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9 Internet Printing Protocol (IPP):
10 Resource Objects
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33 Abstract

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35 This document is a submission to the Internet Printing Protocol
36 Working Group of the Internet Engineering Task Force (IETF). The
37 open issues in this document each begin 'ISSUE_n:'. Comments should
38 be submitted to the ipp@pwg.org mailing list.

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40 This IPP Resource Objects document specifies an extension to IPP/1.0
41 [RFC-2565] [RFC-2566] and IPP/1.1 [IPP-MOD] [IPP-PRO]. This document
42 extends the current IPP object model with a passive polymorphic
43 object type - Resource - to support the long-term evolution of IPP.

44
45 This document defines:

- 46 - Resource object (passive polymorphic object);
- 47 - Resource query operations (e.g., Get-Resource-Attributes);
- 48 - Resource admin operations (e.g., Create-Resource);
- 49 - Resource template attributes (e.g., "resource-charset");
- 50 - Resource description attributes (e.g., "resource-name"); and
- 51 - new Printer attributes (e.g., "resource-type-supported").

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1. Introduction

See section 1 'Introduction' in [IPP-MOD] for a full description of the IPP document set and overview information about IPP.

This document is a submission to the Internet Printing Protocol Working Group of the Internet Engineering Task Force (IETF). The open issues in this document each begin 'ISSUE_n:'. Comments should be submitted to the `ipp@pwg.org` mailing list.

This IPP Resource Object documents specifies an extension to IPP/1.0 [RFC-2565] [RFC-2566] and IPP/1.1 [IPP-MOD] [IPP-PRO]. This document extends the current IPP object model with a passive polymorphic object type - Resource - to support the long-term evolution of IPP.

This document defines:

- Resource object (passive polymorphic object);
- Resource query operations (e.g., Get-Resource-Attributes);
- Resource admin operations (e.g., Create-Resource);
- Resource template attributes (e.g., "resource-charset");
- Resource description attributes (e.g., "resource-name"); and
- new Printer attributes (e.g., "resource-type-supported").

This document is laid out as follows:

- Section 2 adds the Resource object to the IPP object model.
- Section 3 is the terminology used throughout the document.
- Section 4 specifies the operations on Resource objects, including new status codes for Resource operations.
- Section 5 specifies the attributes common to all Resource objects.
- Section 6 specifies the rules for defining new Resource object types.
- Section 7 specifies the conformance requirements for this document.
- Section 8, 9, and 10 specify IANA, internationalization, and security considerations.
- Section 11 allocates new protocol encoding values for this document.
- Sections 12, 13, 14, and 15 list references, authors' addresses, change history, and full IETF copyright statement.

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2. IPP Model for Resources

See section 2 'IPP Objects' in [IPP-MOD] for a full description of the IPP object model and terminology.

2.1. Resource Object

IPP Resource objects are used to model installed features or capabilities of IPP Printers (e.g., 'font'). All Resource object instances contain a common set of base Resource object attributes.

Resource object instances MAY have an additional set of attributes, according to their "resource-type" and IPP Printer implementation.

Resource objects instances MAY also have associated data, according to their "resource-type" and IPP Printer implementation. Resource data (if any) is available by reference in "resource-data-uri" or by value if "resource-data-present" is 'true' (i.e., a local copy of the Resource data is available on the IPP Printer).

Section 4 describes each of the Resource operations in detail.

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3. Terminology

This specification document uses the terminology defined in this section.

3.1. Conformance Terminology

The terms "MUST", "MUST NOT", "REQUIRED", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC-2119]. These terms are used to specify conformance requirements which apply if this specification is implemented (in addition to IPP/1.0 or higher).

3.2. Model Terminology

See section 12.2 'Model Terminology' in [IPP-MOD].

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4. Resource Operations

The common semantics of all IPP Resource operations are the ones defined for all IPP operations in [IPP-MOD], e.g., "operation-id", "status-code", "attributes-charset", etc.

See section 3.1 'Common Semantics' in [IPP-MOD].

4.1. Resource Query Package - REQUIRED

The following three Resource query operations are REQUIRED for all IPP Printers to implement, if they implement Resource objects.

4.1.1. Get-Resource-Attributes Operation

REQUIRED - for IPP Printers to implement.

This operation allows an IPP Client to request the values of attributes of a Resource object instance and is similar to the Get-Job-Attributes operation (see section 3.2.5 in [IPP-MOD]). The only differences are that the operation is directed at a Resource object instance rather than a Job object instance, there is a "resource-type" operation attribute required when querying a Resource object, and the returned attribute group is a set of Resource object attributes rather than a set of Job object attributes.

For Resources, the possible names of attribute groups are:

- 'resource-template': the subset of the Resource Template attributes that the implementation supports for Resource objects (see section 5.1).
- 'resource-description': the subset of the Resource Description attributes that the implementation supports for Resource objects (see section 5.2).
- 'all': the special group 'all' that includes all attributes that the implementation supports for Resource objects.

Since an IPP Client MAY request specific attributes or named groups, there is a potential that there is some overlap. For example, if an IPP Client requests 'resource-create-time' and 'resource-description', the IPP Client is actually requesting the "resource-create-time" attribute once by naming it explicitly, and once by inclusion in the 'resource-description' group. In such cases, the IPP Printer object NEED NOT return the attribute only once

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in the response even if it is requested multiple times. The IPP Client SHOULD NOT request the same attribute in multiple ways.

4.1.1.1. Get-Resource-Attributes Request

The IPP Client submits the Get-Resource-Attributes request to an IPP Printer object.

The IPP Client supplies the following groups of attributes as part of the Get-Resource-Attributes Request:

Group 1: Operation Attributes

Natural Language and Character Set:

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

Target:

The "printer-uri" (uri) operation attribute which is the target for ALL Resource operations as described in section 3.1.5 in [IPP-MOD].

ISSUE_1: The target of all IPP Resource operations is always simply "printer-uri" and separate required operation attributes are used to specify resource type and name or ID. This is like IPP Subscription objects but unlike the earlier IPP Job objects. Should we continue to follow the IPP Subscription object model?

Resource Type:

The "resource-type (type2 keyword)" attribute as described in section 5.4.1. The IPP Client MUST supply "resource-type" in all IPP Resource operation requests. The IPP Printer MUST support and validate "resource-type" in all IPP Resource operation requests.

Resource Name or ID:

The "resource-name (name(127))" attribute as described in section 5.4.2 in this document
<OR>
the "resource-id (integer(1:MAX))" attribute as described in section 5.4.3.

Requesting User Name:

The "requesting-user-name" (name(MAX)) attribute SHOULD be supplied by the IPP Client as described in section 8.3 in [IPP-MOD].

"requested-attributes" (1setOf keyword):

The IPP Client OPTIONALLY supplies this attribute. The IPP Printer MUST support this attribute. It is a set of attribute names and/or attribute group names in whose values the requester is interested.

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If the IPP Client omits this attribute, the IPP Printer MUST respond as if this attribute had been supplied with a value of 'all'.

4.1.1.2. Get-Resource-Attributes Response

The Printer object returns the following sets of attributes as part of the Get-Resource-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 sections 13 and 3.1.6 in [IPP-MOD].

Natural Language and Character Set:

The "attributes-charset" and "attributes-natural-language" attributes as described in section 3.1.4.2 in [IPP-MOD]. The "attributes-natural-language" MAY be the natural language of the Resource object, rather than the one requested.

Group 2: Unsupported Attributes

See section 3.1.7 in [IPP-MOD] for details on returning Unsupported Attributes.

The response NEED NOT contain the "requested-attributes" operation attribute with any supplied values (attribute keywords) that were requested by the IPP Client but are not supported by the IPP Printer. If the Printer object does include unsupported attributes referenced in "requested-attributes" and such attributes include group names, such as 'all', the unsupported attributes MUST NOT include attributes described in this document but not supported by the implementation.

Group 3: Resource Object Attributes

This is the set of requested Resource object attributes and their current values, i.e., any of the Resource object attributes in the tables in sections 5.1 and 5.2. The IPP Printer ignores (does not respond with) any requested attribute or value which is not supported or which is restricted by the security policy in force, including whether the requesting user is the user that created the Resource object instance. However, the IPP Printer MUST respond

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with the 'unknown' value for any supported attribute (including all REQUIRED attributes) for which the IPP Printer does not know the value, unless it would violate the security policy. See the description of the "out-of-band" values in the beginning of Section 4.1 in [IPP-MOD].

See section 5.1 'Table of Resource Template Attributes'.
See section 5.2 'Table of Resource Description Attributes'.

4.1.2. Get-Resource-Data Operation

REQUIRED - for IPP Printers to implement.

This operation allows an IPP Client to request the values of attributes of a Resource object instance AND the value of associated Resource data (i.e., this operation is like 'Print-Job' except that the opaque data is transferred in the opposite direction). This operation is a strict superset of the Get-Resource-Attributes operation above. The only difference is that the operation returns Resource data in addition to Resource attributes.

This operation is only supported for the "resource-type" values for which the Resource is defined to allow data (e.g., 'form'). If the IPP Client supplies a value for "resource-type" that does NOT allow Resource data, the IPP Printer MUST return a status code of 'client-error-not-possible'.

Note: This separate operation is defined (rather than overloading the 'Get-Resource-Attributes' operation above) to simplify access control policies. Note that some Resource types (e.g, 'font') MAY have have copyright and intellectual property considerations with respect to IPP Clients reading their associated data.

4.1.2.1. Get-Resource-Data Request

See section 4.1.1.1 'Get-Resource-Attributes Request'.

The IPP Client submits the Get-Resource-Data request to an IPP Printer object.

The IPP Client supplies the following groups of attributes as part of the Get-Resource-Data Request:

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.1 'Get-Resource-Attributes Request'.

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4.1.2.2. Get-Resource-Data Response

See section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.2
'Get-Resource-Attributes Response'.

Group 2: Unsupported Attributes

See 'Group 2: Unsupported Attributes' in section 4.1.1.2
'Get-Resource-Attributes Response'.

Group 3: Resource Object Attributes

See 'Group 3: Resource Object Attributes' in section 4.1.1.2
'Get-Resource-Attributes Response'.

See section 5.1 'Table of Resource Template Attributes'.

Group 4: Resource Object Data

See section 5.x 'resource-data-present'.

See section 3.2.1.1 'Print-Job Request' in [IPP-MOD].

The IPP Printer MUST return the Resource data (if any) to the IPP Client, within the constraints of administratively configured access control policies and any applicable copyright or other intellectual property considerations.

4.1.3. Get-Resources Operation

REQUIRED - for IPP Printers to implement.

This operation allows an IPP Client to retrieve the list of Resource object instances (of a specified resource type) belonging to the target Printer object. The IPP Client may also supply a list of Resource attribute names and/or attribute group names. A group of Resource object attributes will be returned for each Resource object instance that is returned.

This operation is similar to the Get-Resource-Attributes operation,

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except that this Get-Resources operation returns attributes from possibly more than one object.

See section 3.2.6 'Get-Jobs Operation' in [IPP-MOD].

4.1.3.1. Get-Resources Request

The IPP Client submits the Get-Resources request to an IPP Printer object.

The IPP Client supplies the following groups of attributes as part of the Get-Resources Request:

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.1 'Get-Resource-Attributes Request'.

Resource Name or ID:

The IPP Client MUST NOT send either "resource-name" or "resource-id". The IPP Printer MUST return them as Unsupported Attributes if supplied and MUST reject the Get-Resources operation.

"limit" (integer(1:MAX)):

[added]

The IPP Client OPTIONALLY supplies this attribute. The IPP Printer MUST support this attribute. It is an integer value that determines the maximum number of resources that an IPP Client will receive from the IPP Printer.

Groups 2 to N: Resource Filter Attributes

See 'Group 3: Resource Object Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

This is the set of filter attributes and their filter values. The IPP Printer ignores Resources which do not satisfy the specified filter. A multi-valued filter attribute matches if the corresponding Resource object instance attribute contains all of the one or more values of the multi-valued filter attribute.

The filter criteria in each Resource Filter Attribute group MUST all be true for a match (logical AND within the set). But only ONE Resource Filter Group need be true for a match (logical OR across the sets).

ISSUE_2: What mechanism should we use for filters?

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1. Group mechanism with multiple new Resource Filter Attributes groups, limited to simple logical AND and OR filters?
2. Simple mechanism with new "resource-filter (collection)" operation attribute in Get-Resources operations, limited to one simple logical AND filter?
3. Robust mechanism with new "resource-filter (text)" operation attribute in Get-Resources operations, supporting full LDAPv3 string attribute filters or a profile (subset) of LDAPv3 filters?
See 'String Representation of LDAP Search Filters' [RFC-2254].

[Editor - favors solution 3 at this writing]

4.1.3.2. Get-Resources Response

The Printer object returns all of the Resource object instances, up to the number specified by the "limit" attribute, that match the criteria as defined by the filter attribute values supplied by the IPP Client in the request. It is possible that no Resource objects are returned since there may literally be none at the Printer, or there may be no Resource objects that match the criteria supplied by the IPP Client. If the IPP Client requests any Resource attributes at all, there is a set of Resource Object Attributes returned for each Resource object instance.

It is not an error for the IPP Printer to return 0 Resources. If the response returns 0 Resources because there are no Resources matching the criteria, and the request would have returned 1 or more Resources with a status code of 'successful-ok' if there had been Resources matching the criteria, then the status code for 0 Resources MUST be 'successful-ok'.

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.3.1 'Get-Resources Request'.

Group 2: Unsupported Attributes

See 'Group 2: Unsupported Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

Groups 3 to N: Resource Object Attributes

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See 'Group 3: Resource Object Attributes' in section 4.1.1.2
'Get-Resource-Attributes Response'.

See section 5.1 'Table of Resource Template Attributes'.

Resource object instances MUST be returned sorted by "resource-id".

ISSUE_3: Should we require that Resource object instances are always
returned sorted by "resource-id" (as stated above) and not by
"resource-name" (more user-friendly). Should we add an operation
attribute to control the choice of sort order?

4.2. Resource Admin Package - OPTIONAL

The following four Resource admin operations are OPTIONAL for all IPP
Printers to implement, if they implement Resource objects. However,
when implemented, these four Resource admin operations MUST be
implemented as a package (all four).

Note: The Set-Resource operation is intentionally NOT defined here.
For simplicity and robustness, Resource object instances are entirely
static, except that their leases MAY be renewed with the
Renew-Resource operation.

4.2.1. Create-Resource Operation

OPTIONAL - for IPP Printers to implement.

This operation allows an authorized IPP Client to create a Resource
object instance on this IPP Printer and to send OPTIONAL Resource
data for local storage on the IPP Printer along with the Resource
object attributes for those values of "resource-type" which are
defined to allow Resource data.

Note: Specific Resource types (values of "resource-type") constrain
whether Resource data may be sent with the Create-Resource operation.

4.2.1.1. Create-Resource Request

The IPP Client submits the Create-Resource request to an IPP Printer
object.

The IPP Client supplies the following groups of attributes as part of
the Create-Resource Request:

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Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.1
'Get-Resource-Attributes Request'.

"resource-name" (name(127)):

The IPP Client MUST supply this attribute.

Note: Unlike the "job-name" attribute, the value of
"resource-name" MUST be unique among Resources of the SAME
"resource-type". IPP Printers MUST not allow Resource object
instances of the SAME "resource-type" to exist with duplicate
"resource-name" values. IPP Printers MUST reject Create-Resource
operations that specify duplicate "resource-name" values.

"resource-id" (integer(1:MAX)):

[omitted]

The IPP Client MUST NOT send "resource-id" and the IPP Printer MUST
return it in Unsupported Attributes if supplied.

"requested-attributes" (1setOf keyword):

The IPP Client OPTIONALLY supplies this attribute. The IPP Printer
MUST support this attribute. It is a set of attribute names and/or
attribute group names in whose values the requester is interested.
If the IPP Client omits this attribute, the IPP Printer MUST
respond as if this attribute had been supplied with a value of
'all'.

ISSUE_4: Should we make Resources more Subscriptions (and Jobs)
and just drop the "requested-attributes" from all of the Resource
admin operations? Then "requested-attributes" would only be
permitted in the Resource query operations.

Group 2: Resource Object Attributes

This is the set of IPP Client supplied Resource Template attributes
and their new values, i.e., any of the Resource object attributes
in section 5.1.

The IPP Client MUST supply the "resource-create-date-time"
attribute (see section 5.3.5). All other Resource attributes are
OPTIONAL for the IPP Client to supply.

See 'Group 3: Resource Object Attributes' in section 4.1.1.2
'Get-Resource-Attributes Response'.

See section 5.1 'Table of Resource Template Attributes'.

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Group 3: Resource Object Data

See section 5.x 'resource-data-present'.
See section 3.2.1.1 'Print-Job Request' in [IPP-MOD].

The IPP Client OPTIONALLY sends the Resource data (if any) to the IPP Printer, within the constraints of administratively configured access control policies and any applicable copyright or other intellectual property considerations. If the IPP Client supplies Resource data for a Resource type that is not defined to allow Resource data, the IPP Printer MUST reject the request and return a status code of 'client-error-not-possible'.

4.2.1.2. Create-Resource Response

See section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 2: Unsupported Attributes

See 'Group 2: Unsupported Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 3: Resource Object Attributes

This group MUST be returned if and only if the "status-code" parameter returned in Group 1 has the value 'successful-ok' or 'successful-ok-ignored-or-substituted-attributes'. All IPP Printers MUST return the following Resource attributes in successful Create-Resource responses:
"resource-id" (integer(1:MAX)) -- generated by the IPP Printer
"resource-lease-duration" (integer(0:MAX)) -- lease actually granted

All IPP Printers MUST support the "requested-attributes" operation attribute and conform to the behavior described in section 4.1.1.1 'Get-Resource-Attributes Request'.

See 'Group 3: Resource Object Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

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See section 5.1 'Table of Resource Template Attributes'.

In addition to the MANDATORY parameters required for every operation request, the simplest Create-Resource Request consists of just the "attributes-charset", "attributes-natural-language", "resource-type", and "resource-name" operation attributes; the "printer-uri" target operation attribute; the OPTIONAL Resource data (if any) and nothing else. In this simplest case, the IPP Printer object:

- creates a new Resource object (the Resource object MAY contain Resource data);
- generates a locally unique "resource-id" for the new Resource;
- stores the name supplied by the IPP Client in the "resource-name" attribute in the natural language and charset requested (see Section 3.1.4.1 of [IPP-MOD]) (if those are supported, otherwise using the Printer object's default natural language and charset); and
- uses its corresponding default value attributes (e.g., "resource-lease-duration-default") for the supported Resource Template attributes that were not supplied by the IPP Client in the Create-Resource operation.

4.2.2. Delete-Resource Operation

OPTIONAL - for IPP Printers to implement.

This operation allows an authorized IPP Client to delete a Resource object instance on this IPP Printer.

4.2.2.1. Delete-Resource Request

The IPP Client submits the Delete-Resource request to an IPP Printer object.

The IPP Client supplies the following groups of attributes as part of the Delete-Resource Request:

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.1 'Get-Resource-Attributes Request'.

Resource Name or ID:

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The "resource-name (name(127))" attribute as described in section 5.4.2 in this document

<OR>

the "resource-id (integer(1:MAX))" attribute as described in section 5.4.3.

"requested-attributes" (1setOf keyword):

The IPP Client OPTIONALLY supplies this attribute. The IPP Printer MUST support this attribute. It is a set of attribute names and/or attribute group names in whose values the requester is interested. If the IPP Client omits this attribute, the IPP Printer MUST respond as if this attribute had been supplied with a value of 'all'.

4.2.2.2. Delete-Resource Response

See section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 2: Resource Object Attributes

This group MUST be returned if and only if the "status-code" parameter returned in Group 1 has the value 'successful-ok'. All IPP Printers MUST return the following Resource attribute in successful Delete-Resource responses:
"resource-id" (integer(1:MAX))

All IPP Printers MUST support the "requested-attributes" operation attribute and conform to the behavior described in section 4.1.1.1 'Get-Resource-Attributes Request'.

4.2.3. Refresh-Resource Operation

OPTIONAL - for IPP Printers to implement.

This operation allows an authorized IPP Client to refresh a Resource object instance on this IPP Printer (i.e., fetch the Resource data and locally cache it, setting "resource-data-present" to 'true' and "resource-data-k-octets" to the actual size).

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4.2.3.1. Refresh-Resource Request

The IPP Client submits the Refresh-Resource request to an IPP Printer object.

The IPP Client supplies the following groups of attributes as part of the Refresh-Resource Request:

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.1 'Get-Resource-Attributes Request'.

Resource Name or ID:

The "resource-name (name(127))" attribute as described in section 5.4.2 in this document

<OR>

the "resource-id (integer(1:MAX))" attribute as described in section 5.4.3.

"requested-attributes" (1setOf keyword):

The IPP Client OPTIONALLY supplies this attribute. The IPP Printer MUST support this attribute. It is a set of attribute names and/or attribute group names in whose values the requester is interested.

If the IPP Client omits this attribute, the IPP Printer MUST respond as if this attribute had been supplied with a value of 'all'.

4.2.3.2. Refresh-Resource Response

See section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 2: Resource Object Attributes

This group MUST be returned if and only if the "status-code" parameter returned in Group 1 has the value 'successful-ok'. All IPP Printers MUST return the following Resource attribute in successful Refresh-Resource responses:

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1068 "resource-id" (integer(1:MAX))

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1070 All IPP Printers MUST support the "requested-attributes" operation

1071 attribute and conform to the behavior described in section 4.1.1.1

1072 'Get-Resource-Attributes Request'.

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1076 4.2.4. Renew-Resource Operation

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1078 OPTIONAL - for IPP Printers to implement.

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1080 This operation allows an authorized IPP Client to renew the (finite)

1081 lease of a Resource object instance on this IPP Printer (i.e., renew

1082 the Resource lease for "resource-duration" forward from the current

1083 time).

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1087 4.2.4.1. Renew-Resource Request

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1089 The IPP Client submits the Renew-Resource request to an IPP Printer

1090 object.

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1092 The IPP Client supplies the following groups of attributes as part of

1093 the Renew-Resource Request:

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1096 Group 1: Operation Attributes

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1098 See 'Group 1: Operation Attributes' in section 4.1.1.1

1099 'Get-Resource-Attributes Request'.

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1101 Resource Name or ID:

1102 The "resource-name (name(127))" attribute as described in section

1103 5.4.2 in this document

1104 <OR>

1105 the "resource-id (integer(1:MAX))" attribute as described in

1106 section 5.4.3.

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1108 "requested-attributes" (1setOf keyword):

1109 The IPP Client OPTIONALLY supplies this attribute. The IPP Printer

1110 MUST support this attribute. It is a set of attribute names and/or

1111 attribute group names in whose values the requester is interested.

1112 If the IPP Client omits this attribute, the IPP Printer MUST

1113 respond as if this attribute had been supplied with a value of

1114 'all'.

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1117 Group 2: Resource Object Attributes

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1120 Hastings, McDonald

Expires 7 March 2001

[Page 20]

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"resource-lease-duration" (integer(0:MAX))

Note: Even though Resource objects are static (i.e, there is no Set-Resource operation defined, intentionally), an IPP Client MAY supply a new (possibly different) value for "resource-lease-duration". As always, the IPP Printer MAY grant a shorter lease according to the value of the Printer attribute "resource-lease-duration-supported".

in a Renew-Resource operation.

4.2.4.2. Renew-Resource Response

See section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 1: Operation Attributes

See 'Group 1: Operation Attributes' in section 4.1.1.2 'Get-Resource-Attributes Response'.

Group 2: Resource Object Attributes

This group MUST be returned if and only if the "status-code" parameter returned in Group 1 has the value 'successful-ok'. All IPP Printers MUST return the following Resource attributes in successful Renew-Resource responses:

"resource-id" (integer(1:MAX))

"resource-lease-duration" (integer(0:MAX))

All IPP Printers MUST support the "requested-attributes" operation attribute and conform to the behavior described in section 4.1.1.1 'Get-Resource-Attributes Request'.

4.3. Printer Operation Extensions - REQUIRED

4.3.1. Get-Printer-Attributes Operation

This operation is extended so that it returns Printer attributes defined .

All IPP Printers that support IPP Resource objects MUST implement this extension to the 'Get-Printer-Attributes' operation.

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In addition to the requirements of [IPP-MOD] section 3.2.5, an IPP Printer MUST support the following additional values for the "requested-attributes" Operation attribute in this operation and return such attributes in the Printer Object Attributes group of its response.

1. Resource Template Attributes: ALL "xxx-default" attributes in column 1 of section 5.1 'Table of Resource Template Attributes'.
2. New Printer Description Attributes: ALL "xxx-supported" attributes in column 1 of section 5.1 'Table of Resource Template Attributes'.
3. New Group Name: The 'resource-template' group name, which names all supported Resource Template attributes in section 5.1 'Table of Resource Template Attributes'. This group name is also used in the Get-Resources-Attributes and Get-Resources operation with an analogous meaning.
4. Extended Group Name: The 'all' group name, which names all IPP Printer attributes according to [IPP-MOD] section 3.2.5. In this extension 'all' names all attributes specified in [IPP-MOD] plus those named in items 1 and 2 of this list.

4.4. Resource Operation Response Status Codes

client-error-not-authenticated
client-error-not-authorized
client-error-resource-type-not-supported
client-error-resource-data-not-supported
client-error-resource-data-not-present

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5. Resource Attributes

All IPP Resource attributes presently defined are REQUIRED for all IPP Printer implementations of Resource objects.

5.1. Table of Resource Template Attributes

All IPP Printers that support IPP Resource objects MUST implement ALL of the following REQUIRED Resource Template attributes defined in this specification (on the Resource object or the Printer object as specified below).

All Resource Template attributes are passed in a Resource Attributes Group in IPP Resource operations.

Resource Object Attribute	Resource Attribute Type
Printer Object Attribute(s)	Printer Attribute Type(s)
-----	-----
resource-charset	(charset)
charset-configured	(charset)
charset-supported	(1setOf charset)
resource-natural-language	(naturalLanguage)
natural-language-configured	(naturalLanguage)
generated-natural-language-supported	(1setOf naturalLanguage)
resource-info	(text(127))
[no default/supported on Printer]	
resource-document-formats	(1setOf mimeType)
document-format-default	(mimeType)
document-format-supported	(1setOf mimeType)
resource-create-date-time	(dateTime)
[no default/supported on Printer]	
resource-lease-duration	(integer(0:MAX))
resource-lease-duration-default	(integer(0:MAX))
resource-lease-duration-supported	(rangeOfInteger(0:MAX))
resource-data-present	(boolean)
[no default on Printer]	
resource-data-present-supported	(1setOf boolean)
resource-data-uri	(1setOf uri)
[no default on Printer]	
reference-uri-schemes-supported	(1setOf uriScheme)

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resource-data-k-octets (integer(0:MAX))
 [no default on Printer]
resource-data-k-octets-supported (rangeOfInteger (0:MAX))
resource-data-compression (type3 keyword)
 [no default on Printer]
compression-supported (1setOf type3 keyword)

5.2. Table of Resource Description Attributes

All IPP Printers that support IPP Resource objects MUST implement ALL of the following REQUIRED Resource Description attributes defined in this specification (on the Resource object or the Printer object as specified below).

All Resource Description attributes that MAY be supplied by an IPP Client are passed in an Operation Attributes Group in IPP Resource operations.

Resource Description Attribute	Resource Attribute Type
resource-type	(type2 keyword)
resource-name	(name(127))
resource-id	(integer(1:MAX))
resource-printer-uri	(uri)
resource-create-user-name	(name(MAX))
resource-create-time	(integer(0:MAX))
resource-expiration-time	(integer(0:MAX))

5.3. Resource Template Attributes

5.3.1. resource-charset (charset)

REQUIRED - for IPP Printers to implement.

This attribute specifies the charset of 'text' and 'name' attributes of the Resource and of textual data in the associated Resource data (if any).

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5.3.2. resource-natural-language (naturalLanguage)

REQUIRED - for IPP Printers to implement.

This attribute specifies the natural language of 'text' and 'name' attributes of the Resource and of textual data in the associated Resource data (if any).

5.3.3. resource-info (text(127))

REQUIRED - for IPP Printers to implement.

This attribute specifies descriptive information about this Resource object. This may include manufacturer, version, copyright, etc.

See section 4.4.6 'printer-info' in [IPP-MOD].

See section 4.4.9 'printer-make-and-model' in [IPP-MOD].

5.3.4. resource-document-formats (1setOf mimeType)

REQUIRED - for IPP Printers to implement.

This attribute specifies the list of document formats supported by the Resource (e.g., 'application/postscript' for a Resource of type 'font').

5.3.5. resource-create-date-time (dateTime)

REQUIRED - for IPP Printers to implement.

This attribute indicates the date and time at which the Resource object instance was created.

IPP Resource objects created during product manufacturing (via software download to the IPP Printer, for example) MUST include a vendor-supplied value for "resource-create-date-time". This value SHOULD reflect the actual 'build date' of the Resource, rather than simply the 'install date' on the IPP Printer, because this is more informative for the end user.

IPP Resource objects created with the Create-Resource operation MUST include an IPP Client-supplied value for "resource-create-date-time" in the create request.

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See section 4.4.30 'printer-current-time' in [IPP-MOD].
See section 4.3.14.5 'date-time-at-creation' in [IPP-MOD].

5.3.6. resource-lease-duration (integer(0:MAX))

REQUIRED - for IPP Printers to implement.

This attribute indicates length of the Resource object instance lease in seconds.

If this attribute is zero '0', then the lease on this Resource object instance is infinite (i.e., the lease never expires).

If this attribute is non-zero, then this Resource object instance has a finite lease and expires according to "resource-expiration-time" granted by the IPP Printer.

See section 5.x 'resource-create-time'.
See section 5.x 'resource-expiration-time'.

5.3.7. resource-data-present (boolean)

REQUIRED - for IPP Printers to implement.

The attribute indicates whether or not a local copy of the Resource data is present at the IPP Printer.

This attribute MUST default to 'false', if not supplied by the IPP Client in the Create-Resource operation.

When "resource-data-present" is 'true' on a Resource object instance, it indicates that the IPP Printer has stored a local copy of the Resource data or has fetched a local copy of the Resource data that was specified by reference in "resource-data-uri".

When "resource-data-present" is 'false' on a Resource object instance and "resource-data-uri" is empty, it indicates that there is no Resource data.

When "resource-data-present" is 'false' on a Resource object instance and "resource-data-uri" is non-empty, it indicates that the IPP Printer has NOT yet fetched a local copy of the Resource data that was specified by reference and the value of "resource-data-k-octets" is unverified.

See section 4.2.3 'Refresh-Resource Operation'.

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5.3.8. resource-data-uri (1setOf uri)

REQUIRED - for IPP Printers to implement.

This attribute contains the URI of associated Resource data (if any) as a reference.

Lazy Refresh:

An IPP Printer NEED NOT immediately fetch a local copy of the Resource data specified by reference in "resource-data-uri", but MUST set "resource-data-present" to 'false' until a local copy is fetched.

When an IPP Printer does fetch a local copy of the Resource data, it MUST set (REQUIRED) "resource-data-present" to 'true' and set (REQUIRED) "resource-data-k-octets" to the actual size.

ISSUE_5: This 'lazy refresh' behavior may have performance and 'stale data' consequences for IPP Clients. Because the manufacturer may also be slow to inform installed IPP Printers of a new version of a Resource (for update by means outside of this specification) the 'stale data' problem may also apply to IPP Printers. Should we add an operation attribute to PREVENT this 'lazy refresh' behavior?

See section 4.2.3 'Refresh-Resource Operation'.

See section 5.x 'resource-data-present'.

See section 4.4.27 'reference-uri-schemes-supported' in [IPP-MOD].

See section 3.2.2 'Print-URI' in [IPP-MOD].

5.3.9. resource-data-k-octets (integer(0:MAX))

REQUIRED - for IPP Printers to implement.

This attribute contains the size of associated Resource data (if any). An IPP Printer MUST set this attribute to zero for Resource types that MUST not have Resource data supplied by reference in "resource-data-uri" or by value in a Create-Resource operation.

See 'Lazy Refresh' in section 5.x 'resource-data-uri' of this document for IPP Printer behavior with respect to "resource-data-k-octets".

See section 4.2.3 'Refresh-Resource Operation'.

See section 5.x 'resource-data-present'.

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5.3.10. resource-data-compression (type3 keyword)

REQUIRED - for IPP Printers to implement.

This attribute identifies the compression of the associated Resource data (if any).

See section 4.4.32 'compression-supported' in [IPP-MOD] for standard keyword values.

5.4. Resource Description Attributes

5.4.1. resource-type (type2 keyword)

REQUIRED - for IPP Printers to implement.

This attribute identifies the type of this Resource object instance which determines additional Resource attributes specific to the named type.

The following standard keyword values are defined:

'font': The Resource contains font characteristics and (OPTIONALLY) font data.

'form': The Resource contains form characteristics and (OPTIONALLY) form data.

'image': The Resource contains image characteristics and (OPTIONALLY) image data.

'logo': The Resource contains logo characteristics and (OPTIONALLY) logo data.

'media': The Resource contains media characteristics for a single medium and MUST NOT contain media data.

See section 5.5 'Job Template Attributes for Resources'.

5.4.2. resource-name (name(127))

REQUIRED - for IPP Printers to implement.

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This attribute is the human-readable name of the Resource object instance. This name is more user-friendly than the integer "resource-id" attribute.

Note: Unlike the "job-name" attribute, the value of "resource-name" MUST be unique among Resources of the SAME "resource-type". IPP Printers MUST not allow Resource object instances of the SAME "resource-type" to exist with duplicate "resource-name" values. IPP Printers MUST reject Create-Resource operations that specify duplicate "resource-name" values.

Note: This attribute has been specified as REQUIRED (unlike "job-name") in the interests of ease-of-use. IPP Printers are expected to implement large numbers of Resource objects and the guaranteed presence of a user-friendly name will benefit ease-of-use.

See section 4.3.5 'job-name' in [IPP-MOD].

5.4.3. resource-id (integer(1:MAX))

REQUIRED - for IPP Printers to implement.

This attribute contains the locally unique ID (for a given value of "resource-type") of the Resource object instance.

The IPP Printer, on creation of a new Resource object instance, (by means outside of this specification) generates an ID which identifies the new Resource object instance on the Printer specified by the value of "resource-printer-uri" (but not globally). The zero '0' value is not included to allow for compatibility with SNMP index values which also cannot be zero '0'.

See section 4.3.2 'job-id' in [IPP-MOD].

5.4.4. resource-printer-uri (uri)

REQUIRED - for IPP Printers to implement.

This attribute identifies the IPP Printer that hosts this Resource object instance (i.e., records the value of the "printer-uri" target attribute from a Create-Resource operation).

See section 4.3.3 'job-printer-uri' in [IPP-MOD].

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5.4.5. resource-create-user-name (name(MAX))

REQUIRED - for IPP Printers to implement.

This attribute contains the name of the end user that created this Resource object instance.

For factory-installed resources, "resource-create-user-name" MUST be set to the empty string to prevent namespace conflicts in end user networks.

See section 4.3.6 'job-originating-user-name' in [IPP-MOD].

5.4.6. resource-create-time (integer(0:MAX))

REQUIRED - for IPP Printers to implement.

This attribute indicates the time at which the Resource object instance was created (i.e., the value of "printer-up-time" when the Resource object instance was created).

If this Resource was created prior to the most recent system startup, then the IPP Printer MUST set this attribute to zero '0'.

See section 5.x 'resource-expiration-time'.

See section 5.x 'resource-lease-duration'.

See section 4.4.29 'printer-up-time' in [IPP-MOD].

See section 4.3.14.1 'time-at-creation' in [IPP-MOD].

5.4.7. resource-expiration-time (integer(0:MAX))

REQUIRED - for IPP Printers to implement.

This attribute indicates the time at which the Resource object instance lease will expire. (i.e., the value of "printer-up-time" when the Resource object instance will be deleted by the IPP Printer).

If "resource-lease-duration" is zero '0', then the IPP Printer MUST set "resource-expiration-time" also to zero '0' (i.e., infinite lease).

See section 5.x 'resource-create-time'.

See section 5.x 'resource-lease-duration'.

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See section 4.4.29 'printer-up-time' in [IPP-MOD].
See section 4.3.14.3 'time-at-completed' in [IPP-MOD].

5.5. Job Template Attributes for Resources

Each Resource Type Definition MUST specify whether or not the Resource type MAY be associated with a Job object. If so, then two new Job Description attributes are algorithmically added to the definition of a Job object:

5.5.1. restype (name (127))

Where 'restype' is a standard keyword for "resource-type" (e.g., 'media' yields the Job attribute named simply "media").

This Job attribute specifies the "resource-name" value of a single Resource object instance with "resource-type" of 'restype' that is REQUIRED for this Job and that SHOULD override any PDL instructions in the Job datastream.

This attribute supplies advice for job scheduling to the IPP Printer.

See section 4.2.1 "media" in [IPP-MOD].
See 'media-needed' keyword in section 4.4.12 "printer-state-reasons" in [IPP-MOD].

5.5.2. restype-required (1setOf name(127))

Where 'restype' is a standard keyword for "resource-type" (e.g., 'media' yields the Job attribute named "media-required").

This Job attribute specifies the "resource-name" values of a set of Resource object instances with "resource-type" of 'restype' that are REQUIRED for this Job and that SHOULD override any PDL instructions in the Job datastream.

This attribute supplies advice for job scheduling to the IPP Printer.

See section 4.2.1 "media" in [IPP-MOD].
See 'media-needed' keyword in section 4.4.12 "printer-state-reasons" in [IPP-MOD].

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6. Rules for Resource Type Definitions

6.1. Do NOT define new operations for Resource

REQUIRED - Do NOT define any new operations for the Resource.

6.2. Define new type keyword for Resource

REQUIRED - Define a new type keyword 'restype' for the Resource.

6.3. Define new type-specific attributes for Resource

OPTIONAL - Define type-specific attributes for the Resource with names of the form "restype-yyy" (e.g., "media-size"), using the 'restype' keyword chosen above. is a simple attribute name for this Resource type.

6.4. Define new Printer attributes for Resource

REQUIRED - Define new Resource Template attributes on the Printer object for the Resource, named "restype-default" and "restype-supported", using the 'restype' keyword chosen above (e.g., "media-default" and "media-supported"). "restype-supported" lists all the current values of "resource-name" for this Resource type.

OPTIONAL - Define new Resource Template attributes on the Printer object for the Resource, if this Resource has type-specific attributes (e.g., "media-size-default").

6.5. Define new Job attributes for Resource

OPTIONAL - Define new Job Template attributes for the Resource, if this Resource MAY be associated with a Job (e.g., "media-required").

See section 5.5 'Job Template Attributes for Resources'.

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6.6. Define Printer operation extensions for Resource

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7. Conformance Requirements

7.1. IPP Client Conformance Requirements

IPP Clients MUST supply the required operation attributes in Resource operations.

7.2. IPP Printer Conformance Requirements

7.2.1. Resource Operations

All IPP Printers that support IPP Resource objects MUST implement the following REQUIRED operations defined in this specification:

- Resource Operation
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- Get-Resource-Attributes
- Get-Resource-Data
- Get-Resources

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7.2.2. Resource Attributes

All IPP Resource attributes presently defined are REQUIRED for all IPP Printer implementations of Resource objects.

See section 5.1 'Table of Resource Template Attributes'

See section 5.2 'Table of Resource Description Attributes'.

1966 8. IANA Considerations
1967

1968 See section 6 'IANA Considerations' in [IPP-MOD].
1969
1970
1971

1972 9. Internationalization Considerations
1973

1974 This IPP Resource Objects specification continues support for the
1975 internationalization in [IPP-MOD] attributes containing text strings
1976 and names.
1977

1978 See section 7 'Internationalization Considerations' in [IPP-MOD].
1979
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1982 10. Security Considerations
1983

1984 This IPP Resource Objects specification inherits the same security
1985 considerations for Resources as are specified for Jobs in [IPP-MOD].
1986

1987 See section 8 'Security Considerations' in [IPP-MOD].
1988
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1991 11. Encodings of Additional Protocol Tags
1992
1993
1994

1995 11.1. Encodings of Additional Attribute Tags
1996

1997 The section assigns a value to a new attribute tag as an extension to
1998 the encoding defined in [IPP-PRO].
1999

2000 The resource-attributes-tag delimits Resource Template Attributes
2001 Groups in requests and Resource Attributes Groups in responses.
2002

Tag Value (Hex)	Tag Meaning
-----	-----
0x08	resource-attributes-tag

2007
2008
2009 11.2. Encodings of Additional Operation Tags
2010

2011 The section assigns values to new operation tags as extensions to the
2012 encoding defined in [IPP-PRO].
2013
2014
2015

2020	Tag Value (Hex)	Tag Meaning
2021	-----	-----
2022	0x1E	Get-Resource-Attributes
2023	0x1F	Get-Resource-Data
2024	0x20	Get-Resources
2025	[TBD]	Create-Resource
2026	[TBD]	Delete-Resource
2027	[TBD]	Refresh-Resource
2028	[TBD]	Renew-Resource

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2032 12. References

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2034 See section 9 'References' in [IPP-MOD].

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2036 [IPP-MOD] R. deBry, T. Hastings, R. Herriot, S. Isaacson, P. Powell.
2037 IPP/1.1 Model and Semantics, <draft-ietf-ipp-model-v11-07.txt>, May
2038 2000 (adopted by IESG as Proposed Standard in June 2000).

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2040 [IPP-NOT] S. Isaacson, J. Martin, R. deBry, T. Hastings, M. Shepherd,
2041 R. Bergman. IPP Event Notification Specification,
2042 <draft-ietf-ipp-not-spec-02.txt> (work-in-progress), March 2000.

2043

2044 [OS-TYPE] IANA Registry of Operating System Names at
2045 ftp://ftp.isi.edu/in-notes/iana/assignments/operating-system-names.

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2049 13. Authors' Addresses

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14. Appendix A - Change History

[To be deleted before RFC publication]

- 7 September 2000 - draft-ietf-ipp-get-resource-01.txt
- revised Abstract and Introduction for admin operations
 - deleted all references to the resource type 'driver'
 - named package of Resource query (Get) operations in section 4
 - added package of Resource system admin operations to section 4
 - added Create-Resource to create (install) static resources
 - added Delete-Resource to delete (remove) static resources
 - added Refresh-Resource to refresh (locally cache) resource data
 - added Renew-Resource to renew (finite) resource leases
 - revised section 5.1 'Table of Resource Template Attributes'
 - revised section 5.2 'Table of Resource Description Attributes'
 - added section 6 'Rules for Resource Type Definitions'
 - deleted "resource-persistence" (redundant with zero lease)
 - renamed "resource-duration" to "resource-lease-duration"
 - deleted "resource-os-types" (was used for 'driver' resources)
 - deleted "resource-change-time" and "resource-refresh-time"
- 7 July 2000 - draft-ietf-ipp-get-resource-00.txt
- initial version - Get operations and Driver resource type

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