INTERNET-DRAFT <mark>- 17 ISSUES are numbered and highlighted like this</mark>   Carl Kugler
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Internet Printing Protocol/1.1: Set2 Operations

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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

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

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

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

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

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

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

55 This document is intended for registration following the registration procedures of IPP/1.0 [RFC2566] and
56 IPP/1.1 [ipp-mod]. This version includes the comments discussed at the IPP telecon, on 6/23/1999,
57 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
58 August, 1999 IPP meeting in Alaska and subsequent phone conferences and discussions. Specifically, the
59 9/16 update refers to this set of extensions simply as "Set2" rather than using the term "Administrative"
60 which was misleading, controversial and incorrect as an overall description. Also, two new attributes have
61 been proposed to clarify the intent of each operation in terms of its target, the Printer vs. the Print Job.
62 Unresolved ISSUES are highlighted like this in the .doc and .pdf files.

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63   The full set of IPP documents includes:
64   Design Goals for an Internet Printing Protocol [RFC2567]
65   Rationale for the Structure and Model and Protocol for the Internet Printing Protocol [RFC2568]
66   Internet Printing Protocol/1.1: Model and Semantics (this document)
67   Internet Printing Protocol/1.1: Encoding and Transport [IPP-PRO]
68   Internet Printing Protocol/1.1: Implementer's Guide [IPP-IIG]
69   Mapping between LPD and IPP Protocols [RFC2569]
70

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

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

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

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

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

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1   Introduction

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

2   New objects and new relationships of existing objects

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

2.1   Interpreter object

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

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

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

Note: The Interpreter object is really a sub-class of the Printer object, rather than being a full fledged object in the sense that the Job and Printer objects are. There are no operations defined solely for the Interpreter object. The Get-Printer-Attributes and Set-Printer-Attributes operations operate on the Interpreter object if 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 a specific output device when there was fan-out. This specification generalizes the semantics of the
211 Printer object to represent such "subordinate" fan-out output devices as IPP Printer objects. This concept is
212 called "Printer object fan-out". A Printer object that has a subordinate Printer object is called a "non-leaf"
213 Printer object. Thus a "non-leaf" Printer object MAY support one or more subordinate Printer objects in
214 order to represent Printer object fan-out. A Printer object that does not have any subordinate Printer objects
215 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 The 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 non-leaf Printer object MUST support this Printer Description attribute. A leaf Printer
243   object either does not support the "subordinate-printers-supported" attribute or does so with the 'no-
244   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

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

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

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

266 2.2.4   Printer object attributes used to represent output device fan-out

267 When a Printer object is a non-leaf, it MUST NOT have an associated output device. Only leaf IPP Printer
268 objects are allowed to have one or more associated output devices. Each leaf Printer object MAY support
269 the "output-devices-supported" (1setOf name(127)) to indicate the user-friendly name(s) of the output
270 device(s) that the leaf Printer object represents. It is RECOMMENDED that each leaf Printer object have
271 only one associated output device, so that the individual output devices can be represented completely and

272   controlled completely by clients. In other words, the Printer's "output-devices-supported" attribute
273   SHOULD have only one value.

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275   2.2.5   Figures to show all possible configurations

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

279   ----> indicates a network protocol with the direction of its requests
280
281   ##### indicates a Printer object which is either:
282   - embedded in an output device or
283   - hosted in a server. The Printer object
284   might or might not be capable of queuing/spooling.
285
286   any   indicates any network protocol or direct
287   connect, including IPP

```
288                                                       output device
289                                                  +---------------+
290                                                  |  ##########   |
291     O    +--------+                              |  # (leaf)  #  |
292    /|\   | client |------------IPP-------------->#  Printer  #  |
293    / \   +--------+                              |  # Object   # |
294                                                  |  ##########   |
295                                                  +---------------+
```
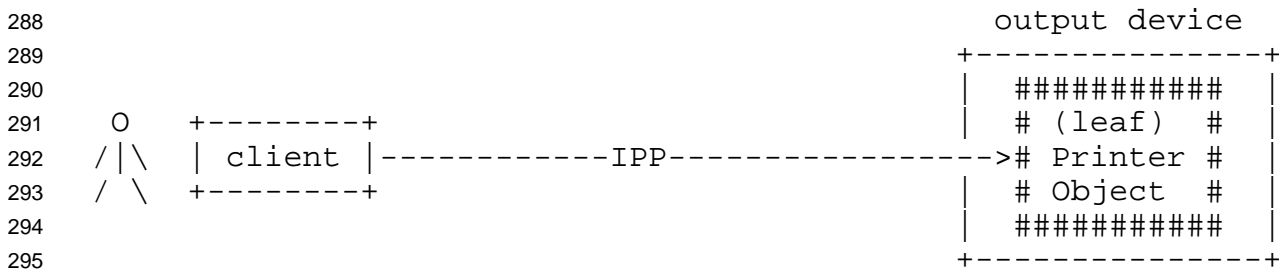
296   **Figure 1 - embedded Printer object**

```
297
298                                ##########        output device
299     O    +--------+           # (leaf)  #       +---------------+
300    /|\   | client |---IPP---># Printer #---any->|               |
301    / \   +--------+           # object   #       |               |
302                                ##########         +---------------+
303
```
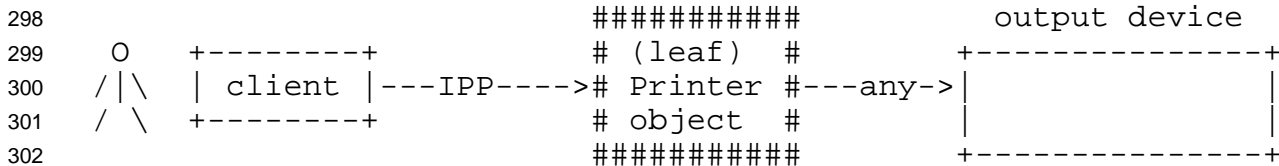
304   **Figure 2 - hosted Printer object**

```
305
306                                                  +---------------+
307                                                  |               |
308                                            +->|  output device |
309                                ########## any/   |               |
310     O    +--------+           # (leaf)  #   /    +---------------+
311    /|\   | client |---IPP---># Printer #--*
312    / \   +--------+           # Object   #   \    +---------------+
313                                ########## any\   |               |
314                                            +->|  output device |
315                                                  |               |
316                                                  +---------------+
```
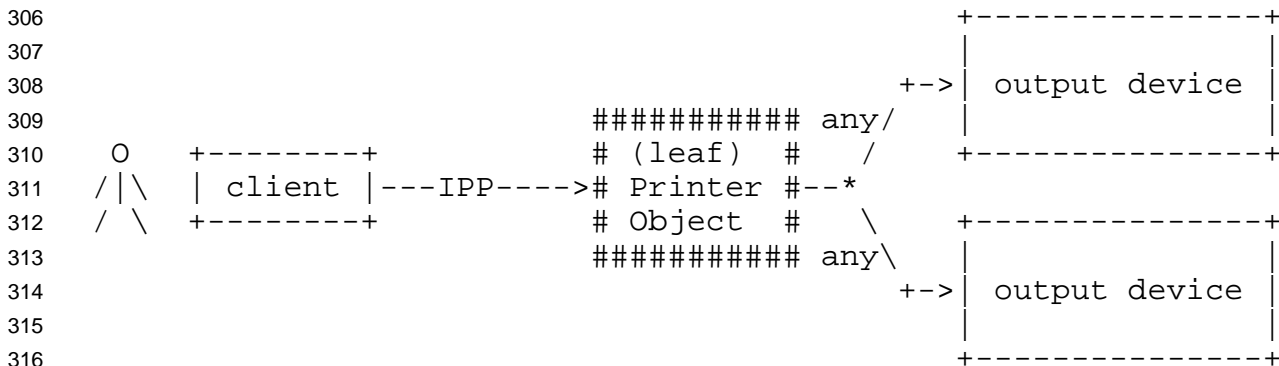
317   **Figure 3 - output device fan out**
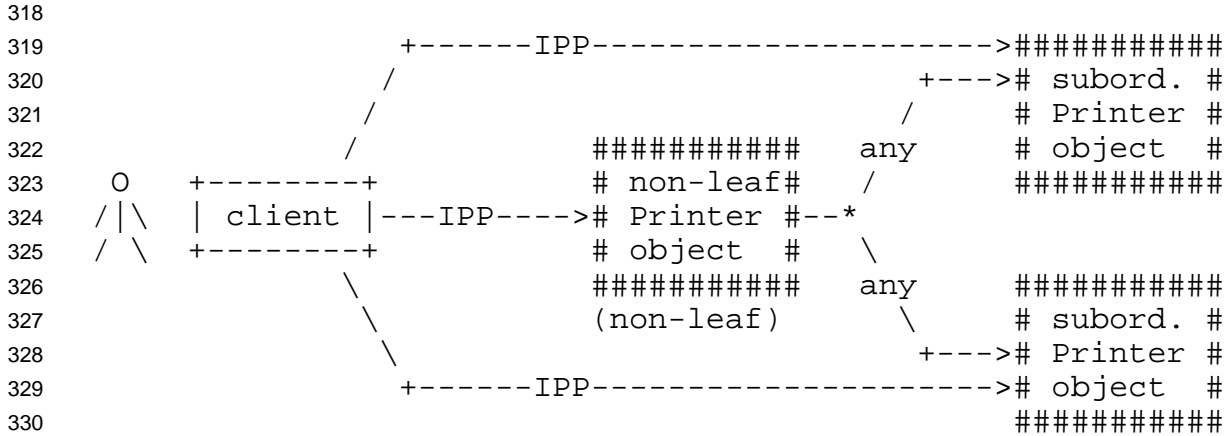
                                Expires: May 16, 2000

318
319   +------IPP--------------------->##########
320   /   +---># subord. #
321   /   /   # Printer #
322   /   ##########   any   # object #
323   O   +--------+   # non-leaf#   /   ##########
324   /|\ | client |---IPP----># Printer #--*
325   / \   +--------+   # object #   \
326   \   ##########   any   ##########
327   \   (non-leaf)   \   # subord. #
328   \   +---># Printer #
329   +------IPP---------------------># object #
330   ##########
331
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
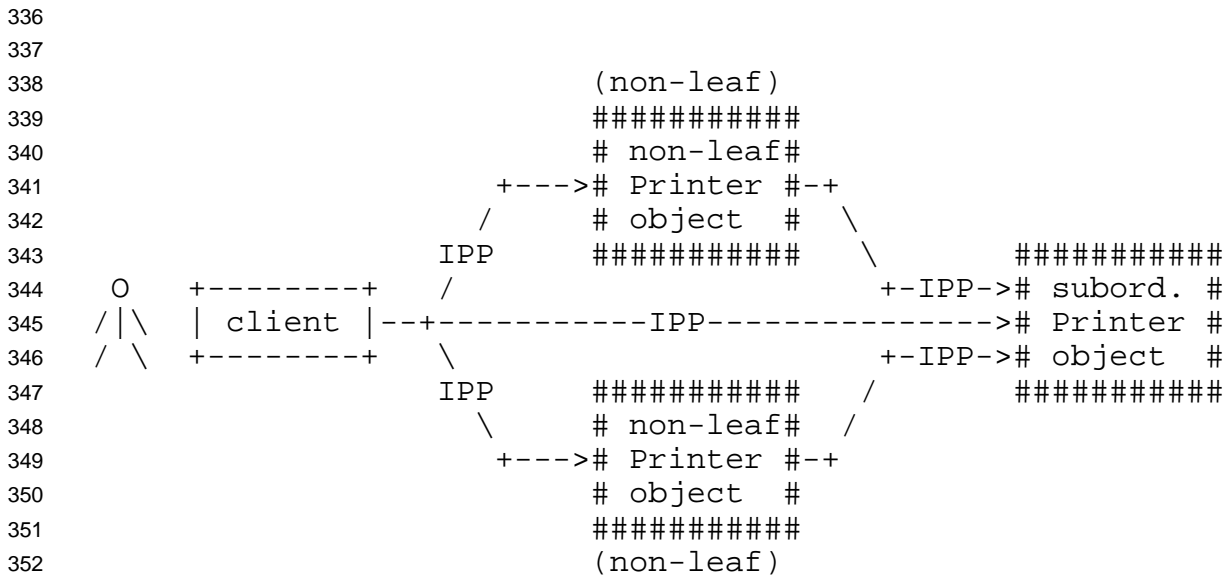
336
337
338   (non-leaf)
339   ##########
340   # non-leaf#
341   +---># Printer #-+
342   /   # object # \
343   IPP   ##########   \   ##########
344   O   +--------+   /   +-IPP-># subord. #
345   /|\ | client |--+----------IPP--------------># Printer #
346   / \   +--------+   \   +-IPP-># object #
347   IPP   ##########   /   ##########
348   \   # non-leaf# /
349   +---># Printer #-+
350   # object #
351   ##########
352   (non-leaf)
353
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

358

2.3   Forwarding requests

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

361   2.3.1   Forwarding requests that affect Printer objects

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

367   **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

368

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

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

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

381   2.3.2   Forwarding requests that affect Jobs

382   Unlike Printer operations that only affect Printer objects (see section 2.3.1, a non-leaf Printer object MUST
383   forward operations that directly affect jobs to the appropriate Job object(s) in one or more of its immediate
384   subordinate Printer objects. Such forwarding MAY be immediate or queued, depending on the operation
385   and the implementation. For example, a non-leaf Printer object MAY queue/spool jobs, feeding a job at a
386   time to its subordinate Printer(s), or MAY forward jobs immediately to one of its subordinate Printers. In

387 either case, the non-leaf Printer object is forwarding Job Creation operations to one of its subordinate
388 Printers. Only the time of forwarding of the Job Creation operations depends on whether the policy is to
389 queue/spool jobs in the non-leaf Printer or the subordinate Printer.

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

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

397 **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

398 <mark>ISSUE 04 : Do we want to define whether the response to the client for Job operations can happen before</mark>
399 <mark>the non-leaf Printer gets the response from its subordinate Printer or MUST the non-leaf Printer wait until</mark>
400 <mark>its gets the response from its subordinate Printer?</mark>

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

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

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

412 <mark>ISSUE 05 - The "requesting-user-name" operation attribute is the parent Printer's host, not the original</mark>
413 <mark>requesting user, correct?)</mark>

414 <mark>ISSUE 06 - Presumably the "job-originating-user-name" remains as the authenticated original user, not the</mark>
415 <mark>parent Printer's authenticated host, correct?</mark>

416 ## 3   New Operation attributes

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

419 ### 3.1   New operation attribute: "printer-message-from-operator" (text(127))

420 Type of registration: attribute
421 Proposed keyword name of this attribute: "printer-message-from-operator"
422 Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation
423 Operations to be used with if the attribute is an operation attribute: See below
424 Object (Job, Printer, etc. if bound to an object):   Printer (already in IPP/1.0 and IPP/1.1)
425 Attribute syntax(es) (include 1setOf and range as in Section 4.2): text(127)
426
427 Specification of this attribute (follow the style of IPP Model Section 4.2):
428
429 "printer-message-from-operator" (text(127))
430   The client OPTIONALLY supplies this attribute. The Printer object SHOULD supports this
431   operation attribute if it supports the corresponding Printer Description attribute. The value of this
432   attribute is a message from the operator about the Printer object on which the operator is performing
433   the operation. If supported, the Printer copies the value to the Printer's "printer-message-from-

434   operator" Printer Description attribute (see [ipp-mod] section 4.4.25), automatically sets the value of
435   the Printer's "printer-message-time" with the current value of the Printer's "printer-up-time"
436   attribute, the value of the "printer-message-date-time" with the current value of the Printer's printer-
437   current-date-time" attribute, and the value of the Printer's "printer-message-operation" with the
438   operation-id value of this operation (see [ipp-mod] section 4.4.15).

439

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

443

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

449

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

451   Pause-Printer - see [ipp-mod] section 3.2.7
452   Resume-Printer - see [ipp-mod] section 3.2.8
453   Purge-Jobs - see [ipp-mod] section 3.2.9
454   Disable-Printer - see section 8.1.2
455   Enable-Printer - see section 8.1.3
456   Restart-Printer - see section 8.1.4
457   Shutdown-Printer - see section 8.1.5

458

459   The "printer-message-from-operator" operation attribute MUST NOT be supported as an operation attribute
460   for the Set-Printer-Attributes operation. If the operator wants to set the Printer's "printer-message-from-
461   operator" Printer Description attribute when issuing the Set-Printer-Attributes operation, the client supplies
462   the "printer-message-from-operator" with its new value as one of the Printer Description attributes in Group
463   2 in the request. The Printer also updates the Printer's "printer-message-date-time" and "printer-message-
464   operation" Printer Description attributes. If the client does not explicitly supply the "printer-message-from-
465   operator" with its new value, the Printer leaves the value of the Printer's "printer-message-from-operator"
466   Printer Description attribute unchanged.

467   3.2   New operation attribute: "job-message-from-operator" (text(127))

468   Type of registration: attribute
469   Proposed keyword name of this attribute: "job-message-from-operator"
470   Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation
471   Operations to be used with if the attribute is an operation attribute: See below
472   Object (Job, Printer, etc. if bound to an object):   Job (already in IPP/1.0 and IPP/1.1)
473   Attribute syntax(es) (include 1setOf and range as in Section 4.2): text(127)

474

475 Specification of this attribute (follow the style of IPP Model Section 4.2):
476
477 "job-message-from-operator" (text(127))
478   The client OPTIONALLY supplies this attribute. The Printer object SHOULD supports this
479   operation attribute if it supports the corresponding Job Description attribute. The value of this
480   attribute is a message from the operator about the Job object on which the operator has just
481   performed an operation. If supported, the Printer copies the value to the Job's "job-message-from-
482   operator" Job Description attribute (see [ipp-mod] section 4.3.16).
483
484   If the client omits this attribute, the Printer does not change the value of its "printer-message-from-
485   operator" Job Description attribute.
486
487   If the client supplies this attribute with a zero-length text value or with a value consisting solely of
488   white space, the Printer copies that value as any other value to the job's "job-message-from-
489   operator". Supplying such a value is the way that the operator indicates that there is no longer a job
490   message from the operator (rather than using the "out-of-band" 'no-value' value).
491
492   Note: There are no corresponding 'job-message-time", "job-message-date-time", and "job-message-
493   operation" Job Description attributes, since the usual lifetime of a job is limited.
494
495 This operation attribute is defined for use with the following operator operations on the Job object:

496   Cancel-Job - see [ipp-mod] section 3.2.4
497   Hold-Job - see [ipp-mod] section 3.3.5
498   Release-Job - see [ipp-mod] section 3.3.6
499   Restart-Job - see [ipp-mod] section 3.3.7
500   Reprocess-Job - see section 8.2.2
501   Cancel-Current-Job - see section 8.2.3
502   Pause-Current-Job - see section 8.2.4
503   Resume-Job - see section 8.2.5
504   Promote-Job - see section 8.2.6
505

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

512 3.3   New operation attribute for Get-Printer-Attributes: "factory-settings" (boolean)

513 Type of registration: attribute
514 Proposed keyword name of this attribute: "factory-settings"
515 Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation

516 Operations to be used with if the attribute is an operation attribute: Get-Printer-Attributes
517 Object (Job, Printer, etc. if bound to an object):   N/A
518 Attribute syntax(es) (include 1setOf and range as in Section 4.2): boolean
519
520 Specification of this attribute (follow the style of IPP Model Section 4.2):
521   "factory-settings" (boolean)
522   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
523   attribute, if it supports the Set-Printer-Attributes operation. If the client omits this attribute or
524   supplies the 'false' value, the Printer returns the current values of the requested attributes that are
525   settable, i.e., the values that have been set by previous Set-Printer-Attributes. If the client supplies
526   the 'true' value, the Printer returns the factory settings, i.e., the inherent values supported by the
527   implementation as shipped from the manufacturer or established at install time. This operation
528   attribute allows an operator to determine which values are supported in an implementation after
529   having modified a settable attribute. Attributes that are not settable are not affected by this
530   operation attribute, so that the Printer returns the same values for non-settable attribute when either
531   the 'true' or 'false' value has been supplied. If this operation attribute is supported, both 'true' and
532   'false' values MUST be supported.

533 3.4   New operation attribute for Pause-Printer: "when" (type2 keyword)

534 Type of registration: attribute
535 Proposed keyword name of this attribute: "when"
536 Types of attribute (Operation, Job Template, Job Description, Printer Description): Operation
537 Operations to be used with if the attribute is an operation attribute: Pause-Printer, Shutdown-Printer, and
538 Pause-Current-Job
539 Object (Job, Printer, etc. if bound to an object):   N/A
540 Attribute syntax(es) (include 1setOf and range as in Section 4.2): type2 keyword
541
542 Specification of this attribute (follow the style of IPP Model Section 4.2):
543   "when" (type2 keyword)
544   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
545   attribute, if it supports this operation. The value of this attribute indicates when to pause the printer.
546   If the client omits this attribute, the Printer assumes the 'now' value. The 'now' value is REQUIRED
547   to be supported if the "when" attribute is supported; the remaining values are OPTIONAL.
548   Note: There is no way to query to see which values of the "when" attribute are supported for this or
549   any other operation. Since this operation is intended for Operators, rather than End-Users, it did not
550   seem necessary to provide the means to query the supported values.
551
552   Standard keyword values are:
553   'now' - pause the Printer immediately, while the current job is processing. See [ipp-mod]
554   section 3.2.7) for the effect on the Printer's "printer-state" and "printer-state-reasons"
555   attributes. Jobs in the 'held' and 'pending' state remain in those states.
556   'after-current-copy' - pause the Printer after the current job finishes printing its current copy.
557   Jobs in the 'held' and 'pending' state remain in those states.

558   'after-current-job' - pause the Printer after the current job finishes printing (all its copies).
559   Jobs in the 'held' and 'pending' state remain in those states.
560   'after-all' - pause the Printer after all 'pending' jobs finish printing. Jobs in the 'held' state
561   remain in the 'held' state.

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

564 3.5   Summary of the operation attributes for the Printer operations

565 The following table shows the operation attributes for the Printer operations that a client MAY supply in a
566 request. Operation parameters and attributes that a client MUST supply are not shown. Also "requesting-
567 user-name" is not shown, though it is RECOMMENDED that a client supply it in every request.
568 Legend:
569   R - REQUIRED for a Printer to support
570   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		Shutdown-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

571 3.6   Summary of the operation attributes for the Job operations

572 The following table shows the operation attributes for the Job operations that a client MAY supply in a
573 request. Operation attributes that specify the Printer or Job object as the target are shown in the first two
574 rows, respectively. Other operation attributes and parameters that a client MUST supply are not shown.
575 Also "requesting-user-name" is not shown, though it is RECOMMENDED that a client supply it in every
576 request.
577 Legend:
578   R - REQUIRED for a Printer to support
579   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**	

⁵⁸⁰ *   The Printer MUST support the "job-hold-until" operation attribute if it supports the "job-hold-until" Job
⁵⁸¹ Template attribute.

⁵⁸² ** The Printer MUST support the "job-hold-until" operation attribute if it supports the Set-Job-Attributes
⁵⁸³ operation, so that the client can hold the job with the Reprocess-Job operation and the modify the job before
⁵⁸⁴ releasing it to be processed.

⁵⁸⁵ 4   New Printer Description Attributes

⁵⁸⁶ The following new Printer Description attributes are needed to support the new operations defined in this
⁵⁸⁷ document.

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

⁵⁸⁹ Type of registration: attribute
⁵⁹⁰ Proposed keyword name of this attribute: printer-settable-attributes
⁵⁹¹ Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
⁵⁹² Operations to be used with if the attribute is an operation attribute: N/A
⁵⁹³ Object (Job, Printer, etc. if bound to an object): Printer
⁵⁹⁴ Attribute syntax(es) (include 1setOf and range as in Section 4.2): 1setOf type2 keyword
⁵⁹⁵ If attribute syntax is 'keyword' or 'enum', is it type2 or type3: type2
⁵⁹⁶ If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): Yes
⁵⁹⁷ If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
⁵⁹⁸ document-handling" attribute: N/A
⁵⁹⁹ Specification of this attribute (follow the style of IPP Model Section 4.2):

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

⁶⁰¹ This READ-ONLY Printer attribute identifies the Printer object attributes that are settable in this
⁶⁰² implementation, i.e., that are settable using the Set-Printer-Attributes operations. This attribute MUST be
⁶⁰³ supported if the Set-Printer-Attributes operations is supported. The Printer MUST reject attempts to set any
⁶⁰⁴ Printer attributes that are not in this list, returning the 'client-error-attributes-not-settable' status code (see
⁶⁰⁵ section 6.1). The value of this attribute MAY depend on the value of the "document-format" operation
⁶⁰⁶ attribute supplied in the Get-Printer-Attributes operation (see [ipp-mod] section 3.2.5.1).

607   4.2   job-settable-attributes (1setOf type2 keyword)

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

619   4.4.? job-settable-attributes (1setOf type2 keyword)

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

625   4.3   printer-controls-other-protocols (boolean)

626   Type of registration: attribute
627   Proposed keyword name of this attribute: printer-controls-other-protocols
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): boolean
632   If attribute syntax is 'keyword' or 'enum', is it type2 or type3: N/A
633   If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): No
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.? printer-controls-other-protocols (boolean)

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

642   A 'false' value indicates that IPP operations only affect jobs submitted by the IPP Protocol. For example, a
643   'true' value indicates that a Disable-Printer operation prevents all protocols from submitting jobs, not just
644   the IPP protocol. A 'true' value indicates that the Pause-Printer operation would pause the current job, no

645 matter what job submission protocol had submitted it. A 'true' value indicates that the Cancel-Job operation
646 will cancel the specified job even if it was submitted using a different job submission protocol, such as
647 LPR.

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

652 4.4   printer-message-time (integer(MIN:MAX))

653 Type of registration: attribute
654 Proposed keyword name of this attribute: printer-message-time
655 Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
656 Operations to be used with if the attribute is an operation attribute: N/A
657 Object (Job, Printer, etc. if bound to an object): Printer
658 Attribute syntax(es) (include 1setOf and range as in Section 4.2): integer(MIN:MAX)
659 If attribute syntax is 'keyword' or 'enum', is it type2 or type3: N/A
660 If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): No
661 If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
662 document-handling" attribute: N/A
663 Specification of this attribute (follow the style of IPP Model Section 4.2):

664 4.4.? printer-message-time (integer(MIN:MAX))

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

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

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

676 4.5   printer-message-date-time (dateTime)

677 Type of registration: attribute
678 Proposed keyword name of this attribute: printer-message-date-time
679 Types of attribute (Operation, Job Template, Job Description, Printer Description): Printer Description
680 Operations to be used with if the attribute is an operation attribute: N/A
681 Object (Job, Printer, etc. if bound to an object): Printer

682 Attribute syntax(es) (include 1setOf and range as in Section 4.2): dateTime
683 If attribute syntax is 'keyword' or 'enum', is it type2 or type3: N/A
684 If this is a Printer attribute, MAY the value returned depend on "document-format" (See Section 6.2): No
685 If this is a Job Template attribute, how does its specification depend on the value of the "multiple-
686 document-handling" attribute: N/A
687 Specification of this attribute (follow the style of IPP Model Section 4.2):

688 4.4.? printer-message-date-time (dateTime)

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

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

697 4.6   printer-message-operation (type2 keyword)

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

709 4.4.? printer-message-operation (type2 enum)

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

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

716   4.7   subordinate-printers-supported (1setOf uri)

717   This Printer attribute is REQUIRED if an implementation supports subordinate Printers (see section 2.2)
718   and contains the URIs of the immediate subordinate Printer object(s) associated with this Printer object.

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

720   If the Printer object does not have an associated Device object (see [ipp-set3]), the value of the subordinate
721   Printer object's "printer-name" MAY be used to populate the Job object's "output-device-assigned"
722   attribute (see [ipp-mod] section 4.3.13). The "output-device-assigned" Job attribute identifies the output
723   device to which the Printer object has assigned a job, for example, when a single Printer object is
724   supporting fan-out.

725   5   Additional values for "printer-state-reasons" and "job-state-reasons" attributes

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

728   5.1   Value for "printer-state-reasons": 'standby'

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

736   5.2   Value for "job-state-reasons": 'job-paused'

737   Type of registration: type2 keyword attribute value
738   Name of attribute to which this keyword specification is to be added: job-state-reasons
739   Proposed keyword name of this keyword value: job-paused
740   Specification of this keyword value (follow the style of IPP Model Section 4.1.2.3):
741   'job-paused': The job has been paused while processing using the Pause-Current-Job operations and
742   other jobs can be processed on the Printer. The Job can be resumed using the Resume-Job operation
743   which removes this value.
744

745   6   New status codes

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

747   6.1   New status code: 'client-error-attributes-not-settable'

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

754   13.1.4.20 client-error-attributes-not-settable (0x0413)

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

761   6.2   New status code: 'server-error-printer-is-in-standby-mode'

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

768   13.1.5.8 server-error-printer-is-in-standby-mode

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

772   7   New out-of-band values

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

775   7.1   'not-settable' out of band value

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

780   8   Summary of Set 2 operations and Operation-Id Assignments

781   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

782   All of the operations in this registration proposal specification are OPTIONAL for an IPP object to support.

783   Unless the specification of an OPTIONAL operation requires support of another OPTIONAL operation,

784   conforming implementations may support any combination of these operations.

785

8.1   Printer Operations

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

8.1.1   Set-Printer-Attributes Operation

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

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

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

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

8.1.1.1   Settable and READ-ONLY Printer Description attributes

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

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

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

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

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

817   printer-state
818   printer-state-reasons
819   printer-state-message
820   printer-is-accepting-jobs - see Enable-Printer/Disable-Printer
821   queued-job-count
822   printer-message-time - see Set-Printer-Attributes when setting "printer-message-from-operator"
823   printer-message-date-time - see Set-Printer-Attributes when setting "printer-message-from-operator"
824   printer-message-operation - see Set-Printer-Attributes when setting "printer-message-from-operator"
825   printer-up-time

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

831   For example, if the "operations-supported" Printer Description attribute (see [ipp-mod] section
832   4.4.15) is settable, then changing its value MUST affect the operations that the implementation
833   accepts or rejects. Such an implementation will need to be able to reject values for operations that it
834   contains no code support for.

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

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

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

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

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

850

851   8.1.1.2   Set-Printer-Attributes Request

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

853   Group 1: Operation Attributes

854   Natural Language and Character Set:
855   The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
856   section 3.1.4.1.
857
858   Target:
859   The "printer-uri" (uri) operation attribute which is the target for this operation as described in [ipp-
860   mod] section 3.1.5.
861
862   Requesting User Name:
863   The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
864   described in [ipp-mod] section 8.3.
865
866
867   "document-format" (mimeMediaType):
868   The client SHOULD supply this attribute. The Printer object MUST support this attribute. This
869   attribute is useful for a client to select the Interpreter object to which the attribute modification
870   should be applied. Each Printer object is modeled to contain one or more Interpreter objects. Those
871   Printer attributes whose values vary from Interpreter to Interpreter, are modeled as Interpreter
872   objects, while those that do not are Printer object attributes. Thus the target of a Get-Printer-
873   Attributes or Set-Printer-Attributes operation is either the Printer object or the Interpreter object
874   identified by the "document-format" operation attribute supplied by the client. Except for Get-
875   Printer-Attributes and Set-Printer-Attributes, there are no other operations with the Interpreter object
876   as a target. See [ipp-mod] section 3.2.5.1 "Get-Printer-Attributes Request".
877
878   If a client wants to set an attribute of all of the Interpreter objects to the same value, it can query the
879   Printer's "document-format-supported" Printer Description attribute and perform separate Set-
880   Printer-Attributes for each document format supported.
881
882   If the Printer object does not distinguish between different sets of supported values for each
883   different document format when validating jobs in the create and Validate-Job operations, it MUST
884   NOT distinguish between different document formats in the Set-Printer-Attributes operation. If the
885   Printer object does distinguish between different sets of supported values for each different
886   document format specified by the client, this specialization applies only to the same Printer
887   attributes as the Get-Printer-Attributes operation (see [ipp-mod] section 3.2.5.1).
888
889   If the client omits this "document-format" operation attribute, the Printer object MUST respond as if
890   the attribute had been supplied with the value of the Printer object's "document-format-default"

891 attribute. It is recommended that the client always supply a value for "document-format", since the
892 Printer object's "document-format-default" may be 'application/octet-stream', in which case the set
893 attributes and values are for the union of the document formats that the Printer can automatically
894 sense. For more details, see the description of the 'mimeMediaType' attribute syntax in [ipp-mod]
895 section 4.1.9.
896
897 If the client supplies a value for the "document-format" Operation attribute that is not supported by
898 the Printer, i.e., is not among the values of the Printer object's "document-format-supported"
899 attribute, the Printer object MUST reject the operation and return the 'client-error-document-format-
900 not-supported' status code.
901

902 Group 2: Printer Attributes

903 The client MUST supply a set of Printer attributes as defined in [ipp-mod] section 4.2 Job Template
904 Attributes ("xxx-default", "xxx-supported", and "xxx-ready" attributes) and section 4.4 Printer
905 Description Attributes. Each Printer attribute supplied in Group 2 replaces the value(s) of the
906 corresponding Printer attribute on the target Printer object. If a Printer object attribute had not been
907 configured yet and so had the 'no-value' out-of-band value (see [ipp-mod] 4.1), the supplied value(s)
908 replace the 'no-value' value. For attributes that can have multiple values (1setOf), all values
909 supplied by the client replace all values of the corresponding Printer object attribute.
910

911 8.1.1.3   Set-Printer-Attributes Response

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

913 Group 1: Operation Attributes

914 Status Message:
915 In addition to the REQUIRED status code returned in every response, the response OPTIONALLY
916 includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation
917 attribute as described in [ipp-mod] sections 13 and 3.1.6.
918
919 Natural Language and Character Set:
920 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
921 section 3.1.4.2.
922

923 Group 2: Unsupported Attributes

924 See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.
925
926 In the case of attributes that are supported, but are not settable by the implementation, i.e., are not
927 among the values of the Printer's "settable-attributes" Printer Description attribute (see section 4.1),
928 the Printer object returns the client-supplied attribute(s) with a substituted value of 'not-supported'
929 (same out-of-band value as for attributes that are not supported). This value's syntax type is "out-of-
930 band" and its encoding is defined by special rules for "out-of-band" values in the "Encoding and

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

933

934 8.1.2   Disable-Printer Operation

935 Type of registration: operation
936 Proposed name of this operation: Disable-Printer
937 Object Target: Printer
938 Specification of this operation:

939 This OPTIONAL operation allows a client to stop the Printer object from accepting jobs, i.e., cause the
940 Printer to reject subsequent create job operations (Print-Job, Print-URI, and Create-Job operation) and
941 return the 'server-error-not-accepting-jobs' status code. The Printer still accepts all other operations. All
942 previously submitted Jobs and currently processing Jobs continue unaffected. The Printer sets the value of
943 its "printer-is-accepting-jobs" READ-ONLY Printer Description attribute to 'false' (see [ipp-mod] section
944 4.4.20), no matter what the previous value was. This operation has no immediate effect on the Printer's
945 "printer-state" and "printer-state-reasons" attributes.

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

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

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

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

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

957 The Disable-Printer Request and Disable-Printer Response have the same attribute groups and attributes as
958 the Resume-Printer operation (see [ipp-mod] sections 3.2.7.1 and 3.2.7.2), including the new "printer-
959 message-from-operator" operation attribute (see section 3.1), and with the addition of the following Group
960 1 operation attribute in the request:

961   "job-type" (type2 keyword):
962   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
963   attribute. The value of this attribute indicates the type of job to be disabled. If the client omits this
964   attribute, the Printer assumes the 'network-jobs' value.
965
966   Standard keyword values are:
967   'network-jobs' - disable jobs submitted using the create job operations.
968   'walk-up-jobs' - disable jobs submitted locally, such as walkup copy jobs
969   'all-jobs' - disable all type of jobs

970

971 8.1.3   Enable-Printer Operation

972 Type of registration: operation
973 Proposed name of this operation: Enable-Printer
974 Object Target: Printer
975 Specification of this operation:

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

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

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

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

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

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

993 The Enable-Printer Request and Enable-Printer Response have the same attribute groups and attributes as
994 the Resume-Printer operation (see [ipp-mod] sections 3.2.8.1 and 3.2.8.2), including the new "printer-
995 message-from-operator" operation attribute (see section 3.1), and with the addition of the following Group
996 1 operation attribute in the request:

997   "job-type" (type2 keyword):
998   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
999   attribute. The value of this attribute indicates the type of job to be enabled. If the client omits this
1000   attribute, the Printer assumes the 'network-jobs' value.
1001
1002   Standard keyword values are:
1003   'network-jobs' - enable jobs submitted using the create job operations.
1004   'walk-up-jobs' - enable jobs submitted locally, such as walkup copy jobs
1005   'all-jobs' - enable all types of jobs

1006   8.1.4   Restart-Printer operation

1007   Type of registration: operation
1008   Proposed name of this operation: Restart-Printer
1009   Object Target: Printer
1010   Specification of this operation:

1011   This OPTIONAL operation allows a client to restart a Printer that has previously been shutdown in standby
1012   mode (see section 8.1.5). Standby mode is indicated by the Printer's "printer-state" being 'stopped' and its
1013   "printer-state-reasons" including the 'standby' and 'paused' values. If the Printer is not in standby mode, the
1014   Printer MUST reject this operation and return the 'client-error-not-possible' status code.

1015   ISSUE 08:   What state does the Printer comes back up on Restart-Printer and how can the client control?
1016   Possible alternatives:

1017   a. Restart-Printer always brings the Printer up Disabled ("printer-is-accepting-jobs" = 'false') and
1018   Paused ("printer-state" = 'stopped', and "printer-state-reasons" = 'paused') which is the state that
1019   Shutdown-Printer leaves the Printer in. Then the operator issues Enable-Printer and Resume-Printer
1020   when want to restore normal operation. The client can automatically issues these addition 2
1021   operations depending on GUI options. Advantages: This is the simplest to implement, allows new
1022   states to be added without changing the Restart-Printer operation, and can have the same GUI
1023   interface as b:

1024   b. Add a REQUIRED operation attribute to Restart-Printer, something like "printer-condition" with
1025   values: 'disabled-and-paused', 'enabled-and-paused', and 'enabled-and-idle'.

1026   DENVER MEETING> There was significant confusion as to the meaning of shutdown. If a shutdown
1027   operation halts communications to the printer a restart is not possible. It was agreed to include restart
1028   attributes 'restart-to-standby' (requires a two step process), 'restart-fully', and 'restart-sync'.

1029   ACTION ITEM (Harry Lewis): make a complete proposal and submit for approval.

1030   If the Restart-Printer operation is supported, then the Shutdown-Printer operation MUST be supported,
1031   since the Restart-Printer operation is meaningful only after a Shutdown-Printer operation has been
1032   performed. However, if the Shutdown-Printer operation is supported, the Restart-Printer NEED NOT be
1033   supported.

1034   Issue 09: Why? This is backward, if you ask me (HRL).

1035   Denver meeting> Consider "shutdown-attributes" similar to Windows "shutdown". Like:

1036   –   Completely power off (walk to printer to bring it back up
1037   –   Power off but listen for "restart" - shutdown to standby

1038   Denver meeting> Also consider restart attributes.

1039   –   Restart to Standby (disabled and paused) (two step bring up)
1040   –   Restart (fully).
1041   –   Restart sych

1042 *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1043 operation.

1044 The Restart-Printer Request and Restart-Printer Response have the same attribute groups and attributes as
1045 the Resume-Printer operation (see [ipp-mod] sections 3.2.8.1 and 3.2.8.2), including the new "printer-
1046 message-from-operator" operation attribute (see section 3.1) and the following Group 1 operation attribute:

1047

1048   8.1.5   Shutdown-Printer Operation

1049   Type of registration: operation
1050   Proposed name of this operation: Shutdown-Printer
1051   Object Target: Printer
1052   Specification of this operation:

1053   This OPTIONAL operation allows a client to shutdown a Printer, i.e., stop processing jobs and power off in
1054   some implementation-dependent manner. The purpose of Shutdown-Printer is to shutdown the Printer for
1055   an extended period, not to reset the device(s) or modify a Printer attribute. See Reset-Device [ipp-set3] for
1056   the way to reset the device(s). See the Disable-Printer operation (section 8.1.2) for a way for the client to
1057   stop the Printer from accepting Job Creation requests without stopping processing or shutting down.

1058   The Printer is disabled immediately (see the Disable-Printer operation in section 8.1.2). The Printer adds
1059   the 'shutdown' value (see [ipp-mod] section 4.4.11) to its "printer-state-reasons" Printer Description
1060   attribute. The "when" operation attribute specifies how much processing occurs before the Printer is paused
1061   (see [ipp-mod] section 3.2.7) and the shutdown is complete. All other requests continue to be accepted
1062   until the printer is powered down.

1063   ISSUE 10 - Need to look at life cycle of the Printer versus standby/power-down and the other operations
1064   that can be accepted. There can be appreciable time between acceptance of this operation and when the
1065   final state of the printer, either standby or powered down is reached. Is it ok for non-submission operations
1066   to continue to be accepted during this time? May need 'moving-to-shutdown'. What about 'moving-to-
1067   standby'?

1068   TH> Add 'moving-to-shutdown' which the Shutdown-Printer sets
1069   immediately (analogous to 'moving-to-paused'). Then the 'shutdown'
1070   values means that the shutdown has completed (and is only meaningful to
1071   a server implementation that hosts the Printer object). Thus the server
1072   can still respond to a Get-Printer-Attributes operation after the
1073   Printer is shutdown as stated in IPP/1.1.

1075   HRL> Is this granularity really achievable enough of a wide enough
1076   variety of environments to be reliable or, in reality, will this be
1077   implementation dependent?

1078   Whether or not the Shutdown-Printer operation affects jobs that were submitted to the device using job
1079   submission protocols other than IPP, depends on implementation, i.e., on whether the IPP protocol is being
1080   used as a universal management protocol or just to manage IPP jobs, respectively. See "printer-controls-
1081   other-protocols" (section 4.3).

1082   The Printer object MUST accept this operation in any state and transition the Printer object to the 'idle'
1083   state.

1084   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1085   operation.

1086   The Shutdown-Printer Request and Shutdown-Printer Response have the same attribute groups and
1087   attributes as the Pause-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 attributes in the request:

"when" (type2 keyword)

The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this attribute, if it supports this operation. The value of this attribute indicates when to pause the printer. If the client omits this attribute, the Printer assumes the 'after-current-job' value. The 'after-current-job' value is REQUIRED to be supported if the "when" attribute is supported; the remaining values are OPTIONAL.

Note: There is no way to query to see which values of the "when" attribute are supported for this or any other operation. Since this operation is intended for Operators, rather than End-Users, it did not seem necessary to provide the means to query the supported values.

Standard keyword values are:

'now' - cancel the currently printing job(s) and shutdown the Printer. Jobs in the 'held' and 'pending' state remain in those states.

'after-current-job' - shutdown the Printer after the current job finishes printing (all its copies). Jobs in the 'held' and 'pending' state remain in those states.

'after-all' - shutdown the Printer after all 'pending' jobs finish printing. Jobs in the 'held' state remain in the 'held' state.

ISSUE 11 - Ok to remove the 'after-current-copy' value from Shutdown-Printer?

ISSUE 12 - Ok to have removed the "shutdown-function" operation attribute with values 'stand-by' vs. 'power-off' Shutdown-Printer on the grounds that for the Printer object they have no meaning. Power-off is for the Shutdown-Device operation.

"synchronize" (boolean)

The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this attribute. This attribute indicates whether or not the printer is to synchronize the checkpoint data for the current job ("when" = 'now') with the pages that have actually printed. If the value of the "when" attribute is not 'now' or the "when" attribute is not supplied, then the "synchronize" attribute has no meaning and the Printer MUST ignore it. If this attribute is supported, then a value of 'true' implies that the Printer will be able to resume the job at the point of synchronization when the Printer is restarted. If the implementation does not support resuming a job (either automatically or with the Resume-Job operation) after a Shutdown-Printer with "when" = 'now', then it does not implement this attribute. In this case, check-pointing implies that the job may be resumed in the future, exactly from the point and in the state and resource context from which it left off.

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

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

1132

8.2 Job Operations

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

8.2.1 Set-Job-Attributes

Type of registration: operation
Proposed name of this operation: Set-Job-Attributes
Object Target: Job
Specification of this operation:

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

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

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

The IPP object MUST accept or reject the request based on the job's current state and transition the job to 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'

1157 8.2.1.1   Settable and READ-ONLY Job Description attributes

1158 If the Printer supports the "job-message-from-operator" Job Description attribute (see [ipp-mod] section
1159 4.3.16) and the client explicitly supplies a new value for the "job-message-from-operator" in the request,
1160 then the Printer MUST set the "job-message-from-operator" Job attribute to this new value.

1161 If the Printer supports the Set-Job-Attributes operation, then it SHOULD support setting of:

1162   all Job Template ("xxx") attributes (see [ipp-mod] section 4.2 and extensions)

1163 that the implementation supports.

1164 The following Job Description attributes (see [ipp-mod] section 4.3) MUST NOT be settable, i.e., they are
1165 READ-ONLY:

```
1166        job-uri
1167        job-id
1168        job-printer-uri
1169        job-more-info
1170        job-originating-user-name - set in create operation
1171        job-state
1172        job-state-reasons
1173        job-state-message
1174        number-of-documents
1175        output-device-assigned
1176        time-at-creation
1177        time-at-processing
1178        time-at-completed
1179        job-printer-up-time
1180        date-time-at-creation
1181        date-time-at-processing
1182        date-time-at-completed
1183        number-of-intervening-jobs
1184        job-k-octets
1185        job-k-octets-processed
1186        job-impressions-completed
1187        job-media-sheets-completed
1188        attributes-charset - set in Job Creation operation
1189        attributes-natural-language - set in Job Creation operation
```

1190   The following Set2 Job Description attributes are READ-ONLY:

1191   original-requesting-user-name - set in Job Creation operation

1192   The remaining Job Description attributes MAY be settable using the Set-Job-Attributes operation,
1193   depending on implementation.

1194   Whether or not the Set-Job-Attributes operation affects jobs that are submitted using job submission
1195   protocols other than IPP, depends on implementation, i.e., on whether the IPP protocol is being used as a
1196   universal management protocol or just to manage IPP jobs, respectively. See "printer-controls-other-
1197   protocols" (section 4.3).

1198   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1199   operation.

1200   8.2.1.2   Set-Job-Attributes Request

1201   The following sets of attributes are part of the Set-Job-Attributes Request:

1202   Group 1: Operation Attributes

1203   Natural Language and Character Set:
1204   The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
1205   section 3.1.4.1.
1206

1207   Target:
1208   Either (1) the "printer-uri" (uri) plus "job-id" (integer(1:MAX)) or (2) the "job-uri" (uri) operation
1209   attribute(s) which define the target for this operation as described in [ipp-mod] section 3.1.5.
1210
1211   Requesting User Name:
1212   The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as
1213   described in [ipp-mod] section 8.3.
1214
1215

1216   Group 2: Job Attributes

1217   The client MUST supply a set of Job attributes as defined in [ipp-mod] section 4.2 Job Template
1218   Attributes ("xxx" attributes) and section 4.3 Job Description Attributes. Each Job attribute supplied
1219   in Group 2 replaces the value(s) of the corresponding Job attribute on the target Job object. For
1220   attributes that can have multiple values (1setOf), all values supplied by the client replace all values
1221   of the corresponding Job object attribute.
1222

1223   8.2.1.3   Set-Job-Attributes Response

1224   The Printer object returns the following sets of attributes as part of the Set-Job-Attributes Response:

1225   Group 1: Operation Attributes

1226   Status Message:
1227   In addition to the REQUIRED status code returned in every response, the response OPTIONALLY
1228   includes a "status-message" (text(255)) and/or a "detailed-status-message" (text(MAX)) operation
1229   attribute as described in [ipp-mod] sections 13 and 3.1.6.
1230
1231   Natural Language and Character Set:
1232   The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
1233   section 3.1.4.2.
1234

1235   Group 2: Unsupported Attributes

1236   See [ipp-mod] section 3.1.7 for details on returning Unsupported Attributes.
1237
1238   The attributes returned are the same as for the create operation with the same new attribute values.
1239   In the case of attributes that are supported, but are not settable by the implementation, i.e., are not
1240   among the values of the Printer's "settable-attributes" Printer Description attribute (see section 4.1),
1241   the Printer object returns the client-supplied attribute(s) with a substituted value of 'not-supported'
1242   (same out-of-band value as for attributes that are not supported). This value's syntax type is "out-of-
1243   band" and its encoding is defined by special rules for "out-of-band" values in the "Encoding and
1244   Transport" document [IPP-PRO]. Its value indicates that the attribute is either not settable or is not
1245   supported at all.

1246

1247   8.2.2   Reprocess-Job Operation

1248   This OPTIONAL operation is a create job operation that allows a client to re-process a copy of a job that
1249   had been retained in the queue after processing completed, was canceled, or was aborted (see [ipp-mod]
1250   section 4.3.7.2). This operation is the same as the Restart-Job operation (see [ipp-mod] section 3.3.7),
1251   except that the Printer creates a new job that is a copy of the target job and the target job is unchanged. The
1252   new job is assigned new values to the "job-uri" and "job-id" attributes and the new job's Job Description
1253   attributes that accumulate job progress, such as "job-impressions-completed", "job-media-sheets-
1254   completed", and "job-k-octets-processed", are initialized to 0 as with any create job operation. The target
1255   job moves to the Job History after a suitable period, independent of whether one or more Reprocess-Job
1256   operations have been performed on it.

1257   If the Set-Job-Attributes operation is supported, then the "job-hold-until" operation attribute MUST be
1258   supported with at least the 'indefinite' value, so that a client can modify the new job before it is scheduled
1259   for processing using the Set-Job-Attributes operation. After modifying the job, the client can release the
1260   job for processing, by using the Release-Job operation specifying the newly assigned "job-uri" or "job-id"
1261   for the new job.

1262

1263   8.2.3   Cancel-Current-Job Operation

1264   This OPTIONAL operation allows a client to cancel the current job on the target Printer or the specified job
1265   if it is the current job on the Printer. See [ipp-mod] section 3.3.3 for the semantics of canceling a job.
1266   Since a Job might already be marking by the time a Cancel-Current-Job is received, some media sheet
1267   pages might be printed before the job is actually terminated.

1268   If the client does not supply a "job-id" operation attribute, the Printer MUST accept the request and cancel
1269   the current job if there is a current job in the 'processing' or 'processing-stopped' state; otherwise, it MUST
1270   reject the request and return the 'client-error-not-possible' status code. If more than one job is in the
1271   'processing' or 'processing-stopped' states, the one that is marking is canceled and the others are unaffected.

1272   Warning: On a shared printer, there is a race condition. Between the time that a user issues this operation
1273   and its acceptance, the current job might change to a different job. If the user or operator is authenticated to
1274   cancel the new job, the wrong job is canceled. To prevent this race from canceling the wrong job, the client
1275   MAY supply the "job-id" operation attribute which is checked against the current job's job-id. If the job
1276   identified by the "job-id" attribute is not the current job on the Printer, i.e., is not in the 'processing' or
1277   'processing-stopped' states, the Printer MUST reject this operation and return the 'client-error-not-possible'
1278   status code. Otherwise, the Printer cancels the specified job.

1279   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1280   operation.

1281   The Cancel-Current-Job Request and Cancel-Current-Job Response have the same attribute groups and
1282   attributes as the Resume-Printer operation (see [ipp-mod] section 3.2.8), including the new "job-message-
1283   from-operator" operation attribute (see section 3.2), with the addition of the following Group 1 Operation
1284   attributes in the request:

1285   "job-id" (integer(1:MAX)):

1286   The client OPTIONALLY supplies this Operation attribute in order to verify that the identified job
1287   is still the current job on the target Printer object. The IPP object MUST supports this operation
1288   attribute, if it supports this operation.

1289

1290   8.2.4   Pause-Current-Job operation

1291   ISSUE 14 - Since the semantics of Pause-Current-Job is different from Pause-Printer, in that other jobs are
1292   processed, while this job is stopped, should we have a different name for the verb, such as Suspend-
1293   Current-Job, instead of Pause-Current-Job. Otherwise, users may be mistakenly think that the printer is
1294   paused when the job is paused. If the name is changes, then the 'job-paused' job state reason would also be
1295   changed to 'job-suspended'.

1296   This OPTIONAL operation allows a client to stop the current job on the target Printer or the specified job if
1297   it is the current job on the Printer, and allow other jobs to be processed instead. The Printer moves the
1298   current job or the target job to the 'processing-stopped' state and sets the 'job-paused' value in the job's "job-
1299   state-reasons" attribute and processes other jobs.

1300   If the client does not supply a "job-id" operation attribute, the Printer MUST accept the request and pause
1301   the current job if there is a current job in the 'processing' or 'processing-stopped' state; otherwise, it MUST
1302   reject the request and return the 'client-error-not-possible' status code. If more than one job is in the
1303   'processing' or 'processing-stopped' states, all of them are paused.

1304   Warning: On a shared printer, there is a race condition. Between the time that a user issues this operation
1305   and its acceptance, the current job might change to a different job. If the user or operator is authenticated to
1306   pause the new job, the wrong job is paused. To prevent this race from pausing the wrong job, the client
1307   MAY supply the "job-id" operation attribute which is checked against the current job's job-id. If the job
1308   identified by the "job-id" attribute is not the current job on the Printer, i.e., is not in the 'processing' or
1309   'processing-stopped' states, the Printer MUST reject this operation and return the 'client-error-not-possible'
1310   status code. Otherwise, the Printer pauses the specified job and processed other jobs.

1311   A paused job is resumed using the Resume-Job operation (see section 8.2.5). If the Pause-Current-Job
1312   operation is supported, then the Resume-Job operation MUST be supported, and vice-versa.

1313   The Printer MUST reject a Release-Job request (and return the 'client-error-not-possible') for a job that has
1314   been paused , i.e., for a job in the 'processing-stopped' state, with the 'job-paused' value in its "job-state-
1315   reasons" attribute. The Hold-Job and Release-Job operations are for holding and releasing held jobs, not
1316   pausing and resuming paused jobs.

1317   ISSUE 15 - Ok for Pause-Job to reject a request for a Job that is already paused (like Cancel-Job), instead
1318   of accepting the request?

1319   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1320   operation.

1321   The Pause-Current-Job Request and Pause-Current-Job Response have the same attribute groups and
1322   attributes as the Resume-Printer operation (see [ipp-mod] section 3.2.8), including the new "job-message-
1323   from-operator" operation attribute (see section 3.2), with the addition of the following Group 1 Operation
1324   attributes in the request:

1325   "job-id" (integer(1:MAX)):

1326   The client OPTIONALLY supplies this Operation attribute in order to verify that the identified job
1327   is still the current job on the target Printer object. The IPP object MUST supports this operation
1328   attribute, if it supports this operation.

1329   "when" (type2 keyword)

1330   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
1331   attribute, if it supports this operation. The value of this attribute indicates when to pause the printer.
1332   If the client omits this attribute, the Printer assumes the 'after-current-copy' value. The 'after-
1333   current-copy' value is REQUIRED to be supported if the "when" attribute is supported; the
1334   remaining values are OPTIONAL.
1335   Note: There is no way to query to see which values of the "when" attribute are supported for this or
1336   any other operation. Since this operation is intended for Operators, rather than End-Users, it did not
1337   seem necessary to provide the means to query the supported values.
1338
1339   Standard keyword values are:
1340   'now' - pause the current Job immediately, while the current Job is processing.
1341   'after-current-copy' - pause the current Job after the current Job finishes printing its current
1342   copy.
1343   ISSUE 16 - Ok that the only values for the "when" operation attribute for the Pause-Current-Job are
1344   'now' and 'after-current-copy' with 'now' being the default and REQUIRED?
1345
1346   "synchronize" (boolean)

1347   The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this
1348   attribute. This attribute indicates whether or not the printer is to synchronize the checkpoint data for
1349   the current job being paused with the pages that have actually printed. If this attribute is supported,
1350   then a value of 'true' implies that the Printer will be able to resume the job at the point of
1351   synchronization when the job is resumed.
1352
1353   If the Printer supports this attribute but the client does not supply it, the Printer is assumed to
1354   perform synchronization ('true' behavior). If the Printer does not support this attribute, the Printer is
1355   assumed to not synchronize ('false' behavior).

1356

1357 8.2.5   Resume-Job operation

1358 This OPTIONAL operation allows a client to resume the target job at the point where it was paused. The
1359 Printer moves the target job to the 'pending' state and removes the 'job-paused' value from the job's "job-
1360 state-reasons" attribute.

1361 If the target job is not in the 'processing-stopped' state with the 'job-paused' value in the job's "job-state-
1362 reasons" attribute, the Printer rejects the request and returns the 'client-error-not-possible' status code, since
1363 the job was not paused.

1364 ISSUE 17 - Ok to return an error (like Cancel-Job), rather than having Resume-Job accept the request even
1365 if the Job is already resumed (i.e., not paused)?

1366 If the Resume-Job operation is supported, then the Pause-Current-Job operation MUST be supported, and
1367 vice-versa.

1368 *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1369 operation.

1370 The Resume-Job Request and Resume-Job Response have the same attribute groups and attributes as the
1371 Release-Job operation (see [ipp-mod] section 3.3.6), including the new "job-message-from-operator"
1372 operation attribute (see section 3.2).

1373

1374   8.2.6   Promote-Job operation

1375   This OPTIONAL operation allows a client to make the pending target job be processed next after the
1376   current job completes. This operation is specially useful in a production printing environment where the
1377   operator is involved in job scheduling.

1378   If the target job is in the 'pending' state, this operation does not change the job's state, but causes the job to
1379   be processed after the current job(s) complete. If the target job is not in the 'pending' state, the Printer
1380   rejects the request and returns the 'client-error-not-possible' status code. The Printer returns the target job
1381   immediately after the current job(s) in a Get-Jobs response (see [ipp-mod] section 3.2.6) for the 'not-
1382   completed' jobs.

1383   When the current job completes, is canceled, paused, or aborted, the target of this operation is processed
1384   next.

1385   If a client issues this request (again) before the target of the operation of the original request started
1386   processing, the target of this new request is scheduled before the previous job that was to be processed next.

1387   Note: IPP is specified not to require queues for job scheduling, since there are other implementations for
1388   scheduling multiple jobs. However, if an implementation does implement queues for jobs, then the
1389   Promote-Job puts the specified job at the front of the queue. A subsequent Promote-Job before the first job
1390   starts processing puts that specified job at the front of the queue, so that it is "in front" of the previously
1391   promoted job.

1392   *Access Rights:* Authentication and access control (see [ipp-mod] sections 1, 8.3, and 8.5) apply to this
1393   operation.

1394   The Promote-Job Request and Promote-Job Response have the same attribute groups and attributes as the
1395   Cancel-Job operation (see [ipp-mod] section 3.3.3), including the new "job-message-from-operator"
1396   operation attribute (see section 3.2).

1397

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.

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1436   13   References

1437   [ipp-mod]
1438   R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and
1439   Semantics", <draft-ietf-ipp-model-v11-03.txt>, June, 1999.

1440   [RFC2566]
1441   R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and
1442   Semantics", RFC 2566, April 1999.

1443   14   Change History

1444   This section summarizes the changes. Each sub-section is in reverse chronological order. Adding or
1445   removing ISSUES that don't change the document are not listed here.

1446   14.1   Changes to the November 1, 1999 version to make the November 16, 1999 version

1447   The following changes to the October 22, 1999 version to make the November 1, 1999 version as a result of
1448   the IPP WG meeting in Durham, 10/99:

1449   1. Formally defined IPP Printer fan-out, IPP Printer fan-in, and output device fan-out. Added figures to
1450   show IPP Printer fan-out and IPP Printer fan-in.

1451   2. Added "parent-printers-supported (1setOf uri) Printer Description attribute to point back up the Printer
1452   hierarchy.

1453   3. Added the requirements for forwarding operations that affect Jobs and for not forwarding operations
1454   that affect Printers.

1455   4. Added "original-requesting-user-name" (name(MAX)) to represent the original end user, not the parent
1456   Printer's host.

1457   5. Changed the default for "when" for the Pause-Printer operation from 'after-current-job' to 'now', since
1458   that is the behavior in IPP/1.1 where the "when" operation attribute is not defined.

1459   6. Allowed a non-leaf Printer to have only one subordinate Printer.

1460 7. Changed most of the "parent" Printer terminology to "non-leaf" Printer to contrast more clearly with
1461   "leaf" Printer objects. The term "parent" is only used when talking about a subordinate's immediate
1462   parent Printer object.

1463 8. Added "original-requesting-user-name" (name (MAX)) to the list of READ-ONLY Job Description
1464   attributes.

1465 14.2 Changes to the October 22, 1999 version to make the November 1, 1999 version

1466 The following changes to the October 22, 1999 version to make the November 1, 1999 version as a result of
1467 the IPP WG meeting in Durham, 10/99:

1468 1. Removed the Reset-Printer, Non-Process-Run-Out, and Space-Current-Job operations from this Set2
1469   spec and moved them to a new Set3 spec for use with the new Device object, renaming them
1470   appropriately, to Reset-Device, Non-Process-Run-Out-Device, and Space-Device.

1471 2. Added the concept of parent and subordinate Printer objects to formally represent fan-out. Mentioned
1472   the Device object that is in a new [ipp-set3] spec.

1473 3. Distributed the definition of the "when" operation attribute to the Pause-Printer (IPP/1.1), Shutdown-
1474   Printer, and Pause-Current-Job operations and listed the values that are appropriate to that operation
1475   only:
1476   Pause-Printer: 'now', 'after-current-copy', 'after-current-job' (default), and 'after-all'.
1477   Shutdown-Printer: 'now', 'after-current-job' (default), and 'after-all'
1478   Pause-Current-Job: 'now', 'after-current-copy' (default)

1479 4. Deleted the "device-name" operation attribute and the "device-names-supported" (1setOf name(127))
1480   Printer Description attribute. The latter will be part of the [ipp-set3] document.

1481 5. Kept the "job-settable-attributes" (1setOf type2 keyword) and "printer-settable-attributes" (1setOf type2
1482   keyword), but deleted the "interpreter-settable-attributes (1setOf type2 keyword), since the Interpreter
1483   object and its attributes are really a sub-class of the Printer object.

1484 6. Deleted the "when-values-supported" (1setOf type2 keyword) Printer Description attribute.

1485 7. Added the "subordinate-printers-supported" (1setOf uri) Printer Description attribute.

1486 14.3 Changes to the September 19, 1999 version to make the October 22, 1999 version

1487 Adding or removing ISSUES that don't change the document are not listed here. The following changes to
1488 the September 19, 1999 version to make the October 22, 1999 version as a result of the IPP WG meeting in
1489 Denver, 9/99:

1490 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.

1552 19. Section 6.1.6: Deleted Space-Printer operation. Keep Space-Current-Job operation only which has a
1553   "job-id" operation attribute that a client MAY supply.

1554 20. Section 6.1.6: Clarified that Shutdown-Printer is for a long period of time, not just to reset the device or
1555   change attribute values. Also that Shutdown performs an immediate Disable-Printer and an eventual
1556   Pause-Printer.

1557 21. Sections 6.2.3, 6.2.4, and 6.2.7 : Added a "job-id" operation attribute to Cancel-Current-Job, Pause-
1558   Current-Job, and Space-Current-Job that a client MAY supply to check for race condition where current
1559   job changes

1560 22. Section 6.2.4: Combined Pause-Job into Pause-Current-Job operation.

1561 23. Sections 6.2.4 and 6.2.5: Pause-Current-Job puts job in 'processing-stopped' state, not 'pending-held'
1562   state.

1563 24. Section 6.2.6: Simplified Promote-Job, so that it behaves as if the job were put at the front of the
1564   queue.

1565 15   Appendix A: Full Copyright Statement