                  Lightweight Directory Access Protocol (LDAP):
                        Schema for Printer Services

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Abstract

   This document defines a schema, object classes and attributes, for
   printers and printer services, for use with directories that support
   Lightweight Directory Access Protocol v3 (LDAP-TS).  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).

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1.  Introduction

   This document defines several object classes to provide Lightweight
   Directory Access Protocol v3 [LDAP-TS] 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] 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].

   The schema defined in this document is technically aligned with the
   stable IANA-registered 'service:printer:' v2.0 template [SLP-PRT],
   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' [RFC2252] rather than
   'labeledURI' [RFC2079] for the 'printer-uri' attribute).

   Please send comments directly to the authors at the addresses listed
   in Section 13 "Authors' Addresses".

1.1.  Rationale for using DirectoryString Syntax

   The attribute syntax 'DirectoryString' (UTF-8 [RFC2279]) defined in
   [RFC2252] 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 forward compatible with any future
       deployment of (UTF-8 based) IRI (Internationalized Resource
       Identifiers) [W3C-IRI] currently being developed by the W3C
       Internationalization Working Group.

   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"
[RFC2277].

Note:  The printer-natural-language-configured attribute contains
a language tag [RFC3066] 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 [RFC2252] 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 [RFC2396], 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 [RFC1274].

        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
    [RFC2252] 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 [RFC1274].

    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 BCP 14 [RFC2119].

    Schema definitions are provided using LDAPv3 [LDAP-TS] 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 [SLP-PRT].

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 [SLP-PRT].  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 )
   )

   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-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 6 of [RFC2252] (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 8 of [RFC2252] and/or Section 2 of [RFC3698]
   (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 names from [RFC2911].  Some
   attribute names described in [RFC2911] have been prefixed with
   'printer-' as recommended in [RFC2926], to address the flat namespace
   for LDAP identifiers.

```
   LDAP & SLP Printer Schema       IPP Model [RFC2911]
   ----------------------------    -----------------------------------
   printer-uri
   printer-xri-supported
                                   [IPP printer-uri-supported]
                                   [IPP uri-authentication-supported]
                                   [IPP 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-current-operator
   printer-service-person
   printer-delivery-orientation-supported
   printer-stacking-order-supported
   printer-output-features-supported
   printer-aliases
```

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 [RFC2396], although URI schemes may
    be defined which do not conform to [RFC2396] (see [RFC2717] and
    [RFC2718]).

    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 [RFC2396], although URI schemes may
    be defined which do not conform to [RFC2396] (see [RFC2717] and
    [RFC2718]).

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/1.0, [RFC2246])

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
[SLP-PRT].  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
      [RFC2396]).

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 the
      Identification of Languages" [RFC3066].  For example:

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

      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
    )

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 [RFC2396], although URI schemes may
be defined which do not conform to [RFC2396] (see [RFC2717] and
[RFC2718]).

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 [RFC2279])
        'iso-8859-1' (Latin1)

    Values of charset tags should be defined in the IANA Registry of
    Coded Character Sets [IANA-CHAR] (see also [RFC2978]) 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 [RFC2279])
         'iso-8859-1' (Latin1)

   Values of charset tags should be defined in the IANA Registry of
   Coded Character Sets [IANA-CHAR] (see also [RFC2978]) 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 the
   Identification of Languages" [RFC3066].  For example:

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

   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 [IANA-MIME] (see also [RFC2048]).

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}
    )

    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
   [SLP-PRT].  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
)
```

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 [SLP-
PRT].

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 [SLP-
PRT].

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 [SLP-
PRT].

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 [SLP-
   PRT].

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 [SLP-
   PRT].

   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.

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 6 of [RFC2252], 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 [RFC2279])
   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 8 of [RFC2252] and/or Section 2 of
   [RFC3698], 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.  They have been registered by the IANA:

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:  RFC3712

    Author/Change Controller:

        Pat Fleming
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        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

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:  RFC3712

    Author/Change Controller:

        Pat Fleming
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        Phone: +1 507-253-7583
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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
printer-pages-per-minute-color              1.3.18.0.2.4.1126
printer-finishings-supported                1.3.18.0.2.4.1125
printer-number-up-supported                 1.3.18.0.2.4.1124
printer-sides-supported                     1.3.18.0.2.4.1123
printer-media-supported                     1.3.18.0.2.4.1122
printer-media-local-supported               1.3.18.0.2.4.1117
printer-resolution-supported                1.3.18.0.2.4.1121
printer-print-quality-supported             1.3.18.0.2.4.1120
printer-job-priority-supported              1.3.18.0.2.4.1110
printer-copies-supported                    1.3.18.0.2.4.1118
printer-job-k-octets-supported              1.3.18.0.2.4.1111
printer-current-operator                    1.3.18.0.2.4.1112
printer-service-person                      1.3.18.0.2.4.1113
printer-delivery-orientation-supported      1.3.18.0.2.4.1114
printer-stacking-order-supported            1.3.18.0.2.4.1115
printer-output-features-supported           1.3.18.0.2.4.1116
printer-aliases                             1.3.18.0.2.4.1108
```

8.  Internationalization Considerations

    All text string attributes defined in this document of syntax
    [RFC2279], as required by [RFC2252].

    A language tag [RFC3066] 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" [RFC2277].

9.  Security Considerations

See [RFC2829] for detailed guidance on authentication methods for LDAP.  See [RFC2830] for detailed guidance of using TLS/1.0 [RFC2246] 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].

10.  References

10.1.  Normative References

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