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Internet Printing Protocol/1.1: Set Operations

Status of this Memo

Abstract

This document specifies 2 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 the Set-Printer-Attributes operation that operators/administrators may perform on a Printer object and the Set-Job-Attributes operation that end-users may perform on their jobs and operators/administrators may perform on any job, depending on circumstances.

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

Two operation attributes: "printer-message-from-operator" (text) and "job-message-from-operator" (text) are included to set the corresponding IPP/1.1 Printer and Job Description attributes with the same names. A "factory-settings" (boolean) operation attribute is added to the Get-Printer-Attributes operation.

New Printer Description attributes are added:

- printer-settable-attributes (1setOf type2 keyword)
- job-settable-attributes (1setOf type2 keyword)
- printer-message-time (integer(MIN:MAX))
- printer-message-date-time (dateTime)
- printer-message-operation (type2 enum)

A new status code is added: 'client-error-attributes-not-settable'.

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

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

This document is intended for registration following the registration procedures of IPP/1.0 [RFC2566] and IPP/1.1 [ipp-mod]. This version contains only the Set-Printer-Attributes and Set-Job-Attributes operations which have been removed from the Set2 operation document so that t

The full set of IPP documents includes:

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

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

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

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

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

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

Table of Contents

List of Tables

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 Set-Job-Attributes and Set-Printer-Attributes operations used to modify Job objects and Printer objects. 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 Terminology

This section defines terminology used throughout this document.

2.1 Conformance Terminology

Capitalized terms, such as MUST, MUST NOT, REQUIRED, SHOULD, SHOULD NOT, MAY, NEED NOT, and OPTIONAL, have special meaning relating to conformance. These terms are defined in [ipp-mod] section 12.1 on conformance terminology, most of which is taken from RFC 2119 [RFC2119].

The following specialization of these terms apply to this document:

REQUIRED: if an implementation supports the extensions described in this document, it MUST support a REQUIRED feature.

OPTIONAL: if an implementation supports the extensions described in this document, it MAY support an OPTIONAL feature.

2.2 Other terminology

This document uses terms such as "attributes", "keywords", and "support". These terms have special meaning and are defined in the model terminology [ipp-mod] section 12.2.

IPP Printer object (or Printer for short) - a software abstraction defined by [ipp-mod].

3 Requirements and Use Cases

The following requirements and usage cover only the Set operations.

1. The end-user and the operator need a way to modify a Job that is in the 'pending' or 'pending-held' state.

   Usage: The end-user discovers that he/she forgot to include a print instruction, such as "finishings" = 'staple' after submitting a job. Rather than canceling the job and resubmitting it to the same Printer, the end-user is able to modify the job on the Printer.

The operator needs to modify a job because it is requesting a particular kind of media for which there is no more, but the policy is to print the job on a comparable medium.

2. The system administrator needs a way to re-configure or change the policy of the IPP Printer remotely.

   Usage: The system administrator is adding additional media to the supported media list.

   The system administrator is reducing the capability of the IPP Printer by removing one of the operations from the supported operations list, such as Cancel-Job, because the policy is to run the IPP Printer like a public FAX.

   The system administrator is remotely configuring the Printer after installing it, and so is replacing the Printer Description attributes that have the out-of-band 'no-value' value with the proper values.

4 New objects and new relationships of existing objects

This section defines the new Interpreter object.

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

ISSUE 01 - Is there a better way to model the Printer attributes that depend on the interpreter (that is still compatible with IPP/1.1)? It should be clear to the operator whether the Set-Printer-Attributes operation is affecting all interpreters or just the one specified by the "document-format" operation attribute (or its default)? There have been suggestions to have "xxx-exceptions" (collection) Printer Description attributes where "xxx" is the document-format that indicate for each interpreter explicitly which Printer attributes are specialized for it. For example: "application-postscript-exceptions" (collection) and "application-vnd-hp-pcl-exceptions (collection). Or have a "set-all-interpreters" (boolean) Set-Printer-Attributes operation attribute that sets all interpreters.

Note: The interaction of the Set operations and fan-out and fan-in will be defined in the Set2 document, rather than this document.

5 New Operation attributes

This section defines new operation attributes for use with the IPP/1.1 and the Set operations as shown in Table 1..

Table 1 - Operation Attribute Usage

Operation	"printer-message-from-operator"	"job-message-from-operator"	"factory-settings"
Print-Job	no	no	no
Print-URI	no	no	no
Validate-Job	no	no	no
Create-Job	no	no	no
Get-Printer-Attributes	yes	no	yes
Set-Printer-Attributes	no	no	no
Get-Jobs	no	no	no
Pause-Printer	yes	no	no
Resume-Printer	yes	no	no
Purge-Jobs	yes	no	no
Send-Document	no	no	no
Send-URI	no	no	no
Cancel-Job	no	yes	no
Get-Job-Attributes	no	yes	no
Set-Job-Attributes	no	no	no
Hold-Job	no	yes	no

Release-Job	no	yes	no
Restart-Job	no	yes	no

5.1 "printer-message-from-operator" (text(127))

The client OPTIONALLY supplies this attribute. The Printer object SHOULD supports this operation attribute if it supports the corresponding Printer Description attribute. The value of this attribute is a message from the operator about the Printer object on which the operator is performing the operation. If this operation attribute is supported, the Printer copies the value to its "printer-message-from-operator" Printer Description attribute (see [ipp-mod] section 4.4.25). In addition, the Printer automatically copies:

1. the value of its "printer-up-time" attribute (see [ipp-mod] section 4.4.29) to its "printer-message-time" attribute,

2. the value of its printer-current-time" (dateTime) attribute (see [ipp-mod] section 4.4.30) to its "printer-message-date-time" attribute, if supported, and

3. the value of the operation-id value of this operation (see [ipp-mod] section 4.4.15) to its "printer-message-operation" attribute.

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

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

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

5.2 "job-message-from-operator" (text(127))

The client OPTIONALLY supplies this attribute. The Printer object SHOULD supports this operation attribute if it supports the corresponding Job Description attribute. The value of this attribute is a message from the operator about the Job object on which the operator has just performed an operation. If supported,

the Printer copies the value to the Job's "job-message-from-operator" Job Description attribute (see [ipp-mod] section 4.3.16).

If the client omits this attribute, the Printer does not change the value of its "printer-message-from-operator" Job Description attribute.

If the client supplies this attribute with a zero-length text value or with a value consisting solely of white space, the Printer copies that value as any other value to the job's "job-message-from-operator". Supplying such a value is the way that the operator indicates that there is no longer a job message from the operator (rather than using the "out-of-band" 'no-value' value).

Note: There are no corresponding 'job-message-time", "job-message-date-time", and "job-message-operation" Job Description attributes, since the usual lifetime of a job is limited.

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

5.3 "factory-settings" (boolean) - new operation attribute for Get-Printer-Attributes:

The client OPTIONALLY supplies this attribute. The Printer object OPTIONALLY supports this attribute, if it supports the Set-Printer-Attributes operation. If the client omits this attribute or supplies the 'false' value, the Printer returns the current values of the requested attributes that are settable, i.e., the values that have been set by previous Set-Printer-Attributes. If the client supplies the 'true' value, the Printer returns the factory settings, i.e., the inherent values supported by the implementation as shipped from the manufacturer or established at install time. This operation attribute allows an operator to determine which values are supported in an implementation after having modified a settable attribute. Attributes that are not settable are not affected by this operation attribute, so that the Printer returns the same values for non-settable attribute when either the 'true' or 'false' value has been supplied. If this operation attribute is supported, both 'true' and 'false' values MUST be supported.

ISSUE 02 - Should the attribute names be modified (e.g., with a unique suffix) to identify them as “factory defaults”? At the IPP WG meeting, some individuals thought that this would make some of the factory default handling easier to specify/implement. Also, some of the attributes could be prefixed/suffixed to indicate that they are [only] applicable to specific document formats. Although preliminary discussion appears encouraging, the topic was deferred for more detailed examination.

6 New Printer Description Attributes

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

6.1 printer-settable-attributes (1setOf type2 keyword)

This READ-ONLY Printer attribute identifies the Printer object attributes that are settable in this implementation, i.e., that are settable using the Set-Printer-Attributes operations (see section 9.1). This attribute MUST be supported if the Set-Printer-Attributes operations is supported. The Printer MUST reject attempts to set any Printer attributes that are not one of the values of this attribute, returning the 'client-error-attributes-not-settable' status code (see section 7.1). The value of this attribute MAY depend on the value of the "document-format" operation attribute supplied in the Get-Printer-Attributes operation (see [ipp-mod] section 3.2.5.1).

For a Printer attribute that is normally settable, if a Printer object only supports a single fixed value for that attribute, it SHOULD NOT include that attribute's keyword name in this attribute's value. For example, if a Printer only supports "sides" with a 'one-sided' value, then the "sides-supported" keyword SHOULD NOT be one of the values of its "printer-settable-attributes" attribute.

Standard keyword values are:

'none': There are no settable Printer attributes.
'xxx': Where 'xxx' is any of the keyword attribute names allowed by section 9.1.1

6.2 job-settable-attributes (1setOf type2 keyword)

This READ-ONLY Printer attribute identifies the Job object attributes that are settable in this implementation, i.e., that are settable using the Set-Job-Attributes operation (see section 9.2). This attribute MUST be supported if the Set-Job-Attributes operations is supported. The Printer MUST reject attempts to set any Job attributes that are not one of the values of this attribute, returning the 'client-error-attributes-not-settable' status code (see section 7.1).

For a Job attribute that is normally settable, if a Printer object only supports a single fixed value for that attribute, it SHOULD NOT include that attribute's keyword name in this attribute's value. For example, if a Printer only supports "sides" with a 'one-sided' value, then the "sides" keyword SHOULD NOT be one of the values of its "job-settable-attributes" attribute.

Standard keyword values are:

'none': There are no settable Job attributes.
'xxx': Where 'xxx' is any of the keyword attribute names allowed by section 9.2.1

6.3 printer-message-time (integer(MIN:MAX))

This READ-ONLY Printer Description attribute contains the time that the Printer's "printer-message-from-operator" was changed by the operator using any operation where the client supplied the "printer-message-from-operator" operation attribute (see section 5.1) or was explicitly set using the Set-Printer-Attributes operation (see section 9.1). This attribute allows the users to know when the "printer-message-from-operator" attribute was last set.

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

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

6.4 printer-message-date-time (dateTime)

This READ-ONLY Printer Description attribute contains the date and time that the Printer's "printer-message-from-operator" was changed by the operator using any operation where the client supplied the "printer-message-from-operator" operation attribute (see section 5.1) or was explicitly set using the Set-Printer-Attributes operation (see section 9.1). This attribute allows the users to know when the "printer-message-from-operator" attribute was last set.

This attribute MUST be supported if the Printer supports both the "printer-message-time" and the "printer-current-time" (dateTime) attributes (see [ipp-mod] section 4.4.30).

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

6.5 printer-message-operation (type2 enum)

This READ-ONLY Printer Description attribute identifies the operation that was used to change the Printer's "printer-message-from-operator" by the operator using any operation where the client supplied the "printer-message-from-operator" operation attribute (see section 5.1) or explicitly set using the Set-Printer-Attributes operation (see section 9.1). This attribute allows the users to know which operation was used to change the "printer-message-from-operator" attribute when it was last set.

The standard enum values are those defined for the "operations-supported" Printer Description attribute (see [ipp-mod] section 4.4.15).

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

7 Additional status codes

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

7.1 'client-error-attributes-not-settable' (0x0413)

In a Set-Printer-Attributes or Set-Job-Attributes request, if all the client-supplied attributes are supported, but the Printer object does not support one or more attributes as settable, the Printer object MUST return

this status code. The Printer object MUST also return in the Unsupported Attributes Group (see [ipp-mod] section 3.1.7) all the attributes supplied by the client that are not settable with the values changed to the out-of-band 'not-settable' value (see section 8.1). For example, if the request indicates 'job-state', all implementations MUST reject the request. As another example, if the request indicates an attribute that is supported, but not settable by this implementation, such as, say, "printer-name", the implementation rejects the request.

8 Additional out-of-band values

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

8.1 'not-settable' out of band value

The 'not-settable' out of band value is used by the IPP Printer in a Set-Job-Attributes or Set-Printer-Attributes response to indicate an attribute that was supplied by the client, is supported but is defined to be a READ-ONLY attribute, is not settable in that implementation or as defined by the policy for that system, because it is not in the "job-settable-attributes" or "printer-settable-attributes" Printer Description attributes, respectively.

The encoding of the out-of-band value is TBD (see [ipp-pro]).

9 Definition of the Set operations

The Set-Printer-Attributes operation (as are 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.

The Set-Job-Attributes operation (as are 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 as defined in [ipp-mod]. The IPP object implementation MUST support both forms of identification for every job.

The Set Printer operations are summarized in Table 2:

Table 2 - Printer operation Operation-Id assignments

Operation Name	Operation-Id	Brief description
Set-Printer-Attributes	0x??	Sets attribute values of the target Printer object
Set-Job-Attributes	0x??	Sets attribute values of the target Job object

9.1 Set-Printer-Attributes 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. However, if any of the supplied attributes are not supported, are not settable, or the values are not supported, the Printer object MUST reject the entire operation; the Printer object MUST NOT partially set some of the supplied attributes. In other words, after the operation, all the supplied attributes MUST be set or none of them MUST be set.

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 6.3, 6.4, and 6.5).

ISSUE 03 - While reviewing the Set-Printer-Attributes operation at the IPP WG meeting, it was suggested that a more general mechanism should be defined for handling and supporting side effects - such as modifying values of any related attributes.

The Printer MUST accept this operation in any state, i.e., for any of the values of the Printer object's "printer-state" and "printer-state-reasons" attributes, unless explicitly defined otherwise in the definition of the values.

9.1.1 Settable and READ-ONLY Printer Description attributes

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:

printer-state
printer-state-reasons
printer-state-message
printer-is-accepting-jobs - see Enable-Printer/Disable-Printer
queued-job-count
printer-up-time

The following Printer Description attributes defined in this document MUST NOT be settable, i.e., they are READ-ONLY:

printer-message-time - see Set-Printer-Attributes when setting "printer-message-from-operator"
printer-message-date-time - see Set-Printer-Attributes when setting "printer-message-from-operator"
printer-message-operation - see Set-Printer-Attributes when setting "printer-message-from-operator"

Note: From now on, all extensions that define new object attributes will indicate whether or not they are READ-ONLY, by including the "READ-ONLY" adjective in their descriptionsor whether they MAY be settable.

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

For example, if the "operations-supported" Printer Description attribute (see [ipp-mod] section 4.4.15) is settable in a particular implementation, then changing its value with a Set-Printer-Attributes operation MUST affect the operations that the implementation accepts or rejects. Such an implementation will need to be able to reject values for operations that it contains no code support for. If the "operations-supported" Printer Description attribute is not settable in a particular implementation, then that implementation MUST reject an attempt to set it with a Set-Printer-Attributes operation and return the 'client-error-attributes-not-settable' status code (see section 7.1).

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

See the "factory-settings" operation attribute (see section 5.3) for a way to query the implementation supported values using the Get-Printer-Attributes operation.

Access Rights: The authenticated user (see [ipp-mod] section 8.3) performing this operation must be an operator or administrator of the Printer object (see [ipp-mod] Sections 1 and 8.5).

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

9.1.2 Set-Printer-Attributes Request

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

Group 1: Operation Attributes

Natural Language and Character Set:

The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod] section 3.1.4.1.

Target:

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

Requesting User Name:

The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as described in [ipp-mod] section 8.3.

"document-format" (mimeMediaType):

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

If the client omits this "document-format" operation attribute, the Printer object MUST respond as if the attribute had been supplied with the value of the Printer object's "document-format-default" attribute. It is recommended that the client always supply a value for "document-format", since the Printer object's "document-format-default" may be 'application/octet-stream', in which case the set attributes and values are for the union of the document formats that the Printer can automatically sense. For more details, see the description of the 'mimeMediaType' attribute syntax in [ipp-mod] section 4.1.9.

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

If the Printer object does not distinguish between different sets of supported values for each different document format when validating jobs in the create and Validate-Job operations, it MUST NOT distinguish between different document formats in the Set-Printer-Attributes operation. If the Printer object does distinguish between different sets of supported values for each different

document format specified by the client, this specialization applies only to the same Printer attributes as the Get-Printer-Attributes operation (see [ipp-mod] section 3.2.5.1).

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

Group 2: Printer Attributes

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

9.1.3 Set-Printer-Attributes Response

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

Group 1: Operation Attributes

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

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

Group 2: Unsupported Attributes

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

If all the client-supplied attributes are supported, but one or more are not settable by the implementation, i.e., are not among the values of the Printer's "printer-settable-attributes" Printer Description attribute (see section 6.1), the Printer object MUST reject the operation, return the 'client-error-attributes-not-settable' status code, and return the client-supplied attribute(s) with a substituted out-of-band value of 'not-settable' (see section 8.1). This value's syntax type is "out-of-band" and its encoding is defined by special rules for "out-of-band" values in the "Encoding and

Transport" document [IPP-PRO]. Its value indicates that the attribute is supported, but is not settable.

9.2 Set-Job-Attributes 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 9.1). 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. In addition, if any of the supplied attributes are not supported, are not settable, or the values are not supported, the Printer object MUST reject the entire operation; the Printer object MUST NOT partially set some of the supplied attributes. In other words, after the operation, all the supplied attributes MUST be set or none of them MUST be set.

If a client supplies a job attribute in a Set-Job-Attributes request and the job was originally submitted without supplying that attribute, the Printer adds the attribute to the Job object.

ISSUE 04 - How does a client indicate in a Set-Job-Attributes operation that a Job attribute is to be removed from the Job object? At the IPP WG meeting, there was general agreement that the protocol should support the ability to “unset” values.

ISSUE 05 - There is no need to be able to remove a particular attribute value from a (multi-valued) attribute, is there?

ISSUE 06 - Removing an attribute from a Printer is not needed, correct?

ISSUE 07 - Is it OK that Set-Job-Attributes validates independently from how the "ipp-attribute-fidelity" operation attribute had been supplied in the Job Creation operation? Its not currently stored with the Job object.

ISSUE 08 - For simplicity, is it OK that we don't have an "ipp-attribute-fidelity" operation attribute for the Set-Job-Attributes operation, so that the behavior is as if it were supplied with the 'true' value?

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 implementation, including the attributes being set, whether the job has started marking media, etc.
'processing-stopped'	'processing-stopped'	'successful-ok' or 'client-error-not-possible' depending on implemenation, including the attributes being set, whether the job has started marking media, etc.
'completed'	'completed'	'client-error-not-possible'
'canceled'	'canceled'	'client-error-not-possible'
'aborted'	'aborted'	'client-error-not-possible'

9.2.1 Settable and READ-ONLY Job Description attributes

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

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

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

that the implementation supports.

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

556 job-uri
557 job-id
558 job-printer-uri
559 job-more-info
560 job-originating-user-name - set in create operation
561 job-state
562 job-state-reasons
563 job-state-message
564 number-of-documents
565 output-device-assigned
566 time-at-creation
567 time-at-processing
568 time-at-completed
569 job-printer-up-time
570 date-time-at-creation
571 date-time-at-processing
572 date-time-at-completed
573 number-of-intervening-jobs
574 job-k-octets
575 job-k-octets-processed
576 job-impressions-completed
577 job-media-sheets-completed
578 attributes-charset - set in Job Creation operation
579 attributes-natural-language - set in Job Creation operation

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

582 Note: From now on, all extensions that define new object attributes will indicate whether or not they are
583 READ-ONLY, by including the "READ-ONLY" adjective in their descriptions. If "READ-ONLY" is
584 omitted, it is assumed that the attribute MAY be settable by the appropriate Set-Xxx operation.

585 *Access Rights:* The authenticated user (see [ipp-mod] section 8.3) performing this operation must either be
586 the job owner (as determined in the Job Creation operation) or an operator or administrator of the Printer
587 object (see [ipp-mod] Sections 1 and 8.5).

588 9.2.2 Set-Job-Attributes Request

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

590 Group 1: Operation Attributes

591 Natural Language and Character Set:
592 The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod]
593 section 3.1.4.1.
594
595 Target:
596 Either (1) the "printer-uri" (uri) plus "job-id" (integer(1:MAX)) or (2) the "job-uri" (uri) operation
597 attribute(s) which define the target for this operation as described in [ipp-mod] section 3.1.5.
598

Requesting User Name:

The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the client as described in [ipp-mod] section 8.3.

Group 2: Job Attributes

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

9.2.3 Set-Job-Attributes Response

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

Group 1: Operation Attributes

Status Message:

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

Natural Language and Character Set:

The "attributes-charset" and "attributes-natural-language" attributes as described in [ipp-mod] section 3.1.4.2.

Group 2: Unsupported Attributes

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

If all the client-supplied attributes are supported, but one or more are not settable by the implementation, i.e., are not among the values of the Printer's "job-settable-attributes" Printer Description attribute (see section 6.1), the Printer object MUST reject the operation, return the 'client-error-attributes-not-settable' status code, and return the client-supplied attribute(s) with a substituted out-of-band value of 'not-settable' (see section 8.1). This value's syntax type is "out-of-band" and its encoding is defined by special rules for "out-of-band" values in the "Encoding and Transport" document [IPP-PRO]. Its value indicates that the attribute is supported, but is not settable.

10 Conformance Requirements

Both the Set-Job-Attributes and the Set-Printer-Attributes operations defined in the document are OPTIONAL for an IPP object to support. Either one MAY be supported without the other or both MAY be supported.

If the Set-Printer-Attributes operation is supported, then the "printer-settable-attributes" Printer Description attribute MUST be supported.

If the Set-Job-Attributes operation is supported, then the "job-settable-attributes" Printer Description attribute MUST be supported.

If the Set-Printer-Attributes operation and the "printer-message-from-operator" Printer Description attribute are supported, then the latter MUST be settable.

If the Set-Job-Attributes operation and the "job-message-from-operator" Printer Description attribute are supported, then the latter MUST be settable.

It is OPTIONAL for the Printer object to support the "printer-message-time" (integer), "printer-message-date-time" (dateTime) and "printer-message-operation" (type2 enum). If both the "printer-message-time" (integer) and the "printer-current-time" (dateTime) (see [ipp-mod] section 4.4.30) Printer Description attributes are supported, then the "printer-message-date-time" (dateTime) attribute MUST be supported.

11 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/set.txt

12 Internationalization Considerations

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

13 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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15 References

[ipp-mod]
R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell, "Internet Printing Protocol/1.0: Model and Semantics", <draft-ietf-ipp-model-v11-04.txt>, June 23, 1999.

[ipp-pro]
Herriot, R., Butler, S., Moore, P., Tuner, R., "Internet Printing Protocol/1.1: Encoding and Transport", draft-ietf-ipp-protocol-v11-03.txt, June 23, 1999.

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

16 Change History

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

16.1 Changes to the December 8, 1999 version to make the January 4, 2000 version

The following changes to the December 8, 1999 version to make the January 4, 2000 version as a result of the IPP WG telecons and mailing list discussion:

1. Removed the Set operations and related items from the Set2 specification [ipp-set2] to create this Set specification.
2. Added that an attribute that can only be set to one fixed value SHOULD NOT be included in the "printer-settable-attributes" or "job-settable-attributes" attributes.
3. Indicated that the encoding of the 'not-settable' out-of-band value is TBD.
4. Added that Set-Job-Attributes operation adds an attribute to the Job object if it wasn't already there
5. Added the conformance section to make it easy to understand the conformance requirements.

17 Appendix A: Full Copyright Statement