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Lightweight Directory Access Protocol (LDAP): Schema for Printer Services <<u>draft-mcdonald-ldap-printer-schema-06.txt</u>>

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 <u>Appendix E</u> 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 document is an individual submission to the IETF 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.

This document obsoletes <u>RFC 3712</u>.

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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 document is an individual submission to the IETF by the Internet Printing Protocol Working Group of the IEEE-ISTO Printer Working Group, as part of their PWG IPP Everywhere [PWG5100.14] project for secure mobile printing with vendor-neutral Client software. This document updates RFC 3712.

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' [<u>RFC2079</u>] 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 [<u>RFC3712</u>].

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. Subsequently, the PWG permanently assigned subordinate ASN.1 OIDs to all of the new attribute types defined in this updated LDAP Printer Schema.

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 [<u>BCP18</u>].

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.

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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. Terminology and Conventions

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].

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

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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 [<u>RFC2911</u>], and LPR [<u>RFC1179</u>].

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 <u>Section 4</u> 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) [<u>RFC2608</u>] 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 [<u>SLPPRT20</u>]. This object class is derived from 'slpService', the parent class for all SLP services, defined in [<u>RFC2926</u>].

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 \$

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```
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

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

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```
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  SUP
        printerAbstract
        ( printer-uri $
  MAY
          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 )
        ( printer-aliases)
  MAY
  )
  This auxiliary class defines LPR [RFC1179] information. It is used
  to identify directory entries that support LPR.
```

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4. Definition of Attribute Types

The following attribute types are referenced by the object classes defined in <u>Section 3</u>.

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 CO 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.

The following table is a summary of the attribute names defined by this document and their corresponding source document names as defined in [<u>RFC2911</u>], [<u>RFC3805</u>], [<u>PWG5107.2</u>], or [<u>PWG5100.13</u>]. Some source attribute names have been prefixed with 'printer-' as recommended in [RFC2926], to address the flat namespace for LDAP identifiers.

LDAP & SLP Printer Schema	Source Document and Attribute Name
* * *	IPP/1.1 and Semantics Model [<u>RFC2911</u>]
printer-uri	

printer-xri-supported

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```
[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 [<u>RFC3805</u>]
                                 prtGeneralCurrentOperator
printer-current-operator
                                 prtGeneralServicePerson
printer-service-person
printer-delivery-orientation-supported
                                 prtOutputPageDeliveryOrientation
printer-stacking-order-supported
                                 prtOutputStackingOrder
printer-output-features-supported
                                 [prtOutputBursting]
                                 [prtOutputDecollating]
                                 [prtOutputPageCollated]
                                 [prtOutputOffsetStacking]
printer-aliases
                                 prtGeneralPrinterName
* * *
                                 Cmd Set 1284 Device ID [PWG5107.2]
```

printer-device-id

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

Values of URI SHOULD conform to [<u>STD66</u>], although URI schemes can be defined which do not conform to [<u>STD66</u>] (see [<u>BCP35</u>]).

Note: For compatibility with IPP/1.1 [<u>RFC2911</u>], 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 [<u>RFC3510</u>] and IPP over HTTPS Transport Binding and 'ipps' URI Scheme [<u>IPPSURI</u>] 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 [<u>RFC2608</u>] service discovery.

Note: See Sections 1.1, 1.2, and 1.3 for rationale for design choices.

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```
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.

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

Values of URI SHOULD conform to [STD66], although URI schemes can be defined which do not conform to [STD66] (see [BCP35]).

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 URT values into this attribute.

Note: This attribute is based on 'printer-uri-supported', 'uri-authentication-supported', and 'uri-security-supported' (called the 'Three Musketeers' because they are parallel ordered attributes) defined in IPP/1.1 [RFC2911]. 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 [<u>RFC2911</u>], 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)

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```
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       'basic' (HTTP/1.1 Basic [RFC2617])
       'digest' (HTTP/1.1 Digest [RFC2617])
       'certificate' (X.509 Certificate [RFC5280])
       'negotiate' (HTTP/1.1 Negotiate [<u>RFC4559</u>])
  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, [<u>RFC5246</u>])
   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: 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 <u>1.1</u>, <u>1.2</u>, and <u>1.3</u> 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
   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.

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```
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  Note: For compatibility with IPP/1.1 [<u>RFC2911</u>], values of this
  attribute SHOULD NOT exceed 255 octets in length.
  Note: This name MAY be the last part of the Printer's URI or it MAY
  be completely unrelated. This name MAY 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.'

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Internet-Draft LDAP Schema for Printer Services 3 March 2014 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 CO 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 [<u>RFC5198</u>]; (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

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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.

Values of URI SHOULD conform to [STD66], although URI schemes can be defined which do not conform to [STD66] (see [BCP35]).

Note: For compatibility with IPP/1.1 [<u>RFC2911</u>], 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 <u>1.1</u>, <u>1.2</u>, and <u>1.3</u> 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.

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```
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```

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 [<u>RFC2566</u>], OBSOLETE) '1.1' (IPP/1.1 [RFC2911]) '2.0' (IPP/2.0 [<u>PWG5100.12</u>]) '2.1' (IPP/2.1 [<u>PWG5100.12</u>]) '2.2' (IPP/2.2 [<u>PWG5100.12</u>])

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

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```
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  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 [<u>RFC2911</u>], 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.'
  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:

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```
'iso-8859-1' (ISO Latin1)
'utf-8' (UTF-8 [<u>STD63</u>])
```

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-fr' (French as spoken in France)

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.

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

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```
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        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
  )
  Comma-delimited list of compression algorithms supported by this
  Printer. For example:
       'none'
       'deflate,gzip'
```

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```
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  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 [<u>RFC2911</u>], 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 [<u>RFC1951</u>])
       '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

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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 [<u>IANAIPP</u>] 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

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)

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'
```

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```
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
)
```

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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);

    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: 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 [<u>RFC2911</u>] (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 '>'.
```

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```
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

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```
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   '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
  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].

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```
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 CO 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 CO or C1 control characters except for HT, CR, and LF; and (c) SHOULD only contain CR and LF characters together (not as singletons).

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```
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 [<u>RFC3805</u>] 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
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'
```

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Values defined in Printer MIB v2 [<u>RFC3805</u>] 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 [<u>RFC3805</u>] 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

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equivalent attribute in the 'service:printer:' v2.0 template [SLPPRT20].

Note: Implementations MAY support other values.

4.34. printer-aliases

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 [<u>RFC2911</u>], 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 [<u>RFC5198</u>]; 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

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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:

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

Values of this attribute MUST conform to the UUID URN namespace [<u>RFC4122</u>].

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

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```
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  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 [<u>PWG5100.13</u>], 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 [<u>RFC5198</u>]; (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 [<u>PWG5100.13</u>].

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:

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'http://example.com/charges'

Values of URI SHOULD conform to [STD66], although URI schemes can be defined which do not conform to [STD66] (see [BCP35]).

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 [<u>PWG5100.13</u>].

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 [<u>RFC2911</u>] and [<u>PWG5100.13</u>], 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].

```
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  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 [<u>PWG5100.13</u>] 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].

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5. Definition of Syntaxes

No new attribute syntaxes are defined by this document.

The attribute types defined in <u>Section 4</u> 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

<u>6</u>. Definition of Matching Rules

No new matching rules are defined by this document.

The attribute types defined in <u>Section 4</u> 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

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7. IANA Considerations

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

This document does define the following Object Identifier Descriptors, for registration by IANA when this RFC is published:

7.1. Registration of Object Classes 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: object class 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:

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

LDAP Schema for Printer Services Internet-Draft 3 March 2014 7.2. Registration of Attribute Types 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: OID Attribute Type -----1.3.18.0.2.4.1140 printer-uri printer-xri-supported 1.3.18.0.2.4.1107 1.3.18.0.2.4.1135 printer-name 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 1.3.18.0.2.4.1129 printer-color-supported 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

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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 1.3.18.0.2.4.1114 printer-delivery-orientation-supported printer-stacking-order-supported 1.3.18.0.2.4.1115 printer-output-features-supported 1.3.18.0.2.4.1116 1.3.18.0.2.4.1108 printer-aliases ---------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 1.3.18.0.2.24.46.1.104 printer-uuid 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

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8. Internationalization Considerations

All text string attributes defined in this document of syntax 'DirectoryString' [<u>RFC4517</u>] 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 CO 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 CO 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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[PWG] IEEE-ISTO Printer Working Group (PWG) <http://www.pwg.org>

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[PWGIPP] IEEE-ISTO PWG Internet Printing Protocol Working Group <http://www.pwg.org/ipp>

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11. 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

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Zeilenga during the development of the original LDAP Printer schema [<u>RFC3712</u>].

The editors wish to acknowledge excellent comments from Alexey Melnikov, Tom Petch, and Mike Sweet during the development of the current 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.

12. Appendix A - Changes since RFC 3712

- 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], [<u>RFC3805</u>], [<u>PWG5107.2</u>], [<u>PWG5100.13</u>], and [<u>PWG5100.14</u>].
- 3) Added new Printer attributes defined in [PWG5107.2], [<u>PWG5100.13</u>], and [<u>PWG5100.14</u>]. - see the table of Printer attributes and source documents in <u>section 4</u> '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 and 'One of xxx' - 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 include single-valued and multi-valued examples
- 6) Clarified use of printer-xri-supported attribute - added examples to show optional *trailing* whitespace after '<' delimiters.
- 7) Clarified section 8 'Internationalization Considerations' - added note about Network Unicode [RFC5198] and avoiding use of

C0 and C1 control characters.

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- 8) Clarified section 9 'Security Considerations' - added note about security vulnerabilities caused by use of DEL or any CO or C1 control characters in names.
- 9) Clarified terms and abbreviations - added 'Appendix B - Abbreviations'
- 10) Changed intended document category to 'Standards Track' - for consistency with more recent LDAP schema specs and [PWG5100.14]; - replaced 'must' with 'MUST', 'should' with 'SHOULD', and 'may' with 'can' or 'MAY' (as appropriate) for Standards Track document.

13. Appendix B - Abbreviations Used in this Document

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

- IANA - Internet Assigned Numbers Authority <<u>http://www.iana.org</u>>
- 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 <<u>http://www.pwg.org</u>>
- RFC - Request for Comments <http://www.rfc-editor.org/rfc.html>
- TLS - Transport Layer Security [RFC5246]
- URI - Uniform Resource Identifier [STD66]
- Uniform Resource Locator [STD66] URL
- UTF-8 Unicode Transformation Format 8-bit [STD63]

<u>14</u>. <u>Appendix X</u> - Change History

[[RFC Editor: This section to be deleted before RFC publication]] 3 March 2014 - draft-mcdonald-ldap-printer-schema-06.txt Seventh draft - for IEEE-ISTO PWG IPP WG 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 <u>section 1</u> 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, 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.

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Global - updated various references.

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

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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 TPP 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 CO 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 singleand 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 <u>section 4.34</u> 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.

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Editorial - revised <u>section 4.39</u> printer-charge-info-uri to add example, per IEEE-ISTO PWG IPP WG review.

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LDAP Schema for Printer Services 3 March 2014 Internet-Draft Editorial - revised section 4.40 printer-geo-location to add example of a value 'geo:' URI per [<u>RFC5870</u>], 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 CO 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 Third 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/ [RFC 3805], per IEEE-ISTO PWG IPP WG review. Global - replaced lowercase 'printer' with titlecase 'Printer' for readability and consistency with IPP standards usage. 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 <u>section 4.24</u> 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

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Revised section 4.22 and section 4.23, to add normative reference to

PWG Media Standardized Names [<u>PWG5101.1</u>], per IEEE-ISTO PWG IPP WG review.

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   Revised <u>section 4.24</u>, 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 <u>section 4</u>, 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 [<u>RFC5870</u>], 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 <u>section 10</u> References, to update out-of-date references.
   2 October 2011 - draft-mcdonald-ldap-printer-schema-00.txt
   Initial version - 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
   [<u>PWG5107.2</u>] and [IPPJPS3].
   Revised <u>section 3.5</u>, 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 <u>section 7.2</u> Registration of Attribute Types, to add new
   attributes from [PWG5107.2] and [IPPJPS3] - new OIDs needed.
   Revised <u>section 10</u> References, to update out-of-date references.
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15. Authors' Addresses

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

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