-b3-white   Specifies the ISO B3 white medium
iso-b6-white   Specifies the ISO B6 white medium
iso-b7-white   Specifies the ISO B7 white medium
iso-b8-white   Specifies the ISO B8 white medium
iso-b9-white   Specifies the ISO B9 white medium
iso-b10-white   Specifies the ISO B10 white medium
jis-b0-white   Specifies the JIS B0 white medium

```
              jis-b1-white          Specifies the JIS B1 white medium
              jis-b2-white          Specifies the JIS B2 white medium
              jis-b3-white          Specifies the JIS B3 white medium
              jis-b6-white          Specifies the JIS B6 white medium
              jis-b7-white          Specifies the JIS B7 white medium
              jis-b8-white          Specifies the JIS B8 white medium
              jis-b9-white          Specifies the JIS B9 white medium
              jis-b10-white         Specifies the JIS B10 white medium
1212


1213    The following standard values are defined for engineering media:

              a                     Specifies the engineering A size
                                    medium
              b                     Specifies the engineering B size
                                    medium
              c                     Specifies the engineering C size
                                    medium
              d                     Specifies the engineering D size
                                    medium
              e                     Specifies the engineering E size
                                    medium
1214


1215    The following standard values are defined for input-trays (from ISO
1216    DPA and the Printer MIB):

              top          The top input tray in the printer.
              middle       The middle input tray in the printer.
              bottom       The bottom input tray in the printer.
              envelope     The envelope input tray in the printer.
              manual       The manual feed input tray in the printer.
              large        The large capacity input tray in the printer.
              capacity
              Main         The main input tray
              side         The side input tray
1217


1218    The following standard values are defined for media sizes (from ISO
1219    DPA):

              iso-a0   Specifies the ISO A0 size: 841 mm by 1189 mm as
                       defined in ISO 216
              iso-a1   Specifies the ISO A1 size: 594 mm by 841 mm as
                       defined in ISO 216
              iso-a2   Specifies the ISO A2 size: 420 mm by 594 mm as
                       defined in ISO 216
              iso-a3   Specifies the ISO A3 size: 297 mm by 420 mm as
                       defined in ISO 216
              iso-a4   Specifies the ISO A4 size: 210 mm by 297 mm as
                       defined in ISO 216
```

          iso-a5   Specifies the ISO A5 size: 148 mm by 210 mm as
                      defined in ISO 216
          iso-a6   Specifies the ISO A6 size: 105 mm by 148 mm as
                      defined in ISO 216
          iso-a7   Specifies the ISO A7 size: 74 mm by 105 mm as
                      defined in ISO 216
          iso-a8   Specifies the ISO A8 size: 52 mm by 74 mm as
                      defined in ISO 216
          iso-a9   Specifies the ISO A9 size: 37 mm by 52 mm as
                      defined in ISO 216
          iso-a10   Specifies the ISO A10 size: 26 mm by 37 mm as
                      defined in ISO 216

1220

          iso-b0   Specifies the ISO B0 size: 1000 mm by 1414 mm as
                      defined in ISO 216
          iso-b1   Specifies the ISO B1 size: 707 mm by 1000 mm as
                      defined in ISO 216
          iso-b2   Specifies the ISO B2 size: 500 mm by 707 mm as
                      defined in ISO 216
          iso-b3   Specifies the ISO B3 size: 353 mm by 500 mm as
                      defined in ISO 216
          iso-b4   Specifies the ISO B4 size: 250 mm by 353 mm as
                      defined in ISO 216
          iso-b5   Specifies the ISO B5 size: 176 mm by 250 mm as
                      defined in ISO 216
          iso-b6   Specifies the ISO B6 size: 125 mm by 176 mm as
                      defined in ISO 216
          iso-b7   Specifies the ISO B7 size: 88 mm by 125 mm as
                      defined in ISO 216
          iso-b8   Specifies the ISO B8 size: 62 mm by 88 mm as
                      defined in ISO 216
          iso-b9   Specifies the ISO B9 size: 44 mm by 62 mm as
                      defined in ISO 216
          iso-b10   Specifies the ISO B10 size: 31 mm by 44 mm as
                      defined in ISO 216

1221

          na-letter   Specifies the North American letter size:
                          8.5 inches by 11 inches
          na-legal   Specifies the North American legal size:
                          8.5 inches by 14 inches
          executive   Specifies the executive size (7.25 X 10.5
                          in)
          folio   Specifies the folio size (8.5 X 13 in)
          invoice   Specifies the invoice size (5.5 X 8.5 in)
          ledger   Specifies the ledger size (11 X 17 in)
          quarto   Specifies the quarto size (8.5 X 10.83 in)

1222

          iso-c3   Specifies the ISO C3 size: 324 mm by 458 mm
                          as defined in ISO 269
          iso-c4   Specifies the ISO C4 size: 229 mm by 324 mm
                          as defined in ISO 269
          iso-c5   Specifies the ISO C5 size: 162 mm by 229 mm
                          as defined in ISO 269

                iso-c6   Specifies the ISO C6 size: 114 mm by 162 mm
                                   as defined in ISO 269
                iso-   Specifies the ISO Designated Long size: 110
                designated-   mm by 220 mm as defined in ISO 269
                long
1223

                na-10x13-envelope Specifies the North American 10x13
                                   size: 10 inches by 13 inches
                na-9x12 envelope   Specifies the North American 9x12 size:
                                   9 inches by 12 inches
                na-number-10-   Specifies the North American number 10
                envelope   business envelope size: 4.125 inches by
                                   9.5 inches
                na-7x9 envelope   Specifies the North American 7x9 inch
                                   envelope size
                na-9x11-envelope   Specifies the North American 9x11 inch
                                   envelope size
                na-10x14 envelope Specifies the North American 10x14 inch
                                   envelope size
                na-number-9-   Specifies the North American number 9
                envelope   business envelope size
                na-6x9-envelope   Specifies the North American 6x9
                                   envelope size
                na-10x15 envelope Specifies the North American 10x15
                                   envelope size
                monarch-envelope   Specifies the Monarch envelope size
                                   (3.87 x 7.5 in)
1224

                a   Specifies the engineering A size:
                                   8.5 inches by 11 inches
                b   Specifies the engineering B size:
                                   11 inches by 17 inches
                c   Specifies the engineering C size:
                                   17 inches by 22 inches
                d   Specifies the engineering D size:
                                   22 inches by 34 inches
                e   Specifies the engineering E size:
                                   34 inches by 44 inches
1225
                jis-b0   Specifies the JIS B0 size: 1030mm x 1456mm
                jis-b1   Specifies the JIS B1 size: 728mm x 1030mm
                jis-b2   Specifies the JIS B2 size: 515mm x 728mm
                jis-b3   Specifies the JIS B3 size: 364mm x 515mm
                jis-b4   Specifies the JIS B4 size: 257mm x 364mm
                jis-b5   Specifies the JIS B5 size: 182mm x 257mm
                jis-b6   Specifies the JIS B6 size: 128mm x 182mm
                jis-b7   Specifies the JIS B7 size: 91mm x 128mm
                jis-b8   Specifies the JIS B8 size: 64mm x 91mm
                jis-b9   Specifies the JIS B9 size: 45mm x 64mm
                jis-b10   Specifies the JIS B10 size: 32mm x 45mm
1226

1227 2.3.5.1 finishing (type2Enum)

1228 This attribute identifies the finishing operation that the Printer
1229 should apply to each copy of the printed document.

1230 NOTE   The effect of this atttribute on jobs and documents is
1231 controlled by the files-are-one-document and files-are-interleaved
1232 job attributes.

1233 Standard values for this attribute are:

none	Perform no finishing.
staple	This indicates that staples are to be used to bind the document. The exact number and placement of the staples is site-defined; other finishing object attributes may be included to provide this information.
staple-top- left	This indicates that one or more staples should be placed on the top left corner of the document
staple-bottom- left	This indicates that one or more staples should be placed on the bottom left corner of the document
staple-top- right	This indicates that one or more staples should be placed on the top right corner of the document
staple bottom- right	This indicates that one or more staples should be placed on the bottom right corner of the document
saddle-stitch	This indicates that one or more staples (wire stitches) are to be used to bind the document along the middle fold. The exact number and placement of the stitches is site-defined.
edge-stitch	This indicates that one or more staples (wire stitches) are to be used to bind the document along one edge. The exact number and placement of the staples is site- defined.
punch	This indicates that holes are required in the finished document. The exact number and placement of the holes is site defined The punch specification may be satisfied (in a site- and implementation-specific manner) either by drilling/punching, or by substituting predrilled media.
cover	This value is specified when it is desired to select a non printed (or pre printed) cover for the document. This does not supplant the specification of a printed cover (on cover stock medium) by the document itself.

bind   This indicates that a binding is to be
                                applied to the document; the type and
                                placement of the binding is site defined.

1234

1235   2.3.5.1 number-up (type3Enum)

1236   This attribute specifies the number of source page-images to impose
1237   upon a single side of an instance of a selected medium.

1238   In general, only certain numeric values are valid for this attribute
1239   and the value "none", depending upon the Printer implementation to
1240   which the print-request is directed. Standard values are: "none",
1241   "1", "2", "4".

1242   This attribute primarily controls the translation, scaling and
1243   rotation of page images, but a site may choose to add embellishments,
1244   such as borders to each logical page. The value "none" shall not
1245   include any embellishments and shall place one logical page on a
1246   single side of an instance of the selected medium without any
1247   translation, scaling, or rotation.

1248   2.3.5.1 sides (type2Enum)

1249   This attribute specifies how source page images are to be imposed
1250   upon the sides of an instance of a selected medium.

1251   The standard values are: 1-sided, 2-sided-long-edge, 2-sided-short-
1252   edge.

1253   1-sided imposes each consecutive source page image upon the same side
1254   of consecutive media sheets.

1255   2-sided-long-edge imposes each consecutive pair of source page-image
1256   upon front and back sides of consecutive media sheets, such that the
1257   orientation of each pair of source-pages on the medium would be
1258   correct for the reader as if for binding on the long edge. This
1259   imposition is sometimes called "duplex".

1260   2-sided-short-edge imposes each consecutive pair of source page-image
1261   upon front and back sides of consecutive media sheets, such that the
1262   orientation of each pair of source-pages on the medium would be
1263   correct for the reader as if for binding on the short edge. This
1264   imposition is sometimes called "tumble" or "head to toe".

1265   Issue: How does sides interact with portrait vs. landscape and
1266   reverse-landscape documents?

2.3.5.1 copies (positiveInteger)

   This attribute specifies the number of copies of the job to be
   printed. If this attribute is unspecified by both the client and the
   Printer's Job Template, its default value shall be 1.

   NOTE - The effect of this atttribute on jobs and documents is
   controlled by the files-are-one-document and files-are-interleaved
   job attributes.

2.3.5.1 printer resolution select (positiveIntegerCross)

   This attribute specifies the resolution that the Printer should use.

   The syntax allows a single integer to specify the resolution or a
   pair of integers to specify the resolution when the x and y
   dimensions differ. When two integers are specified, the first is in
   the x direction, ie., in the direction of the shortest dimension of
   the medium, so that the value is independent of whether the printer
   feeds long edge or short edge first.

2.3.5.1 print-quality (type2Enum)

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

   The standard values are:

       draft   Lowest quality available on the printer
       normal   Normal or intermediate quality on the printer
       high   Highest quality available on the printer

2.3.5.1 page-select (positiveIntegerRange)

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

2.3.5.1 files-are-one-document (boolean)

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

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

1305   If the files for the job are a and b and this attribute is false or
1306   unspecified by both the client and the Printer's Job Template, then
1307   each file is treated as a single document for finishing operations.
1308   Also, a client may specify that a slip sheet be between files a and
1309   b. If more than one copy is made, and the attribute files-are-
1310   interleaved false or unspecified, the ordering is a, a, b, b, ... If
1311   more than one copy is made, and the attribute files-are-interleaved
1312   true, the ordering is a, b, a, b, ...

1313   2.3.5.1 files are interleaved (boolean)

1314   This attribute is used in conjunction with files-are-one-document
1315   (q.v.).

1316

1317   2.3.6 Attributes for Conversion of Text and HTML Files (Set by
1318   Client/End User)

1319   The client shall specify these attributes to control formatting for
1320   text documents or HTML documents.

1321   A client need not specify these attributes for other types of
1322   documents, such as PostScript or PCL.

1323   2.3.5.1 width (cardinalUnits)

1324   This attribute specifies the media width for the document in
1325   characters.

1326   2.3.5.1 length (cardinalUnits)

1327   This attribute specifies the media length for the document in
1328   characters.

1329   2.3.5.1 left-margin (cardinalUnits

1330   This attribute specifies the left-margin for the document in
1331   characters.

1332   2.3.5.1 right margin (cardinalUnits)

1333   This attribute specifies the right margin for the document in
1334   characters.

1335   2.3.5.1 top-margin (cardinalUnits)

1336   This attribute specifies the top-margin for the document in lines.

1337   2.3.5.1 bottom-margin (cardinalUnits)

1338   This attribute specifies the bottom-margin for the document in lines.

1339   2.3.5.1 repeated tab stops (cardinalUnits)

1340   This attribute specifies the tab stops for the document in
1341   characters.

1342   2.3.5.1 header-text (string)

1343   This attribute specifies the header text for the document.

1344   2.3.5.1 footer text (string)

1345   This attribute specifies the footer text for the document.

1346   2.3.5.1 number-pages (boolean)

1347   This attribute specifies that the pages should be numbered in the
1348   document.

1349   2.3.5.1 default font (string)

1350   This attribute specifies the font to use for all text in the
1351   document.

1352   2.3.5.1 font-size (cardinalUnits)

1353   This attribute specifies the font-size in points for text in the
1354   document. The value of this attribute affects the size of the other
1355   text attributes.

1356   If this attribute is omitted and the Printer's default Job Template
1357   does not contain this attribute, the Printer shall assume a value of
1358   10. A value of 10 with a fixed pitch font, shall produce 12
1359   characters per inch in the horizontal direction and with 6 lines per
1360   inch in the vertical direction.

1361   2.3.5.1 default-code-set (type3Enum)

1362   This attribute specifies the code-set in which the document is
1363   encoded.

1364   2.3.5.1 content orientation (type2Enum)

1365   This attribute specifies the orientation of the document.

1366   The standard values are:

portrait   The page orientation such that the sides
                are longer than the top when the page is
                held in the intended human reading
                orientation

landscape   The page orientation such that the sides
                are shorter than the top when the page is
                held in the intended human readable
                orientation. Landscape is defined to be a
                rotation of the page by +90 degrees with
                respect to the medium (i.e. anti-clockwise)
                from the portrait orientation
                NOTE - The +90 direction was chosen because
                simple finishing on the long edge is the
                same edge whether portrait or landscape

reverse-   The page orientation defined to be a
portrait   rotation of 180 degrees with respect to
                portrait

reverse-   The page orientation defined to be a
landscape   rotation of 180 degrees with respect to
                landscape. Landscape is defined to be a
                rotation of the page by -90 degrees with
                respect to the medium (i.e. clockwise) from
                the portrait orientation
                NOTE - Reverse landscape was added because
                some applications rotate landscape -90
                degrees from portrait, rather than +90
                degrees.

1367

1368 2.3.6 Job Resource Attributes (Set by the program that produces or
1369 senses the PDL)

1370   A program (described below) shall add these attributes, which
1371   describe the resources needed to print the job.

1372   A Printer may use these attributes to validate and schedule the
1373   print job without interpreting the contents of the document. This
1374   provides the opportunity for a Printer to support a broad set of
1375   document formats yet still support fast efficient scheduling and
1376   validation of each job.

1377   The client/end user shall not specify these attributes. Instead, it
1378   is the duty of the program that translates the document to the
1379   printer's PDL (or analyzes it) to add these attributes and their
1380   values to the job. Such a program may execute at a number of
1381   different points in time:

1382   1. The program produces a final form document and stores these
1383   resource attributes in a file before the end user submits the
1384   print job.

1385   2. The program produces a final form document data stream when the
1386   end-user specifies "Print" to the application program (e.g.,
1387   Windows GDI driver).

1388   3. The program running in the context of the Printer or server
1389   translates a revisable or final form document into a PDL that the
1390   output device understands.

1391   If any of these attributes is unspecified, the Printer shall assume
1392   that the all resources required by the document of the type specified
1393   by the missing attributes are ready, ie., are available to the
1394   Printer and/or output device without human intervention.

1395   These attributes may be unspecified if the translation program fails
1396   to provides such values, or if no translation occurs (e.g. the
1397   document is a PostScript document.

1398   Note: The Printer does not use these attributes during the actual
1399   printing of a document.

1400   Note: these attributes allow more than one value wherever it is
1401   possible for a job to specify more than one value of the
1402   corresponding job attribute, possibly by embedded instructions.

1403   The client may specify these attributes in: Get Attributes and Get
1404   Jobs.

1405   See the section on job production attributes for an explanation of
1406   how the job resource attributes differ from the job production
1407   attributes.

1408 2.3.5.1 document formats used (1#type2Format)

1409   This attribute identifies the document formats needed to print the
1410   document(s) in this job.

1411   A format consists of two elements, a name and a version. The latter
1412   element is optional.

1413   The syntax is for type2Format:

1414   name ["/" version]

1415   Examples include: PostScript, PostScript/2.0 and PCL/5e

1416   Note: The version component is optional.

1417   The names shall be registered with IANA as "printer languages"
1418   following the procedures established by the Printer MIB (currently
1419   proposed as an ITEF standard by RFC 1759).

1420 2.3.5.1 fonts-used (1#string)

1421   This attribute identifies the font resources used in the document(s)
1422   in the job.

1423 2.3.5.1 code-sets-used (1#type3Enum)

1424   This attribute identifies the code-sets used in the document(s) in
1425   the Job. This attribute is relevant only for files that are not in
1426   ASCII, such as text files and possibly PCL files. PostScript files
1427   are always ASCII. Normally there is at most 1 code set.

1428   Standard values are defined in the section specifying the default
1429   code-set attribute.

1430 2.3.5.1 media-used (1#type2Enum)

1431   This attribute identifies the media, media-sizes, input-trays or
1432   electronic forms needed to print the document(s) in the job.

1433   Standard values for this attribute are defined in the section
1434   specifying the medium-select attribute.

1435 2.3.5.1 sides-used (type2Enum)

1436   This attribute specifies whether a job needs 1-sided, 2-sided-long-
1437   edge, or 2 sided short edge printing.

1438   Standard values for this attribute are defined in the section
1439   specifying the sides Job attribute.

1440 2.3.5.1 print-quality-used (type2Enum)

1441   This attribute specifies what print quality the job needs.

1442   Standard values for this attribute are defined in the section
1443   specifying the print quality attribute.

1444 2.3.5.1 finishing-used (type2Enum)

1445   This attribute specifies what finishing the job needs.

1446   Standard values for this attribute are defined in the section
1447   specifying the finishing attribute.

1448 2.3.5.1 printer resolution used (positiveIntegerCrossState)

1449   This attribute specifies what resolution the job needs.

1450   The interpretation of the values for this attribute are defined in
1451   the section on printer-resolution-select Job attribute.

1452 2.3.5.1 total-job-octets (positiveInteger)

1453   This attribute specifies the total size of the job in octets. This
1454   attribute is the first of three that a translation program can use to
1455   specify the size of a job.

1456 2.3.5.1 job-impression-count (positiveInteger)

1457   This attribute specifies the total size of the job in impressions.

1458 2.3.5.1 job-media-sheet-count (positiveInteger)

1459   This attribute specifies the total size of the job in media sheets.

1460 2.3.6 Number of Documents (Set by Printer)

1461   This group contains a single attribute which specifies the number of
1462   documents in the job.

1463   The Printer sets the value of this attribute depending on the number
1464   of documents that the client supplies in the Print operation. The
1465   client shall not specify this attribute (directly) in Print, but may
1466   specify this attribute in: Get-Attributes and Get-Jobs.

1467 2.3.5.1 number-of-documents (positiveInteger)

1468   This attribute specifies the number of documents in the job. Each
1469   document shall contain its own set of document content attributes
1470   described below.

1471 2.3.6 Document Data (Set by a Client/End User)

1472   This group of attributes describes the document data for the job.
1473   These attributes also include the document data or reference it.

1474   All job attributes in other sections of this document occur only once
1475   per job and apply to all documents in a job.

1476   The client may specify document-data attributes in Print. The client
1477   must specify either the document-URL or document-content in Print.

1478   Except for document-content, the client may specify document-data
1479   attributes in: Get Attributes, and Get Jobs.

1480 2.3.5.1 document format (type2Format)

1481   This attribute identifies the document format of this document.

1482   If the client does not specify this attribute, then the Printer shall
1483   attempt to determine the format in order to decide if the document
1484   data needs to be translated. The version component is optional.

1485 2.3.5.1 document-name (string)

1486   This attribute contains the name of the document used by the client
1487   to initially identify the document.

1488 2.3.5.1 document URL (url)

1489   This attribute contains the URL of the document if the client
1490   specified the document with a URL.

1491   If this attribute is specified, then document-content shall be
1492   unspecified.

1493 2.3.5.1 document content (octetString)

1494   This attribute contains the actual contents of the document.

1495   If this attribute is specified, then document-URL shall be
1496   unspecified.

1497   This attribute shall be used during the transmission of the Print
1498   operation over a network. A Printer shall save the document data to a
1499   file and reference it with the document-URL. A Get-Attribute or Get-
1500   Jobs operation shall always find that this attribute is unspecified.

1501 2.4 Operation Attributes (Set by Client)

1502   NOTE: These attributes have just been introduced and they are not as
1503   stable as the attributes in the other sections. Some work is still
1504   needed to show the relationship between these attributes, job
1505   attributes, printer attributes, and authentication and authorization.

1506   The client shall set these attributes and associate them with an
1507   operation rather than an object.

1508   It is intended that a client program rather than an end user has
1509   control over the setting of these values so that they cannot be
1510   easily forged.

1511 2.3.6 operation-locale (type3Locale)

1512   This attribute identifies the locale of the client. The Printer uses
1513   this attribute to determine the locale of (1) messages in the result
1514   of the operation, (2) in errors returned by the operation or (3)
1515   notification events sent to the submitter.

1516   The standard values are defined in the section on the job-locale
1517   attribute.

1518   If an operation does not specify this attribute, the Printer shall
1519   assume that the operation has the same locale as the Printer.

1520   2.3.6 operation-notification-address (url)

1521   This attribute specifies both the address and mechanism for delivery
1522   of events. If the URL has a "mailto:" scheme, then email is used and
1523   the rest of the URL is used as the email address. If the URL has a
1524   "http:" scheme, then an HTTP APPEND method is used to add HTML
1525   formatted events to the end of the specified HTML file.

1526   2.3.6 operation-user-name (name)

1527   This attribute identifies the most authenticated end user name that
1528   the client can supply. This name identifies the end user performing
1529   the operation.

1530   This value shall be set by the system rather than the end-user in
1531   order to minimize the chance of forgery.

1532   2.3.6 operation host name (name)

1533   This attribute identifies the most authenticated host name that the
1534   client can supply. This name identifies the host from which the
1535   operation comes.

1536   This value shall be set by the system rather than the end-user in
1537   order to minimize the chance of forgery.

1538   2.4 Printer Attributes (Set by the Administrator)

1539   A printer object may be realized in either a Print Server or Output
1540   Device. Note: How these attribute are set by an Administrator is
1541   outside the scope of this specification.

1542   A Printer Object in an Output Device contains a set of printer object
1543   attributes that represent an Output Device capable of rendering a
1544   document in visible form. Examples include electronic and electro-
1545   mechanical printers such as laser printers, ink-jet printers, and
1546   various kinds of impact printers, but may include other types of
1547   output devices such as microfiche imagers and plotters as well.

1548   A Printer Object in a Print Server may supply queuing, spooling, and
1549   scheduling for an Output device that does not queue or spool.

1550   A Print Server, in the most common case, controls exactly one
1551   downstream Output Device. The Print Server's Printer object has
1552   attributes whose values are the same as those of the Printer object
1553   in the downstream Output Device.

1554   A Printer Object in a Print Server may contain a set of printer
1555   object attributes that are the union of the Printer objects in the
1556   downstream Output Devices. This object extends the capabilities of
1557   an Output Device. For example, an administrator might define a

1558   single Print Server to represent all of the Output Devices of the
1559   same type and capability in a single location, associated with a
1560   particular server. A end user would normally send a print job to a
1561   Print Server, and allow the Print Server to assign the job to a
1562   particular Output Device based on the relative load and availability
1563   of the printers under its control, thus providing a load balancing
1564   service. However, nothing precludes an administrator from
1565   configuring a print system so that an end user can send a print job
1566   directly to an Output Device.

1567   The attributes defined in this section provide information about a
1568   particular Printer.

1569   2.3.6 printer-name (name)

1570   This attribute uniquely identifies the printer on its host.

1571   2.3.6 printer location (string)

1572   This attribute identifies the location of this printer.

1573   2.3.6 printer-model (string)

1574   This attribute identifies the make and model of the printer.

1575   2.3.6 printer type (type2Enum)

1576   This attribute identifies the marking technology of the printer.

1577   The standard values for this attribute are the descriptive names
1578   specified by ISO DPA which have corresponding enum symbolic and
1579   numeric values assigned by the Printer MIB (RFC 1759).. These
1580   standard values are:

other	Other than the standard values
unknown	Unknown printer type
electrophotographic-LED	electrophotographic LED
electrophotographic-laser	electrophotographic laser
electrophotographic-other	other electrophotographic
impact-moving-head-dot-matrix-9-pin	9-pin impact moving head dot matrix
impact moving head dot-matrix 24 pin	24 pin impact moving head dot matrix
impact-moving-head-dot-matrix-other	neither 9-pin nor 24-pin moving head dot matrix
impact-moving-head-fully-formed	fully formed impact moving head
impact band	impact band
impact-other	impact other
inkjet-aqueous	aqueous inkjet

inkjet-solid   solid inkjet
inkjet-other   other inkjet
pen   pen
thermal-transfer   thermal transfer
thermal-sensitive   thermal sensitive
thermal-diffusion   thermal diffusion
thermal-other   other thermal
electro erosion   electro erosion
electro static   electro static
photographic-microfiche   photographic microfiche
photographic-   photographic imagesetter
imagesetter
photographic other   other photographic
ion deposition   ion deposition
E-beam   E-beam
typesetter   typesetter

1581

1582 2.3.6 printer state (type1Enum)

1583   This attribute identifies the current state of the printer and shall
1584   be set by the Printer. The protocol support all values for printer
1585   states, however a Printer shall only generate the printer states
1586   which are appropriate for the particular implementation.

1587   The following standard values are defined:

        unknown   The printer state is not known, or is
                        indeterminate, or is not returned by the
                        operation
        idle   The printer is ready to accept jobs, but
                        none have been scheduled on it.
        printing   The printer is currently printing a job
        needs-   The printer needs human attention (no
        attention   special skills required). This state
                        typically includes adding paper, clearing a
                        jam, changing the medium, etc.
        paused   The operator has (temporarily) paused the
                        printer, by means outside the scope of IPP
                        V1.0.
        shutdown   The printer has been taken out of service,
                        (for a long time), whether for repairs or
                        others reasons. The printer's message
                        generic attribute may be used to record a
                        reason and estimated time for return to
                        service
        job start   The currently processing job was started
        wait   with the job start wait attribute set, and
                        is awaiting operator intervention or time-
                        out.

                job-end-wait   The currently processing job was started
                                with the job-end-wait attribute set, and is
                                awaiting operator intervention or time out.
                job password   The currently processing job was started
                wait   with the job-password attribute set, and is
                                awaiting the operator or user to enter the
                                password supplied by the job-password
                                attribute.
                needs key   The printer needs the attention of a key
                operator   operator. Key operator functions are
                                printer-specific, but typically include
                                adding toner or developer, or attending to a
                                hardware fault.
                connecting   The server has scheduled a job on the
                to-printer   printer and is in the process of connecting
                                to a shared network printer (and may not be
                                able to actually start printing the job for
                                an arbitrarily long time depending on the
                                usage of the printer by other servers).
                timed-out   The server was able to connect to the
                                printer (or is always connected), but was
                                unable to get a response from the printer in
                                the time specified by the printer's printer
                                timeout period attribute.

1588

1589   2.3.6 printer-state-message (string)

1590   This attributes specifies a message that gives further information
1591   about the current printer state and shall be set by the Printer.

1592   2.3.6 message (string)

1593   This attribute provides a message from an operator, system
1594   administrator or "intelligent" process to indicate to the end user
1595   information or status of the printer, such as why it is unavailable
1596   or when it is expected to be available.

1597   2.3.6 printer job templates (1#urlDefault)

1598   This attribute identifies the URL of each of the Job Templates that
1599   this Printer is associated with and the one Job Template this Printer
1600   uses as its default for supply job attributes that the client omits.
1601   There shall be only one value with the default qualifier. Other
1602   Printers can be associated with the same Job Templates.

1603   The syntax is:

1604   url [":" default]

1605 2.3.6 locale (type3Locale)

1606   This attribute specifies the locale that the Printer operates in.

1607   The standard values are defined in the section on the job locale
1608   attribute.

1609 2.3.6 notification-events (1#type2Enum)

1610   This attribute specifies the events on whose occurrence the Printer
1611   should notify those addresses specified by the notification-addresses
1612   attribute.

1613   If the attribute is unspecified, the Printer does not perform
1614   notification, though the Printer still checks the job's notification-
1615   events attribute.

1616   In this attribute, job-problem and printer-problem have the same
1617   meaning.

1618   The standard values are defined in the section on the job's
1619   notification-events attribute.

1620   NOTE - This attribute is intended to notify operators, not end-users.

1621 2.3.6 notification-addresses (1#url)

1622   This attribute specifies the method and addresses to which the
1623   Printer should send messages when events specified by the
1624   notification-events attribute occur.

1625   If the attribute is unspecified, the Printer does not perform
1626   notification, though the Printer still checks the job's notification-
1627   events attribute.

1628   NOTE - This attribute is intended to notify operators, not end users.

1629 2.3.6 end-user-acl (1#name)

1630   This attribute specifies the end users who are allowed to print on
1631   the Printer.

1632   If the attribute is unspecified, the Printer allows anyone to print.

1633 2.3.6 maximum printer speed (positiveIntegerUnits)

1634   This attribute indicates the maximum printer speed of the Printer in
1635   units of pages per minute, impressions per minute, lines per minute,
1636   and characters per minute. A job cannot control a Printer's speed,
1637   but a Printer Browser can use printer speed as a criteria.

1638   The standard units are a type2Enum and are: ppm, ipm, spm, lpm, cps.

1639   2.3.6 fonts-substitutions (1#stringPair)

1640   This attribute specifies an appropriate substitute for a font that is
1641   advertised as supported in the fonts supported attribute, even though
1642   the Printer doesn't actually have the font available.

1643   This attribute consists of a set of font pairs: a font name and the
1644   font to use instead.

1645   If this attribute is unspecified, the Printer does not perform any
1646   font substitutions.

1647   2.3.6 fonts-supported (1#stringState)

1648   This attribute identifies the font resources supported by this
1649   printer and indicates the state of readiness for each font.

1650   The standard names are defined in the section on default font.

1651   Each item in the list contains the pair consisting of a font name and
1652   a state indicating the font's readiness state.

1653   2.3.6 media-supported (1#nameState)

1654   This attribute identifies the media, media-sizes, input trays, and
1655   electronic forms supported by this printer, and indicates the state
1656   of readiness for each medium resource.

1657   The standard names are defined in the section on the section on the
1658   medium-select.

1659   Standard states are: not-ready, on-order, and special-order. The
1660   omission of a state shall indicate that the medium is ready, i.e.,
1661   can be used without human intervention..

1662   2.3.6 document-formats-supported (1#type2FormatState)

1663   This attribute identifies the document-formats, including the
1664   document-format-versions, supported by the Printer. This set includes
1665   both the formats that are native to the Printer and those formats
1666   that the Printer can translate to one that is native to the Printer.
1667   From the client's point of view, this set contains all formats in
1668   which documents can be submitted to this Printer.

1669   Proprietary document format identifiers, and versions are assigned by
1670   the owners of those formats.

1671   The state of readiness for each format is also included, though all
1672   formats should normally always be ready.

1673 2.3.6 numbers-up-supported (1#type3EnumState)

1674   This attribute identifies the number-up values supported by this
1675   printer..

1676   The state of readiness for each number up value is also included,
1677   though all number-up conversions should always be ready.

1678 2.3.6 finishings-supported (1#type2EnumState)

1679   This attribute identifies the finishing operations supported by this
1680   Printer and states of readiness for each finishing.

1681   The standard finishing objects are defined in the section on the
1682   finishing Job attribute.

1683 2.3.6 sides-supported (1#type2EnumState)

1684   This attribute indicates the values of the sides attribute supported
1685   by this printer and the states of readiness of each value.

1686   The standard values are defined in the section on the sides
1687   attribute.

1688 2.3.6 print-qualities-supported (1#type2EnumState)

1689   This attribute indicates the values of the printer-quality attribute
1690   supported by this printer and the states of readiness for each print
1691   quality value.

1692   The standard values are defined in the printer-quality attribute.

1693 2.3.6 printer-resolutions-supported (1#positiveIntegerCrossState)

1694   This attribute indicates the values of the printer-resolution-select
1695   attribute supported by this printer and their states of readiness.

1696   The state of readiness for each printer resolution is also included,
1697   though normally all printer-resolutions should always be ready.

1698   The syntax is discussed in the section on the printer-resolution-
1699   select attribute.

1700 2.3.6 code sets supported (1#type3EnumState)

1701   This attribute indicates the values of the default code set attribute
1702   supported by this printer and the states of readiness for each code
1703   set.

1704   The standard values are defined in the default-code-set attribute.

1705   2.3.6 off-peak-times-supported (1#type3EnumState)

1706   This attribute indicates the values of the job-print-off-peak
1707   attribute supported by this printer and the states of readiness for
1708   each value.

1709   If this attribute is unspecified, then the Printer has no off-peak
1710   periods.

1711   The standard values are defined in the section on the job-print-off-
1712   peak Job attribute.

1713   Note: this document does not define how an administrator associates
1714   the off-peak names with actual time periods.

1715   2.3.6 events-supported (1#type2EnumState)

1716   This attribute indicates the values of the job and printer
1717   notification events attribute supported by this Printer and the
1718   states of readiness for each value.

1719   If this attribute is unspecified, then the Printer does not support
1720   notification.

1721   The standard values are defined in the section on the notification-
1722   events attribute.

1723   2.3.6 locales supported (1#type3LocaleState)

1724   This attribute indicates the values of the job-locale attribute
1725   supported by this Printer and the states of readiness for each value.

1726   The standard values are defined in the section on the job-locale
1727   attribute.

1728   2.3.6 job sheets supported (1#type3EnumState)

1729   This attribute identifies the job-sheet values supported by this
1730   printer, and the state of readiness for each job-sheet.

1731   To allow no job sheets, the system administrator shall include the
1732   value "none" as a value for this attribute. The client specifies that
1733   there are no job sheets by using the value "none" as the value of the
1734   job-sheets attribute.

1735   If the job-sheets attribute is not specified or contains a value
1736   which the Printer does not support, then the server shall select from
1737   among the values of this attribute. The server shall not select the
1738   value "none" unless it is the only value specified for the job-
1739   sheets-supported attribute.

1740   NOTE - When the client supplies a value other than "none", it is
1741   preferable for the server to produce some job jobsheet, even if not
1742   the desired one, rather than produce none at all or reject the job.

1743   2.3.6 maximum-copies (positiveInteger)

1744   This attribute indicates the maximum number of copies of a document
1745   that can be rendered by this printer in a single print-job.

1746   If the attribute is unspecified, there is no limit on the maximum
1747   number of copies for this Printer.

1748   2.3.6 maximum-job-octets (positiveInteger)

1749   This attribute indicates that the Printer shall accept a job only if
1750   its size in octets is less that the value specified by this
1751   attribute.

1752   If the attribute is unspecified, there is no limit on the size of a
1753   job in octets.

1754   2.3.6 maximum-impressions (positiveInteger)

1755   This attribute indicates that the Printer shall accept a job only if
1756   its size in impression is less that the value specified by this
1757   attribute.

1758   If the attribute is unspecified, there is no limit on the size of a
1759   job in impressions.

1760   2.3.6 maximum-media-sheets (positiveInteger)

1761   This attribute indicates that the Printer shall accept a job only if
1762   its size in media sheets is less that the value specified by this
1763   attribute.

1764   If the attribute is unspecified, there is no limit on the size of a
1765   job in media-sheets.

1766   2.3.6 maximum-job-retention-period (deltaTime)

1767   This attribute indicates that when the Printer accepts a job, the
1768   retention period must not exceed the value of this attribute.
1769   Otherwise, the Printer sets the job's retention-period to the value
1770   of this attribute.

1771   If this attribute is unspecified, then the Printer places no limit on
1772   the retention time.

1773   2.3.6 maximum-end-user-priority (type1Enum)

1774   This attribute indicates that when the Printer accepts a job, the
1775   job priority must not exceed the value of this attribute. Otherwise,
1776   the Printer sets the job's job priority to the value of this
1777   attribute.

1778   If this attribute is unspecified, then the Printer places no limit on
1779   the job-priority.

1780   The standard values are defined in the section on the job priority
1781   attribute.

1782   2.3.6 queued-job-count (cardinal)

1783   This attribute contains a count of the number of jobs that are either
1784   pending and/or processing and shall be set by the Printer.

1785   2.3.6 scheduling algorithm (type3Enum)

1786   This attribute indicates the current scheduling algorithm for this
1787   Printer. Standard values are: "none", "smallest-job-first", "time-
1788   received".

1789   2.4 Job Templates

1790   The attributes for a Job Template can be any of the Job object
1791   attributes defined in the sections:

1792   ───── Job Sheet Attributes
1793   ───── Notification Attributes
1794   ───── Job Scheduling Attributes
1795   ─────── (except job print after)
1796   ───── Job Production Attributes
1797   ─────── (except page-select)
1798   ───── Attributes for Conversion of Text and HTML Files
1799
1800   2.4 Conformance

1801   A conforming implementation shall implement all operations, objects
1802   and attributes defined in this document.

1803   Also, for the core set of attributes listed in this specification, it
1804   is not required that a conforming server support all (standard)
1805   values of all supported attributes. For example, it is not required
1806   that a printer implement all finishing methods indicated by the
1807   standard values.

1808   The explicit requirement of the term "supported", with respect to one
1809   of the attributes that deal with printer functions or resources, is
1810   that the server shall recognize the attribute and those values that

1811   are supported, and shall be able to respond to a query about which
1812   values that printer does, in fact, support.

1813   IPP is explicitly designed to be extensible. Additional attributes
1814   can be proposed to be registered by going through the type 2 enum
1815   process which will register their specification after approval with
1816   IANA. In addition specific implementation instances may support not
1817   only the basic protocol as defined in this specification, but may add
1818   vendor specific private extensions by prefixing attribute names with
1819   their company name registered with IANA for use in domains. See
1820   attribute syntax section. However, such private extensions shall not
1821   duplicate attribute semantics already in this specification.

1822 3. Security Considerations

1823   This protocol does not identify any new authentication mechanisms.
1824   The authentication mechanisms built into HTTP (such as SSL and SHTTP)
1825   are recommended.

1826   This protocol does define a simple authorization mechanism by
1827   introducing the "end-user-acl" attribute as part of the Printer
1828   object. This ACL attribute is a multi-valued list of all of the
1829   authenticated names of end-users. This protocol does not specify
1830   what the domain is for names in this ACL attribute.

1831   Issue: Will it always be possible for a Printer to obtain a
1832   meaningful authenticated name that the Printer can match against the
1833   end-user-acl, or will some other mechanism be necessary, such as a
1834   password?

1835 4. References

1836   [1]   Smith, R., Wright, F., Hastings, T., Zilles, S., and
1837   Gyllenskog, J., "Printer MIB", RFC 1759, March 1995.
1838
1839   [2]   Berners-Lee, T, Fielding, R., and Nielsen, H., "Hypertext
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1870
1871   5. Author's Address

1872   Scott A. Isaacson
1873   Novell, Inc.
1874   122 E 1700 S
1875   Provo, UT   84606
1876
1877   Phone: 801-861-7366
1878   Fax: 801 861 4025
1879   EMail: scott_isaacson@novell.com
1880
1881   Tom Hastings
1882   Xerox Corporation
1883   701 S. Aviation Blvd.
1884   El Segundo, CA   90245
1885
1886   Phone: 310-333-6413
1887   Fax: 310-333-5514
1888   EMail: hastings@cp10.es.xerox.com
1889
1890   Robert Herriot
1891   Sun Microsystems Inc.
1892   2550 Garcia Ave., MPK-17
1893   Mountain View, CA 94043
1894
1895   Phone: 415-786-8995
1896   Fax: 415-786-7077
1897   Email: robert.herriot@eng.sun.com
1898
1899   Roger deBry
1900   HUC/003G
1901   IBM Corporation
1902   P.O. Box 1900
1903   Boulder, CO 80301-9191
1904
1905   Phone: (303) 924-4080
1906   Fax: (303) 924-9889
1907   Email: debry@vnet.ibm.com

     Other Participants:

     Devon Taylor, Novell, Inc.
     Mike MacKay, Novell, Inc.
     Peter Zehler, Xerox, Corp.
     Keith Carter, IBM Corporation
     Carl-Uno Manros, Xerox, Corp.
     Don Wright - Lexmark
     Steve Gebert - IBM
     Ray Lutz - Cognisys
     Mabry Dozier - QMS
     Lee Ferrel - Canon
     Hiro Sato - Canon
     Pat Nogay - IBM
     Jim Walker - Dazel
     Jay Martin - Underscore
     Bill Wagner - DPI
     Stan McConnell - Xerox
     Bob Setterbo - Adobe
     Randy Turner - Sharp
     Rob Whittle - Novell
     Ron Bergman - Data Products
     Lloyd Young - Lexmark
     Andy Davidson - Tektronix
     Rick Landau - Digital
     David Kellerman - Northlake Software
     David Roach - Unisys
     Mike Timperman - Lexmark
     Chris Wellens - Interworking Labs
     Pete Loya - HP
     Bob Pentecost - HP
     Harry Lewis - IBM
     William Wagner - Digital Products
     Atsushi Yuki - Kyocera
     Rob Rhoads - Intel
     Jeff Barnett - IBM
     Jim Walker - Dazel
     Jeff Copeland - QMS
     Chuck Adams - Tektronix

1950   6. Appendix A: Sample IPP Operations

1951   The following examples illustrate typical flows using the IPP
1952   protocol. In these examples, the IPP Printer object named "printer-1"
1953   is located at the node identified by the DNS name "some.domain.com".
1954   A Job Template has been defined for printer-1 which establishes the
1955   print defaults.

1956   For brevity in the following flows, none of the HTTP headers are
1957   shown. CRLF sequences are not shown.

1958   6.1 Querying the printer

1959   Client   some.domain.com
1960
1961   --->
1962   Post http://some.domain.com/printer-1   http/1.0
1963   Get-Attributes IPP/1.0
1964   printer-state :
1965   sides-supported :
1966   media-supported :
1967   document-formats-supported :
1968
1969   <--
1970   http/1.0 201 "Created" (a response)
1971   IPP/1.0 xxx "attribute list returned"
1972   printer-state : idle
1973   sides-supported : 1-sided
1974   media-supported : iso-a4-white, iso-b4-white
1975   document-formats-supported : Postscript/2.0
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993   6.2 Print Operation - with print data included

1994   Client   some.domain.com
1995
1996   -->

```
1997      Post http://some.domain.com/printer-1  http/1.0
1998         Print IPP/1.0
1999         Print-Job-Object Header
2000            job-name : My Job
2001            medium : iso-a4-white
2002            notification-events : Job-completion
2003            notification-address : joe@pc.domain.com
2004         Document Header
2005            document-name : Letter to Mom
2006         Document-Content Header (content type = Postscript/2.0)
2007            <Document in Postscript level 2 format>
2008
2009
2010      <--------------------------------------------------
2011      http/1.0  200 "accepted"
2012         IPP/1.0 xxx "print job accepted and queued"
2013            job-identifier : some.domain.com/printer-1/0037
2014            current-job-state : pending
2015            printer-state : needs-sttention
2016
2017   6.3 Print Operation - with no data included
2018      Client                                some.domain.com
2019
2020      --------------------------------------------------->
2021      Post http://some.domain.com/printer-1  http/1.0
2022         Print IPP/1.0
2023         Print-Job-Object Header
2024            job-name : My Job
2025            medium : iso-a4-white
2026            notification-events : Job-completion
2027            notification-address : joe@some.domain.com
2028         Document Header
2029            document-name : Letter to Mom
2030            document-URL : joe@pc.domain.com/Docs/To-mom.ps
2031
2032      <------------------------------------------------
2033      http/1.0  200 "accepted"
2034         IPP/1.0 xxx "print job accepted and queued"
2035            job-identifier : some.domain.com/printer-1/0037
2036            current-job-state : pending
2037            printer-state : processing
2038   6.4 Querying the state of the job
2039      In this example, no attributes are specified, so all job attributes
2040      are returned.
2041      Client                                some.domain.com
2042      --------------------------------------------------->
2043      Post http://some.domain.com/printer-1/0037  http/1.0
2044         Get-Attributes  IPP/1.0
```

```
2045
2046
2047      <-------------------------------------------------
2048      http/1.0 201 "Created" (a response)
2049         IPP/1.0  xxx "atribute list returned"
2050         job-Name : My Job
2051         job-Originator : Joe@some.domain.com
2052         job-originating-host : pc.domain.com
2053         notification-address : joe@pc.domain.com
2054         job-locale : xx:xx:xx
2055         current-job-status : printing
2056         submission-time : 1996 Nov 22 1214
2057         media-sheets-completed : 2
2058
2059
2060   6.5 Canceling a Job

2061      Client                                  some.domain.com

2062      --------------------------------------------------->
2063      Post: http://some.domain.com/printer-1/0037
2064         Cancel-Job  IPP/1.0



2068      <-----------------------------------------------
2069      http/1.0  200 "okay"
2070      Current-job-state : terminating
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081   6.6 Listing jobs on a Printer

2082      List jobs on printer-1, only return job sizes. Jobs are returned in
2083      the order they are scheduled for printing. A Job-identifier attribute
2084      precedes the attributes returned for each job to delimit job
2085      boundaries.

2086      Client                                  some.domain.com

2087      --------------------------------------------------->
2088      Post http/1.0 some.domain.com/printer-1
2089         Get-Jobs  IPP/1.0
2090            total-job-octets :
2091
```

```
2092      <--------------------------------------------------
2093      http/1.0  201 "Created" (a response)
2094          IPP/1.0 xxx "created an attribute list"
2095          job-identifier : 0033
2096          total-job-octets : 4567
2097          job-identifier : 0034
2098          total-job-octets : 12345
2099          job-identifier : 0035
2100          total-job-octets : 12356

2101
```