INTERNET-DRAFT - 17 ISSUES are numbered and highlighted like this   Carl Kugler
<draft-ietf-ipp-ops-set2-01.txt>   IBM Corporation
                                                                             T. Hastings
                                                                         Xerox Corporation
                                                                                H. Lewis
                                                                          IBM Corporation
                                                          October 29November 16, 1999

Internet Printing Protocol/1.1: Set2 Operations

Status of this Memo

Abstract

This document specifies 14 additional OPTIONAL operations for use with the Internet Printing Protocol/1.0 (IPP) [RFC2565, RFC2566] and IPP/1.1 [ipp-mod, ipp-pro]. These operations are 7 Printer object operations that operators/administrators may perform on a Printer object:

        Set-Printer-Attributes
        Enable-Printer
        Disable-Printer
        Restart-Printer
        Shutdown-Printer

and 7 Job object operations that end-users may perform on their jobs and operators/administrators may perform on any job, depending on circumstances:

        Set-Job-Attributes
        Reprocess-Job
        Cancel-Current-Job (though the target is the Printer object)
        Pause-Current-Job (though the target is the Printer object)
        Resume-Job
        Promote-Job

The Interpreter object is added for those implementations that make a distinction on the values of some Printer attributes depending on the document-format, such as "resolution-supported".

In addition, two operation attributes are defined: "printer-message-from-operator" and "job-message-from-operator" are included to set the corresponding Printer and Job Description attributes with the same names. And the "when" operation attribute is added to the IPP/1.1 Pause-Printer operation as well as some of the Set2 Printer operations.

New Printer Description attributes are added, along with additional values for the "printer-state-reasons" and "job-state-reasons" attributes.

New status codes: 'client-error-attributes-not-settable' and 'server-error-printer-is-in-standby-mode' are added.

Finally, the 'not-settable' out-of-band value is added for use with the Set-Printer-Attributes and Set-Job-Attributes operations.

The scope of IPP, is characterized in RFC2526 "Design Goals for an Internet Printing Protocol". It is not the intent of this document to revise or clarify this scope or conjecture as to the degree of industry adoption or trends related to IPP within printing systems. It is the intent of this document to extend the original set of operations - in a similar fashion to the Set1 extensions which referred to IPP/1.0 and were later incorporated into IPP/1.1.

This document is intended for registration following the registration procedures of IPP/1.0 [RFC2566] and IPP/1.1 [ipp-mod]. This version includes the comments discussed at the IPP telecon, on 6/23/1999, 6/30/1999, at the IETF IPP WG meeting, 7/7/99-7/8/99, in Copenhagen, and the IPP telecon, 7/17/1999, the August, 1999 IPP meeting in Alaska and subsequent phone conferences and discussions. Specifically, the 9/16 update refers to this set of extensions simply as "Set2" rather than using the term "Administrative" which was misleading, controversial and incorrect as an overall description. Also, two new attributes have been proposed to clarify the intent of each operation in terms of its target, the Printer vs. the Print Job. Unresolved ISSUES are highlighted like this in the .doc and .pdf files.

The full set of IPP documents includes:
    Design Goals for an Internet Printing Protocol [RFC2567]
    Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
    Internet Printing Protocol/1.1: Model and Semantics (this document)
    Internet Printing Protocol/1.1: Encoding and Transport [IPP-PRO]
    Internet Printing Protocol/1.1: Implementer's Guide [IPP-IIG]
    Mapping between LPD and IPP Protocols [RFC2569]

The "Design Goals for an Internet Printing Protocol" document takes a broad look at distributed printing functionality, and it enumerates real-life scenarios that help to clarify the features that need to be included in a printing protocol for the Internet. It identifies requirements for three types of users: end users, operators, and administrators. It calls out a subset of end user requirements that are satisfied in IPP/1.0. A few OPTIONAL operator operations have been added to IPP/1.1.

The "Rationale for the Structure and Model and Protocol for the Internet Printing Protocol" document describes IPP from a high level view, defines a roadmap for the various documents that form the suite of IPP specification documents, and gives background and rationale for the IETF working group's major decisions.

The "Internet Printing Protocol/1.1: Encoding and Transport" document is a formal mapping of the abstract operations and attributes defined in the model document onto HTTP/1.1 [RFC2616]. It defines the encoding rules for a new Internet MIME media type called "application/ipp". This document also defines the rules for transporting over HTTP a message body whose Content-Type is "application/ipp". This document defines a new scheme named 'ipp' for identifying IPP printers and jobs.

The "Internet Printing Protocol/1.1: Implementer's Guide" document gives insight and advice to implementers of IPP clients and IPP objects. It is intended to help them understand IPP/1.1 and some of the considerations that may assist them in the design of their client and/or IPP object implementations. For example, a typical order of processing requests is given, including error checking. Motivation for some of the specification decisions is also included.

The "Mapping between LPD and IPP Protocols" document gives some advice to implementers of gateways between IPP and LPD (Line Printer Daemon) implementations.

Table of Contents

154   **List of Tables**

157

158

159   **List of Figures**

165

166   1   Introduction

167   The Internet Printing Protocol (IPP) is an application level protocol that can be used for distributed printing
168   using Internet tools and technologies. IPP version 1.1 (IPP/1.1) focuses on end user functionality with a
169   few administrative operations included. This document defines additional OPTIONAL end user, operator,
170   and administrator operations used to control Jobs and Printers. This document is a registration proposal for
171   an extension to IPP/1.0 and IPP/1.1 following the registration procedures in those documents.

172   2   New objects and new relationships of existing objects

173   This section defines the new Interpreter object and the use of the IPP Printer object to represent IPP Printer
174   fan-out and IPP Printer fan-in.

175   2.1   Interpreter object

176   The Interpreter object models the document format interpreters that are contained in the Printer object. The
177   purpose of the Interpreter object is to model those Printer attributes whose value depends on which
178   interpreter is being used to process the document. Depending on implementation, the Printer object
179   attributes whose values ("xxx-supported" and "xxx-default") depend on the interpreter, i.e., on the
180   "document-format" of the document being processed, are considered to be Interpreter object attributes
181   instead. A Get-Printer-Attributes operation returns Printer and Interpreter attributes as specified in the
182   "requested-attributes" operation attribute supplied by the client. Depending on the value of the "document-
183   format" attribute supplied by the client in the Get-Printer-Attributes request (or the "document-format-
184   default", if the client omits the "document-format" attribute), selects the corresponding Interpreter object.

185   If an implementation does not make a distinction on the values of Printer attributes by document format,
186   say, for purposes of job validation (see [ipp-mod] Get-Printer-Attributes), there is no need to implement or
187   support the Interpreter object. The Interpreter object is introduced to provide a means to model an
188   implementation in which some attributes do depend on the document format. Those attributes are then sub-
189   classed to be Interpreter object attributes.

190   Note: the addition of the Interpreter object is completely compatible with IPP/1.0 and IPP/1.1 (see the
191   description of the "document-format" operation attribute in [ipp-mod] section 3.2.5.1 Get-Printer-Attributes
192   request). The protocol and semantics are the same whether or not the Interpreter object is used to
193   distinguish attributes that depend on the "document-format". Consequently, there is no "interpreters-
194   supported" Printer Description attribute. In order to determine which Interpreter objects there MAY be, the
195   client can request the values of the Printer's "document-format-supported" attribute.

196   Note: The Interpreter object is really a sub-class of the Printer object, rather than being a full fledged object
197   in the sense that the Job and Printer objects are. There are no operations defined solely for the Interpreter
198   object. The Get-Printer-Attributes and Set-Printer-Attributes operations operate on the Interpreter object if
199   the implementation has the concept of an Interpreter object. However, if the IPP Printer implementation

200 does not contain Interpreter objects, the same Interpreter object attributes are considered Printer object
201 attributes, instead.

202 2.2   Use of the Printer object to represent IPP Printer fan-out and IPP Printer fan-in

203 This section defines how the Printer object MAY be used to represent IPP Printer fan-out and IPP Printer
204 fan-in. Fan-out is where an IPP Printer is used to represent other IPP Printer objects. Fan-in is where
205 several IPP Printer objects are used to represent another IPP Printer object.

206 2.2.1   IPP Printer fan-out

207 The IPP/1.1 Model and Semantics introduces the semantic concept of an IPP Printer object that represents
208 more than one output device (see [ipp-mod] section 2.1). This concept is called "output device fan-out".
209 However, there was no way to represent the individual states of the output devices or to perform operations
210 on selected a specific output device when there was fan-outs. This specification generalizes the semantics
211 of the Printer object to represent such "subordinate" fan-out output devices as IPP Printer objects. This
212 concept is called "Printer object fan-out". A Printer object that has a subordinate Printer object is called a
213 "non-leaf" Printer object. Thus a "parentnon-leaf" Printer object MAY support two one or more
214 subordinate Printer objects in order to represent Printer object fan-out. A Printer object that does not have
215 any subordinate Printer objects is called a "leaf" Printer object.

216 2.2.2   IPP Printer fan-in

217 The IPP/1.1 Model and Semantics did not preclude the semantic concept of multiple IPP Printer objects that
218 represent a single output device (see [ipp-mod] section 2.1). However, there was no way for the client to
219 determine that there was a fan-in configuration, nor was there a way to perform operations on the
220 subordinate device. This specification generalizes the semantics of the Printer object to allow several "non-
221 leaf" IPP Printer objects to represent a single "subordinate" Printer object. Thus a "non-leaf" Printer object
222 MAY share a subordinate Printer object with one or more other non-leaf Printer objects in order to
223 represent IPP Printer fan-in. As with fan-out (see section 2.2), when a Printer object is a non-leaf, it MUST
224 NOT have an associated output device. As with fan-out, a leaf Printer object has an associated output
225 device(s). As with fan-out, the non-leaf Printer objects submit jobs to their subordinate Printer objects and
226 otherwise control the subordinate Printer. As with fan-out, whether pending jobs are kept in the non-leaf
227 Printers until the subordinate Printer can accept them or are kept in the subordinate Printer depends on
228 implementation and/or configuration policy.

229 2.2.3   Printer object attributes used to represent Printer fan-out and Printer fan-in

230 Each non-leaf Printer object submits jobs to its immediate subordinate Printers and otherwise controls the
231 subordinate Printers using IPP or other protocols. Whether pending jobs are kept in the non-leaf Printer
232 until a subordinate Printer can accept them or are kept in the subordinate Printers depends on
233 implementation and/or configuration policy. Furthermore, a subordinate Printer object MAY, in turn, have
234 subordinate Printer objects. Thus a Printer object can be both a non-leaf Printer and a subordinate Printer.

235 A subordinate Printer object MUST be a conforming Printer object, so it MUST support all of the
236 REQUIRED operations and attributes. However, with access control, the subordinate Printer MAY be
237 configured so that end-user clients are not permitted to perform any operations (or just Get-Printer-
238 Attributes) while one or more non-leaf Printer object(s) are permitted to perform any operation.

239 Such aThe following Printer Description attributes are defined to represent the relationship between Printer
240 object(s) and their subordinate Printer object(s):

241 1. "subordinate-printers-supported" (1setOf uri) - contains the URI of the immediate subordinate Printer
242   object(s). Each parentnon-leaf Printer object MUST support this Printer Description attribute. A leaf
243   Printer object either does not support the "subordinate-printers-supported" attribute or does so with the
244   'no-value' out-of-band value (see [ipp-mod] section 4.1).

245 2. "parent-printers-supported (1setOf uri) - contains the URI of the non-leaf printer object(s) for which this
246   Printer object is the immediate subordinate, i.e., this Printer's immediate "parent" or "parents". Each
247   subordinate Printer object MUST support this Printer Description attribute. A Printer that has no
248   parents, either does not support the "parent-printers-supported" attribute or does so with the 'no-value'
249   out-of-band value (see [ipp-mod] section 4.1).

250 A conforming subordinate Printer object NEED NOT support all of the REQUIRED operations. For
251 example a subordinate Printer NEED NOT support a Print-Job operation, unless it is a networked printer
252 that supports the IPP Protocol. In such a case, the subordinate Printer MAY be configured so that its access
253 control list only permits the parent Printer to submit jobs to it. The degenerate case of a Printer having only
254 a single subordinate Printer is not allowed. A subordinate Printer MAY, in turn, have subordinate Printers.

255 ISSUE 01 - What sub-set of the REQUIRED IPP/1.1 operations MUST a subordinate Printer object
256 support? Get-Printer-Attributes? Any others?

257 ISSUE 02 - Are there any IPP Printer or Job operations that a subordinate Printer MUST NOT support?

258 ISSUE 03 - Are all the REQUIRED attributes of a Printer object REQUIRED for a subordinate Printer
259 object?

260 The degenerate case of a Printer having only a single subordinate Printer is not allowed.

261 Each subordinate Printer object has a URI which is used as the target of each operation on the subordinate
262 Printer. The means for configuring URIs for subordinate Printer objects is implementation-dependent as
263 are all URIs. However, there are two distinct approaches:

264   a. When the implementation wants to make sure that no operation on a subordinate Printer object as
265   a target "sneaks by" the parent Printer object (or the subordinate Printer is fronting for a device that
266   is not networked), the host part of the URI specifies the host of the parent Printer. Then the parent
267   Printer object can easily reflect the state of the subordinate Printer objects in the parent's Printer
268   object state and state reasons as the operation passes "through" the parent Printer object.

269   b. When the subordinate Printer is networked and the implementation allows operations to go
270   directly to the subordinate Printer (with proper access control) without knowledge of the parent
271   Printer object, the host part of the URI is different than the host part of the parent Printer object. In
272   such a case, the parent Printer object MUST keep its "printer-state" and "printer-state-reasons" up to
273   date, either by polling the subordinate Printer object or by subscribing to events with the subordinate
274   Printer object (see [ipp-not-spec] for means to do this when the subordinate Printer object supports
275   IPP notification).

276   2.2.4   Printer object attributes used to represent output device fan-out

277   When a Printer object is a non-leaf, it MUST NOT have an associated output device. Only leaf IPP Printer
278   objects are allowed to have one or more associated output devices. Each leaf Printer object MAY support
279   the "output-devices-supported" (1setOf name(127)) to indicate the user-friendly name(s) of the output
280   device(s) that the leaf Printer object represents. It is RECOMMENDED that each leaf Printer object have
281   only one associated output device, so that the individual output devices can be represented completely and
282   controlled completely by clients. In other words, the Printer's "output-devices-supported" attribute
283   SHOULD have only one value.

284

285   2.2.5   Figures to show all possible configurations

286   Figure 1, Figure 2, and Figure 3 are taken from [ipp-mod] to show the configurations possible with IPP/1.0
287   and IPP/1.1 where all Printer objects are leaf Printer objects. The remaining figures show additional
288   configurations that this document defines using non-leaf and leaf Printer objects. Legend for all figures:

```
289   ----> indicates a network protocol with the direction of its requests
290
291   ##### indicates a Printer object which is either:
292         - embedded in an output device or is
293         - hosted in a server.  The Printer object
294       might or might not be capable of queuing/spooling.
295
296   any   indicates any network protocol or direct
297       connect, including IPP
298                                                      output device
299                                               +---------------+
300                                               |  ##########   |
301    O    +--------+                            |  # (leaf)  #  |
302   /|\   | client |------------IPP------------->#  Printer  #  |
303   / \   +--------+                            |  # Object   #  |
304                                               |  ##########   |
305                                               +---------------+
```
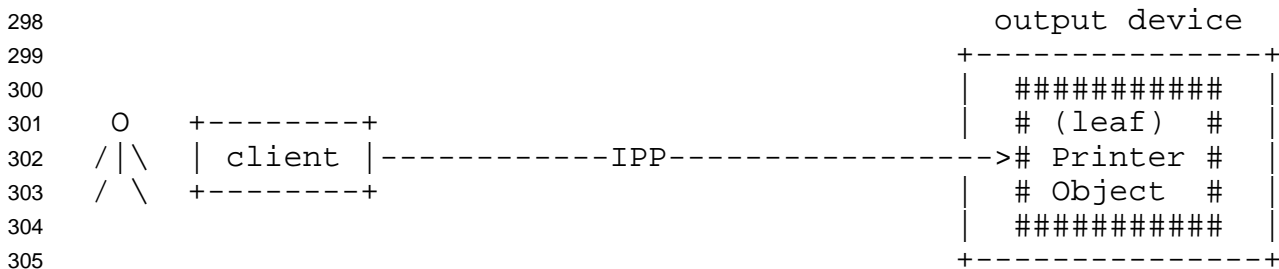
Figure 1 - embedded Printer object
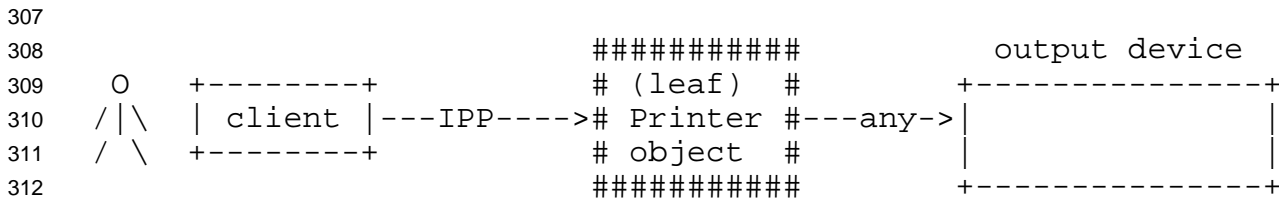
```
307
308                              ##########    output device
309    O    +--------+           # (leaf)  #   +---------------+
310   /|\   | client |---IPP---># Printer #---any->|           |
311   / \   +--------+           # object   #   |               |
312                              ##########    +---------------+
313
```

Figure 2 - hosted Printer object

```
315
316                                           +---------------+
317                                           |               |
318                                     +->| output device |
319                         ########## any/   |               |
320    O    +--------+      # (leaf)  #   /   +---------------+
321   /|\   | client |---IPP---># Printer #--*
322   / \   +--------+      # Object   #   \   +---------------+
323                         ########## any\  |               |
324                                     +->| output device |
325                                           |               |
326                                           +---------------+
```
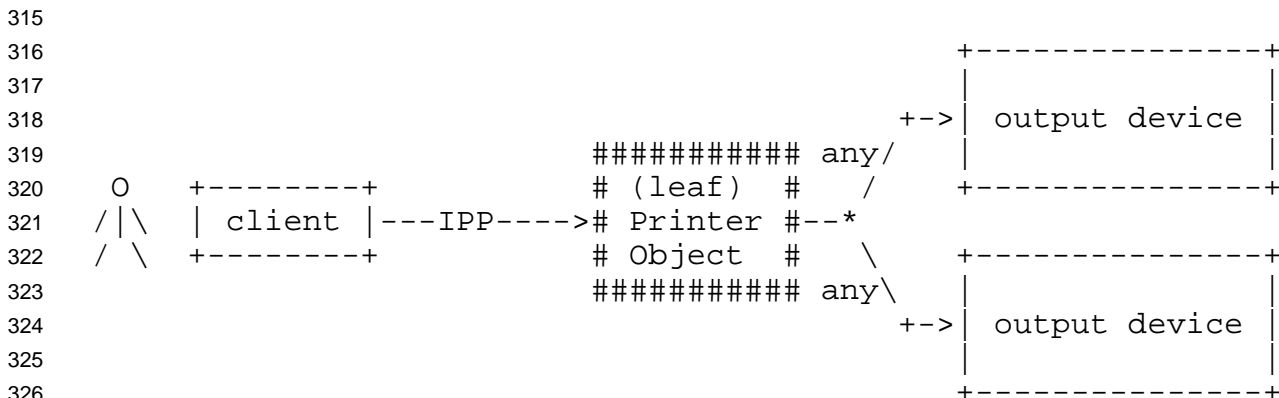
Figure 3 - output device fan out
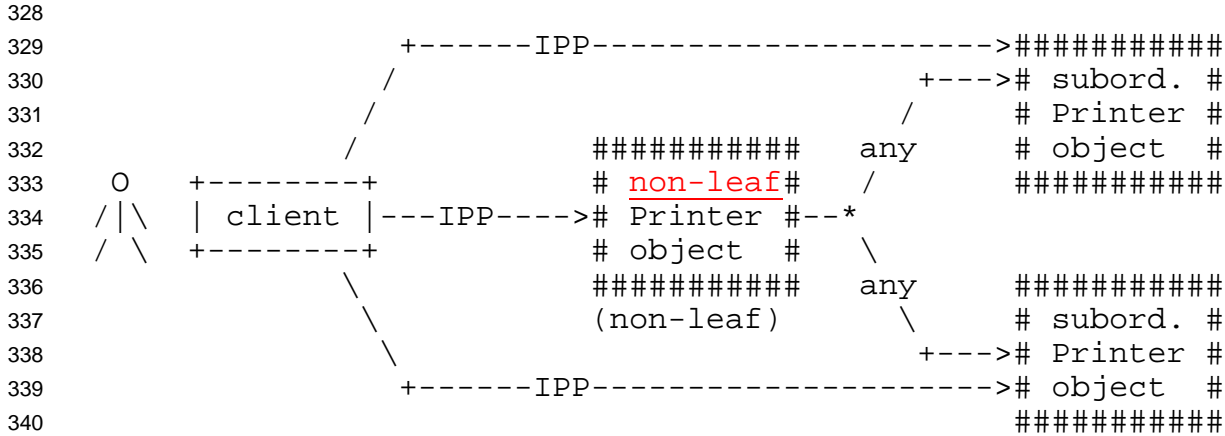
```
328
329                    +------IPP------------------->###########
330                   /                       +--->#  subord. #
331                  /                        /    #  Printer  #
332                 /            ###########  any   #  object   #
333    O   +--------+            # non-leaf#   /    ###########
334   /|\  | client |---IPP---->#  Printer #--*
335   / \  +--------+            #  object   #   \
336          \                  ###########  any   ###########
337           \                 (non-leaf)       \  #  subord. #
338            \                            +--->#  Printer #
339             +------IPP------------------->#  object   #
340                                          ###########
341
```

The subordinate Printer can be a non-leaf Printer as in Figure 4 or
Figure 5, or can be a leaf Printer as in Figure 1, Figure 2, or Figure
3.

Figure 4 - IPP Printer fan out
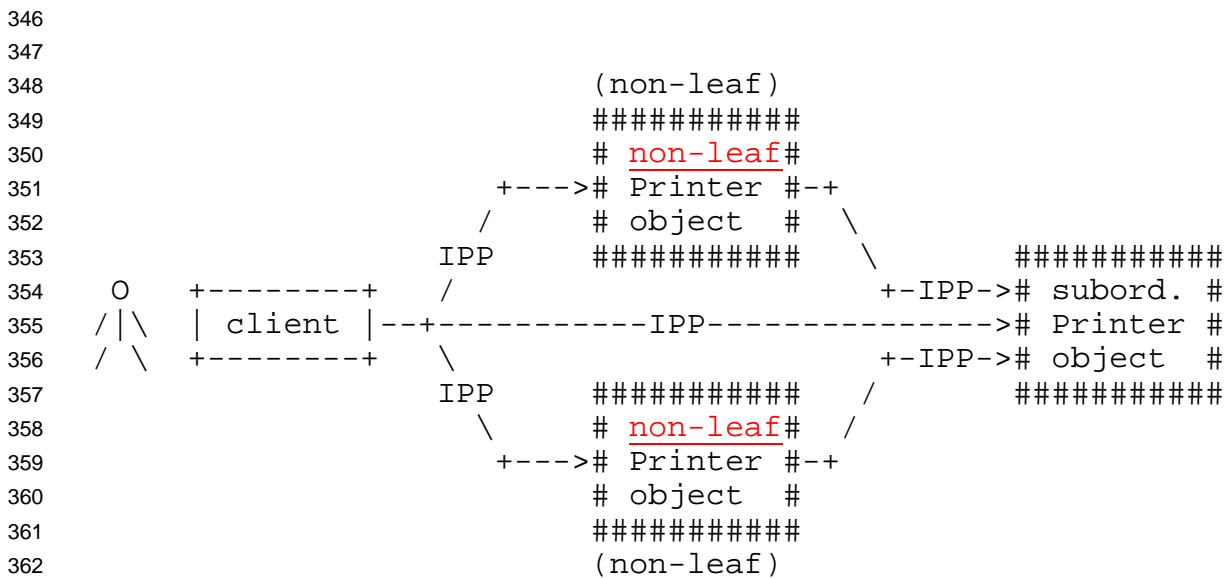
```
348                        (non-leaf)
349                       ###########
350                       # non-leaf#
351                 +--->#  Printer #-+
352                /     #  object   # \
353          IPP    #   ###########   \     ###########
354    O   +--------+  /                   +-IPP->#  subord. #
355   /|\  | client |--+----------IPP-------------->#  Printer #
356   / \  +--------+  \                   +-IPP->#  object   #
357          IPP    #   ###########   /     ###########
358                \     # non-leaf#   /
359                 +--->#  Printer #-+
360                       #  object   #
361                       ###########
362                        (non-leaf)
363
```

The subordinate Printer can be a non-leaf Printer as in Figure 4 or
Figure 5, or can be a leaf Printer as in Figure 1, Figure 2, or Figure
3.

Figure 5 - IPP Printer fan in

2.3 Device object

In order to control the physical device, the Device object is introduced. Its semantics are defined in [ipp-set3]. The Device object has attributes that represent physical characteristics of the device, such as input trays, output bins, and finishing equipment. Thus the Printer object remains as the representative of a

372 logical entity or service, while the Device object represents a physical entity. The operations in this Set2
373 document operate only on Printer objects, not on Device objects. However, some of the Set2 Printer
374 operations have analogous Device operations. For example, the Shutdown-Printer and Shutdown-Device
375 operations are defined in Set2 and Set3, respectively.

376 ## 2.3   Forwarding requests

377 This section describes the forwarding Job and Printer requests to subordinate Printer objects.

378 ### 2.3.1   Forwarding requests that affect Printer objects

379 In both fan-out and fan-in, the non-leaf IPP Printer object MUST NOT forward the Printer operations that
380 affect Printer object to its subordinate Printer objects. If a client wants to explicitly target a subordinate
381 Printer, the client must specify the URI of the subordinate Printer. Table 1 lists the operations that affect
382 Printer objects and the forwarding behavior that a non-leaf Printer MUST exhibit to its immediate
383 subordinate Printers:

384 **Table 1 - Forwarding operations that affect Printer objects**

Printer operation	Non-leaf Printer action
Set2 Printer operations:	
Set-Printer-Attributes	MUST NOT forward to any of its subordinate Printers
Enable-Printer	MUST NOT forward to any of its subordinate Printers
Disable-Printer	MUST NOT forward to any of its subordinate Printers
Restart-Printer	MUST NOT forward to any of its subordinate Printers
Shutdown-Printer	MUST NOT forward to any of its subordinate Printers
IPP/1.1 Printer operations:	
Get-Printer-Attribute	MUST NOT forward to any of its subordinate Printers
Pause-Printer	MUST NOT forward to any of its subordinate Printers
Resume-Printer	MUST NOT forward to any of its subordinate Printers

385

386 ISSUE 01- Should the purpose of the corresponding device operations, such as Pause-Device, Disable-
387 Device, and Shutdown-Device (see [ipp-set3], to be forwarded by Printer objects to their subordinate
388 Printers down to the leaf Printers objects in order to affect their corresponding output device? Using device
389 operations in this way would relieve the operator client from having to work its way down the Printer object
390 chain in order to affect an output device of a leaf Printer object.

391 ISSUE 02 - If a Printer object MUST forward a device operation down to the leaf Printer objects, would
392 fanning out such forwarded device operations be too drastic? If yes, then maybe the device operations
393 would need an operation attribute to say whether or not to allow fan-out of device operations, with the
394 default value being 'false'.

395 ISSUE 03 - Does the administrator need a Printer object attribute that says whether or not this Printer object
396 is to forward device operations when it has more than one subordinate Printer object? The default would be
397 'false'.

398 2.3.2   Forwarding requests that affect Jobs

399 Unlike Printer operations that only affect Printer objects (see section 2.3.1, a non-leaf Printer object MUST
400 forward operations that directly affect jobs to the appropriate Job object(s) in one or more of its immediate
401 subordinate Printer objects. Such forwarding MAY be immediate or queued, depending on the operation
402 and the implementation. For example, a non-leaf Printer object MAY queue/spool jobs, feeding a job at a
403 time to its subordinate Printer(s), or MAY forward jobs immediately to one of its subordinate Printers. In
404 either case, the non-leaf Printer object is forwarding Job Creation operations to one of its subordinate
405 Printers. Only the time of forwarding of the Job Creation operations depends on whether the policy is to
406 queue/spool jobs in the non-leaf Printer or the subordinate Printer.

407 When a non-leaf Printer object creates a Job object in its subordinate Printer, whether that non-leaf Printer
408 object keeps a fully formed Job object or just keeps a mapping from the "job-ids" that it assigned to those
409 assigned by its subordinate Printer object is IMPLEMENTATION-DEPENDENT. In either case, the non-
410 leaf Printer MUST be able to accept and carry out future Job operations that specify the "job-id" that the
411 non-leaf Printer assigned and returned to the job submitting client.

412 Table 2 lists the operations that directly affect jobs and the forwarding behavior that a non-leaf Printer
413 MUST exhibit to its subordinate Printers:

414   **Table 2 - Forwarding operations that affect Jobs objects**

Job operation	Non-leaf Printer action
Set2 Job operations:	
Set-Job-Attributes	MUST forward to the appropriate Job in one of its subordinate Printers
Reprocess-Job	MUST forward to the appropriate Job in one of its subordinate Printers
Cancel-Current-Job	MUST forward to the appropriate Job in one of its subordinate Printers
Pause-Current-Job	MUST forward to the appropriate Job in one of its subordinate Printers
Resume-Job	MUST forward to the appropriate Job in one of its subordinate Printers
Promote-Job	MUST forward to the appropriate Job in one of its subordinate Printers
IPP/1.1 Printer operations:	
Print-Job	MUST forward immediately or queue to the appropriate subordinate Printer
Print-URI	MUST forward immediately or queue to the appropriate subordinate Printer
Validate-Job	MUST forward to the appropriate subordinate Printer
Create-Job	MUST forward immediately or queue to the appropriate subordinate Printer
Get-Jobs	MUST forward to *all* its subordinate Printers
Purge-Jobs	MUST forward to *all* its subordinate Printers
IPP/1.1 Job operations:	

Send-Document	MUST forward immediately or queue to the appropriate Job in one of its subordinate Printers
Send-URI	MUST forward immediately or queue to the appropriate Job in one of its subordinate Printers
Cancel-Job	MUST forward to the appropriate Job in one of its subordinate Printers
Get-Job-Attributes	MUST forward to the appropriate Job in one of its subordinate Printers, if the non-leaf Printer doesn't know the complete status of the Job object
Hold-Job	MUST forward to the appropriate Job in one of its subordinate Printers
Release-Job	MUST forward to the appropriate Job in one of its subordinate Printers
Restart-Job	MUST forward to the appropriate Job in one of its subordinate Printers

415 ISSUE 04 : Do we want to define whether the response to the client for Job operations can happen before
416 the non-leaf Printer gets the response from its subordinate Printer or MUST the non-leaf Printer wait until
417 its gets the response from its subordinate Printer?

418 The following Job Description attributes are defined to help represent Job relationships for fan-out and
419 forwarding of jobs:

420 1. "output-device-assigned" (name(127)) - from [ipp-mod]: This attribute identifies the output device to
421   which the Printer object has assigned this job. If an output device implements an embedded Printer
422   object, the Printer object NEED NOT set this attribute. If a print server implements a Printer object, the
423   value MAY be empty (zero-length string) or not returned until the Printer object assigns an output
424   device to the job. This attribute is particularly useful when a single Printer object supports multiple
425   devices (so called "fan-out").

426 2. "original-requesting-user-name" (name(MAX)) - operation attribute containing the user name of the
427   original user, i.e., corresponds to the "requesting-user-name" operation attribute that the original client
428   supplied to the first Printer object.

429 ISSUE 05 - The "requesting-user-name" operation attribute is the parent Printer's host, not the original
430 requesting user, correct?)

431 ISSUE 06 - Presumably the "job-originating-user-name" remains as the authenticated original user, not the
432 parent Printer's authenticated host, correct?

433 3   New Operation attributes

434 This section defines the new "printer-message-from-operation" and "job-message-from-operator" operation
435 attributes that set the corresponding Printer and Job Description attributes.

436 3.1   New operation attribute: "printer-message-from-operator" (text(127))

437 Type of registration: attribute
438 Proposed keyword name of this attribute: "printer-message-from-operator"

439   Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation
440   Operations to be used with if the attribute is an operation attribute: See below
441   Object (Job, Printer, etc. if bound to an object):   Printer (already in IPP/1.0 and IPP/1.1)
442   Attribute syntax(es) (include 1setOf and range as in Section 4.2): text(127)

444   Specification of this attribute (follow the style of IPP Model Section 4.2):

446   "printer-message-from-operator" (text(127))
447   The client OPTIONALLY supplies this attribute. The Printer object SHOULD supports this
448   operation attribute if it supports the corresponding Printer Description attribute. The value of this
449   attribute is a message from the operator about the Printer object on which the operator is performing
450   the operation. If supported, the Printer copies the value to the Printer's "printer-message-from-
451   operator" Printer Description attribute (see [ipp-mod] section 4.4.25), automatically sets the value of
452   the Printer's "printer-message-time" with the current value of the Printer's "printer-up-time"
453   attribute, the value of the "printer-message-date-time" with the current value of the Printer's printer-
454   current-date-time" attribute, and the value of the Printer's "printer-message-operation" with the
455   operation-id value of this operation (see [ipp-mod] section 4.4.15).

457   If the client omits this attribute, the Printer does not change the value of its "printer-message-from-
458   operator", "printer-message-time", "printer-message-date-time", and "printer-message-operation"
459   Printer Description attributes.

461   If the client supplies this attribute with a zero-length text value or with a value consisting solely of
462   white space, the Printer copies that value as any other value to the Printer's "printer-message-from-
463   operator" and sets the "printer-message-time", "printer-message-date-time", and "printer-message-
464   operation" attributes. Supplying such a value is the way that the operator indicates that there is no
465   longer a printer message from the operator (rather than using the "out-of-band" 'no-value' value).

467   This operation attribute is defined for use with the following operator operations on the Printer object:

468   Pause-Printer - see [ipp-mod] section 3.2.7
469   Resume-Printer - see [ipp-mod] section 3.2.8
470   Purge-Jobs - see [ipp-mod] section 3.2.9
471   Disable-Printer - see section 8.1.2
472   Enable-Printer - see section 8.1.3
473   Restart-Printer - see section 8.1.4
474   Shutdown-Printer - see section 8.1.5

476   The "printer-message-from-operator" operation attribute MUST NOT be supported as an operation attribute
477   for the Set-Printer-Attributes operation. If the operator wants to set the Printer's "printer-message-from-
478   operator" Printer Description attribute when issuing the Set-Printer-Attributes operation, the client supplies
479   the "printer-message-from-operator" with its new value as one of the Printer Description attributes in Group
480   2 in the request. The Printer also updates the Printer's "printer-message-date-time" and "printer-message-
481   operation" Printer Description attributes. If the client does not explicitly supply the "printer-message-from-

482 operator" with its new value, the Printer leaves the value of the Printer's "printer-message-from-operator"
483 Printer Description attribute unchanged.

484 3.2   New operation attribute: "job-message-from-operator" (text(127))

485 Type of registration: attribute
486 Proposed keyword name of this attribute: "job-message-from-operator"
487 Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation
488 Operations to be used with if the attribute is an operation attribute: See below
489 Object (Job, Printer, etc. if bound to an object):   Job (already in IPP/1.0 and IPP/1.1)
490 Attribute syntax(es) (include 1setOf and range as in Section 4.2): text(127)
491
492 Specification of this attribute (follow the style of IPP Model Section 4.2):
493
494 "job-message-from-operator" (text(127))
495   The client OPTIONALLY supplies this attribute. The Printer object SHOULD supports this
496   operation attribute if it supports the corresponding Job Description attribute. The value of this
497   attribute is a message from the operator about the Job object on which the operator has just
498   performed an operation. If supported, the Printer copies the value to the Job's "job-message-from-
499   operator" Job Description attribute (see [ipp-mod] section 4.3.16).
500
501   If the client omits this attribute, the Printer does not change the value of its "printer-message-from-
502   operator" Job Description attribute.
503
504   If the client supplies this attribute with a zero-length text value or with a value consisting solely of
505   white space, the Printer copies that value as any other value to the job's "job-message-from-
506   operator". Supplying such a value is the way that the operator indicates that there is no longer a job
507   message from the operator (rather than using the "out-of-band" 'no-value' value).
508
509   Note: There are no corresponding 'job-message-time", "job-message-date-time", and "job-message-
510   operation" Job Description attributes, since the usual lifetime of a job is limited.
511
512 This operation attribute is defined for use with the following operator operations on the Job object:

513   Cancel-Job - see [ipp-mod] section 3.2.4
514   Hold-Job - see [ipp-mod] section 3.3.5
515   Release-Job - see [ipp-mod] section 3.3.6
516   Restart-Job - see [ipp-mod] section 3.3.7
517   Reprocess-Job - see section 8.2.2
518   Cancel-Current-Job - see section 8.2.3
519   Pause-Current-Job - see section 8.2.4
520   Resume-Job - see section 8.2.5
521   Promote-Job - see section 8.2.6
522

523 The "job-message-from-operator" operation attribute MUST NOT be supported as an operation attribute for
524 the Set-Job-Attributes operation. If the operator wants to set the Job's "job-message-from-operator" Job
525 Description attribute when issuing the Set-Job-Attributes operation, the client supplies the "job-message-
526 from-operator" with its new value as one of the Job Description attributes in Group 2 in the request.
527 Otherwise, the Printer leaves the value of the Job's "job-message-from-operator" Job Description attribute
528 unchanged by not explicitly setting the attribute.

529 3.3   New operation attribute for Get-Printer-Attributes: "factory-settings" (boolean)

530 Type of registration: attribute
531 Proposed keyword name of this attribute: "factory-settings"
532 Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation
533 Operations to be used with if the attribute is an operation attribute: Get-Printer-Attributes
534 Object (Job, Printer, etc. if bound to an object):   N/A
535 Attribute syntax(es) (include 1setOf and range as in Section 4.2): boolean
536
537 Specification of this attribute (follow the style of IPP Model Section 4.2):
538   "factory-settings" (boolean)
539   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
540   attribute, if it supports the Set-Printer-Attributes operation. If the client omits this attribute or
541   supplies the 'false' value, the Printer returns the current values of the requested attributes that are
542   settable, i.e., the values that have been set by previous Set-Printer-Attributes. If the client supplies
543   the 'true' value, the Printer returns the factory settings, i.e., the inherent values supported by the
544   implementation as shipped from the manufacturer or established at install time. This operation
545   attribute allows an operator to determine which values are supported in an implementation after
546   having modified a settable attribute. Attributes that are not settable are not affected by this
547   operation attribute, so that the Printer returns the same values for non-settable attribute when either
548   the 'true' or 'false' value has been supplied. If this operation attribute is supported, both 'true' and
549   'false' values MUST be supported.

550 3.4   New operation attribute for Pause-Printer: "when" (type2 keyword)

551 Type of registration: attribute
552 Proposed keyword name of this attribute: "when"
553 Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation
554 Operations to be used with if the attribute is an operation attribute: Pause-Printer, Shutdown-Printer, and
555 Pause-Current-Job
556 Object (Job, Printer, etc. if bound to an object):   N/A
557 Attribute syntax(es) (include 1setOf and range as in Section 4.2): type2 keyword
558
559 Specification of this attribute (follow the style of IPP Model Section 4.2):
560   "when" (type2 keyword)
561   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
562   attribute, if it supports this operation. The value of this attribute indicates when to pause the printer.
563   If the client omits this attribute, the Printer assumes the 'after-current-jobnow' value. The 'after-

564   ~~current job~~now' value is REQUIRED to be supported if the "when" attribute is supported; the
565   remaining values are OPTIONAL.
566   Note: There is no way to query to see which values of the "when" attribute are supported for this or
567   any other operation. Since this operation is intended for Operators, rather than End-Users, it did not
568   seem necessary to provide the means to query the supported values.
569
570   Standard keyword values are:
571   'now' - pause the Printer immediately, while the current job is processing. See [ipp-mod]
572   section 3.2.7) for the effect on the Printer's "printer-state" and "printer-state-reasons"
573   attributes. Jobs in the 'held' and 'pending' state remain in those states.
574   'after-current-copy' - pause the Printer after the current job finishes printing its current copy.
575   Jobs in the 'held' and 'pending' state remain in those states.
576   'after-current-job' - pause the Printer after the current job finishes printing (all its copies).
577   Jobs in the 'held' and 'pending' state remain in those states.
578   'after-all' - pause the Printer after all 'pending' jobs finish printing. Jobs in the 'held' state
579   remain in the 'held' state.

580   Note: The "when" operation attribute is also defined for use with the Shutdown-Printer (see section 8.1.5)
581   and the Pause-Current-Job (see section 8.2.4) operations, but with a subset of these values.

582   3.5   Summary of the operation attributes for the Printer operations

583   The following table shows the operation attributes for the Printer operations that a client MAY supply in a
584   request. Operation parameters and attributes that a client MUST supply are not shown. Also "requesting-
585   user-name" is not shown, though it is RECOMMENDED that a client supply it in every request.
586   Legend:
587   R - REQUIRED for a Printer to support
588   O - OPTIONAL for a Printer to support; the Printer ignores the attribute if not supported

Operation Attribute	Pause-Printer	Resume-Printer	Purge-Jobs	Get-Printer-Attributes	Set-Printer-Attributes	Enable-Print	Disable-Printer		Restart-Printer		Shut down-Printer
document-format				R	R						
factory-settings				O							
printer-message-from-operator	O	O	O			O	O		O		O
job-type						O	O				
when	O										O
reset-function											
synchronize											O
shutdown-function											R

589   3.6   Summary of the operation attributes for the Job operations

590   The following table shows the operation attributes for the Job operations that a client MAY supply in a
591   request. Operation attributes that specify the Printer or Job object as the target are shown in the first two

592 rows, respectively. Other operation attributes and parameters that a client MUST supply are not shown.
593 Also "requesting-user-name" is not shown, though it is RECOMMENDED that a client supply it in every
594 request.
595 Legend:
596   R - REQUIRED for a Printer to support
597   O - OPTIONAL for a Printer to support; the Printer ignores the attribute if not supported

Operation Attribute	Cancel-Job	Cancel-Current-Job	Hold-Job	Release-Job		Pause-Current-Job	Resume-Job	Get-Job-Attributes	Set-Job-Attributes	Restart-Job	Reprocess-Job	Promote-Job
printer-uri		R				R						
printer-uri/job-id or job-uri	R		R	R			R	R	R	R	R	R
job-id		R				R						
requested-attributes								R				
back-space												
forward-space												
synchronize						O						
when						O						
job-message-from-operator	O	O	O	O		O	O			O	O	O
message [to-operator]	O		O	O		O	O			O	O	O
job-hold-until			O*	O*							O**	

598 *   The Printer MUST support the "job-hold-until" operation attribute if it supports the "job-hold-until" Job
599 Template attribute.
600 ** The Printer MUST support the "job-hold-until" operation attribute if it supports the Set-Job-Attributes
601 operation, so that the client can hold the job with the Reprocess-Job operation and the modify the job before
602 releasing it to be processed.

603   4   New Printer Description Attributes

604 The following new Printer Description attributes are needed to support the new operations defined in this
605 document.

606   4.1   printer-settable-attributes (1setOf type2 keyword)

607 Type of registration: attribute
608 Proposed keyword name of this attribute: printer-settable-attributes
609 Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
610 Operations to be used with if the attribute is an operation attribute: N/A
611 Object (Job, Printer, etc. if bound to an object): Printer
612 Attribute syntax(es) (include 1setOf and range as in Section 4.2): 1setOf type2 keyword
613 If attribute syntax is 'keyword' or 'enum', is it type2 or type3: type2
614 If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): Yes

615   If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
616   document-handling" attribute: N/A
617   Specification of this attribute (follow the style of IPP Model Section 4.2):

618   4.4.? printer-settable-attributes (1setOf type2 keyword)

619   This READ-ONLY Printer attribute identifies the Printer object attributes that are settable in this
620   implementation, i.e., that are settable using the Set-Printer-Attributes operations. This attribute MUST be
621   supported if the Set-Printer-Attributes operations is supported. The Printer MUST reject attempts to set any
622   Printer attributes that are not in this list, returning the 'client-error-attributes-not-settable' status code (see
623   section 6.1). The value of this attribute MAY depend on the value of the "document-format" operation
624   attribute supplied in the Get-Printer-Attributes operation (see [ipp-mod] section 3.2.5.1).

625   4.2   job-settable-attributes (1setOf type2 keyword)

626   Type of registration: attribute
627   Proposed keyword name of this attribute: job-settable-attributes
628   Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
629   Operations to be used with if the attribute is an operation attribute: N/A
630   Object (Job, Printer, etc. if bound to an object): Printer
631   Attribute syntax(es) (include 1setOf and range as in Section 4.2): 1setOf type2 keyword
632   If attribute syntax is 'keyword' or 'enum', is it type2 or type3: type2
633   If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): Yes
634   If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
635   document-handling" attribute: N/A
636   Specification of this attribute (follow the style of IPP Model Section 4.2):

637   4.4.? job-settable-attributes (1setOf type2 keyword)

638   This READ-ONLY Printer attribute identifies the Job object attributes that are settable in this
639   implementation, i.e., that are settable using the Set-Job-Attributes operations. This attribute MUST be
640   supported if the Set-Job-Attributes operations is supported. The Printer MUST reject attempts to set any
641   Job attributes that are not in this list, returning the 'client-error-attributes-not-settable' status code (see
642   section 6.1).

643   4.3   printer-controls-other-protocols (boolean)

644   Type of registration: attribute
645   Proposed keyword name of this attribute: printer-controls-other-protocols
646   Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
647   Operations to be used with if the attribute is an operation attribute: N/A
648   Object (Job, Printer, etc. if bound to an object): Printer
649   Attribute syntax(es) (include 1setOf and range as in Section 4.2): boolean
650   If attribute syntax is 'keyword' or 'enum', is it type2 or type3: N/A
651   If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): No
652   If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
653   document-handling" attribute: N/A

654   Specification of this attribute (follow the style of IPP Model Section 4.2):

655   4.4.? printer-controls-other-protocols (boolean)

656   This Printer attribute indicates whether all IPP printer and job operations, such as Disable-Printer, Pause-
657   Printer, Cancel-Job, etc., affect non-IPP protocols that may be supported. It is RECOMMENDED that IPP
658   control other non-IPP protocols. However, this attribute permits an implementation to indicate explicitly
659   whether it does affect other protocols or not.

660   A 'false' value indicates that IPP operations only affect jobs submitted by the IPP Protocol. For example, a
661   'true' value indicates that a Disable-Printer operation prevents all protocols from submitting jobs, not just
662   the IPP protocol. A 'true' value indicates that the Pause-Printer operation would pause the current job, no
663   matter what job submission protocol had submitted it. A 'true' value indicates that the Cancel-Job operation
664   will cancel the specified job even if it was submitted using a different job submission protocol, such as
665   LPR.

666   As with any Printer Description attribute that this specification does not list as READ-ONLY, an
667   implementation MAY allow a client to change the value of this attribute using Set-Printer-Attributes,
668   thereby changing the way that the IPP operations affect other non-IPP protocols. An implementation MAY
669   also support other means to change the value of this attribute, such as via the console or at installation time.

670   4.4   printer-message-time (integer(MIN:MAX))

671   Type of registration: attribute
672   Proposed keyword name of this attribute: printer-message-time
673   Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
674   Operations to be used with if the attribute is an operation attribute: N/A
675   Object (Job, Printer, etc. if bound to an object): Printer
676   Attribute syntax(es) (include 1setOf and range as in Section 4.2): integer(MIN:MAX)
677   If attribute syntax is 'keyword' or 'enum', is it type2 or type3: N/A
678   If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): No
679   If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
680   document-handling" attribute: N/A
681   Specification of this attribute (follow the style of IPP Model Section 4.2):

682   4.4.? printer-message-time (integer(MIN:MAX))

683   This READ-ONLY Printer Description attribute contains the time that the Printer's "printer-message-from-
684   operator" was changed by the operator using any operation where the client supplied the "printer-message-
685   from-operator" operation attribute (see section 3.1) or was explicitly set using the Set-Printer-Attributes
686   operation (see section 8.1.1). This attribute allows the users to know when the "printer-message-from-
687   operator" attribute was last set.

688   The Printer sets the value of this attribute by copying the value of the Printer's "printer-up-time" attribute
689   (see [ipp-mod] section 4.3.14). If the Printer resets its "printer-up-time" attribute to 1 on power-up, then it
690   MUST change the value of the "printer-message-time" to 0 or a negative number as specified in [ipp-mod]
691   section 4.3.14.

692   Note: This attribute helps users better understand the context for the "printer-message-from-operator"
693   message.

694   4.5   printer-message-date-time (dateTime)

695   Type of registration: attribute
696   Proposed keyword name of this attribute: printer-message-date-time
697   Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
698   Operations to be used with if the attribute is an operation attribute: N/A
699   Object (Job, Printer, etc. if bound to an object): Printer
700   Attribute syntax(es) (include 1setOf and range as in Section 4.2): dateTime
701   If attribute syntax is 'keyword' or 'enum', is it type2 or type3: N/A
702   If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): No
703   If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
704   document-handling" attribute: N/A
705   Specification of this attribute (follow the style of IPP Model Section 4.2):

706   4.4.? printer-message-date-time (dateTime)

707   This READ-ONLY Printer Description attribute contains the date and time that the Printer's "printer-
708   message-from-operator" was changed by the operator using any operation where the client supplied the
709   "printer-message-from-operator" operation attribute (see section 3.1) or was explicitly set using the Set-
710   Printer-Attributes operation (see section 8.1.1). This attribute allows the users to know when the "printer-
711   message-from-operator" attribute was last set. This attribute MUST be supported if the Printer supports
712   both the "printer-message-from-operator" and the "printer-current-date-time" attributes.

713   Note: This attribute helps users better understand the context for the "printer-message-from-operator"
714   message.

715   4.6   printer-message-operation (type2 keyword)

716   Type of registration: attribute
717   Proposed keyword name of this attribute: printer-message-operation
718   Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
719   Operations to be used with if the attribute is an operation attribute: N/A
720   Object (Job, Printer, etc. if bound to an object): Printer
721   Attribute syntax(es) (include 1setOf and range as in Section 4.2): type2 enum
722   If attribute syntax is 'keyword' or 'enum', is it type2 or type3: type2
723   If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): No
724   If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
725   document-handling" attribute: N/A
726   Specification of this attribute (follow the style of IPP Model Section 4.2):

727   4.4.? printer-message-operation (type2 enum)

728 This READ-ONLY Printer Description attribute contains the operation that was used to changed the
729 Printer's "printer-message-from-operator" by the operator using any operation where the client supplied the
730 "printer-message-from-operator" operation attribute (see section 3.1) or explicitly set using the Set-Printer-
731 Attributes operation (see section 8.1.1). This attribute allows the users to know which operation was used
732 to change the "printer-message-from-operator" attribute when it was last set.

733 Note: This attribute helps users better understand the context for the "printer-message-from-operator".

734 4.7   subordinate-printers-supported (1setOf uri)

735 This Printer attribute is REQUIRED if an implementation supports subordinate Printers (see section 2.2)
736 and contains the URIs of the immediate subordinate Printer object(s) associated with this Printer object. In
737 order to support subordinate Printer objects, there MUST be at least two subordinate Printer objects.

738 The precise format of the subordinate Printer URIs is implementation dependent (see section 2.2).

739 If the Printer object does not have an associated Device object (see section 1.1), the value of the subordinate
740 Printer object's "printer-name" MAY be used to populate the Job object's "output-device-assigned"
741 attribute (see [ipp-mod] section 4.3.13). The "output-device-assigned" Job attribute identifies the output
742 device to which the Printer object has assigned a job, for example, when a single Printer object is
743 supporting fan-out.

744 5   Additional values for "printer-state-reasons" and "job-state-reasons" attributes

745 The following values are added to the "printer-state-reasons" and "job-state-reasons" for use with the
746 operations defined in this document.

747 5.1   Value for "printer-state-reasons": 'standby'

748 Type of registration: type2 keyword attribute value
749 Name of attribute to which this keyword specification is to be added: printer-state-reasons
750 Proposed keyword name of this keyword value: standby
751 Specification of this keyword value (follow the style of IPP Model Section 4.1.2.3):
752   'standby': The Printer has been shutdown in standby mode. Only Restart-Printer and Get-Printer-
753   Attributes operations are accepted in this state; all other operations are rejected with the 'server-
754   error-printer-is-in-standby-mode'.

755 5.2   Value for "job-state-reasons": 'job-paused'

756 Type of registration: type2 keyword attribute value
757 Name of attribute to which this keyword specification is to be added: job-state-reasons
758 Proposed keyword name of this keyword value: job-paused
759 Specification of this keyword value (follow the style of IPP Model Section 4.1.2.3):

760 'job-paused': The job has been paused while processing using the Pause-Current-Job operations and
761   other jobs can be processed on the Printer. The Job can be resumed using the Resume-Job operation
762   which removes this value.

763

764 6   New status codes

765 This section defines new status codes used by the operations defined in this document.

766 6.1   New status code: 'client-error-attributes-not-settable'

767 Type of registration: status code
768 Keyword symbolic name of this status code value: 'client-error-attributes-not-settable'
769 Numeric value (to be assigned by the IPP Designated Expert in consultation with IANA):
770 Operations that this status code may be used with: Set-Printer-Attributes, Set-Job-Attributes
771 Specification of this status code (follow the style of IPP Model Section 13 APPENDIX B: Status Codes
772 and Suggested Status Code Messages):

773 13.1.4.20 client-error-attributes-not-settable (0x0413)

774 In a Set-Printer-Attributes or Set-Job-Attributes request, if the Printer object does not support one or more
775 attributes as settable, the Printer object MUST return this status code. The Printer object MUST also return
776 in the Unsupported Attributes Group all the attributes and/or values supplied by the client that are not
777 settable. See [ipp-mod] section 3.1.7. For example, if the request indicates 'job-state', all implementations
778 MUST reject the request. As another example, if the request indicates an attribute that is supported, but not
779 settable by this implementation, such as, say, "printer-name", the implementation rejects the request.

780 6.2   New status code: 'server-error-printer-is-in-standby-mode'

781 Type of registration: status code
782 Keyword symbolic name of this status code value: 'server-error-printer-is-in-standby-mode'
783 Numeric value (to be assigned by the IPP Designated Expert in consultation with IANA):
784 Operations that this status code may be used with: Shutdown-Printer
785 Specification of this status code (follow the style of IPP Model Section 13 APPENDIX B: Status Codes
786 and Suggested Status Code Messages):

787 13.1.5.8 server-error-printer-is-in-standby-mode

788 The Printer has been shutdown and is only accepting the Restart-Printer (see section 8.1.4) and Get-Printer-
789 Attributes operations. An operator can perform the Restart-Printer operation to allow the Printer to accept
790 other operations.

791   7   New out-of-band values

792   This section defines additional out-of-band values that can be used with any attribute in principle. See the
793   beginning of [ipp-mod] section 4.1.

794   7.1   'not-settable' out of band value

795   The 'not-settable' out of band value is used by the IPP Printer in a Set-Job-Attributes or Set-Printer-
796   Attributes response to indicate an attribute that was supplied, but is not settable in that implementation or as
797   defined by the policy for that system, because it is not in the "job-settable-attributes" on the one hand, or the
798   "interpreter-settable-attributes" or "printer-settable-attributes", on the other hand.

799   8   Summary of Set 2 operations and Operation-Id Assignments

800   The Set 2 operations are summarized in the following table:

Operation Name	Operation-Id	Brief description
Set-Printer-Attributes	0x??	Sets attribute values of the target Printer object
Enable-Printer	0x??	Allows the target Printer to accept create job operations
Disable-Printer	0x??	Prevents the target Printer from accepting create job operations
Restart-Printer	0x??	Restarts the target Printer from a standby shutdown mode
Shutdown-Printer	0x??	Shuts down the target Printer in several ways
Set-Job-Attributes	0x??	Sets attribute values of the target Job object
Reprocess-Job	0x??	Creates a copy of a completed target job with a new Job ID and processes it
Cancel-Current-Job	0x??	Cancels the current job on the target Printer or the specified job if it is the current job
Pause-Current-Job	0x??	Pauses the current processing job on the target Printer or the specified job if it is the current job, allowing other jobs to be processed instead
Resume-Job	0x??	Resume the paused target job
Promote-Job	0x??	Promote the pending target job to be next after the current job(s) complete

801   All of the operations in this registration proposal specification are OPTIONAL for an IPP object to support.
802   Unless the specification of an OPTIONAL operation requires support of another OPTIONAL operation,
803   conforming implementations may support any combination of these operations.

804

8.1   Printer Operations

806 All Printer operations are directed at Printer objects. A client MUST always supply the "printer-uri"
807 operation attribute in order to identify the correct target of the operation. These descriptions assume all of
808 the common semantics of IPP/1.1 Model and Semantics document [ipp-mod] section 3.1.

8.1.1   Set-Printer-Attributes Operation

810 Type of registration: operation
811 Proposed name of this operation: Set-Printer-Attributes
812 Object Target: Printer
813 Specification of this operation:

814 This OPTIONAL operation allows a client to set the values of the attributes of a Printer object.   In the
815 request, the client supplies the set of Printer attribute names and values that are to be set. In the response,
816 the Printer object returns success or rejects the request with indications of which attribute or attributes
817 could not be set.

818 How the Printer object validates the client-supplied attributes in the Set-Printer-Attributes request is
819 implementation-dependent, since there are no corresponding Printer attributes that specify the allowed
820 values that may be set on the Printer object.

821 The Printer MUST accept this operation in any state, i.e., for any of the values of the Printer object's
822 "printer-state" attribute.

8.1.1.1   Settable and READ-ONLY Printer Description attributes

824 If the Printer supports the "printer-message-from-operator" Printer Description attribute (see [ipp-mod]
825 section 4.4.25) and the client explicitly supplies a new value for the "printer-message-from-operator" in the
826 request, then the Printer MUST set the "printer-message-from-operator" Printer attribute to this new value
827 and MUST also set the "printer-message-time", "printer-message-date-time", and "printer-message-
828 operation" attributes, if supported (see sections 4.4, 4.5, and 4.6).

829 If the Printer supports the Set-Printer-Attributes operation, then it SHOULD support setting of:

830   all Job Template Default ("xxx-default") attributes
831   all Job Template Supported ("xxx-supported") attributes
832   all Job Template Ready ("xxx-ready") attributes

833 that the implementation supports (see [ipp-mod] section 4.2 and extensions).

834 The following Printer Description attributes (see [ipp-mod] section 4.4) MUST NOT be settable, i.e., they
835 are READ-ONLY:

836   printer-state
837   printer-state-reasons
838   printer-state-message
839   printer-is-accepting-jobs - see Enable-Printer/Disable-Printer
840   queued-job-count
841   printer-message-time - see Set-Printer-Attributes when setting "printer-message-from-operator"
842   printer-message-date-time - see Set-Printer-Attributes when setting "printer-message-from-operator"
843   printer-message-operation - see Set-Printer-Attributes when setting "printer-message-from-operator"
844   printer-up-time

845   The remaining Printer Description attributes MAY be settable using the Set-Printer-Attributes operation,
846   depending on implementation. If "xxx-supported" Printer Description attribute are settable, then they
847   MUST affect the behavior of the implementation. If they are READ-ONLY then they reflect the
848   implementation and cannot be changed using the Set-Printer-Attributes operation. Consider the following
849   examples:

850   For example, if the "operations-supported" Printer Description attribute (see [ipp-mod] section
851   4.4.15) is settable, then changing its value MUST affect the operations that the implementation
852   accepts or rejects. Such an implementation will need to be able to reject values for operations that it
853   contains no code support for.

854   As another example, if the "ipp-versions-supported" Printer Description attribute (see [ipp-mod]
855   section 4.4.14) is settable, then changing its value MUST affect the protocol versions that are
856   accepted or rejected. Such an implementation will need to be able to reject values for operations
857   that it contains no code support for.

858   See the "factory-settings" operation attribute (see section 3.3) for a way to query the implementation
859   supported values using the Get-Printer-Attributes operation. See the "reset-function" operation attribute of
860   the Reset-Device operation (see [ipp-set3]) for a way to restore the values of the Device object to the
861   factory settings.

862   ISSUE 07 - Ok not to have a way to reset the values of the Printer object to the factory settings, but only
863   have a way to reset the factory default settings for the Device object?

864   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
865   operation.

866   Most Printer attributes will require administrator privileges to set, such as "xxx-supported", while some will
867   require operator privileges only, such as "media-ready" and "printer-message-from-operator". Which
868   attributes require which privileges depends on implementation and MAY depend on site policy.

869

870   8.1.1.2   Set-Printer-Attributes Request

871   The following sets of attributes are part of the Set-Printer-Attributes Request:

872   Group 1: Operation Attributes

873   Natural Language and Character Set:
874   The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
875   section 3.1.4.1.
876

877   Target:
878   The "printer-uri" (uri) operation attribute which is the target for this operation as described in [ipp-
879   mod] section 3.1.5.
880

881   Requesting User Name:
882   The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
883   described in [ipp-mod] section 8.3.
884

885

886   "document-format" (mimeMediaType):
887   The client SHOULD supply this attribute. The Printer object MUST support this attribute. This
888   attribute is useful for a client to select the Interpreter object to which the attribute modification
889   should be applied. Each Printer object is modeled to contain one or more Interpreter objects. Those
890   Printer attributes whose values vary from Interpreter to Interpreter, are modeled as Interpreter
891   objects, while those that do not are Printer object attributes. Thus the target of a Get-Printer-
892   Attributes or Set-Printer-Attributes operation is either the Printer object or the Interpreter object
893   identified by the "document-format" operation attribute supplied by the client. Except for Get-
894   Printer-Attributes and Set-Printer-Attributes, there are no other operations with the Interpreter object
895   as a target. See [ipp-mod] section 3.2.5.1 "Get-Printer-Attributes Request".
896

897   If a client wants to set an attribute of all of the Interpreter objects to the same value, it can query the
898   Printer's "document-format-supported" Printer Description attribute and perform separate Set-
899   Printer-Attributes for each document format supported.
900

901   If the Printer object does not distinguish between different sets of supported values for each
902   different document format when validating jobs in the create and Validate-Job operations, it MUST
903   NOT distinguish between different document formats in the Set-Printer-Attributes operation. If the
904   Printer object does distinguish between different sets of supported values for each different
905   document format specified by the client, this specialization applies only to the same Printer
906   attributes as the Get-Printer-Attributes operation (see [ipp-mod] section 3.2.5.1).
907

908   If the client omits this "document-format" operation attribute, the Printer object MUST respond as if
909   the attribute had been supplied with the value of the Printer object's "document-format-default"

910 attribute. It is recommended that the client always supply a value for "document-format", since the
911 Printer object's "document-format-default" may be 'application/octet-stream', in which case the set
912 attributes and values are for the union of the document formats that the Printer can automatically
913 sense. For more details, see the description of the 'mimeMediaType' attribute syntax in [ipp-mod]
914 section 4.1.9.

915

916 If the client supplies a value for the "document-format" Operation attribute that is not supported by
917 the Printer, i.e., is not among the values of the Printer object's "document-format-supported"
918 attribute, the Printer object MUST reject the operation and return the 'client-error-document-format-
919 not-supported' status code.

920

921 Group 2: Printer Attributes

922 The client MUST supply a set of Printer attributes as defined in [ipp-mod] section 4.2 Job Template
923 Attributes ("xxx-default", "xxx-supported", and "xxx-ready" attributes) and section 4.4 Printer
924 Description Attributes. Each Printer attribute supplied in Group 2 replaces the value(s) of the
925 corresponding Printer attribute on the target Printer object. If a Printer object attribute had not been
926 configured yet and so had the 'no-value' out-of-band value (see [ipp-mod] 4.1), the supplied value(s)
927 replace the 'no-value' value. For attributes that can have multiple values (1setOf), all values
928 supplied by the client replace all values of the corresponding Printer object attribute.

929

930 8.1.1.3   Set-Printer-Attributes Response

931 The Printer object returns the following sets of attributes as part of the Get-Printer-Attributes Response:

932 Group 1: Operation Attributes

933 Status Message:
934 In addition to the REQUIRED status code returned in every response, the response OPTIONALLY
935 includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation
936 attribute as described in [ipp-mod] sections 13 and 3.1.6.

937

938 Natural Language and Character Set:
939 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
940 section 3.1.4.2.

941

942 Group 2: Unsupported Attributes

943 See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.

944

945 In the case of attributes that are supported, but are not settable by the implementation, i.e., are not
946 among the values of the Printer's "settable-attributes" Printer Description attribute (see section 4.1),
947 the Printer object returns the client-supplied attribute(s) with a substituted value of 'not-supported'
948 (same out-of-band value as for attributes that are not supported). This value's syntax type is "out-of-
949 band" and its encoding is defined by special rules for "out-of-band" values in the "Encoding and

950 Transport" document [IPP-PRO]. Its value indicates that the attribute is either not settable or is not
951 supported at all.

952

8.1.2   Disable-Printer Operation

Type of registration: operation
Proposed name of this operation: Disable-Printer
Object Target: Printer
Specification of this operation:

This OPTIONAL operation allows a client to stop the Printer object from accepting jobs, i.e., cause the Printer to reject subsequent create job operations (Print-Job, Print-URI, and Create-Job operation) and return the 'server-error-not-accepting-jobs' status code. The Printer still accepts all other operations. All previously submitted Jobs and currently processing Jobs continue unaffected. The Printer sets the value of its "printer-is-accepting-jobs" READ-ONLY Printer Description attribute to 'false' (see [ipp-mod] section 4.4.20), no matter what the previous value was. This operation has no immediate effect on the Printer's "printer-state" and "printer-state-reasons" attributes.

Note: Use the Enable-Printer operation (section 8.1.3) to enable a Printer to accept Jobs again.

If the Disable-Printer operation is supported, then the Enable-Printer operation MUST be supported, and vice-versa.

Note: Use the Enable-Printer and Disable-Printer operations to allow or prevent input to a Printer. Use the Pause-Printer and Resume-Printer operations to prevent or allow output from the Printer.

Whether or not the Disable-Printer operation stops jobs that are submitted using job submission protocols other than IPP, depends on implementation, i.e., on whether the IPP protocol is being used as a universal management protocol or just to manage IPP jobs, respectively. See "printer-controls-other-protocols" (section 4.3).

Access Rights: Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this operation.

The Disable-Printer Request and Disable-Printer Response have the same attribute groups and attributes as the Resume-Printer operation (see [ipp-mod] sections 3.2.7.1 and 3.2.7.2), including the new "printer-message-from-operator" operation attribute (see section 3.1), and with the addition of the following Group 1 operation attribute in the request:

   "job-type" (type2 keyword):
       The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this attribute. The value of this attribute indicates the type of job to be disabled. If the client omits this attribute, the Printer assumes the 'network-jobs' value.

       Standard keyword values are:
              'network-jobs' - disable jobs submitted using the create job operations.
              'walk-up-jobs' - disable jobs submitted locally, such as walkup copy jobs
              'all-jobs' - disable all type of jobs

989

990   8.1.3   Enable-Printer Operation

991   Type of registration: operation
992   Proposed name of this operation: Enable-Printer
993   Object Target: Printer
994   Specification of this operation:

995   This OPTIONAL operation allows a client to start the Printer object accepting jobs, i.e., cause the Printer to
996   accept subsequent create job operations (Print-Job, Print-URI, and Create-Job operation). The Printer still
997   accepts all other operations. All previously submitted Jobs and currently processing Jobs continue
998   unaffected. The Printer sets the value of its "printer-is-accepting-jobs" READ-ONLY Printer Description
999   attribute to 'true' (see [ipp-mod] section 4.4.20), no matter what the previous value was. This operation has
1000   no immediate effect on the Printer's "printer-state" and "printer-state-reasons" attributes.

1001   Note: Use the Disable-Printer operation (section 8.1.2) to stop a Printer from accepting Jobs.

1002   If the Enable-Printer operation is supported, then the Disable-Printer operation MUST be supported, and
1003   vice-versa.

1004   Note: Use the Enable-Printer and Disable-Printer operations to allow or prevent input to a Printer. Use the
1005   Pause-Printer and Resume-Printer operations to prevent or allow output from the Printer.

1006   Whether or not the Enable-Printer operation allows acceptance of jobs that are submitted using job
1007   submission protocols other than IPP, depends on implementation, i.e., on whether the IPP protocol is being
1008   used as a universal management protocol or just to manage IPP jobs, respectively. See "printer-controls-
1009   other-protocols" (section 4.3).

1010   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1011   operation.

1012   The Enable-Printer Request and Enable-Printer Response have the same attribute groups and attributes as
1013   the Resume-Printer operation (see [ipp-mod] sections 3.2.8.1 and 3.2.8.2), including the new "printer-
1014   message-from-operator" operation attribute (see section 3.1), and with the addition of the following Group
1015   1 operation attribute in the request:

1016   "job-type" (type2 keyword):
1017   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
1018   attribute. The value of this attribute indicates the type of job to be enabled. If the client omits this
1019   attribute, the Printer assumes the 'network-jobs' value.
1020
1021   Standard keyword values are:
1022   'network-jobs' - enable jobs submitted using the create job operations.
1023   'walk-up-jobs' - enable jobs submitted locally, such as walkup copy jobs
1024   'all-jobs' - enable all types of jobs

8.1.4   Restart-Printer operation

Type of registration: operation
Proposed name of this operation: Restart-Printer
Object Target: Printer
Specification of this operation:

This OPTIONAL operation allows a client to restart a Printer that has previously been shutdown in standby mode (see section 8.1.5). Standby mode is indicated by the Printer's "printer-state" being 'stopped' and its "printer-state-reasons" including the 'standby' and 'paused' values. If the Printer is not in standby mode, the Printer MUST reject this operation and return the 'client-error-not-possible' status code.

ISSUE 08:   What state does the Printer comes back up on Restart-Printer and how can the client control? Possible alternatives:

> a. Restart-Printer always brings the Printer up Disabled ("printer-is-accepting-jobs" = 'false') and Paused ("printer-state" = 'stopped', and "printer-state-reasons" = 'paused') which is the state that Shutdown-Printer leaves the Printer in. Then the operator issues Enable-Printer and Resume-Printer when want to restore normal operation. The client can automatically issues these addition 2 operations depending on GUI options. Advantages: This is the simplest to implement, allows new states to be added without changing the Restart-Printer operation, and can have the same GUI interface as b:

> b. Add a REQUIRED operation attribute to Restart-Printer, something like "printer-condition" with values: 'disabled-and-paused', 'enabled-and-paused', and 'enabled-and-idle'.

DENVER MEETING> There was significant confusion as to the meaning of shutdown. If a shutdown operation halts communications to the printer a restart is not possible. It was agreed to include restart attributes 'restart-to-standby' (requires a two step process), 'restart-fully', and 'restart-sync'.

ACTION ITEM (Harry Lewis): make a complete proposal and submit for approval.

If the Restart-Printer operation is supported, then the Shutdown-Printer operation MUST be supported, since the Restart-Printer operation is meaningful only after a Shutdown-Printer operation has been performed. However, if the Shutdown-Printer operation is supported, the Restart-Printer NEED NOT be supported.

Issue 09: Why? This is backward, if you ask me (HRL).

> Denver meeting> Consider "shutdown-attributes" similar to Windows "shutdown". Like:

>   – Completely power off (walk to printer to bring it back up
>   – Power off but listen for "restart" - shutdown to standby

> Denver meeting> Also consider restart attributes.

>   – Restart to Standby (disabled and paused) (two step bring up)
>   – Restart (fully).
>   – Restart sych

1061 *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1062 operation.

1063 The Restart-Printer Request and Restart-Printer Response have the same attribute groups and attributes as
1064 the Resume-Printer operation (see [ipp-mod] sections 3.2.8.1 and 3.2.8.2), including the new "printer-
1065 message-from-operator" operation attribute (see section 3.1) and the following Group 1 operation attribute:

1066

1067   8.1.5   Shutdown-Printer Operation

1068   Type of registration: operation
1069   Proposed name of this operation: Shutdown-Printer
1070   Object Target: Printer
1071   Specification of this operation:

1072   This OPTIONAL operation allows a client to shutdown a Printer, i.e., stop processing jobs and power off in
1073   some implementation-dependent manner. The purpose of Shutdown-Printer is to shutdown the Printer for
1074   an extended period, not to reset the device(s) or modify a Printer attribute. See Reset-Device [ipp-set3] for
1075   the way to reset the device(s). See the Disable-Printer operation (section 8.1.2) for a way for the client to
1076   stop the Printer from accepting Job Creation requests without stopping processing or shutting down.

1077   The Printer is disabled immediately (see the Disable-Printer operation in section 8.1.2). The Printer adds
1078   the 'shutdown' value (see [ipp-mod] section 4.4.11) to its "printer-state-reasons" Printer Description
1079   attribute. The "when" operation attribute specifies how much processing occurs before the Printer is paused
1080   (see [ipp-mod] section 3.2.7) and the shutdown is complete. All other requests continue to be accepted
1081   until the printer is powered down.

1082   ISSUE 10 - Need to look at life cycle of the Printer versus standby/power-down and the other operations
1083   that can be accepted. There can be appreciable time between acceptance of this operation and when the
1084   final state of the printer, either standby or powered down is reached. Is it ok for non-submission operations
1085   to continue to be accepted during this time? May need 'moving-to-shutdown'. What about 'moving-to-
1086   standby'?

1087   TH>   Add 'moving-to-shutdown' which the Shutdown-Printer sets
1088   immediately (analogous to 'moving-to-paused'). Then the 'shutdown'
1089   values means that the shutdown has completed (and is only meaningful to
1090   a server implementation that hosts the Printer object). Thus the server
1091   can still respond to a Get-Printer-Attributes operation after the
1092   Printer is shutdown as stated in IPP/1.1.

1093
1094   HRL> Is this granularity really achievable enough of a wide enough
1095   variety of environments to be reliable or, in reality, will this be
1096   implementation dependent?

1097   Whether or not the Shutdown-Printer operation affects jobs that were submitted to the device using job
1098   submission protocols other than IPP, depends on implementation, i.e., on whether the IPP protocol is being
1099   used as a universal management protocol or just to manage IPP jobs, respectively. See "printer-controls-
1100   other-protocols" (section 4.3).

1101   The Printer object MUST accept this operation in any state and transition the Printer object to the 'idle'
1102   state.

1103   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1104   operation.

1105   The Shutdown-Printer Request and Shutdown-Printer Response have the same attribute groups and
1106   attributes as the Pause-Printer operation (see [ipp-mod] sections 3.2.7.1 and 3.2.7.2), including the new

1107 "printer-message-from-operator" operation attribute (see section 3.1), and with the addition of the following
1108 Group 1 operation attributes in the request:

1109   "when" (type2 keyword)
1110   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
1111   attribute, if it supports this operation. The value of this attribute indicates when to pause the printer.
1112   If the client omits this attribute, the Printer assumes the 'after-current-job' value. The 'after-current-
1113   job' value is REQUIRED to be supported if the "when" attribute is supported; the remaining values
1114   are OPTIONAL.
1115   Note: There is no way to query to see which values of the "when" attribute are supported for this or
1116   any other operation. Since this operation is intended for Operators, rather than End-Users, it did not
1117   seem necessary to provide the means to query the supported values.

1119   Standard keyword values are:
1120   'now' - cancel the currently printing job(s) and shutdown the Printer. Jobs in the 'held' and
1121   'pending' state remain in those states.
1122   'after-current-job' - shutdown the Printer after the current job finishes printing (all its copies).
1123   Jobs in the 'held' and 'pending' state remain in those states.
1124   'after-all' - shutdown the Printer after all 'pending' jobs finish printing. Jobs in the 'held' state
1125   remain in the 'held' state.
1126   ISSUE 11 - Ok to remove the 'after-current-copy' value from Shutdown-Printer?

1128   ISSUE 12 - Ok to have removed the "shutdown-function" operation attribute with values
1129   'stand-by' vs. 'power-off' Shutdown-Printer on the grounds that for the Printer object
1130   they have no meaning. Power-off is for the Shutdown-Device operation.
1131   "synchronize" (boolean)
1132   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
1133   attribute. This attribute indicates whether or not the printer is to synchronize the checkpoint data for
1134   the current job ("when" = 'now') with the pages that have actually printed. If the value of the "when"
1135   attribute is not 'now' or the "when" attribute is not supplied, then the "synchronize" attribute has no
1136   meaning and the Printer MUST ignore it. If this attribute is supported, then a value of 'true' implies
1137   that the Printer will be able to resume the job at the point of synchronization when the Printer is
1138   restarted. If the implementation does not support resuming a job (either automatically or with the
1139   Resume-Job operation) after a Shutdown-Printer with "when" = 'now', then it does not implement
1140   this attribute. In this case, check-pointing implies that the job may be resumed in the future, exactly
1141   from the point and in the state and resource context from which it left off.

1144   If the Printer supports this attribute but the client does not supply it, the Printer is assumed to
1145   perform synchronization ('true' behavior). If the Printer does not support this attribute, the Printer is
1146   assumed to not synchronize ('false' behavior).

1149   ISSUE 13: Is the current job automatically restarted when the Printer is restarted? Or does some
1150   client have to issue a Restart-Job operation?

1151

1152   8.2   Job Operations

1153   All Job operations are directed at Job objects. A client MUST always supply some means of identifying the
1154   Job object in order to identify the correct target of the operation. That job identification MAY either be a
1155   single Job URI or a combination of a Printer URI with a Job ID. The IPP object implementation MUST
1156   support both forms of identification for every job.

1157   8.2.1   Set-Job-Attributes

1158   Type of registration: operation
1159   Proposed name of this operation: Set-Job-Attributes
1160   Object Target: Job
1161   Specification of this operation:

1162   This OPTIONAL operation allows a client to set the values of the attributes of a Job object.   In the request,
1163   the client supplies the set of Job attribute names and values that are to be set. In the response, the IPP
1164   object returns success or rejects the request with indications of which attribute or attributes could not be set.

1165   This operation is almost identical to the Set-Printer-Attributes operation (see section 8.1.1). The only
1166   differences are that the Set-Job-Attributes operation is directed at a Job object rather than a Printer object,
1167   there is no "document-format" operation attribute used when setting a Job object, and the validation is the
1168   same as the create job operations, i.e., depends on the "xxx-supported" Printer Description attributes.

1169   The validation of the Set-Job-Attributes request is performed as if the job had been submitted originally
1170   with the new values and with "ipp-attribute-fidelity" set to 'true', i.e., all modified attributes MUST be
1171   supported along with the attributes not modified. If such a create job operation would have been accepted,
1172   then the Set-Job-Attributes MUST be accepted. If such a create job operation would have been rejected,
1173   then the Set-Job-Attributes MUST be rejected and the Job MUST be unchanged.

1174   The IPP object MUST accept or reject the request based on the job's current state and transition the job to
1175   the indicated new state as follows:

Current "job-state"	New "job-state"	IPP object's response status code and action:
'pending'	'pending'	'successful-ok'
'pending'	'pending-held'	'successful-ok' - needed resources are not ready
'pending-held'	'pending-held'	'successful-ok'
'pending-held'	'pending'	'successful-ok' - needed resources are ready
'processing'	'processing'	'successful-ok' or 'client-error-not-possible' depending on the attributes being set, whether the job has started marking media, and/or implementation
'processing-stopped'	'processing-stopped'	'successful-ok' or 'client-error-not-possible' depending on the attributes being set, whether the job has started marking media, and/or implementation
'completed'	'completed'	'client-error-not-possible'
'canceled'	'canceled'	'client-error-not-possible'
'aborted'	'aborted'	'client-error-not-possible'

1176   8.2.1.1   Settable and READ-ONLY Job Description attributes

1177   If the Printer supports the "job-message-from-operator" Job Description attribute (see [ipp-mod] section
1178   4.3.16) and the client explicitly supplies a new value for the "job-message-from-operator" in the request,
1179   then the Printer MUST set the "job-message-from-operator" Job attribute to this new value.

1180   If the Printer supports the Set-Job-Attributes operation, then it SHOULD support setting of:

1181   all Job Template ("xxx") attributes (see [ipp-mod] section 4.2 and extensions)

1182   that the implementation supports.

1183   The following Job Description attributes (see [ipp-mod] section 4.3) MUST NOT be settable, i.e., they are
1184   READ-ONLY:

1185   job-uri
1186   job-id
1187   job-printer-uri
1188   job-more-info
1189   job-originating-user-name - set in create operation
1190   job-state
1191   job-state-reasons
1192   job-state-message
1193   number-of-documents
1194   output-device-assigned
1195   time-at-creation
1196   time-at-processing
1197   time-at-completed
1198   job-printer-up-time
1199   date-time-at-creation
1200   date-time-at-processing
1201   date-time-at-completed
1202   number-of-intervening-jobs
1203   job-k-octets
1204   job-k-octets-processed
1205   job-impressions-completed
1206   job-media-sheets-completed
1207   attributes-charset - set in Job Creatione operation
1208   attributes-natural-language - set in Job Creatione operation

1209   The following Set2 Job Description attributes are READ-ONLY:

1210   original-requesting-user-name - set in Job Creation operation

1211   The remaining Job Description attributes MAY be settable using the Set-Job-Attributes operation,
1212   depending on implementation.

1213   Whether or not the Set-Job-Attributes operation affects jobs that are submitted using job submission
1214   protocols other than IPP, depends on implementation, i.e., on whether the IPP protocol is being used as a
1215   universal management protocol or just to manage IPP jobs, respectively. See "printer-controls-other-
1216   protocols" (section 4.3).

1217   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1218   operation.

1219   8.2.1.2   Set-Job-Attributes Request

1220   The following sets of attributes are part of the Set-Job-Attributes Request:

1221   Group 1: Operation Attributes

1222   Natural Language and Character Set:
1223   The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
1224   section 3.1.4.1.
1225

1226   Target:
1227   Either (1) the "printer-uri" (uri) plus "job-id" (integer(1:MAX)) or (2) the "job-uri" (uri) operation
1228   attribute(s) which define the target for this operation as described in [ipp-mod] section 3.1.5.

1229

1230   Requesting User Name:
1231   The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
1232   described in [ipp-mod] section 8.3.

1233

1234

1235   Group 2: Job Attributes

1236   The client MUST supply a set of Job attributes as defined in [ipp-mod] section 4.2 Job Template
1237   Attributes ("xxx" attributes) and section 4.3 Job Description Attributes. Each Job attribute supplied
1238   in Group 2 replaces the value(s) of the corresponding Job attribute on the target Job object. For
1239   attributes that can have multiple values (1setOf), all values supplied by the client replace all values
1240   of the corresponding Job object attribute.

1241

1242   8.2.1.3   Set-Job-Attributes Response

1243   The Printer object returns the following sets of attributes as part of the Set-Job-Attributes Response:

1244   Group 1: Operation Attributes

1245   Status Message:
1246   In addition to the REQUIRED status code returned in every response, the response OPTIONALLY
1247   includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation
1248   attribute as described in [ipp-mod] sections 13 and 3.1.6.

1249

1250   Natural Language and Character Set:
1251   The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
1252   section 3.1.4.2.

1253

1254   Group 2: Unsupported Attributes

1255   See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.

1256

1257   The attributes returned are the same as for the create operation with the same new attribute values.
1258   In the case of attributes that are supported, but are not settable by the implementation, i.e., are not
1259   among the values of the Printer's "settable-attributes" Printer Description attribute (see section 4.1),
1260   the Printer object returns the client-supplied attribute(s) with a substituted value of 'not-supported'
1261   (same out-of-band value as for attributes that are not supported). This value's syntax type is "out-of-
1262   band" and its encoding is defined by special rules for "out-of-band" values in the "Encoding and
1263   Transport" document [IPP-PRO]. Its value indicates that the attribute is either not settable or is not
1264   supported at all.

1265

1266   8.2.2   Reprocess-Job Operation

1267   This OPTIONAL operation is a create job operation that allows a client to re-process a copy of a job that
1268   had been retained in the queue after processing completed, was canceled, or was aborted (see [ipp-mod]
1269   section 4.3.7.2). This operation is the same as the Restart-Job operation (see [ipp-mod] section 3.3.7),
1270   except that the Printer creates a new job that is a copy of the target job and the target job is unchanged. The
1271   new job is assigned new values to the "job-uri" and "job-id" attributes and the new job's Job Description
1272   attributes that accumulate job progress, such as "job-impressions-completed", "job-media-sheets-
1273   completed", and "job-k-octets-processed", are initialized to 0 as with any create job operation. The target
1274   job moves to the Job History after a suitable period, independent of whether one or more Reprocess-Job
1275   operations have been performed on it.

1276   If the Set-Job-Attributes operation is supported, then the "job-hold-until" operation attribute MUST be
1277   supported with at least the 'indefinite' value, so that a client can modify the new job before it is scheduled
1278   for processing using the Set-Job-Attributes operation. After modifying the job, the client can release the
1279   job for processing, by using the Release-Job operation specifying the newly assigned "job-uri" or "job-id"
1280   for the new job.

1281

1282   8.2.3   Cancel-Current-Job Operation

1283   This OPTIONAL operation allows a client to cancel the current job on the target Printer or the specified job
1284   if it is the current job on the Printer. See [ipp-mod] section 3.3.3 for the semantics of canceling a job.
1285   Since a Job might already be marking by the time a Cancel-Current-Job is received, some media sheet
1286   pages might be printed before the job is actually terminated.

1287   If the client does not supply a "job-id" operation attribute, the Printer MUST accept the request and cancel
1288   the current job if there is a current job in the 'processing' or 'processing-stopped' state; otherwise, it MUST
1289   reject the request and return the 'client-error-not-possible' status code. If more than one job is in the
1290   'processing' or 'processing-stopped' states, the one that is marking is canceled and the others are unaffected.

1291   Warning: On a shared printer, there is a race condition. Between the time that a user issues this operation
1292   and its acceptance, the current job might change to a different job. If the user or operator is authenticated to
1293   cancel the new job, the wrong job is canceled. To prevent this race from canceling the wrong job, the client
1294   MAY supply the "job-id" operation attribute which is checked against the current job's job-id. If the job
1295   identified by the "job-id" attribute is not the current job on the Printer, i.e., is not in the 'processing' or
1296   'processing-stopped' states, the Printer MUST reject this operation and return the 'client-error-not-possible'
1297   status code. Otherwise, the Printer cancels the specified job.

1298   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1299   operation.

1300   The Cancel-Current-Job Request and Cancel-Current-Job Response have the same attribute groups and
1301   attributes as the Resume-Printer operation (see [ipp-mod] section 3.2.8), including the new "job-message-
1302   from-operator" operation attribute (see section 3.2), with the addition of the following Group 1 Operation
1303   attributes in the request:

1304   "job-id" (integer(1:MAX)):

1305   The client OPTIONALLY supplies this Operation attribute in order to verify that the identified job
1306   is still the current job on the target Printer object. The IPP object MUST supports this operation
1307   attribute, if it supports this operation.

1308

1309   8.2.4   Pause-Current-Job operation

1310   ISSUE 14 - Since the semantics of Pause-Current-Job is different from Pause-Printer, in that other jobs are
1311   processed, while this job is stopped, should we have a different name for the verb, such as Suspend-
1312   Current-Job, instead of Pause-Current-Job. Otherwise, users may be mistakenly think that the printer is
1313   paused when the job is paused. If the name is changes, then the 'job-paused' job state reason would also be
1314   changed to 'job-suspended'.

1315   This OPTIONAL operation allows a client to stop the current job on the target Printer or the specified job if
1316   it is the current job on the Printer, and allow other jobs to be processed instead. The Printer moves the
1317   current job or the target job to the 'processing-stopped' state and sets the 'job-paused' value in the job's "job-
1318   state-reasons" attribute and processes other jobs.

1319   If the client does not supply a "job-id" operation attribute, the Printer MUST accept the request and pause
1320   the current job if there is a current job in the 'processing' or 'processing-stopped' state; otherwise, it MUST
1321   reject the request and return the 'client-error-not-possible' status code. If more than one job is in the
1322   'processing' or 'processing-stopped' states, all of them are paused.

1323   Warning: On a shared printer, there is a race condition. Between the time that a user issues this operation
1324   and its acceptance, the current job might change to a different job. If the user or operator is authenticated to
1325   pause the new job, the wrong job is paused. To prevent this race from pausing the wrong job, the client
1326   MAY supply the "job-id" operation attribute which is checked against the current job's job-id. If the job
1327   identified by the "job-id" attribute is not the current job on the Printer, i.e., is not in the 'processing' or
1328   'processing-stopped' states, the Printer MUST reject this operation and return the 'client-error-not-possible'
1329   status code. Otherwise, the Printer pauses the specified job and processed other jobs.

1330   A paused job is resumed using the Resume-Job operation (see section 8.2.5). If the Pause-Current-Job
1331   operation is supported, then the Resume-Job operation MUST be supported, and vice-versa.

1332   The Printer MUST reject a Release-Job request (and return the 'client-error-not-possible') for a job that has
1333   been paused , i.e., for a job in the 'processing-stopped' state, with the 'job-paused' value in its "job-state-
1334   reasons" attribute. The Hold-Job and Release-Job operations are for holding and releasing held jobs, not
1335   pausing and resuming paused jobs.

1336   ISSUE 15 - Ok for Pause-Job to reject a request for a Job that is already paused (like Cancel-Job), instead
1337   of accepting the request?

1338   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1339   operation.

1340   The Pause-Current-Job Request and Pause-Current-Job Response have the same attribute groups and
1341   attributes as the Resume-Printer operation (see [ipp-mod] section 3.2.8), including the new "job-message-
1342   from-operator" operation attribute (see section 3.2), with the addition of the following Group 1 Operation
1343   attributes in the request:

1344   "job-id" (integer(1:MAX)):

1345   The client OPTIONALLY supplies this Operation attribute in order to verify that the identified job
1346   is still the current job on the target Printer object. The IPP object MUST supports this operation
1347   attribute, if it supports this operation.

1348   "when" (type2 keyword)
1349   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
1350   attribute, if it supports this operation. The value of this attribute indicates when to pause the printer.
1351   If the client omits this attribute, the Printer assumes the 'after-current-copy' value. The 'after-
1352   current-copy' value is REQUIRED to be supported if the "when" attribute is supported; the
1353   remaining values are OPTIONAL.
1354   Note: There is no way to query to see which values of the "when" attribute are supported for this or
1355   any other operation. Since this operation is intended for Operators, rather than End-Users, it did not
1356   seem necessary to provide the means to query the supported values.
1357
1358   Standard keyword values are:
1359   'now' - pause the current Job immediately, while the current Job is processing.
1360   'after-current-copy' - pause the current Job after the current Job finishes printing its current
1361   copy.
1362   ISSUE 16 - Ok that the only values for the "when" operation attribute for the Pause-Current-Job are
1363   'now' and 'after-current-copy' with 'now' being the default and REQUIRED?
1364
1365   "synchronize" (boolean)
1366   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
1367   attribute. This attribute indicates whether or not the printer is to synchronize the checkpoint data for
1368   the current job being paused with the pages that have actually printed. If this attribute is supported,
1369   then a value of 'true' implies that the Printer will be able to resume the job at the point of
1370   synchronization when the job is resumed.
1371
1372   If the Printer supports this attribute but the client does not supply it, the Printer is assumed to
1373   perform synchronization ('true' behavior). If the Printer does not support this attribute, the Printer is
1374   assumed to not synchronize ('false' behavior).

1375

1376   8.2.5   Resume-Job operation

1377   This OPTIONAL operation allows a client to resume the target job at the point where it was paused. The
1378   Printer moves the target job to the 'pending' state and removes the 'job-paused' value from the job's "job-
1379   state-reasons" attribute.

1380   If the target job is not in the 'processing-stopped' state with the 'job-paused' value in the job's "job-state-
1381   reasons" attribute, the Printer rejects the request and returns the 'client-error-not-possible' status code, since
1382   the job was not paused.

1383   ISSUE 17 - Ok to return an error (like Cancel-Job), rather than having Resume-Job accept the request even
1384   if the Job is already resumed (i.e., not paused)?

1385   If the Resume-Job operation is supported, then the Pause-Current-Job operation MUST be supported, and
1386   vice-versa.

1387   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1388   operation.

1389   The Resume-Job Request and Resume-Job Response have the same attribute groups and attributes as the
1390   Release-Job operation (see [ipp-mod] section 3.3.6), including the new "job-message-from-operator"
1391   operation attribute (see section 3.2).

1392

1393   8.2.6   Promote-Job operation

1394   This OPTIONAL operation allows a client to make the pending target job be processed next after the
1395   current job completes. This operation is specially useful in a production printing environment where the
1396   operator is involved in job scheduling.

1397   If the target job is in the 'pending' state, this operation does not change the job's state, but causes the job to
1398   be processed after the current job(s) complete. If the target job is not in the 'pending' state, the Printer
1399   rejects the request and returns the 'client-error-not-possible' status code. The Printer returns the target job
1400   immediately after the current job(s) in a Get-Jobs response (see [ipp-mod] section 3.2.6) for the 'not-
1401   completed' jobs.

1402   When the current job completes, is canceled, paused, or aborted, the target of this operation is processed
1403   next.

1404   If a client issues this request (again) before the target of the operation of the original request started
1405   processing, the target of this new request is scheduled before the previous job that was to be processed next.

1406   Note: IPP is specified not to require queues for job scheduling, since there are other implementations for
1407   scheduling multiple jobs. However, if an implementation does implement queues for jobs, then the
1408   Promote-Job puts the specified job at the front of the queue. A subsequent Promote-Job before the first job
1409   starts processing puts that specified job at the front of the queue, so that it is "in front" of the previously
1410   promoted job.

1411   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1412   operation.

1413   The Promote-Job Request and Promote-Job Response have the same attribute groups and attributes as the
1414   Cancel-Job operation (see [ipp-mod] section 3.3.3), including the new "job-message-from-operator"
1415   operation attribute (see section 3.2).

1416

9   IANA Considerations

The operations and attributes in this registration proposal will be published by IANA according to the procedures in RFC 2566 [rfc2566] section 6.4 for operations with the following URL:

ftp.isi.edu/iana/assignments/ipp/operations/set2.txt

10   Internationalization Considerations

This document has the same localization considerations as the [ipp-mod].

11   Security Considerations

The IPP Model and Semantics document [ipp-mod] discusses high level security requirements (Client Authentication, Server Authentication and Operation Privacy). Client Authentication is the mechanism by which the client proves its identity to the server in a secure manner. Server Authentication is the mechanism by which the server proves its identity to the client in a secure manner. Operation Privacy is defined as a mechanism for protecting operations from eavesdropping.

12   Author's Addresses

Carl Kugler
IBM
Boulder CA

Phone: (303) 924-5060
FAX:
e-mail: kugler@us.ibm.com

Tom Hastings
Xerox Corporation
737 Hawaii St. ESAE 231
El Segundo, CA 90245

Phone: 310-333-6413
Fax: 310-333-5514
e-mail: hastings@cp10.es.xerox.com

Harry Lewis
IBM
Boulder CA

Phone: (303) 924-5337

FAX:

e-mail: harryl@us.ibm.com

13   References

[ipp-mod]
    R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and
    Semantics", <draft-ietf-ipp-model-v11-03.txt>, June, 1999.

[RFC2566]
    R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and
    Semantics", RFC 2566, April 1999.

14   Change History

This section summarizes the changes. Each sub-section is in reverse chronological order. Adding or removing ISSUES that don't change the document are not listed here.

14.1   Changes to the November 1, 1999 version to make the November 16, 1999 version

The following changes to the October 22, 1999 version to make the November 1, 1999 version as a result of the IPP WG meeting in Durham, 10/99:

1. Formally defined IPP Printer fan-out, IPP Printer fan-in, and output device fan-out. Added figures to show IPP Printer fan-out and IPP Printer fan-in.

2. Added "parent-printers-supported (1setOf uri) Printer Description attribute to point back up the Printer hierarchy.

3. Added the requirements for forwarding operations that affect Jobs and for not forwarding operations that affect Printers.

4. Added "original-requesting-user-name" (name(MAX)) to represent the original end user, not the parent Printer's host.

5. Changed the default for "when" for the Pause-Printer operation from 'after-current-job' to 'now', since that is the behavior in IPP/1.1 where the "when" operation attribute is not defined.

6. Allowed a non-leaf Printer to have only one subordinate Printer.

1479 7. Changed most of the "parent" Printer terminology to "non-leaf" Printer to contrast more clearly with
1480   "leaf" Printer objects. The term "parent" is only used when talking about a subordinate's immediate
1481   parent Printer object.

1482 8. Added "original-requesting-user-name" (name (MAX)) to the list of READ-ONLY Job Description
1483   attributes.

1484 14.2 Changes to the October 22, 1999 version to make the November 1, 1999 version

1485 The following changes to the October 22, 1999 version to make the November 1, 1999 version as a result of
1486 the IPP WG meeting in Durham, 10/99:

1487 1. Removed the Reset-Printer, Non-Process-Run-Out, and Space-Current-Job operations from this Set2
1488   spec and moved them to a new Set3 spec for use with the new Device object, renaming them
1489   appropriately, to Reset-Device, Non-Process-Run-Out-Device, and Space-Device.

1490 2. Added the concept of parent and subordinate Printer objects to formally represent fan-out. Mentioned
1491   the Device object that is in a new [ipp-set3] spec.

1492 3. Distributed the definition of the "when" operation attribute to the Pause-Printer (IPP/1.1), Shutdown-
1493   Printer, and Pause-Current-Job operations and listed the values that are appropriate to that operation
1494   only:
1495   Pause-Printer: 'now', 'after-current-copy', 'after-current-job' (default), and 'after-all'.
1496   Shutdown-Printer: 'now', 'after-current-job' (default), and 'after-all'
1497   Pause-Current-Job: 'now', 'after-current-copy' (default)

1498 4. Deleted the "device-name" operation attribute and the "device-names-supported" (1setOf name(127))
1499   Printer Description attribute. The latter will be part of the [ipp-set3] document.

1500 5. Kept the "job-settable-attributes" (1setOf type2 keyword) and "printer-settable-attributes" (1setOf type2
1501   keyword), but deleted the "interpreter-settable-attributes (1setOf type2 keyword), since the Interpreter
1502   object and its attributes are really a sub-class of the Printer object.

1503 6. Deleted the "when-values-supported" (1setOf type2 keyword) Printer Description attribute.

1504 7. Added the "subordinate-printers-supported" (1setOf uri) Printer Description attribute.

1505 14.3 Changes to the September 19, 1999 version to make the October 22, 1999 version

1506 Adding or removing ISSUES that don't change the document are not listed here. The following changes to
1507 the September 19, 1999 version to make the October 22, 1999 version as a result of the IPP WG meeting in
1508 Denver, 9/99:

1509 1. Added the Interpreter object.

2. Added the "device-name" operation attribute to handle passing operations through the IPP Printer object to the device.

3. Added the out-of-band 'not-settable' to allow the Set-Job-Attributes and Set-Printer-Attributes response to indicate the difference between an unsupported attribute and a supported, but not settable, attribute in the Unsupported Attributes Group.

4. Removed "when-values-supported" and "job-settable-attributes" and "printer-settable-attributes" and "interpreter-settable-attributes" from the list of attributes that MUST be read-only. So an administrator could sub-set the policy on what when values are supported or which attributes can be set.

14.4 Changes to the July 19, 1999 version to make the September 19, 1999 version

The following changes to the July 19, 1999 version to make the September 19, 1999 version as a result of the IPP WG meeting in Alaska, 8/99:

1. Refer to proposal as "Set2" rather than "Administrative" operations.

2. Revise the emphasis on administrator throughout the document, although the word administrator remains wherever appropriate.

3. Convert non-process-run-out from an operations attribute to an operation.

4. Added Issue 21: For all these "access" caveats, why not just say... 'authentication and access control (see ipp-mod sections 1, 8.3 and 8.5) applies to this operation".?

5. Added Issue 22: Why? This is backward, if you ask me (HRL).

6. Per resolution of Issue 2, the "settable-attributes" Printer Description attribute, was replaced with three Printer Description attributes: "printer-settable-attributes", "job-settable-attributes", and "interpreter-settable-attributes". The latter for those implementations that have different values for Printer attributes in the Get-Printer-Attributes and Set-Printer-Attributes operations, depending on the value of the "document-format" operation attribute supplied by the client. If and when we get a Document object, then we can add a "document-settable-attributes" Printer Description attribute.

14.5 Changes to the June 30, 1999 version to make the July 19, 1999 version

The following changes to the June 30, 1999 version to make the July 19, 1999 version as a result of the IPP WG meeting in Copenhagen, 7/7/99-7/8/99, and the IPP telecon, 7/14/1999:

1. Sections 2.1 and 2.2: Clarified that the way to remove a message from the operator was for the client to supply a zero-length or all white space text string which is copied as usual to the "xxx-message-from-operator" attribute.

2. Section 2.3: Added "factory-settings" (boolean) operation attribute to the Get-Printer-Attributes operation.

3. Section 2.4: Added the "when" operation attribute to the Pause-Current-Job operation.

4. Section 2.4: Made the "when" operation attribute OPTIONAL for use in operations (Pause-Printer, Reset-Printer, Shutdown-Printer, and Pause-Current-Job operations).

5. Sections 2.5: Added table of operation attributes for the Printer operations to make it easy to compare.

6. Sections 2.6: Added table of operation attributes for the Job operations to make it easy to compare.

7. Section 3.1: Added "settable-attributes" (1setOf type2 keyword) READ-ONLY Printer Description attribute.

8. Section 3.2: Added "printer-controls-other-protocols" (boolean) Printer Description attribute

9. Section 3.3: Added the READ-ONLY "printer-message-time" (integer(MIN:MAX)) Printer Description attribute to keep time message updated in time ticks.

10. Section 4.2: Deleted the 'process-next' "job-state-reasons" value, so that repeated Promote-Job operations promote each job "to the front of the queue".

11. Sections 6.1.1.1 and 6.2.1.1: Replaced the table that listed all attributes with one that lists only the attributes that MUST be READ-ONLY.

12. Section 6.1.1.1: Indicated that attributes that are not specified as READ-ONLY in this document MAY be settable. If they control behavior, that changing their values MUST change the behavior.

13. Section 6.1.1.2 and 6.2.1.2: Deleted the "ipp-attribute-fidelity" operation attribute from the Set-Printer-Attributes and Set-Job-Attributes operations. All set operations are atomic.

14. Section 6.1.1.2: Add the concept of the Interpreter object to handle attributes whose values vary in the Set-Printer-Attributes and Get-Printer-Attributes, depending on the value of the "document-format" operation attribute.

15. Sections 6.1.1.3 and 6.2.1.2: Changed the "out-of-band" 'not-settable' value back to the existing 'not-supported' value.

16. Section 6.1.2 and 6.1.3: Added "job-type" operation attribute to Disable-Printer and Enable-Printer operations with values: 'network-jobs', 'walk-up-jobs', and 'all-jobs'.

17. Section 6.1.5: Clarified that Restart-Printer brings up the Printer disabled and paused, since that is the eventual state that Shutdown-Printer leaves the printer in.

18. Section 6.1.5: Indicated that if Restart-Printer is supported, then Shutdown-Printer MUST be supported.

19. Section 6.1.6: Deleted Space-Printer operation. Keep Space-Current-Job operation only which has a "job-id" operation attribute that a client MAY supply.

20. Section 6.1.6: Clarified that Shutdown-Printer is for a long period of time, not just to reset the device or change attribute values. Also that Shutdown performs an immediate Disable-Printer and an eventual Pause-Printer.

21. Sections 6.2.3, 6.2.4, and 6.2.7 : Added a "job-id" operation attribute to Cancel-Current-Job, Pause-Current-Job, and Space-Current-Job that a client MAY supply to check for race condition where current job changes

22. Section 6.2.4: Combined Pause-Job into Pause-Current-Job operation.

23. Sections 6.2.4 and 6.2.5: Pause-Current-Job puts job in 'processing-stopped' state, not 'pending-held' state.

24. Section 6.2.6: Simplified Promote-Job, so that it behaves as if the job were put at the front of the queue.

15   Appendix A: Full Copyright Statement