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Pat Fleming
Independent
Ira McDonald
High North
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Lightweight Directory Access Protocol (LDAP):
Schema for Printer Services
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Abstract

This document defines a schema, object classes and attributes, for Printers and Print Services, for use with directories that support Lightweight Directory Access Protocol ([RFC 4510](#)). This document is based on the Printer attributes listed in [Appendix E](#) of Internet Printing Protocol/1.1 ([RFC 2911](#)). Additional Printer attributes are based on definitions in the Printer MIB v2 ([RFC 3805](#)), IEEE-ISTO PWG Command Set for IEEE 1284 Device ID (PWG 5107.2), IEEE-ISTO PWG IPP Job and Printer Extensions - Set 3 (PWG 5100.13), and IEEE-ISTO PWG IPP Everywhere (PWG 5100.14).

This memo is an independent submission to the RFC Editor Stream by the Internet Printing Protocol Working Group of the IEEE-ISTO Printer Working Group, as part of their PWG IPP Everywhere (PWG 5100.14) project for secure mobile printing with vendor-neutral Client software.

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Internet-Draft

LDAP Schema for Printer Services

23 March 2015

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1. Introduction

This document defines several object classes to provide Lightweight Directory Access Protocol [[RFC4510](#)] applications with flexible options in defining Printer information using LDAP schema. Classes are provided for defining directory entries with common Printer information as well as for extending existing directory entries with SLPv2 [[RFC2608](#)], IPP/1.1 [[RFC2911](#)], and LPR [[RFC1179](#)] protocol-specific information.

This memo is an independent submission to the RFC Editor Stream by the Internet Printing Protocol Working Group of the IEEE-ISTO Printer Working Group, as part of their PWG IPP Everywhere (PWG 5100.14) project for secure mobile printing with vendor-neutral Client software.

Please send comments directly to the authors at the addresses listed in the section "Authors' Addresses".

1.1. Relationship to SLP Printer Service

The schema defined in this document is technically aligned with the stable IANA-registered 'service:printer:' v2.0 template [[SLPPRT20](#)], for compatibility with already deployed Service Location Protocol (SLPv2) [[RFC2608](#)] service advertising and discovery infrastructure. The attribute syntaxes are technically aligned with the 'service:printer:' v2.0 template - therefore simpler types are sometimes used (for example, 'DirectoryString' [[RFC4517](#)] rather than 'labeledURI' [[RFC2079](#)] for the 'printer-uri' attribute).

1.2. Source of LDAP Printer Attributes

The schema defined in this document is based on: all of the Printer attributes listed in [Appendix E](#) 'Generic Directory Schema' that are defined in [section 4.4](#) 'Printer Description Attributes' of Internet Printing Protocol/1.1: Model and Semantics [[RFC2911](#)]; and selected Printer attributes defined in the Printer MIB v2 [[RFC3805](#)], IEEE-ISTO PWG Command Set for IEEE 1284 Device ID [[PWG5107.2](#)], IEEE-ISTO PWG IPP Job and Printer Extensions - Set 3 [[PWG5100.13](#)], and IEEE-ISTO PWG IPP Everywhere [[PWG5100.14](#)]

See the table of Printer attributes and source documents in [section 4](#) 'Definition of Attribute Types' in this document.

1.3. Source of LDAP Printer Schema OIDs

1.3.1. IBM Assignments for [RFC 3712](#)

In March 2000, IBM permanently assigned ASN.1 OIDs to all of the object classes and attributes types that were defined in the original LDAP Printer Schema [[RFC3712](#)] (see [section 7.2](#)).

1.3.2. IEEE-ISTO PWG Assignments

In October 2011, IBM permanently delegated the base ASN.1 OID "1.3.18.0.2.24.46" to the IEEE-ISTO PWG for use in any PWG project. In October 2011, the IEEE-ISTO PWG permanently assigned subordinate ASN.1 OIDs for all of the new attribute types defined in this updated LDAP Printer Schema (see [section 7.1](#)).

1.4. Rationale for Design Choices

1.4.1. Rationale for using DirectoryString Syntax

The attribute syntax 'DirectoryString' (UTF-8 [[STD63](#)]) defined in [[RFC4517](#)] is specified for several groups of string attributes that are defined in this document:

- 1) URI
 - printer-uri, printer-xri-supported, printer-more-info, printer-charge-info-uri, printer-uuid

The UTF-8 encoding is compatible with deployment of (UTF-8 based) IRI Internationalized Resource Identifiers (IRIs) [[RFC3987](#)].

- 2) Description
 - printer-name, printer-location, printer-info, printer-make-and-model

The UTF-8 encoding supports descriptions in any language, conformant with the IETF Policy on Character Sets and Languages [[BCP18](#)].

Note: The printer-natural-language-configured attribute contains a language tag [[BCP47](#)] for these description attributes (for

example, to support text-to-speech conversions).

- 3) Keyword
 - printer-compression-supported, printer-finishings-supported, printer-media-supported, printer-media-local-supported, printer-print-quality-supported

The UTF-8 encoding is compatible with the current IPP/1.1 [[RFC2911](#)] definition of the equivalent attributes, most of which have the IPP/1.1 union syntax 'keyword or name'. The keyword attributes defined in this document are extensible by site-specific or vendor-specific 'names' which behave like new 'keywords'

Note: In IPP/1.1, each value is strongly typed over-the-wire as either 'keyword' or 'name'. This union selector is not preserved in the definitions of these equivalent LDAP attributes.

1.4.2. Rationale for using caseIgnoreMatch

The EQUALITY matching rule 'caseIgnoreMatch' defined in [[RFC4517](#)] is specified for several groups of string attributes that are defined in this document:

1) URI

These URI attributes specify EQUALITY matching with 'caseIgnoreMatch' (rather than with 'caseExactMatch') in order to conform to the spirit of [[STD66](#)], which requires case insensitive matching on the host part of a URI versus case sensitive matching on the remainder of a URI.

These URI attributes follow existing practice of supporting case insensitive equality matching for host names in the associatedDomain attribute defined in [[RFC4524](#)].

Either equality matching rule choice would be a compromise:

- a) case sensitive whole URI matching can lead to false negative matches and has been shown to be fragile (given deployed client applications that 'pretty up' host names displayed and transferred in URI);
- b) case insensitive whole URI matching can lead to false positive matches, although it is a dangerous practice to publish URI that differ only by case (for example, in the path elements).

2) Description

Case insensitive equality matching is more user-friendly for description attributes.

3) Keyword

Case insensitive equality matching is more user-friendly for keyword attributes.

4) IEEE 1284 Device ID

Case insensitive equality matching is mandatory for IEEE 1284 Device ID attributes.

1.4.3. Rationale for using caseIgnoreSubstringsMatch

The SUBSTR matching rule 'caseIgnoreSubstringsMatch' defined in [[RFC4517](#)] is specified for several groups of string attributes that are defined in this document:

1) URI

These URI attributes follow existing practice of supporting case insensitive equality matching for host names in the associatedDomain attribute defined in [[RFC4524](#)].

2) Description

Support for case insensitive substring matching is more user-friendly for description attributes.

3) Keyword

Support for case insensitive substring matching is more user-friendly for keyword attributes.

4) IEEE 1284 Device ID

Support for case insensitive substring matching is mandatory for IEEE 1284 Device ID attributes.

[2.](#) Conventions Used in This Document

2.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

2.2. LDAP Schema Descriptions

Schema definitions are provided using LDAP [[RFC4510](#)] description formats. Definitions provided here are formatted (line wrapped) for readability.

2.3. Abbreviations

This document makes use of the following abbreviations (given with their expanded forms and references for further reading):

- IANA - Internet Assigned Numbers Authority
 <<http://www.iana.org>>
- IEEE - Institute of Electrical and Electronics Engineers
 <<http://www.ieee.org>>
- IPP - Internet Printing Protocol [[RFC2911](#)] and [[PWG5100.12](#)]
 <<http://www.pwg.org/ipp/>>
- ISTO - IEEE Industry Standards and Technology Organization
 <<http://www.ieee-isto.org/>>
- PWG - IEEE-ISTO Printer Working Group
 <<http://www.pwg.org>>
- RFC - Request for Comments
 <<http://www.rfc-editor.org/rfc.html>>
- TLS - Transport Layer Security [[RFC5246](#)]
- URI - Uniform Resource Identifier [[STD66](#)]
- URL - Uniform Resource Locator [[STD66](#)]

- UTF-8 - Unicode Transformation Format - 8-bit [[STD63](#)]

3. Definition of Object Classes

We define the following LDAP object classes for use with both generic Printer related information and services specific to SLPv2 [[RFC2608](#)], IPP/1.1 [[RFC2911](#)], and LPR [[RFC1179](#)].

slpServicePrinter - auxiliary class for SLP registered Printers
printerAbstract - abstract class for all Printer classes
printerService - structural class for Printers
printerServiceAuxClass - auxiliary class for Printers
printerIPP - auxiliary class for IPP Printers
printerLPR - auxiliary class for LPR Printers

The following are some examples of how applications could choose to use these classes when creating directory entries:

- 1) Use printerService for directory entries containing common Printer information.
- 2) Use both printerService and slpServicePrinter for directory entries containing common Printer information for SLP registered Printers.
- 3) Use printerService, printerLPR and printerIPP for directory entries containing common Printer information for Printers that support both LPR and IPP.
- 4) Use printerServiceAuxClass and object classes not defined by this document for directory entries containing common Printer information. In this example, printerServiceAuxClass is used for extending other structural classes defining Printer information with common printer information defined in this document.

Refer to [Section 4](#) for definition of attribute types referenced by these object classes. We use attribute names instead of OIDs in

object class definitions for clarity. Some attribute names described in [\[RFC2911\]](#) have been prefixed with 'printer-' as recommended in [\[RFC2926\]](#) and [\[SLPPRT20\]](#).

3.1. slpServicePrinter

```
( 1.3.18.0.2.6.254
NAME 'slpServicePrinter'
DESC 'Service Location Protocol (SLP) information.'
AUXILIARY
SUP   slpService
)
```

This auxiliary class defines Service Location Protocol (SLPv2) [\[RFC2608\]](#) specific information. It MAY be used to create new or extend existing directory entries with SLP 'service:printer' abstract service type information as defined in [\[SLPPRT20\]](#). This object class is derived from 'slpService', the parent class for all SLP services, defined in [\[RFC2926\]](#).

3.2. printerAbstract

```
( 1.3.18.0.2.6.258
NAME 'printerAbstract'
DESC 'Printer related information.'
ABSTRACT
SUP   top
MAY   ( printer-name $
        printer-natural-language-configured $
        printer-location $
```

```

printer-info $
printer-more-info $
printer-make-and-model $
printer-multiple-document-jobs-supported $
printer-charset-configured $
printer-charset-supported $
printer-generated-natural-language-supported $
printer-document-format-supported $
printer-color-supported $
printer-compression-supported $
printer-pages-per-minute $
printer-pages-per-minute-color $
printer-finishings-supported $
printer-number-up-supported $
printer-sides-supported $
printer-media-supported $
printer-media-local-supported $
printer-resolution-supported $
printer-print-quality-supported $
printer-job-priority-supported $
printer-copies-supported $

```

```

printer-job-k-octets-supported $
printer-current-operator $
printer-service-person $
printer-delivery-orientation-supported $
printer-stacking-order-supported $
printer-output-features-supported $
printer-device-id $
printer-device-service-count $
printer-uuid $
printer-charge-info $
printer-charge-info-uri $
printer-geo-location )

```

)

This abstract class defines Printer information. It is a base class for deriving other Printer related classes, such as, but not limited to, classes defined in this document. It defines a common set of printer attributes that are not specific to any one type of service, protocol or operating system.

3.3. printerService

```
( 1.3.18.0.2.6.255
NAME 'printerService'
DESC 'Printer information.'
STRUCTURAL
SUP   printerAbstract
MAY   ( printer-uri $
        printer-xri-supported )
)
```

This structural class defines Printer information. It is derived from class printerAbstract and thus inherits common Printer attributes. This class can be used with or without auxiliary classes to define printer information. Auxiliary classes can be used to extend the common printer information with protocol, service or operating system specific information.

Note: When extending other structural classes with auxiliary classes, printerService SHOULD NOT be used.

3.4. printerServiceAuxClass

```
( 1.3.18.0.2.6.257
NAME 'printerServiceAuxClass'
DESC 'Printer information.'
AUXILIARY
```

```
SUP   printerAbstract
MAY   ( printer-uri $
        printer-xri-supported )
)
```

This auxiliary class defines Printer information. It is derived from class printerAbstract and thus inherits common Printer attributes.

3.5. printerIPP

```
( 1.3.18.0.2.6.256
NAME 'printerIPP'
DESC 'Internet Printing Protocol (IPP) information.'
AUXILIARY
```

```

SUP    top
MAY    ( printer-ipp-versions-supported $
        printer-ipp-features-supported $
        printer-multiple-document-jobs-supported )
)

```

This auxiliary class defines Internet Printing Protocol (IPP/1.1) [[RFC2911](#)] information. It is used to extend structural classes with IPP specific Printer information.

Note: See IPP URL Scheme [[RFC3510](#)] and IPP over HTTPS Transport Binding and 'ipps' URI Scheme [[IPPSURI](#)] for conforming URI for IPP Printers.

3.6. printerLPR

```

( 1.3.18.0.2.6.253
NAME 'printerLPR'
DESC 'LPR information.'
AUXILIARY
SUP    top
MUST   ( printer-name )
MAY    ( printer-aliases)
)

```

This auxiliary class defines LPR [[RFC1179](#)] information. It is used to identify directory entries that support LPR.

[4.](#) Definition of Attribute Types

The following attribute types are referenced by the object classes defined in [Section 3](#).

The following attribute types reference syntax OIDs defined in [Section 3 of \[RFC4517\]](#) (see [Section 5](#) 'Definition of Syntaxes')

below).

The following attribute types reference matching rule names (instead of OIDs) for clarity (see [Section 6](#) below). For optional attributes, if the Printer information is not known, the attribute value SHOULD NOT be set. In the following definitions, referenced matching rules are defined in [Section 4 of \[RFC4517\]](#) and discussed in [Section 6](#) 'Definition of Matching Rules' later in this document.

Note: For compatibility with existing implementations of [\[RFC3712\]](#) and underlying string length limits in [\[RFC2707\]](#), [\[RFC2911\]](#), [\[RFC3805\]](#), [\[PWG5107.2\]](#), [\[PWG5100.13\]](#), and [\[PWG5100.14\]](#), implementations of the attributes defined in this document SHOULD NOT exceed those underlying string length limits (to avoid truncation and false matches).

Note: For interoperability and consistent text display, values of attributes defined in this document: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [\[RFC5198\]](#); (b) SHOULD NOT contain DEL or any C0 or C1 control characters except for HT, CR, and LF; (c) SHOULD only contain CR and LF characters together (not as singletons); and SHOULD NOT contain HT, CR, or LF characters in names, e.g., printer-name and printer-aliases.

Note: Some of the following attributes are described as 'List of xxx' (using a comma as the member delimiter). Some other attributes are described as 'One of xxx' (single-valued). In all cases, any attribute can have multiple values represented as multiple instances, except where explicitly restricted in syntax to be single-valued.

Note: Values of the string attributes printer-xri-supported and printer-resolution-supported use different field delimiters ('<' and '>', respectively). These two field delimiters are different for compatibility with the corresponding attributes in the IANA-registered SLP 'service:printer:' v2.0 template [\[SLPPRT20\]](#), which was defined before the original LDAP Printer Schema [\[RFC3712\]](#) was written.

The following table is a summary of the attribute names defined by this document and their corresponding source document names as defined in [\[RFC2911\]](#), [\[RFC3805\]](#), [\[PWG5107.2\]](#), or [\[PWG5100.13\]](#). Some source attribute names have been prefixed with 'printer-' as

LDAP & SLP Printer Schema	Source Document and Attribute Name
***	IPP/1.1 and Semantics Model [RFC2911]
printer-uri	
printer-xri-supported	[printer-uri-supported] [uri-authentication-supported] [uri-security-supported]
printer-name	printer-name
printer-natural-language-configured	natural-language-configured
printer-location	printer-location
printer-info	printer-info
printer-more-info	printer-more-info
printer-make-and-model	printer-make-and-model
printer-ipp-versions-supported	ipp-versions-supported
printer-multiple-document-jobs-supported	multiple-document-jobs-supported
printer-charset-configured	charset-configured
printer-charset-supported	charset-supported
printer-generated-natural-language-supported	generated-natural-language-supported
printer-document-format-supported	document-format-supported
printer-color-supported	color-supported
printer-compression-supported	compression-supported
printer-pages-per-minute	pages-per-minute
printer-pages-per-minute-color	pages-per-minute-color
printer-finishings-supported	finishings-supported
printer-number-up-supported	number-up-supported
printer-sides-supported	sides-supported
printer-media-supported	media-supported
printer-media-local-supported	[site names from IPP media-supported]
printer-resolution-supported	printer-resolution-supported
printer-print-quality-supported	print-quality-supported
printer-job-priority-supported	job-priority-supported
printer-copies-supported	copies-supported
printer-job-k-octets-supported	job-k-octets-supported
***	Printer MIB v2 [RFC3805]
printer-current-operator	prtGeneralCurrentOperator
printer-service-person	prtGeneralServicePerson
printer-delivery-orientation-supported	prtOutputPageDeliveryOrientation
printer-stacking-order-supported	prtOutputStackingOrder
printer-output-features-supported	[prtOutputBursting]

	[prtOutputDecollating]
	[prtOutputPageCollated]
	[prtOutputOffsetStacking]
printer-aliases	prtGeneralPrinterName

printer-device-id	Cmd Set 1284 Device ID [PWG5107.2] printer-device-id

printer-device-service-count	IPP Job/Printer Ext Set3 [PWG5100.13] device-service-count
printer-uuid	printer-uuid
printer-charge-info	printer-charge-info
printer-charge-info-uri	printer-charge-info-uri
printer-geo-location	printer-geo-location
printer-ipp-features-supported	ipp-features-supported

4.1. printer-uri

```
( 1.3.18.0.2.4.1140
NAME 'printer-uri'
DESC 'A URI supported by this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

If the printer-xri-supported LDAP attribute is implemented, then this printer-uri value MUST be listed in printer-xri-supported.

See [[STD66](#)] for details of URI syntax.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 1023 octets in length.

Note: LDAP application clients SHOULD NOT attempt to use malformed URI values read from this attribute. LDAP administrative clients SHOULD not write malformed URI values into this attribute.

Note: See IPP URL Scheme [[RFC3510](#)] and IPP over HTTPS Transport Binding and 'ipps' URI Scheme [[IPPSURI](#)] for conforming URI for IPP Printers.

Note: For SLP registered Printers, the LDAP printer-uri attribute SHOULD be set to the value of the SLP-registered URL of the Printer,

for interworking with SLPv2 [[RFC2608](#)] service discovery.

Note: See Sections [1.1](#), [1.2](#), and [1.3](#) for rationale for design choices.

4.2. printer-xri-supported

```
( 1.3.18.0.2.4.1107
NAME 'printer-xri-supported'
DESC 'An XRI (extended resource identifier) supported by this
      Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

An XRI (extended resource identifier) supported by this Printer. Each value of this attribute MUST consist of a URI (uniform resource identifier) followed by (optional) authentication and security fields.

Each XRI field MUST be delimited by '<', with optional trailing whitespace. For example:

```
'uri=ipp://example.com/ipp< auth=digest< sec=tls<'
'uri=ipps://example.com/ipp< auth=digest< sec=tls<'
'uri=lpr://example.com/lpr< auth=none< sec=none<'
'uri=mailto:printer@example.com< auth=none< sec=none<'
```

Note: See the note in [section 4](#) about the different field delimiters used in the printer-xri-supported and printer-resolution-supported attributes ('<' and '>', respectively), chosen for compatibility with the IANA-registered SLP 'service:printer:' v2.0 template [[SLPPRT20](#)].

Note: Multiple values for this attribute are represented as multiple instances of this attribute.

See [[STD66](#)] for details of URI syntax.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 1023 octets in length.

Note: LDAP application clients SHOULD NOT attempt to use malformed URI values read from this attribute. LDAP administrative clients SHOULD not write malformed URI values into this attribute.

Note: This attribute is based on the IPP/1.1 [[RFC2911](#)] attributes 'printer-uri-supported', 'uri-authentication-supported', and 'uri-security-supported' (called the 'Three Musketeers' because they are parallel, ordered attributes). This attribute unfolds those IPP/1.1 attributes and thus avoids the ordering (and same number of values) constraints of the IPP/1.1 separate attributes.

Defined keywords for fields include:

- 'uri' (IPP 'printer-uri-supported')
- 'auth' (IPP 'uri-authentication-supported')
- 'sec' (IPP 'uri-security-supported')

A missing 'auth' field SHOULD be interpreted to mean 'none'. Per IPP/1.1 [[RFC2911](#)], IPP Job and Printer Extensions - Set 3 [[PWG5100.13](#)], and IANA IPP Registry [[IANAIPP](#)], defined values of the 'auth' field include:

- 'none' (no authentication for this URI)
- 'requesting-user-name' (from operation request)
- 'basic' (HTTP/1.1 Basic [[RFC2617](#)] and [[RFC7235](#)])
- 'digest' (HTTP/1.1 Digest [[RFC2617](#)] and [[RFC7235](#)])
- 'certificate' (X.509 Certificate [[RFC5280](#)] and [[RFC6818](#)])
- 'negotiate' (HTTP/1.1 Negotiate [[RFC4559](#)])

The 'certificate' value refers to the IPP Client certificate extracted from the TLS session.

A missing 'sec' field SHOULD be interpreted to mean 'none'. Per IPP/1.1 [[RFC2911](#)] and IANA IPP Registry [[IANAIPP](#)], defined values of the 'sec' field include:

- 'none' (no security for this URI)
- 'ssl3' (Netscape SSL3)
- 'tls' (IETF TLS, [[RFC5246](#)])

Note: The syntax and delimiter for this attribute are aligned with the equivalent attribute in the 'service:printer:' v2.0 template [[SLPPRT20](#)]. Whitespace is permitted after (but not before) the

delimiter '<'.

Note: See IPP URL Scheme [[RFC3510](#)] and IPP over HTTPS Transport Binding and 'ipps' URI Scheme [[IPPSURI](#)] for conforming URI for IPP Printers.

Note: See Sections [1.1](#), [1.2](#), and [1.3](#) for rationale for design choices.

4.3. printer-name

```
( 1.3.18.0.2.4.1135
NAME 'printer-name'
DESC 'The site-specific administrative name of this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
```

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```
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

Values of this attribute SHOULD be specified in the language specified in printer-natural-language-configured (for example, to support text-to-speech conversions), although the Printer's name MAY be specified in any language.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 255 octets in length.

Note: This name can be the last part of the Printer's URI or it can be completely unrelated. This name can contain characters that are not allowed in a conventional URI (see [[STD66](#)]).

Note: For interoperability, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; and (b) SHOULD NOT contain DEL or any C0 or C1 control characters.

4.4. printer-natural-language-configured

```
( 1.3.18.0.2.4.1119
```

```
NAME 'printer-natural-language-configured'
DESC 'The configured natural language for LDAP attributes of
      syntax DirectoryString (UTF-8) in this directory entry.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

Also, a possible natural language for IPP protocol string attributes set by operator, system administrator, or manufacturer. Also, the (declared) natural language of the printer-name, printer-location, printer-info, and printer-make-and-model attributes of this Printer.

Values of language tags MUST conform to Tags for Identifying Languages [[BCP47](#)]. For example:

```
'en-us' (English as spoken in the US)
'fr-fr' (French as spoken in France)
```

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 63 octets in length.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], language tags in this attribute SHOULD be lowercase normalized.

4.5. printer-location

```
( 1.3.18.0.2.4.1136
NAME 'printer-location'
DESC 'The physical location of this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

For example:

```
'Room 123A'
'Second floor of building XYZ'
```

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 127 octets in length.

Note: For interoperability and consistent text display, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; (b) SHOULD NOT contain DEL or any C0 or C1 control characters except for HT, CR, and LF; and (c) SHOULD only contain CR and LF characters together (not as singletons).

4.6. printer-info

```
( 1.3.18.0.2.4.1139
NAME 'printer-info'
DESC 'Descriptive information about this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

For example:

```
'This Printer can be used for printing color transparencies for
HR presentations'
'Out of courtesy for others, please print only small (1-5 page)
jobs at this Printer'
'This Printer is going away on July 1, 1997, please find a new
Printer'
```

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 127 octets in length.

Note: For interoperability and consistent text display, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; (b) SHOULD NOT contain DEL or any C0 or C1 control characters except for HT, CR, and LF; and (c) SHOULD only contain CR and LF characters together (not as singletons).

4.7. printer-more-info

```
( 1.3.18.0.2.4.1134
NAME 'printer-more-info'
DESC 'A URI for more information about this specific Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

For example, this could be an HTTP URI referencing an HTML page accessible to a Web Browser. The information obtained from this URI is intended for end user consumption.

See [[STD66](#)] for details of URI syntax.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 1023 octets in length.

Note: LDAP application clients SHOULD NOT attempt to use malformed URI values read from this attribute. LDAP administrative clients SHOULD not write malformed URI values into this attribute.

Note: See Sections [1.1](#), [1.2](#), and [1.3](#) for rationale for design choices.

4.8. printer-make-and-model

```
( 1.3.18.0.2.4.1138
NAME 'printer-make-and-model'
DESC 'Make and model of this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

)

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 127 octets in length.

Note: The Printer manufacturer MAY initially populate this attribute.

Note: For interoperability and consistent text display, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; (b) SHOULD NOT contain DEL or any C0 or C1 control characters except for HT, CR, and LF; and (c) SHOULD only contain CR and LF characters together (not as singletons).

4.9. printer-ipp-versions-supported

```
( 1.3.18.0.2.4.1133
NAME 'printer-ipp-versions-supported'
DESC 'List of IPP versions supported by this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Comma-delimited list of IPP versions supported by this Printer. For example:

```
'1.1,2.0'
```

Note: Length overflow in values of this attribute MUST be handled by multiple instances of this attribute, i.e., individual comma-delimited list members MUST NOT be truncated.

The IPP protocol version(s) MUST include major and minor versions, i.e., the exact version numbers for which this Printer implementation meets the IPP version-specific conformance requirements and registered in the IANA IPP Registry [[IANAIPP](#)].

IANA-registered versions of IPP currently are:

```
'1.0' (IPP/1.0 [RFC2566], OBSOLETE)
'1.1' (IPP/1.1 [RFC2911])
'2.0' (IPP/2.0 [PWG5100.12])
'2.1' (IPP/2.1 [PWG5100.12])
'2.2' (IPP/2.2 [PWG5100.12])
```

4.10. printer-multiple-document-jobs-supported

```
( 1.3.18.0.2.4.1132
NAME 'printer-multiple-document-jobs-supported'
DESC 'Indicates whether or not this Printer supports more than one
      document per job.'
EQUALITY booleanMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.7
SINGLE-VALUE
)
```

4.11. printer-charset-configured

```
( 1.3.18.0.2.4.1109
NAME 'printer-charset-configured'
DESC 'The configured charset for IPP protocol values of error
      and status messages generated by this Printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

Also, a possible charset for IPP protocol string attributes set by operator, system administrator, or manufacturer. For example:

```
'utf-8' (ISO 10646/Unicode in UTF-8 transform [STD63])
'iso-8859-1' (Latin1)
```

Values of charset tags SHOULD be defined in the IANA Registry of Character Sets [[IANACHAR](#)] (see also [[BCP19](#)]) and the '(preferred MIME name)' SHOULD be used as the charset tag in this attribute.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 63 octets in length.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], charset tags in this attribute SHOULD be lowercase normalized.

4.12. printer-charset-supported

```
( 1.3.18.0.2.4.1131
NAME 'printer-charset-supported'
```

DESC 'One of the charsets supported for IPP protocol values of
IPP string attributes that correspond to attributes of
syntax DirectoryString (UTF-8) for this directory entry.'

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EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)

One of the charsets supported for IPP protocol string attributes that
correspond to attributes of syntax DirectoryString (UTF-8) for this
directory entry. For example:

'iso-8859-1' (ISO Latin1)
'utf-8' (UTF-8 [[STD63](#)])

Note: Multiple values for this attribute are represented as multiple
instances of this attribute.

Values of charset tags SHOULD be defined in the IANA Registry of
Character Sets [[IANACHAR](#)] (see also [[BCP19](#)]) and the '(preferred MIME
name)' SHOULD be used as the charset tag in this attribute.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this
attribute SHOULD NOT exceed 63 octets in length.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], charset tags in this
attribute SHOULD be lowercase normalized.

4.13. printer-generated-natural-language-supported

(1.3.18.0.2.4.1137
NAME 'printer-generated-natural-language-supported'
DESC 'One of the natural languages supported for LDAP attributes of
syntax DirectoryString (UTF-8) in this directory entry.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)

Values of language tags SHOULD conform to Tags for Identifying
Languages [[BCP47](#)]. For example:

'en-us' (English as spoken in the US)

'fr-ca' (French as spoken in Canada)

Note: Multiple values for this attribute are represented as multiple instances of this attribute.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 63 octets in length.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], language tags in this attribute SHOULD be lowercase normalized.

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4.14. printer-document-format-supported

```
( 1.3.18.0.2.4.1130
NAME 'printer-document-format-supported'
DESC 'One of the source document formats which can be interpreted
      and printed by this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Values of document formats SHOULD be MIME media types defined in the IANA Registry of MIME Media Types [[IANAMIME](#)] (see also [[BCP13](#)]).

For example:

```
'application/postscript' (Adobe PostScript)
'text/plain' (plain text)
```

Note: Multiple values for this attribute are represented as multiple instances of this attribute.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 255 octets in length.

4.15. printer-color-supported

```
( 1.3.18.0.2.4.1129
NAME 'printer-color-supported'
```

```
DESC 'Indicates whether this Printer is capable of any type of color
      printing at all, including highlight color.'
EQUALITY booleanMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.7
SINGLE-VALUE
)
```

4.16. printer-compression-supported

```
( 1.3.18.0.2.4.1128
NAME 'printer-compression-supported'
DESC 'List of compression algorithms supported by this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
```

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```
)
```

Comma-delimited list of compression algorithms supported by this Printer. For example:

```
'none'
'deflate,gzip'
```

Note: Length overflow in values of this attribute MUST be handled by multiple instances of this attribute, i.e., individual comma-delimited list members MUST NOT be truncated.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 255 octets in length.

Values defined in IPP/1.1 [[RFC2911](#)] and recorded in the IANA IPP Registry [[IANAIPP](#)] include:

```
'none' (no compression is used)
'deflate' (public domain ZIP described in [RFC1951])
'gzip' (GNU ZIP described in [RFC1952])
'compress' (UNIX compression described in [RFC1977])
```

4.17. printer-pages-per-minute

```
( 1.3.18.0.2.4.1127
NAME 'printer-pages-per-minute'
DESC 'The nominal number of pages per minute which can be output by
      this Printer.'
EQUALITY integerMatch
ORDERING integerOrderingMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
SINGLE-VALUE
)
```

This attribute is informative, not a service guarantee. Typically, it is the value used in marketing literature to describe this Printer. For example, the value for a simplex or black-and-white print mode.

4.18. printer-pages-per-minute-color

```
( 1.3.18.0.2.4.1126
NAME 'printer-pages-per-minute-color'
DESC 'The nominal number of color pages per minute which can be
      output by this Printer.'
EQUALITY integerMatch
```

```
ORDERING integerOrderingMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
SINGLE-VALUE
)
```

This attribute is informative, not a service guarantee. Typically, it is the value used in marketing literature to describe this Printer.

4.19. printer-finishings-supported

```
( 1.3.18.0.2.4.1125
NAME 'printer-finishings-supported'
DESC 'List of finishing operations supported by this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Comma-delimited list of finishing operations supported by this Printer. For example:

```
'staple'
'staple,punch,bind'
```

Note: Length overflow in values of this attribute MUST be handled by multiple instances of this attribute, i.e., individual comma-delimited list members MUST NOT be truncated.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 255 octets in length.

Values defined in IPP/1.1 [[RFC2911](#)] and recorded in the IANA IPP Registry [[IANAIPP](#)] include:

```
'none', 'staple', 'punch', 'cover', 'bind', 'saddle-stitch',
'edge-stitch', 'staple-top-left', 'staple-bottom-left',
'staple-top-right', 'staple-bottom-right', 'edge-stitch-left',
'edge-stitch-top', 'edge-stitch-right', 'edge-stitch-bottom',
'staple-dual-left', 'staple-dual-top', 'staple-dual-right',
'staple-dual-bottom'.
```

Note: Implementations MAY support other values.

4.20. printer-number-up-supported

```
( 1.3.18.0.2.4.1124
NAME 'printer-number-up-supported'
DESC 'Maximum number of print-stream pages that can be imposed upon a
      single side of an instance of selected medium by this Printer.'
EQUALITY integerMatch
ORDERING integerOrderingMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
SINGLE-VALUE
)
```

Maximum number of print-stream pages that can be imposed upon a single side of an instance of a selected medium by this Printer. For example:

```
'1'  
'4'
```

Note: Values of this attribute differ from the corresponding IPP attribute, in that only the maximum number-up is mapped from the corresponding IPP attribute 'number-up-supported' defined in [\[RFC2911\]](#).

4.21. printer-sides-supported

```
( 1.3.18.0.2.4.1123  
NAME 'printer-sides-supported'  
DESC 'List of impression sides (one or two) and the two-sided  
      impression rotations supported by this Printer.'  
EQUALITY caseIgnoreMatch  
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15  
)
```

Comma-delimited list of impression sides (one or two) and the two-sided impression rotations supported by this Printer. For example:

```
'one-sided'  
'one-sided,two-sided-short-edge'
```

Note: Length overflow in values of this attribute MUST be handled by multiple instances of this attribute, i.e., individual comma-delimited list members MUST NOT be truncated.

Note: For compatibility with IPP/1.1 [\[RFC2911\]](#), values of this attribute SHOULD NOT exceed 255 octets in length.

Values defined in IPP/1.1 [\[RFC2911\]](#) and recorded in the IANA IPP Registry [\[IANAIPP\]](#) are:

```
'one-sided'  
'two-sided-long-edge'
```


'two-sided-short-edge'

4.22. printer-media-supported

```
( 1.3.18.0.2.4.1122
NAME 'printer-media-supported'
DESC 'One of the names/sizes/types/colors of the media supported by
      this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Values SHOULD conform to PWG Media Standardized Names [[PWG5101.1](#)].

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 255 octets in length.

Values of standardized media size names defined in [[PWG5101.1](#)] and recorded in the IANA IPP Registry [[IANAIPP](#)] include:

```
'na_letter_8.5x11in'
'iso_a4_210x297mm'
```

Values of standardized media types defined in [[PWG5101.1](#)] and recorded in the IANA IPP Registry [[IANAIPP](#)] include:

```
'envelope'
'stationery'
```

Values of standardized media colors defined in [[PWG5101.1](#)] and recorded in the IANA IPP Registry [[IANAIPP](#)] include:

```
'white'
'blue'
```

Note: Multiple values for this attribute are represented as multiple instances of this attribute.

4.23. printer-media-local-supported

```
( 1.3.18.0.2.4.1117
NAME 'printer-media-local-supported'
DESC 'One of the site-specific media supported by this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Values SHOULD conform to PWG Media Standardized Names [[PWG5101.1](#)].

For example:

'custom_purchasing-form_8.5x11in' (site-specific name)

Note: Multiple values for this attribute are represented as multiple instances of this attribute.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 255 octets in length.

4.24. printer-resolution-supported

```
( 1.3.18.0.2.4.1121
NAME 'printer-resolution-supported'
DESC 'One of the resolutions supported for printing documents by this
      Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Each resolution value MUST be a string containing 3 fields:

- 1) Cross feed direction resolution (positive integer);
- 2) Feed direction resolution (positive integer);
- 3) Unit - 'dpi' (dots per inch) or 'dpcm' (dots per centimeter).

Each resolution field MUST be delimited by '>', with optional trailing whitespace. For example:

'300> 300> dpi>'
'600> 600> dpi>'

Note: See the note in [section 4](#) about the different field delimiters used in the printer-xri-supported and printer-resolution-supported

attributes ('<' and '>', respectively), chosen for compatibility with

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the IANA-registered SLP 'service:printer:' v2.0 template [[SLPPRT20](#)].

Note: Multiple values for this attribute are represented as multiple instances of this attribute.

Note: This attribute is based on 'printer-resolution-supported' defined in IPP/1.1 [[RFC2911](#)] (which has a binary complex encoding) derived from 'prtMarkerAddressabilityFeedDir', 'prtMarkerAddressabilityXFeedDir', and 'prtMarkerAddressabilityUnit' defined in the Printer MIB v2 [[RFC3805](#)] (which have integer encodings).

Note: The syntax and delimiter for this attribute are aligned with the equivalent attribute in the 'service:printer:' v2.0 template [[SLPPRT20](#)]. Whitespace is permitted after (but not before) the delimiter '>'.

4.25. printer-print-quality-supported

```
( 1.3.18.0.2.4.1120
NAME 'printer-print-quality-supported'
DESC 'List of print qualities supported for printing documents on
      this Printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Comma-delimited list of print qualities supported for printing documents on this Printer. For example:

```
'unknown'
'draft,normal,high'
```

Note: Length overflow in values of this attribute MUST be handled by multiple instances of this attribute, i.e., individual comma-delimited list members MUST NOT be truncated.

Values defined in IPP/1.1 [[RFC2911](#)] and recorded in the IANA IPP Registry [[IANAIPP](#)] include:

```
'draft'
```

'normal'
'high'

Note: The value 'unknown' MUST only be reported if the corresponding IPP attribute is not present, i.e., the value 'unknown' is an artifact of this LDAP mapping.

4.26. printer-job-priority-supported

```
( 1.3.18.0.2.4.1110
NAME 'printer-job-priority-supported'
DESC 'Indicates the number of job priority levels supported by this
      Printer.'
EQUALITY integerMatch
ORDERING integerOrderingMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
SINGLE-VALUE
)
```

An IPP/1.1 [[RFC2911](#)] conformant Printer, which supports job priority, always supports a full range of priorities from '1' to '100' (to ensure consistent behavior), therefore this attribute describes the 'granularity' of priority supported. Values of this attribute are from '1' to '100'.

4.27. printer-copies-supported

```
( 1.3.18.0.2.4.1118
NAME 'printer-copies-supported'
DESC 'The maximum number of copies of a document that can be printed
      as a single job on this Printer.'
EQUALITY integerMatch
ORDERING integerOrderingMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
SINGLE-VALUE
)
```

A positive value indicates the maximum supported copies. A value of '0' indicates no maximum limit. A value of '-1' indicates 'unknown'.

Note: The syntax and values for this attribute are aligned with the equivalent attribute in the 'service:printer:' v2.0 template [[SLPPRT20](#)].

4.28. printer-job-k-octets-supported

```
( 1.3.18.0.2.4.1111
NAME 'printer-job-k-octets-supported'
DESC 'The maximum size in kilobytes (1,024 octets actually) incoming
      print job that this Printer will accept.'
EQUALITY integerMatch
ORDERING integerOrderingMatch
```

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```
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
SINGLE-VALUE
)
```

A positive value indicates the maximum supported job size. A value of '0' indicates no maximum limit. A value of '-1' indicates 'unknown'.

Note: The syntax and values for this attribute are aligned with the equivalent attribute in the 'service:printer:' v2.0 template [[SLPPRT20](#)].

4.29. printer-current-operator

```
( 1.3.18.0.2.4.1112
NAME 'printer-current-operator'
DESC 'The identity of the current human operator responsible for
      operating this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

The value of this attribute SHOULD include information that would enable other humans to reach the operator, such as a telephone number.

Note: For interoperability and consistent text display, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; (b) SHOULD NOT contain DEL or any C0 or C1 control characters except for HT, CR, and LF; and (c) SHOULD only contain CR and LF characters together (not as singletons).

4.30. printer-service-person

```
( 1.3.18.0.2.4.1113
NAME 'printer-service-person'
DESC 'The identity of the current human service person responsible
      for servicing this Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

The value of this attribute SHOULD include information that would enable other humans to reach the service person, such as a telephone number.

Note: For interoperability and consistent text display, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; (b) SHOULD NOT contain DEL or any C0 or C1 control characters except for HT, CR, and LF; and (c) SHOULD only contain CR and LF characters together (not as singletons).

4.31. printer-delivery-orientation-supported

```
( 1.3.18.0.2.4.1114
NAME 'printer-delivery-orientation-supported'
DESC 'List of delivery orientations of pages as they are printed
      and ejected supported by this Printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
```

)

Comma-delimited list of delivery orientations of pages as they are printed and ejected supported by this Printer. For example:

```
'unknown'
'face-up,face-down'
```

Values defined in Printer MIB v2 [[RFC3805](#)] for prtOutputPageDeliveryOrientation are:

```
'face-up'
'face-down'
```

Note: The value 'unknown' MUST only be reported if the corresponding Printer MIB attribute is not present, i.e., the value 'unknown' is an artifact of this LDAP mapping.

Note: The syntax and values for this attribute are aligned with the equivalent attribute in the 'service:printer:' v2.0 template [[SLPPRT20](#)].

4.32. printer-stacking-order-supported

```
( 1.3.18.0.2.4.1115
NAME 'printer-stacking-order-supported'
DESC 'List of stacking orders of pages as they are printed and
```

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```
    ejected supported by this Printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Comma-delimited list of stacking orders of pages as they are printed and ejected supported by this Printer. For example:

```
'unknown'
'first-to-last'
'first-to-last,last-to-first'
```

Values defined in Printer MIB v2 [[RFC3805](#)] for prtOutputStackingOrder are:

'first-to-last'
'last-to-first'

Note: The value 'unknown' MUST only be reported if the corresponding Printer MIB attribute is not present, i.e., the value 'unknown' is an artifact of this LDAP mapping.

Note: The syntax and values for this attribute are aligned with the equivalent attribute in the 'service:printer:' v2.0 template [[SLPPRT20](#)].

4.33. printer-output-features-supported

```
( 1.3.18.0.2.4.1116
NAME 'printer-output-features-supported'
DESC 'List of output features supported by this Printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Comma-delimited list of output features supported by this Printer.
For example:

'unknown'
'bursting,decollating'
'offset-stacking'

Note: Length overflow in values of this attribute MUST be handled by multiple instances of this attribute, i.e., individual comma-delimited list members MUST NOT be truncated.

Values defined in Printer MIB v2 [[RFC3805](#)] for prtOutputBursting, prtOutputDecollating, prtOutputPageCollated, and prtOutputOffsetStacking are:

'bursting'
'decollating'
'page-collating'
'offset-stacking'

Note: The value 'unknown' MUST only be reported if the corresponding Printer MIB attributes are not present, i.e., the value 'unknown' is

an artifact of this LDAP mapping.

Note: The syntax and values for this attribute are aligned with the equivalent attribute in the 'service:printer:' v2.0 template [[SLPPRT20](#)].

Note: Implementations MAY support other values.

4.34. printer-aliases

```
( 1.3.18.0.2.4.1108
NAME 'printer-aliases'
DESC 'One of the site-specific administrative names of this Printer
      in addition to the value specified for printer-name.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

Values of this attribute SHOULD be specified in the language specified in printer-natural-language-configured (for example, to support text-to-speech conversions), although the Printer's alias MAY be specified in any language.

Note: Multiple values for this attribute are represented as multiple instances of this attribute.

Note: For compatibility with IPP/1.1 [[RFC2911](#)], values of this attribute SHOULD NOT exceed 255 octets in length.

Note: For interoperability, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; and (b) SHOULD NOT contain DEL or any C0 or C1 control characters.

4.35. printer-device-id

```
( 1.3.18.0.2.24.46.1.101
NAME 'printer-device-id'
```

```
DESC 'The IEEE 1284 Device ID for this Printer.'
```

```
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

Values of this attribute SHOULD conform to IEEE-ISTO PWG Command Set Format for IEEE 1284 Device ID [[PWG5107.2](#)].

Note: For compatibility with [[PWG5100.14](#)] and [[PWG5107.2](#)], values of this attribute SHOULD NOT exceed 1023 octets in length.

4.36. printer-device-service-count

```
( 1.3.18.0.2.24.46.1.102
NAME 'printer-device-service-count'
DESC 'The number of Printer (Print Service) instances configured on
      this Imaging Device (host system).'
EQUALITY integerMatch
ORDERING integerOrderingMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
SINGLE-VALUE
)
```

A positive value indicates the number of Printer (Print Service) instances configured on this Imaging Device (host system). A value of '-1' indicates 'unknown'. A value of '0' is not meaningful (because this attribute must be reported by some Printer instance).

Note: The syntax and values for this attribute are aligned with the equivalent 'device-service-count' attribute defined in [[PWG5100.13](#)].

4.37. printer-uuid

```
( 1.3.18.0.2.24.46.1.104
NAME 'printer-uuid'
DESC 'A URN specifying UUID of this Printer (Print Service) instance
      on this Imaging Device (host system).'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

The UUID of this Printer (Print Service) instance on this Imaging Device (host system). For example:

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'urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6'

Values of this attribute MUST conform to the UUID URN namespace [[RFC4122](#)].

Note: For compatibility with [[PWG5100.13](#)] and [[RFC4122](#)], values of this attribute SHOULD NOT exceed 45 octets in length.

Note: LDAP application clients SHOULD NOT attempt to use malformed URN values read from this attribute. LDAP administrative clients SHOULD not write malformed URN values into this attribute.

Note: The syntax and values for this attribute are aligned with the equivalent 'printer-uuid' attribute defined in [[PWG5100.13](#)].

4.38. printer-charge-info

```
( 1.3.18.0.2.24.46.1.105
NAME 'printer-charge-info'
DESC 'Descriptive information about paid printing services for this
      Printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
SINGLE-VALUE
)
```

For example:

'This Printer can be used for paid printing at 2 cents/page.'

Note: For compatibility with [[PWG5100.13](#)], values of this attribute SHOULD NOT exceed 1023 octets in length.

Note: For interoperability and consistent text display, values of this attribute: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; (b) SHOULD NOT contain any C0 or C1 control characters except for HT, CR, and LF; and (c) SHOULD only contain CR and LF characters together (not as singletons).

Note: The syntax and values for this attribute are aligned with the

equivalent 'printer-charge-info' attribute defined in [[PWG5100.13](#)].

4.39. printer-charge-info-uri

```
( 1.3.18.0.2.24.46.1.106
  NAME 'printer-charge-info-uri'
  DESC 'A URI for a human-readable Web page for paid printing services
        for this Printer.'
  EQUALITY caseIgnoreMatch
  SUBSTR caseIgnoreSubstringsMatch
  SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
  SINGLE-VALUE
)
```

For example:

```
'http://example.com/charges'
```

See [[STD66](#)] for details of URI syntax.

Note: For compatibility with IPP/1.1 [[RFC2911](#)] and [[PWG5100.13](#)], values of this attribute SHOULD NOT exceed 1023 octets in length.

Note: LDAP application clients SHOULD NOT attempt to use malformed URI values read from this attribute. LDAP administrative clients SHOULD not write malformed URI values into this attribute.

Note: The syntax and values for this attribute are aligned with the equivalent 'printer-charge-info-uri' attribute defined in [[PWG5100.13](#)].

4.40. printer-geo-location

```
( 1.3.18.0.2.24.46.1.107
  NAME 'printer-geo-location'
```

```
DESC 'A geo: URI specifying the geographic location of this Printer.'  
EQUALITY caseIgnoreMatch  
SUBSTR caseIgnoreSubstringsMatch  
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15  
SINGLE-VALUE  
)
```

For example:

'geo:13.4125,103.8667'

Values of this attribute MUST conform to the 'geo' URI scheme
[\[RFC5870\]](#).

Note: For compatibility with IPP/1.1 [\[RFC2911\]](#) and [\[PWG5100.13\]](#), values of this attribute SHOULD NOT exceed 1023 octets in length.

Note: LDAP application clients SHOULD NOT attempt to use malformed URI values read from this attribute. LDAP administrative clients SHOULD not write malformed URI values into this attribute.

Note: The syntax and values for this attribute are aligned with the equivalent 'printer-geo-location' attribute defined in [\[PWG5100.13\]](#).

4.41. printer-ipp-features-supported

```
( 1.3.18.0.2.24.46.1.108  
NAME 'printer-ipp-features-supported'  
DESC 'List of IPP protocol features that this Printer supports.'  
EQUALITY caseIgnoreMatch  
SUBSTR caseIgnoreSubstringsMatch  
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15  
)
```

Comma-delimited list of IPP protocol features that this Printer supports. For example:

'none'
'unknown'
'proof-print'
'ipp-everywhere,proof-print,job-save'

Note: Length overflow in values of this attribute MUST be handled by multiple instances of this attribute, i.e., individual comma-delimited list members MUST NOT be truncated.

Values of this attribute SHOULD specify only IANA-registered keywords for the 'ipp-features-supported' attribute defined in [[PWG5100.13](#)] or other standards track IETF or IEEE-ISTO PWG specifications if this Printer implementation meets all of the IPP feature-specific conformance requirements.

IANA-registered values include:

- 'none' (No extension features are supported)
- 'document-object' (Document object defined in [[PWG5100.5](#)])
- 'job-save' (Job save defined in [[PWG5100.11](#)])
- 'ipp-everywhere' (IPP Everywhere defined in [[PWG5100.14](#)])
- 'page-overrides' (Page overrides defined in [[PWG5100.6](#)])
- 'proof-print' (Proof print defined in [[PWG5100.11](#)])
- 'subscription-object' (Subscription object defined in [[RFC3995](#)])

Note: The value 'unknown' MUST only be reported if the corresponding IPP Printer attribute is not present, i.e., the value 'unknown' is an artifact of this LDAP mapping.

Note: The syntax and values for this attribute are aligned with the equivalent 'printer-ipp-features-supported' attribute defined in [[PWG5100.13](#)].

5. Definition of Syntaxes

No new attribute syntaxes are defined by this document.

The attribute types defined in [Section 4](#) of this document reference syntax OIDs defined in [Section 3 of \[RFC4517\]](#), which are summarized below:

Syntax OID	Syntax Description
-----	-----
1.3.6.1.4.1.1466.115.121.1.7	Boolean
1.3.6.1.4.1.1466.115.121.1.15	DirectoryString (UTF-8 [STD63])
1.3.6.1.4.1.1466.115.121.1.27	Integer

[6.](#) Definition of Matching Rules

No new matching rules are defined by this document.

The attribute types defined in [Section 4](#) of this document reference matching rules defined in [Section 4 of \[RFC4517\]](#), which are summarized below:

Matching Rule OID	Matching Rule Name	Usage
-----	-----	-----
2.5.13.13	booleanMatch	EQUALITY
2.5.13.2	caseIgnoreMatch	EQUALITY
2.5.13.14	integerMatch	EQUALITY
2.5.13.15	integerOrderingMatch	ORDERING
2.5.13.4	caseIgnoreSubstringsMatch	SUBSTR

[7.](#) IANA Considerations

This document does not define any new syntaxes or matching rules.

This document defines a few new attribute types that should be registered by IANA when this document is published (see [section 7.1](#) below).

All of the object classes and most of the attribute types described in this document were registered by IANA when [RFC 3712](#) was published (see [section 7.2](#) below).

7.1. Registration of Attribute Types

The following Attribute Type OIDs have been assigned by IEEE-ISTO PWG (see [section 1.3.2](#)) and should be registered by IANA when this document is published.

Subject: Request for LDAP Descriptor Registration

Descriptor (short name): see table below

Object Identifier: see table below

Person & email address to contact for further information: see below

Usage: attribute type

Specification: RFCnnnn [[RFC Editor: to be assigned]]

Author/Change Controller:

Ira McDonald
High North Inc
221 Ridge Ave
Grand Marais, MI 49839
USA
Phone: +1 906-494-2434
Email: blueroofmusic@gmail.com

Comments:

Attribute Type	OID
-----	-----
printer-device-id	1.3.18.0.2.24.46.1.101
printer-device-service-count	1.3.18.0.2.24.46.1.102
printer-uuid	1.3.18.0.2.24.46.1.104

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printer-charge-info	1.3.18.0.2.24.46.1.105
printer-charge-info-uri	1.3.18.0.2.24.46.1.106

printer-geo-location	1.3.18.0.2.24.46.1.107
printer-ipp-features-supported	1.3.18.0.2.24.46.1.108

7.2. Object Classes and Attribute Types from [RFC 3712](#)

The following Object Class OIDs were assigned by IBM (see [section 1.3.1](#)) and registered by IANA when [RFC 3712](#) was published.

Object Class	OID
-----	-----
slpServicePrinter	1.3.18.0.2.6.254
printerAbstract	1.3.18.0.2.6.258
printerService	1.3.18.0.2.6.255
printerServiceAuxClass	1.3.18.0.2.6.257
printerIPP	1.3.18.0.2.6.256
printerLPR	1.3.18.0.2.6.253

The following Attribute Type OIDs were assigned by IBM (see [section 1.3.1](#)) and registered by IANA when [RFC 3712](#) was published.

Attribute Type	OID
-----	-----
printer-uri	1.3.18.0.2.4.1140
printer-xri-supported	1.3.18.0.2.4.1107
printer-name	1.3.18.0.2.4.1135
printer-natural-language-configured	1.3.18.0.2.4.1119
printer-location	1.3.18.0.2.4.1136
printer-info	1.3.18.0.2.4.1139
printer-more-info	1.3.18.0.2.4.1134
printer-make-and-model	1.3.18.0.2.4.1138
printer-ipp-versions-supported	1.3.18.0.2.4.1133
printer-multiple-document-jobs-supported	1.3.18.0.2.4.1132
printer-charset-configured	1.3.18.0.2.4.1109
printer-charset-supported	1.3.18.0.2.4.1131
printer-generated-natural-language-supported	1.3.18.0.2.4.1137
printer-document-format-supported	1.3.18.0.2.4.1130
printer-color-supported	1.3.18.0.2.4.1129
printer-compression-supported	1.3.18.0.2.4.1128
printer-pages-per-minute	1.3.18.0.2.4.1127
printer-pages-per-minute-color	1.3.18.0.2.4.1126
printer-finishings-supported	1.3.18.0.2.4.1125
printer-number-up-supported	1.3.18.0.2.4.1124
printer-sides-supported	1.3.18.0.2.4.1123
printer-media-supported	1.3.18.0.2.4.1122
printer-media-local-supported	1.3.18.0.2.4.1117
printer-resolution-supported	1.3.18.0.2.4.1121
printer-print-quality-supported	1.3.18.0.2.4.1120

printer-job-priority-supported	1.3.18.0.2.4.1110
printer-copies-supported	1.3.18.0.2.4.1118
printer-job-k-octets-supported	1.3.18.0.2.4.1111
printer-current-operator	1.3.18.0.2.4.1112
printer-service-person	1.3.18.0.2.4.1113
printer-delivery-orientation-supported	1.3.18.0.2.4.1114
printer-stacking-order-supported	1.3.18.0.2.4.1115
printer-output-features-supported	1.3.18.0.2.4.1116
printer-aliases	1.3.18.0.2.4.1108

[8.](#) Internationalization Considerations

All text string attributes defined in this document of syntax 'DirectoryString' [[RFC4517](#)] have values that are encoded in UTF-8 [[STD63](#)], as required by [[RFC4517](#)].

A language tag [[BCP47](#)] for all of the text string attributes defined in this document is contained in the printer-natural-language-configured attribute.

Therefore, all object classes defined in this document conform to the IETF Policy on Character Sets and Languages [[BCP18](#)].

Note: For interoperability and consistent text display, values of attributes defined in this document: (a) SHOULD be normalized as recommended in Unicode Format for Network Interchange [[RFC5198](#)]; (b) SHOULD NOT contain DEL or any C0 or C1 control characters except for HT, CR, and LF; (c) SHOULD only contain CR and LF characters together (not as singletons); and SHOULD NOT contain HT, CR, or LF characters in names, e.g., printer-name and printer-aliases.

[9.](#) Security Considerations

See [[RFC4513](#)] for detailed guidance on authentication methods for LDAP and the use of TLS/1.2 [[RFC5246](#)] to supply connection confidentiality and data integrity for LDAP sessions.

As with any LDAP schema, it is important to protect specific entries and attributes with the appropriate access control. It is particularly important that only administrators can modify entries defined in this LDAP Printer schema. Otherwise, an LDAP client might be fooled into diverting print service requests from the original Printer (or spooler) to a malicious intruder's host system, thus exposing the information in printed documents.

Note: Security vulnerabilities can arise if DEL or any C0 or C1

control characters are included in names, e.g., printer-name or printer-aliases.

For additional security considerations of deploying Printers in an IPP environment, see [Section 8 of \[RFC2911\]](#).

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- 1) Added many editorial corrections and clarifications
 - corrected typos, missing words, and ambiguous sentences;
 - replaced lowercase 'printer' with titlecase 'Printer' for readability and consistency with IETF and IEEE-ISTO PWG IPP standards usage;
 - added implementation notes;
 - updated and added references.
- 2) Deleted length restrictions from formal definitions of DirectoryString syntax attributes
 - replaced with notes recommending length restrictions for compatibility with existing implementations of [\[RFC3712\]](#) and underlying string length limits in [\[RFC2707\]](#), [\[RFC2911\]](#), [\[RFC3805\]](#), [\[PWG5107.2\]](#), [\[PWG5100.13\]](#), and [\[PWG5100.14\]](#).
- 3) Added new Printer attributes defined in [\[PWG5107.2\]](#), [\[PWG5100.13\]](#), and [\[PWG5100.14\]](#) (see [section 7.1](#))
 - see the table of Printer attributes and source documents in [section 4](#) 'Definition of Attribute Types' in this document;
 - added support for IEEE-ISTO PWG IPP Everywhere [\[PWG5100.14\]](#) project.
- 4) Added implementation note to [section 4](#) about string encodings
 - added discussion of 'List of xxx' and 'One of xxx' encodings;
 - stated that any of these attributes can be represented as multiple instances (i.e., to avoid length overflow).
- 5) Improved comma-delimited examples of string attributes
 - added both single-valued and multi-valued examples.
- 6) Clarified use of printer-xri-supported and printer-resolution-supported attributes and field delimiters
 - added note in [section 4](#) Definition of Attribute Types to explain the origin of the different field delimiters;
 - added examples to show optional *trailing* whitespace after '<' delimiters in printer-xri-supported;
 - added examples to show optional *trailing* whitespace after '>' delimiters in printer-resolution-supported.
- 7) Clarified [section 8](#) 'Internationalization Considerations'
 - added note about Network Unicode [\[RFC5198\]](#) and avoiding use of C0 and C1 control characters.
- 8) Clarified [section 9](#) 'Security Considerations'

- added note about security vulnerabilities caused by use of DEL or any C0 or C1 control characters in names.
- 9) Clarified terms and abbreviations
- renamed [section 2](#) Conventions Used in This Document;
 - added [section 2.1](#) Requirements Language;
 - added [section 2.2](#) LDAP Schema Descriptions;
 - added [section 2.3](#) Abbreviations.

[12. Appendix X](#) - Change History

[[RFC Editor: This section to be deleted before RFC publication]]

23 March 2015 - [draft-mcdonald-ldap-printer-schema-11.txt](#)

Editorial - revised [section 2](#) Conventions Used in This Document to contain [section 2.1](#) Requirements Language, [section 2.2](#) LDAP Schema Descriptions, and [section 2.3](#) Abbreviations (moved from former [Appendix B](#)), per final version of [RFC 7472](#).

Editorial - revised [section 7](#) IANA Considerations and subsections to clarify extent of new IANA registration requests, per Pearl Liang.

Editorial - revised [Appendix A](#) - Changes since [RFC 3712](#), to capture changes in [section 2](#) and [section 7](#).

Editorial - moved Acknowledgements section after all Appendices and before Authors' Addresses, per final version of [RFC 7472](#).

29 January 2015 - [draft-mcdonald-ldap-printer-schema-10.txt](#)

Editorial - Updated copyright year to 2015.

Editorial - revised sections [4.1](#) printer-uri, 4.2

printer-xri-supported, 4.7 printer-more-info, and 4.39

printer-charge-info-uri to simply refer to [[STD66](#)] for details of URI syntax (and be silent about conflicting [RFC 6874](#) for IPv6 addresses) per advice of Alexey Melnikov on 16 December 2014 and clarifications from Mike Sweet on 29 January 2015.

Editorial - revised [section 4.2](#) printer-xri-supported to clarify that the 'certificate' value refers to the IPP Client certificate extracted from the TLS session, per advice of Alexey Melnikov on 16 December 2014.

Editorial - revised [section 4.3](#) printer-name to change "MAY" to "can" throughout the second Note paragraph, per advice of Alexey Melnikov on 16 December 2014.

Editorial - revised [section 4.13](#)

printer-generated-natural-language-supported to change example of from "fr-fr" to "fr-ca" (French as spoken in Canada) as a better illustration, per advice of Alexey Melnikov on 16 December 2014.

Editorial - revised [section 7](#) IANA Considerations to make clear which OIDs were already previously assigned by IBM and IANA-registered by

[RFC 3712](#), per advice of Nevil Brownlee on 18 December 2014.

Editorial - revised [section 12 Appendix A](#) - Changes since [RFC 3712](#) to delete erroneous change from Informational to Standards-Track.

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28 September 2014 - [draft-mcdonald-ldap-printer-schema-09.txt](#)

Editorial - Changed "Intended Status" as "Informational", per advice of Barry Leiba on 18 August 2014.

Editorial - Revised Abstract, Boilerplate, and Introduction to state that this document is an Independent Submission to the RFC Editor Stream, per advice of Barry Leiba on 18 August 2014.

3 July 2014 - [draft-mcdonald-ldap-printer-schema-08.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Editorial - revised sections [4.2](#) and [10.1](#) to add [[RFC7235](#)] normative reference, update for [[RFC2617](#)], per PWG IPP WG review.

Editorial - revised sections [4.2](#) and [10.1](#) to add [[RFC6818](#)] normative reference, update for [[RFC5280](#)], per PWG IPP WG review.

Editorial - revised [section 10.1](#) to update [[PWG5101.1](#)] normative reference to v2.0 (March 2013), per PWG IPP WG review.

13 March 2014 - [draft-mcdonald-ldap-printer-schema-07.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Global - updated publication and expiration dates in copyright, header, footer, and boilerplate.

Editorial - revised sections [4](#), [4.2](#), and [4.24](#) to add implementation notes about different field delimiters in printer-xri-supported and printer-resolution-supported (for compatibility with SLP template), per PWG IPP WG.

Editorial - revised [appendix A](#) 'Changes since [RFC 3712](#)' to correct typos and expand PWG IPP Everywhere reference, per PWG IPP WG.

3 March 2014 - [draft-mcdonald-ldap-printer-schema-06.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Global - updated publication and expiration dates in copyright, header, footer, and boilerplate.

Global - replaced 'SHOULD not' w/ 'SHOULD NOT' for [RFC 2911](#) compliance, per Alexey Melnikov.

Editorial - revised Abstract and [section 1](#) Introduction to clarify that this document is an individual submission to the IETF by the IPP WG of the IEEE-ISTO PWG, per Tom Petch and IPP WG review.

Editorial - revised Abstract and [section 1](#) Introduction to clarify that this document obsoletes [[RFC3712](#)], per Alexey Melnikov.

Editorial - added [section 1.1](#) 'Relationship to SLP Printer Service' and [section 1.2](#) 'Source of LDAP Printer Attributes' for clarity.

Editorial - added [section 1.3](#) 'Sources of LDAP Printer Schema OIDs' to describe permanent delegation of "1.3.18.0.2.24.46" to the IEEE-ISTO PWG by IBM in October 2011, per Alexey Melnikov.

Editorial - added [section 1.4](#) 'Rationale for Design Choices' for clarity.

Editorial - revised sections [3.1](#), [3.4](#), [3.5](#), and [3.6](#) to delete erroneous SHOULD references to structural classes, per Alexey Melnikov.

Editorial - revised [section 4](#) to clarify reference to [section 4 of \[RFC4517\]](#) and forward reference to [section 6](#) of LDAP Printer Schema,

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per Alexey Melnikov.

Editorial - revised [section 4](#) to add implementation note about compatibility with existing implementations of [\[RFC3712\]](#) and underlying string length limits in [\[RFC2707\]](#), [\[RFC2911\]](#), [\[RFC3805\]](#), [\[PWG5107.2\]](#), [\[PWG5100.13\]](#), and [\[PWG5100.14\]](#), per Alexey Melnikov.

Editorial - revised [section 4.4](#) to change SHOULD to MUST for conformance to [\[BCP47\]](#) for natural language tags, per Alexey Melnikov.

Editorial - revised [section 4.4](#) printer-natural-language-configured and [section 4.13](#) printer-generated-natural-language-supported definitions to clarify that they refer to LDAP Printer in syntax DirectoryString (UTF-8), per Alexey Melnikov.

Editorial - revised [section 4.11](#) printer-charset-configured and [section 4.12](#) printer-charset-supported definitions to clarify that they refer to IPP protocol values and that corresponding LDAP Printer attributes are always in syntax DirectoryString (UTF-8), per Alexey Melnikov.

Editorial - revised [section 4.20](#) printer-number-up-supported and [section 4.35](#) printer-device-id definitions to add missing SINGLE-VALUE clause, per Alexey Melnikov.

Editorial - revised [section 4.35](#) printer-device-id to delete confusing and redundant note about ordering of key/value pairs within LDAP attribute values (since this is clearly explained in [\[PWG5107.2\]](#)), per Alexey Melnikov.

Editorial - revised [section 4](#) syntaxes of printer-uri, printer-xri-supported, printer-name, printer-natural-language-configured, printer-location, printer-info, printer-more-info, printer-make-and-model, printer-ipp-versions-supported, printer-charset-configured, printer-charset-supported, printer-generated-natural-language-supported, printer-document-format-supported, printer-compression-supported, printer-finishings-supported, printer-sides-supported, printer-media-supported, printer-media-local-supported,

printer-resolution-supported, printer-current-operator,
printer-service-person, printer-delivery-orientation-supported,
printer-stacking-order-supported, printer-output-features-supported,
printer-aliases, printer-device-id, printer-uuid,
printer-charge-info, printer-charge-info-uri, printer-geo-location,
printer-ipp-features-supported, to remove length restrictions in
syntax and add textual notes instead about IPP compatibility (where
applicable), per Alexey Melnikov.

Editorial - added [appendix A](#) 'Changes since [RFC 3712](#)', per Alexey Melnikov.

Editorial - added missing informative reference to [[RFC3712](#)].

19 September 2013 - [draft-mcdonald-ldap-printer-schema-05.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Global - updated publication and expiration dates in copyright,
header, footer, and boilerplate.

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Global - updated references, per IEEE-ISTO PWG IPP WG review.

17 May 2013 - [draft-mcdonald-ldap-printer-schema-04.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Global - updated publication and expiration dates in copyright,
header, footer, and boilerplate.

Global - added references to IPP Everywhere, per IEEE-ISTO PWG IPP WG
review.

Editorial - revised [section 4.41](#) printer-ipp-features-supported to
show 'ipp-everywhere' defined in PWG 5100.14, per IEEE-ISTO PWG IPP
WG review.

18 November 2012 - [draft-mcdonald-ldap-printer-schema-03.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Global - updated publication and expiration dates in copyright,
header, footer, and boilerplate.

Global - updated contact info for Pat Fleming.

Global - updated various references.

Global - added references to IEEE-ISTO PWG and IEEE-ISTO PWG IPP WG,
per IEEE-ISTO PWG IPP WG review.

Global - deleted all references to PWG IPP Everywhere and values
defined in that specification, per IEEE-ISTO PWG IPP WG review.

Global - deleted 'printer-device-uuid' attribute, per IEEE-ISTO PWG
IPP WG review.

Global - revised all 'One of' attributes to add implementation note
that multiple values are represented as multiple instances, per
IEEE-ISTO PWG IPP WG review.

Global - revised all 'List of' attributes to add implementation note that length overflow is handled by multiple instances, per IEEE-ISTO PWG IPP WG review.

Global - revised many DESC clauses to correct truncation due to no-fill formatting, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4](#) Definition of Attribute Types to add implementation note recommending use of Network Unicode [[RFC5198](#)], recommending against the use of DEL or any C0 or C1 control characters (except HT, CR, and LF), and recommending against HT, CR, and LF in names (e.g., printer-name or printer-aliases), per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4](#) Definition of Attribute Types to add implementation note contrasting 'List of xxx' and 'One of xxx' and stating that any of these attributes can be represented as multiple instances (i.e., to avoid length overflow), per IEEE-ISTO PWG IPP WG review.

Global - revised all comma-delimited examples to include both single- and multi-valued examples, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.2](#) printer-xri-supported text and examples to show optional *trailing* whitespace after '<' delimiters, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.3](#) printer-name to break recommendations into separate implementation notes, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.20](#) printer-number-up-supported to add note explaining that this differs from the corresponding IPP attribute and is mapped from the largest reported value in IPP, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.22](#) printer-media-supported to separate examples of media sizes, types, and colors, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.24](#) printer-resolution-supported text and examples to show optional *trailing* whitespace after '>' delimiters, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.34](#) printer-aliases to add Network Unicode note like printer-name, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.35](#) printer-device-id to explicitly list the required key/value pairs as in PWG IPP Everywhere, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.37](#) printer-uuid to add example of a valid UUID per [[RFC4122](#)], per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.36](#) printer-device-service-count to add example, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.39](#) printer-charge-info-uri to add

example, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.40](#) printer-geo-location to add example of a value 'geo:' URI per [\[RFC5870\]](#), per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 4.41](#) printer-ipp-features-supported to delete 'ipp-everywhere' and add 'unknown' (with explanation), per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 7](#) IANA Considerations to correct truncation of some OIDs, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 7.2](#) Registration of Attribute Types to delete issue for OID assignments, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 8](#) Internationalization Considerations to add detailed note about Network Unicode [\[RFC5198\]](#) and avoiding use of C0 and C1 control characters, per IEEE-ISTO PWG IPP WG review.

Editorial - revised [section 9](#) Security Considerations to add note about security vulnerabilities caused by use of DEL or any C0 or C1 control characters in names, per IEEE-ISTO PWG IPP WG review.

Editorial - added [appendix B](#) Abbreviations, per IEEE-ISTO PWG IPP WG review.

20 May 2012 - [draft-mcdonald-ldap-printer-schema-02.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Cover - changed intended category to Standards Track for consistency w/ recent LDAP schema specs and IPP Everywhere recommendations.

Global - replace 'must' w/ 'MUST', 'should' w/ 'SHOULD', and 'may' w/ 'can' or 'MAY' (as appropriate) for Standards Track document.

Global - updated publication and expiration dates in copyright, header, footer, and boilerplate.

Global - replaced [\[RFC1759\]](#) references (obsolete) w/ [\[RFC3805\]](#), per IEEE-ISTO PWG IPP WG review.

Global - replaced lowercase 'printer' with titlecase 'Printer' for readability and consistency with IPP standards usage.

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Revised [section 1](#), to correct format of reference to IPP JPS3, per IEEE-ISTO PWG IPP WG review.

Revised [section 3.5](#), [section 4.1](#), and [section 4.2](#) to add references to IPP and IPPS URI scheme specs, per IEEE-ISTO PWG IPP WG review.

Revised [section 4.2](#) to correct reference for 'digest' and add reference for 'certificate' to [\[RFC5280\]](#), per IEEE-ISTO PWG IPP WG review.

Revised sections [4.5](#), [4.6](#), [4.8](#), [4.29](#), [4.30](#), and [4.36](#) to add note about use of Network Unicode [\[RFC5198\]](#) and prohibition against all C0 and C1 control characters except HT, CR, and LF, per IEEE-ISTO PWG IPP WG review.

Revised [section 4.9](#) to enumerate all known IPP versions (noting that IPP/1.0 is OBSOLETE) and refer to IANA IPP Registry, per IEEE-ISTO

PWG IPP WG review.

Revised [section 4.22](#) to replace legacy examples w/ examples of media size names, media types, and media colors defined in [[PWG5101.1](#)], per IEEE-ISTO PWG IPP WG review.

Revised [section 4.24](#) to delete obscure note about delimiter, per IEEE-ISTO PWG IPP WG review.

Revised sections [4.25](#), [4.31](#), [4.32](#), and [4.33](#) to add note about use of 'unknown' (out-of-band value) ONLY when the correspond IPP or Printer MIB attributes are not present (i.e., artifact of LDAP mapping), per IEEE-ISTO PWG IPP WG review.

Revised [section 4.39](#) to add exhaustive list of feature keywords from [[PWG5100.JPS3](#)] and [[PWG5100.EVE](#)], per IEEE-ISTO PWG IPP WG review.

Added [section 4.x](#) 'printer-device-service-count' aligned w/ "device-service-count" in [[PWG5100.JPS3](#)], per IEEE-ISTO PWG IPP WG review.

Added [section 4.x](#) 'printer-device-uuid' aligned w/ "device-uuid" in [[PWG5100.JPS3](#)], per IEEE-ISTO PWG IPP WG review.

Revised sections [4.x](#) to add length restrictions to unbounded strings (text, URI, and UUID) w/ maximum 255 octets (consistent w/ [RFC 3712](#)), verify attribute lengths (per source IPP attribute), and clarify "list of" (comma-delimited) versus "one of" (simple multi-valued) for all 'printer-xxx-supported' attributes, per IEEE-ISTO PWG IPP WG review.

Revised [section 7.2](#) to assign new OIDs for the LDAP Printer Schema new attributes, per IEEE-ISTO PWG IPP WG review.

Revised [section 10.1](#) to add [BCP 14](#) to [[RFC2119](#)] definition, per IEEE-ISTO PWG IPP WG review.

Revised [section 10.1](#) and [section 10.2](#) to move [[RFC2617](#)], [[RFC3987](#)], [[RFC4122](#)], [[RFC5198](#)], [[RFC5246](#)], [[RFC5280](#)], [[RFC5870](#)], [[STD63](#)] from informative to normative references, per IEEE-ISTO PWG IPP WG review.

3 April 2012 - [draft-mcdonald-ldap-printer-schema-01.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project
Global - changed [[IPPEVE1](#)] to [[PWG5100.EVE](#)] and [[IPPJPS3](#)] to [[PWG5100.JPS3](#)], per IEEE-ISTO PWG IPP WG review.

Revised [section 1.1](#), to add printer-charge-info-uri and printer-uuid to discussion of URI syntax, per IEEE-ISTO PWG IPP WG review.

Revised [section 1.2](#) and [section 1.3](#), to add printer-device-id to discussions of equality and substring matching, per IEEE-ISTO PWG IPP WG review.

Revised [section 3.2](#), [section 4](#), and [section 7.2](#), to delete redundant printer-organization and printer-organizational-unit (already covered by 'O' and 'OU'), per IEEE-ISTO PWG IPP WG review.

Revised [section 3.2](#), [section 4](#), and [section 7.2](#), to add missing printer-charge-info, per IEEE-ISTO PWG IPP WG review.

Revised [section 3.5](#), [section 4](#), and [section 7.2](#), to rename printer-ipp-extensions-supported to printer-ipp-features-supported, per IEEE-ISTO PWG IPP WG review.

Revised numerous [section 4](#) subsections, to add references to [IANAIPP] or [RFC3805] as appropriate for enumerations and keywords, per IEEE-ISTO PWG IPP WG review.

Revised [section 4.2](#), to add 'negotiate' as value for 'auth' and references to [PWG5100.JPS3], [RFC4559], and [IANAIPP], per IEEE-ISTO PWG IPP WG review.

Revised [section 4.2](#), to use 'example.com' for all DNS names, per IEEE-ISTO PWG IPP WG review.

Revised [section 4.22](#) and [section 4.23](#), to add normative reference to PWG Media Standardized Names [PWG5101.1], per IEEE-ISTO PWG IPP WG review.

Revised [section 4.24](#), to divide notes into two separate paragraphs, per IEEE-ISTO PWG IPP WG review.

Revised [section 4.31](#), [section 4.32](#), and [section 4.33](#), to change 'Values ... include' to 'Values ... are' (i.e., closed set), per IEEE-ISTO PWG IPP WG review.

Revised [section 4.35](#) printer-device-id, to add warning about ordering of required key/value pairs (first) and truncation only at key/value pair boundaries for interoperability, per IEEE-ISTO PWG IPP WG review.

Revised [section 4](#), to add printer-charge-info from [PWG5100.JPS3], per IEEE-ISTO PWG IPP WG review.

Revised [section 4.38](#) printer-geo-location, to change 'should' to 'must' for conformance to [RFC5870], per IEEE-ISTO PWG IPP WG review.

Revised [section 4.39](#), to change printer-ipp-extensions-supported to printer-ipp-features-supported per [PWG5100.JPS3] and add examples, per IEEE-ISTO PWG IPP WG review.

Revised [section 4](#) subsection printer-uuid, to change 'should' to 'must' for conformance to [RFC4122], per IEEE-ISTO PWG IPP WG review.

Revised [section 10](#) References, to update out-of-date references.

2 October 2011 - [draft-mcdonald-ldap-printer-schema-00.txt](#)

Working draft - for IEEE-ISTO PWG IPP Everywhere project

Revised document to add current I-D individual submission boilerplate.

Revised Abstract and [section 1](#) Introduction, to cite [PWG5107.2] and [PWG5100.JPS3] new attribute sources.

Revised [section 3.2](#) printerAbstract, to add new attributes from [PWG5107.2] and [IPPJPS3].

Revised [section 3.5](#), to add new attributes from [IPPJPS3].
Revised [section 4](#) Definition of Attribute Types, to add new attributes from [[PWG5107.2](#)] and [IPPJPS3] to table and later specific definitions.
Revised [section 7.2](#) Registration of Attribute Types, to add new attributes from [[PWG5107.2](#)] and [IPPJPS3] - new OIDs needed.
Revised [section 10](#) References, to update out-of-date references.

[13.](#) Acknowledgments

The editors wish to acknowledge significant contributions from Ken Jones and Harry Lewis and excellent comments from Patrik Faltstrom, Ryan Moats, Robert Moore, Lee Rafalow, Kimberly Reger, and Kurt Zeilenga during the development of the original LDAP Printer schema [[RFC3712](#)].

The editors wish to acknowledge excellent comments from Nevil Brownlee, Barry Leiba, Alexey Melnikov, Tom Petch, and Mike Sweet during the development of this current version of the LDAP Printer schema.

Thanks to the members of the IEEE-ISTO PWG IPP Working Group, for their review comments and help in preparing this document.

[14.](#) Authors' Addresses

Please send comments to the authors at the addresses listed below.

Pat Fleming
Independent
51796 171 Ave
Pine Island, MN 55963
USA
Phone: +1 507-356-8277
Email: patfleminghtc@gmail.com

Ira McDonald
High North Inc
221 Ridge Ave
Grand Marais, MI 49839
USA
Phone: +1 906-494-2434
Email: blueroomusic@gmail.com

