

Network Working Group  
INTERNET-DRAFT  
Obsoletes: [3712](#) (if approved)  
Intended Status: Informational  
Expires: 2 April 2012

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2 October 2011

Lightweight Directory Access Protocol (LDAP):  
Schema for Printer Services  
<[draft-mcdonald-ldap-printer-schema-00.txt](#)>

## Abstract

This document defines a schema, object classes and attributes, for printers and printer 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 (IPP) ([RFC 2911](#)). A few additional printer attributes are based on definitions in the Printer MIB ([RFC 1759](#)), IEEE-ISTO PWG Command Set for IEEE 1284 Device ID (PWG 5107.2), or IEEE-ISTO PWG IPP Job and Printer Extensions - Set 3 (IPP JPS3).

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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.

The schema defined in this document is based on the printer attributes listed in [Appendix E](#) 'Generic Directory Schema' of Internet Printing Protocol/1.1 (IPP) [[RFC2911](#)]. A few additional printer attributes are based on definitions in the Printer MIB [[RFC1759](#)], IEEE-ISTO PWG Command Set for IEEE 1284 Device ID (PWG 5107.2), or IEEE-ISTO PWG IPP Job and Printer Extensions - Set 3 (IPP JPS3).

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).

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

### 1.1. 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

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.

## 1.2. 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 may 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 may 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.

### 1.3. 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.

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



### 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 may 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](#)].

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### 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 should be used with a structural class such as printerService. 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-charge-info-uri $
```

```
printer-geo-location $
printer-organization $
printer-organizational-unit $
printer-uuid )
)
```

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. This class should be used with a structural class.

### 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-extensions-supported $
      printer-multiple-document-jobs-supported )
)
```

This auxiliary class defines Internet Printing Protocol (IPP/1.1) [[RFC2911](#)] information. It should be used with a structural class such as printerService. It is used to extend structural classes with IPP specific printer information.

### 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 should be used with a structural class such as `printerService`. 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 \[RFC4517\]](#) (see [Section 6](#) 'Definition of Matching Rules' below).

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 [[IPPJPS3](#)]. 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 [ <a href="#">RFC2911</a> ]
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

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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 [ <a href="#">RFC3805</a> ]
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 [ <a href="#">PWG5107.2</a> ] printer-device-id
printer-charge-info-uri	IPP Job/PrinterExt Set 3 [ <a href="#">IPPJPS3</a> ] printer-charge-info-uri
printer-geo-location	printer-geo-location
printer-ipp-extensions-supported	ipp-extensions-supported
printer-organization	printer-organization
printer-organizational-unit	printer-organizational-unit
printer-uuid	printer-uuid

#### 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 should be listed in printer-xri-supported.

Values of URI should conform to [\[STD66\]](#), although URI schemes may be defined which do not conform to [\[STD66\]](#) (see [\[BCP35\]](#)).

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: 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 'The unordered list of XRI (extended resource identifiers)
      supported by this printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
)
```

A list of XRI (extended resource identifiers) supported by this printer. Each value of this list should consist of a URI (uniform resource identifier) followed by (optional) authentication and security fields.

Values of URI should conform to [\[STD66\]](#), although URI schemes may be defined which do not conform to [\[STD66\]](#) (see [\[BCP35\]](#)).

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 '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 [[RFC2911](#)], 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](#)])
- 'digest' (HTTP/1.1 Basic, [[RFC2617](#)])
- 'certificate' (from certificate)

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

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

Each XRI field should be delimited by '<'. For example:

- 'uri=ipp://foo.com< auth=digest< sec=tls<'
- 'uri=lpr://bar.com< auth=none< sec=none<'
- 'uri=mailto:printer@foobar.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 that this delimiter differs from printer-resolution-supported.

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
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{127}
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. 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 [\[STD66\]](#)).

#### 4.4. printer-natural-language-configured

```
( 1.3.18.0.2.4.1119
NAME 'printer-natural-language-configured'
DESC 'The configured natural language in which error and status
      messages will be generated (by default) by this printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{127}
SINGLE-VALUE
)
```

Also, a possible natural language for printer 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 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: For consistency 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{127}
SINGLE-VALUE
)
```

For example:

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

#### 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{127}
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'
```

#### 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
```

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For example, this could be an HTTP type 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 may be defined which do not conform to [\[STD66\]](#) (see [\[BCP35\]](#)).

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{127}
SINGLE-VALUE
)
```

Note: The printer manufacturer may initially populate this attribute.

#### 4.9. printer-ipp-versions-supported

```
( 1.3.18.0.2.4.1133
NAME 'printer-ipp-versions-supported'
DESC 'IPP protocol version(s) that this printer supports.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{127}
)
```

The IPP protocol version(s) should include major and minor versions, i.e., the exact version numbers for which this Printer implementation meets the IPP version-specific conformance requirements.

#### 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 in which error and status messages will
      be generated (by default) by this printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{63}
SINGLE-VALUE
)
```

Also, a possible charset for printer 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.

For consistency 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 'Set of charsets supported for the attribute values of syntax
      DirectoryString for this directory entry.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{63}
)
```

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.

For consistency 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 'Natural language(s) supported for this directory entry.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{63}
)
```

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: For consistency 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 'The possible source document formats which may be interpreted
      and printed by this printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{127}
)
```

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

#### 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 'Compression algorithms supported by this printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{255}
)
```

Values defined in IPP/1.1 [[RFC2911](#)] 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 may 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 may 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 'The possible finishing operations supported by this printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{255}
)
```

Values defined in IPP/1.1 [[RFC2911](#)] 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 'The possible numbers of print-stream pages to impose upon a
      single side of an instance of a selected medium.'
EQUALITY integerMatch
ORDERING integerOrderingMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.27
```

)

Values defined in IPP/1.1 [[RFC2911](#)] include: '1', '2', and '4'.

Note: Implementations may support other values.

#### 4.21. printer-sides-supported

```
( 1.3.18.0.2.4.1123
NAME 'printer-sides-supported'
DESC 'The number 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{127}
)
```

Values defined in IPP/1.1 [[RFC2911](#)] include: '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 'The standard names/types/sizes (and optional color suffixes) of
      the media supported by this printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{255}
)
```

Values are defined in IPP/1.1 [[RFC2911](#)] or any IANA registered extensions. For example:

```
'iso-a4'
'envelope'
'na-letter-white'
```

#### 4.23. printer-media-local-supported

```
( 1.3.18.0.2.4.1117
NAME 'printer-media-local-supported'
DESC 'Site-specific names of media supported by this printer.'
```

EQUALITY caseIgnoreMatch  
SUBSTR caseIgnoreSubstringsMatch  
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{255}

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Values should be in the natural language specified by  
printer-natural-language-configured.

For example:

'purchasing-form' (site-specific name)

as opposed to 'na-letter' (standard keyword from IPP/1.1 [[RFC2911](#)])  
in the printer-media-supported attribute.

#### 4.24. printer-resolution-supported

```
( 1.3.18.0.2.4.1121
NAME 'printer-resolution-supported'
DESC 'List of resolutions supported for printing documents by this
      printer.'
EQUALITY caseIgnoreMatch
SUBSTR caseIgnoreSubstringsMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{255}
)
```

Each resolution value should 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 should be delimited by '>'. For example:

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

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 [[RFC1759](#)] (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 '>'. Note that this delimiter differs from printer-xri-supported.

#### 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{127}
)
```

Values defined in IPP/1.1 [[RFC2911](#)] include:

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

#### 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 may 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
```

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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 [\[SLPPRT20\]](#).

#### 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{127}
SINGLE-VALUE
)
```

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

#### 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{127}
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.

#### 4.31. printer-delivery-orientation-supported

```
( 1.3.18.0.2.4.1114
NAME 'printer-delivery-orientation-supported'
DESC 'The possible delivery orientations of pages as they are printed
      and ejected from this printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{127}
)
```

Values defined include:

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

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 'The possible stacking order of pages as they are printed and
      ejected from this printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{127}
)
```

Values defined include:

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

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 'The possible output features supported by this printer.'
EQUALITY caseIgnoreMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{127}
)
```

Values defined include:

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

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 'List of 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{127}
)
```

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.

#### 4.35. printer-device-id



```
( ...
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{255}
)
```

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

#### 4.36. printer-charge-info-uri

```
( ...
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
)
```

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

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.

#### 4.37. printer-geo-location

```
( ...
NAME 'printer-geo-location'
DESC 'A 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
)
```

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

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.

#### 4.38. printer-ipp-extensions-supported

```
( ...  
NAME 'printer-ipp-extensions-supported'  
DESC 'IPP protocol extension(s) that this printer supports.'  
EQUALITY caseIgnoreMatch  
SUBSTR caseIgnoreSubstringsMatch  
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{255}  
)
```

The IPP protocol extension(s) should specify only IANA-registered keywords for the IPP "ipp-extensions-supported" [[IPPJPS3](#)] values for which this Printer implementation meets the IPP extension-specific conformance requirements.

#### 4.39. printer-organization

```
( ...  
NAME 'printer-organization'  
DESC 'An organization name associated with this printer.'  
EQUALITY caseIgnoreMatch  
SUBSTR caseIgnoreSubstringsMatch  
SYNTAX 1.3.6.1.4.1.1466.115.121.1.15{255}  
)
```

Values of this attribute should specify an organization name associated with this printer that conforms to [section 2.19](#) 'o' of [[RFC4519](#)].

#### 4.40. printer-organizational-unit

```
( ...  
NAME 'printer-organizational-unit'  
DESC 'An organizational unit associated with this printer.'  
EQUALITY caseIgnoreMatch  
SUBSTR caseIgnoreSubstringsMatch
```

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Values of this attribute should specify the name of an organizational unit associated with this printer that conforms to [section 2.20](#) 'ou' of [\[RFC4519\]](#).

#### 4.41. printer-uuid

```
( ...  
NAME 'printer-uuid'  
DESC 'A URN specifying UUID 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 conform to the UUID URN namespace [\[RFC4122\]](#).

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.

## 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 [ <a href="#">STD63</a> ])
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 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:

Pat Fleming  
IBM

Highway 52 N  
Rochester, MN 55901  
USA  
Phone: +1 507-253-7583  
EMail: flemingp@us.ibm.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

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## 7.2. Registration of Attribute Types

[[[ ISSUE: Need to assign new IBM subtree OIDs to new attributes - but should wait until final set of new attributes has settled down after review by IEEE-ISTO PWG IPP working group members. ]]]

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:

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Comments:

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

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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
-----	-----
printer-device-id	
printer-charge-info-uri	
printer-geo-location	
printer-ipp-extensions-supported	
printer-organization	
printer-organizational-unit	
printer-uuid	

## 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](#)].

## [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.

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

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## [11. Appendix A](#) - Acknowledgments

The editors wish to acknowledge the very significant contributions of

Ken Jones (Bytemobile) and Harry Lewis (IBM) during the development of the original LDAP printer schema [[RFC3712](#)].

Thanks to Patrik Faltstrom (Cisco), Ryan Moats (Lemur Networks), Robert Moore (IBM), Lee Rafalow (IBM), Kimberly Reger (IBM), and Kurt Zeilenga (OpenLDAP) for comments on the original LDAP printer schema [[RFC3712](#)].

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

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

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

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 [[IPPJPS3](#)] 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.

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