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python-ldap provides an object-oriented API to access LDAP directory servers from Python programs. For LDAP operations the module wraps OpenLDAP’s client library, libldap. Additionally, the package contains modules for other LDAP-related stuff:

- **LDIF** parsing and generation
- **LDAP** URLs
- **LDAPv3** subschema
Installation instructions are available for several platforms.

Source code can be obtained using Git:

```
git clone https://github.com/python-ldap/python-ldap
```
Discussion about the use and future of python-ldap occurs in the python-ldap@python.org mailing list. You can subscribe or unsubscribe to this list or browse the list archive.
The documentation for python-ldap 3.x is hosted at Read the Docs.

You can switch between versions of the library, or download PDF or HTML versions for offline use, using the sidebar on the right.

Documentation for some older versions is available for download at the GitHub release page.
5.1 Installing python-ldap

5.1.1 Installing from PyPI

The preferred point for downloading the “official” source distribution is the PyPI repository which supports installing via pip. For example:

```
$ python -m pip install python-ldap
```

For installing from PyPI, you will need the same Build prerequisites as when installing from source.

We do not currently provide pre-built packages (wheels).

Furthermore, python-ldap requires the modules pyasn1 and pyasn1-modules. pip will install these automatically.

5.1.2 Pre-built Binaries

Because distributions seem to be all over the place, this page tries to list all the current ones we know of.

Note that the python-ldap team is not responsible for the binary packages except the sources you can grab from the PyPI page. Also note that binary packages are most times not up to date. If you experience troubles with a binary package, it would be nice if you try to build a recent version of python-ldap before submitting a bug report to make sure you did not hit a problem already fixed in recent releases.

openSUSE Linux

Ships with python-ldap and there’s an additional download repository which contains builds of latest releases (see also OBS package).
Debian Linux

Have a look into the Debian Package Tracker to get up to date information which versions are available.

Windows

Unofficial packages for Windows are available on Christoph Gohlke’s page.

FreeBSD

The CVS repository of FreeBSD contains the package py-ldap

macOS

You can install directly with pip:

```
$ xcode-select --install
$ pip install python-ldap \
   --global-option=build_ext \
   --global-option="-I$(xcrun --show-sdk-path)/usr/include/sasl"
```

5.1.3 Installing from Source

python-ldap is built and installed using the Python setuptools. From a source repository:

```
$ python -m pip install setuptools
$ python setup.py install
```

If you have more than one Python interpreter installed locally, you should use the same one you plan to use python-ldap with.

Further instructions can be found in Setuptools documentation.

5.1.4 Build prerequisites

The following software packages are required to be installed on the local system when building python-ldap:

- Python including its development files
- C compiler corresponding to your Python version (on Linux, it is usually gcc)
- OpenLDAP client libs version 2.4.11 or later; it is not possible and not supported to build with prior versions.
- OpenSSL (optional)
- Cyrus SASL (optional)
- Kerberos libraries, MIT or Heimdal (optional)
Alpine

Packages for building:

```bash
# apk add build-base openldap-dev python3-dev
```

CentOS

Packages for building:

```bash
# yum groupinstall "Development tools"
# yum install openldap-devel python-devel
```

Debian

Packages for building and testing:

```bash
# apt-get install build-essential python3-dev \
  libldap2-dev libsasl2-dev slapd ldap-utils tox \
  lcov valgrind
```

**Note:** On older releases `tox` was called `python-tox`.

Fedora

Packages for building and testing:

```bash
# dnf install "@C Development Tools and Libraries" openldap-devel \
  python3-devel python3-tox \
  lcov clang-analyzer valgrind
```

**Note:** `openldap-2.4.45-2 (Fedora 26), openldap-2.4.45-4 (Fedora 27) or newer are required.`

5.1.5 setup.cfg

The file `setup.cfg` allows to set some build and installation parameters for reflecting the local installation of required software packages. Only section `[_ldap]` is described here. More information about other sections can be found in `Setup tools documentation`.

**library_dirs**

Specifies in which directories to search for required libraries.

**include_dirs**

Specifies in which directories to search for include files of required libraries.

**libs**

A space-separated list of library names to link to (see `Libraries used`).

**extra_compile_args**

Compiler options.

5.1. Installing python-ldap
extra_objects

## Libraries used

**ldap**

**ldap_r**

The LDAP protocol library of OpenLDAP. ldap_r is the reentrant version and should be preferred.

**lber**

The BER encoder/decoder library of OpenLDAP.

**sasl2**

The Cyrus-SASL library (optional)

**ssl**

The SSL/TLS library of OpenSSL (optional)

**crypto**

The basic cryptographic library of OpenSSL (optional)

### Example

The following example is for a full-featured build (including SSL and SASL support) of python-ldap with OpenLDAP installed in a different prefix directory (here /opt/openldap-2.4) and SASL header files found in /usr/include/sasl. Debugging symbols are preserved with compile option -g.

```python
[_ldap]
library_dirs = /opt/openldap-2.4/lib
include_dirs = /opt/openldap-2.4/include /usr/include/sasl

eextra_compile_args = -g
eextra_objects =
libs = ldap_r lber sasl2 ssl crypto
```

## 5.2 Bytes/text management

The LDAP protocol states that some fields (distinguished names, relative distinguished names, attribute names, queries) be encoded in UTF-8. In python-ldap, these are represented as text (str on Python 3).

Attribute values, on the other hand, **MAY** contain any type of data, including text. To know what type of data is represented, python-ldap would need access to the schema, which is not always available (nor always correct). Thus, attribute values are **always** treated as bytes. Encoding/decoding to other formats – text, images, etc. – is left to the caller.

### 5.2.1 Historical note

Python 3 introduced a hard distinction between text (str) – sequences of characters (formally, Unicode codepoints) – and bytes – sequences of 8-bit values used to encode any kind of data for storage or transmission.

Python 2 had the same distinction between str (bytes) and unicode (text). However, values could be implicitly converted between these types as needed, e.g. when comparing or writing to disk or the network. The implicit encoding and decoding can be a source of subtle bugs when not designed and tested adequately.
In python-ldap 2.x (for Python 2), bytes were used for all fields, including those guaranteed to be text.

From version 3.0 to 3.3, python-ldap uses text where appropriate. On Python 2, special bytes_mode and bytes_strictness settings influenced how text was handled.

From version 3.3 on, only Python 3 is supported. The “bytes mode” settings are deprecated and do nothing.

### 5.3 python-ldap Reference Documentation

This document describes the package python-ldap with its various modules.

Depending on what you want to do this manual assumes basic to expert knowledge about the Python language and the LDAP standard (LDAPv3).

#### 5.3.1 ldap LDAP library interface module

This module provides access to the LDAP (Lightweight Directory Access Protocol) C API implemented in OpenLDAP. It is similar to the C API, with the notable differences that lists are manipulated via Python list operations and errors appear as exceptions.

See also:

For more detailed information on the C interface, please see the (expired) draft-ietf-ldapext-ldap-c-api

This documentation is current for the Python LDAP module, version 3.4.3. Source and binaries are available from https://www.python-ldap.org/.

#### Functions

This module defines the following functions:

```python
ldap.initialize( [uri, trace_level=0, trace_file=sys.stdout, trace_stack_limit=None, fileno=None ] ) → LDAPObject object
```

Initializes a new connection object for accessing the given LDAP server, and return an LDAPObject used to perform operations on that server.

The uri parameter may be a comma- or whitespace-separated list of URIs containing only the schema, the host, and the port fields. Note that when using multiple URIs you cannot determine to which URI your client gets connected.

If fileno parameter is given then the file descriptor will be used to connect to an LDAP server. The fileno must either be a socket file descriptor as int or a file-like object with a fileno() method that returns a socket file descriptor. The socket file descriptor must already be connected. LDAPObject does not take ownership of the file descriptor. It must be kept open during operations and explicitly closed after the LDAPObject is unbound.

The internal connection type is determined from the URI, TCP for ldap:///ldaps://, IPC (AF_UNIX) for ldapi://. The parameter is not available on macOS when python-ldap is compiled with system libldap, see INIT_FD_AVAIL.

Note that internally the OpenLDAP function ldap_initialize(3) is called which just initializes the LDAP connection struct in the C API - nothing else. Therefore the first call to an operation method (bind, search etc.) then really opens the connection (lazy connect). Before that nothing is sent on the wire. The error handling in the calling application has to correctly handle this behaviour.

Three optional arguments are for generating debug log information: trace_level specifies the amount of information being logged, trace_file specifies a file-like object as target of the debug log and trace_stack_limit specifies the stack limit of tracebacks in debug log.
Possible values for `trace_level` are 0 for no logging, 1 for only logging the method calls with arguments, 2 for logging the method calls with arguments and the complete results and 9 for also logging the traceback of method calls.

This function is a thin wrapper around instantiating `LDAPObject`. Any additional keyword arguments are passed to `LDAPObject`. It is also fine to instantiate a `LDAPObject` (or a subclass) directly.

The function additionally takes `bytes_mode` and `bytes_strictness` keyword arguments, which are deprecated and ignored. See `Bytes/text management` for details.

See also:


New in version 3.3: The `fileno` argument was added.

Deprecated since version 3.4: `bytes_mode` and `bytes_strictness` arguments are deprecated.

```python
ldap.get_option(option) → int|string
This function returns the value of the global option specified by `option`.
```

```python
ldap.set_option(option, invalue) → None
This function sets the value of the global option specified by `option` to `invalue`.
```

Note: Most global settings do not affect existing `LDAPObject` connections. Applications should call `set_option()` before they establish connections with `initialize()`.

Changed in version 3.1: The deprecated functions `ldap.init()` and `ldap.open()` were removed.

**Constants**

The module defines various constants. Note that some constants depend on the build options and which underlying libs were used or even on the version of the libs. So before using those constants the application has to explicitly check whether they are available.

**General**

```python
ldap.PORT
The assigned TCP port number (389) that LDAP servers listen on.
```

```python
ldap.SASL_AVAIL
Integer where a non-zero value indicates that python-ldap was built with support for SASL (Cyrus-SASL).
```

```python
ldap.TLS_AVAIL
Integer where a non-zero value indicates that python-ldap was built with support for SSL/TLS (OpenSSL or similar libs).
```

```python
ldap.INIT_FD_AVAIL
Integer where a non-zero value indicates that python-ldap supports `initialize()` from a file descriptor. The feature is generally available except on macOS when python-ldap is compiled with system libldap.
```

**Options**

See also:

`ldap.conf(5)` and `ldap_get_option(3)`
For use with functions `set_option()` and `get_option()` and methods `LDAPObject.set_option()` and `LDAPObject.get_option()` the following option identifiers are defined as constants:

```python
ldap.OPT_API_FEATURE_INFO
ldap.OPT_API_INFO
ldap.OPT_CLIENT_CONTROLS
ldap.OPT_DEBUG_LEVEL
    Sets the debug level within the underlying OpenLDAP C lib (libldap). libldap sends the log messages to stderr.
ldap.OPT_DEFBASE
ldap.OPT_DEREF
    Specifies how alias dereferencing is done within the underlying LDAP C lib.
ldap.OPT_ERROR_STRING
ldap.OPT_DIAGNOSTIC_MESSAGE
ldap.OPT_HOST_NAME
ldap.OPT_MATCHED_DN
ldap.OPT_NETWORK_TIMEOUT
    Changed in version 3.0: A timeout of -1 or None resets timeout to infinity.
ldap.OPT_PROTOCOL_VERSION
    Sets the LDAP protocol version used for a connection. This is mapped to object attribute `ldap.LDAPObject.protocol_version`
ldap.OPT_REFERRALS
    int specifying whether referrals should be automatically chased within the underlying LDAP C lib.
ldap.OPT_REFHOPLIMIT
ldap.OPT_RESTART
ldap.OPT_SERVER_CONTROLS
ldap.OPT_SIZELIMIT
ldap.OPT_SUCCESS
ldap.OPT_TIMELIMIT
ldap.OPT_TIMEOUT
    Changed in version 3.0: A timeout of -1 or None resets timeout to infinity.
ldap.OPT_URI
```

**SASL options**

Unlike most other options, SASL options must be set on an `LDAPObject` instance.

```python
ldap.OPT_X_SASL_AUTHCID
ldap.OPT_X_SASL_AUTHZID
ldap.OPT_X_SASL_MECH
ldap.OPT_X_SASL_NOCANON
    If set to zero, SASL host name canonicalization is disabled.
ldap.OPT_X_SASL_REALM
```
TLS options

**Warning:** libldap does not materialize all TLS settings immediately. You must use `OPT_X_TLS_NEWCTX` with value 0 to instruct libldap to apply pending TLS settings and create a new internal TLS context:

```python
conn = ldap.initialize("ldap://ldap.example")
conn.set_option(ldap.OPT_X_TLS_CACERTFILE, '/path/to/ca.pem')
conn.set_option(ldap.OPT_X_TLS_NEWCTX, 0)
conn.start_tls_s()
conn.simple_bind_s(dn, password)
```

1. **OPT_X_TLS_NEWCTX**
   - Set and apply TLS settings to internal TLS context. Value 0 creates a new client-side context.

2. **OPT_X_TLS_PACKAGE**
   - Get TLS implementation, known values are
     - GnuTLS
     - MozNSS (Mozilla NSS)
     - OpenSSL

3. **OPT_X_TLS_CACERTDIR**
   - Get/set path to directory with CA certs

4. **OPT_X_TLS_CACERTFILE**
   - Get/set path to PEM file with CA certs

5. **OPT_X_TLS_CERTFILE**
   - Get/set path to file with PEM encoded cert for client cert authentication, requires `OPT_X_TLS_KEYFILE`.

6. **OPT_X_TLS_KEYFILE**
   - Get/set path to file with PEM encoded key for client cert authentication, requires `OPT_X_TLS_CERTFILE`.

7. **OPT_X_TLS_CRLCHECK**
   - Get/set certificate revocation list (CRL) check mode. CRL validation requires `OPT_X_TLS_CRLFILE`.
     - `OPT_X_TLS_CRL_NONE` Don’t perform CRL checks
     - `OPT_X_TLS_CRL_PEER` Perform CRL check for peer’s end entity cert.
     - `OPT_X_TLS_CRL_ALL` Perform CRL checks for the whole cert chain

8. **OPT_X_TLS_CRLFILE**
   - Get/set path to CRL file

9. **OPT_X_TLS_CRL_ALL**
   - Value for `OPT_X_TLS_CRLCHECK`
ldap.OPT_X_TLS_CRL_NONE
    value for OPT_X_TLS_CRLCHECK

ldap.OPT_X_TLS_CRL_PEER
    value for OPT_X_TLS_CRLCHECK

ldap.OPT_X_TLS_REQUIRE_CERT
    get/set validation strategy for server cert.
        OPT_X_TLS_NEVER  Don’t check server cert and host name
        OPT_X_TLS_ALLOW Used internally by slapd server.
        OPT_X_TLS_DEMAND Validate peer cert chain and host name
        OPT_X_TLS_HARD Same as OPT_X_TLS_DEMAND

ldap.OPT_X_TLS_REQUIRE_SAN
    get/set how OpenLDAP validates subject alternative name extension, available in OpenLDAP 2.4.52 and newer.
        OPT_X_TLS_NEVER  Don’t check SAN
        OPT_X_TLS_ALLOW Check SAN first, always fall back to subject common name (default)
        OPT_X_TLS_TRY Check SAN first, only fall back to subject common name, when no SAN extension is present (RFC 6125 conform validation)
        OPT_X_TLS_DEMAND Validate peer cert chain and host name
        OPT_X_TLS_HARD Require SAN, don’t fall back to subject common name

    New in version 3.4.0.

ldap.OPT_X_TLS_ALLOW
    Value for OPT_X_TLS_REQUIRE_CERT and OPT_X_TLS_REQUIRE_SAN

ldap.OPT_X_TLS_DEMAND
    Value for OPT_X_TLS_REQUIRE_CERT and OPT_X_TLS_REQUIRE_SAN

ldap.OPT_X_TLS_HARD
    Value for OPT_X_TLS_REQUIRE_CERT and OPT_X_TLS_REQUIRE_SAN

ldap.OPT_X_TLS_NEVER
    Value for OPT_X_TLS_REQUIRE_CERT and OPT_X_TLS_REQUIRE_SAN

ldap.OPT_X_TLS_TRY
    Value for OPT_X_TLS_REQUIRE_CERT
        Deprecated since version 3.3.0: This value is only used by slapd server internally. It will be removed in the future.

ldap.OPT_X_TLS_CIPHER
    get cipher suite name from TLS session

ldap.OPT_X_TLS_CIPHER_SUITE
    get/set allowed cipher suites

ldap.OPT_X_TLS_CTX
    get address of internal memory address of TLS context (DO NOT USE)

ldap.OPT_X_TLS_PEER_CERT
    Get peer’s certificate as binary ASN.1 data structure (DER)

    New in version 3.4.1.
Note: The option leaks memory with OpenLDAP < 2.5.8.

ldap.OPT_X_TLS_PROTOCOL_MIN
get/set minimum protocol version (wire protocol version as int)

ldap.OPT_X_TLS_PROTOCOL_MAX
get/set maximum protocol version (wire protocol version as int), available in OpenLDAP 2.5 and newer.
New in version 3.4.1.

ldap.OPT_X_TLS_PROTOCOL_SSL3
Value for OPT_X_TLS_PROTOCOL_MIN and OPT_X_TLS_PROTOCOL_MAX, represents SSL 3
New in version 3.4.1.

ldap.OPT_X_TLS_PROTOCOL_TLS1_0
Value for OPT_X_TLS_PROTOCOL_MIN and OPT_X_TLS_PROTOCOL_MAX, represents TLS 1.0
New in version 3.4.1.

ldap.OPT_X_TLS_PROTOCOL_TLS1_1
Value for OPT_X_TLS_PROTOCOL_MIN and OPT_X_TLS_PROTOCOL_MAX, represents TLS 1.1
New in version 3.4.1.

ldap.OPT_X_TLS_PROTOCOL_TLS1_2
Value for OPT_X_TLS_PROTOCOL_MIN and OPT_X_TLS_PROTOCOL_MAX, represents TLS 1.2
New in version 3.4.1.

ldap.OPT_X_TLS_PROTOCOL_TLS1_3
Value for OPT_X_TLS_PROTOCOL_MIN and OPT_X_TLS_PROTOCOL_MAX, represents TLS 1.3
New in version 3.4.1.

ldap.OPT_X_TLS_VERSION
Get negotiated TLS protocol version as string

ldap.OPT_X_TLS_RANDOM_FILE
get/set path to /dev/urandom (DO NOT USE)

ldap.OPT_X_TLS
Deprecated since version 3.3.0: The option is deprecated in OpenLDAP and should no longer be used. It will be removed in the future.

Note: OpenLDAP supports several TLS/SSL libraries. OpenSSL is the most common backend. Some options may not be available when libldap uses NSS, GnuTLS, or Apple’s Secure Transport backend.

Keepalive options

ldap.OPT_X_KEEPALIVE_IDLE
ldap.OPT_X_KEEPALIVE_PROBES
ldap.OPT_X_KEEPALIVE_INTERVAL
DN format flags

This constants are used for DN-parsing functions found in sub-module `ldap.dn`.

See also:

- `ldap_str2dn(3)`
- `ldap.DN_FORMAT_LDAP`
- `ldap.DN_FORMAT_LDAPV3`
- `ldap.DN_FORMAT_LDAPV2`
- `ldap.DN_FORMAT_DCE`
- `ldap.DN_FORMAT_UFN`
- `ldap.DN_FORMAT_AD_CANONICAL`
- `ldap.DN_FORMAT_MASK`
- `ldap.DN_PRETTY`
- `ldap.DN_SKIP`
- `ldap.DN_P_NOLEADTRAILSPACES`
- `ldap.DN_P_NOSPACEAFTERRDN`
- `ldap.DN_PEDANTIC`

Exceptions

The module defines the following exceptions:

**exception `ldap.LDAPError`**

This is the base class of all exceptions raised by the module `ldap`. Unlike the C interface, errors are not returned as result codes, but are instead turned into exceptions, raised as soon an the error condition is detected.

The exceptions are accompanied by a dictionary with additional information. All fields are optional and more fields may be added in the future. Currently, python-ldap may set the following fields:

- "result": a numeric code of the error class.
- "desc": string giving a description of the error class, as provided by calling OpenLDAP’s `ldap_err2string` on the result.
- "info": string containing more information that the server may have sent. The value is server-specific: for example, the OpenLDAP server may send different info messages than Active Directory or 389-DS.
- "matched": truncated form of the name provided or alias. dereferenced for the lowest entry (object or alias) that was matched.
- "msgid": ID of the matching asynchronous request. This can be used in asynchronous code where `result()` raises the result of an operation as an exception. For example, this is the case for `compare()`, always raises the boolean result as an exception (COMPARE_TRUE or COMPARE_FALSE).
- "ctrls": list of `ldap.controls.LDAPControl` instances attached to the error.
- "errno": the C `errno`, usually set by system calls or `libc` rather than the LDAP libraries.

**exception `ldap.ADMINLIMIT_EXCEEDED`**

**exception `ldap.AFFECTS_MULTIPLE_DSAS`**
exception  ldap.ALIAS_DEREF_PROBLEM
    A problem was encountered when dereferencing an alias. (Sets the matched field.)

exception  ldap.ALIAS_PROBLEM
    An alias in the directory points to a nonexistent entry. (Sets the matched field.)

exception  ldap.ALIRED_EXISTS
    The entry already exists. E.g. the dn specified with add() already exists in the DIT.

exception  ldap.AUTH_UNKNOWN
    The authentication method specified to bind() is not known.

exception  ldap.BUSY
    The DSA is busy.

exception  ldap.CLIENT_LOOP

exception  ldap.COMpare_FALSE
    A compare operation returned false. (This exception should only be seen asynchronous operations, because compare_s() returns a boolean result.)

exception  ldap.COMpare_TRUE
    A compare operation returned true. (This exception should only be seen asynchronous operations, because compare_s() returns a boolean result.)

exception  ldap.CONFIDENTIALITY_REQUIRED
    Indicates that the session is not protected by a protocol such as Transport Layer Security (TLS), which provides session confidentiality.

exception  ldap.CONNECT_ERROR

exception  ldap.CONSTRAINT_VIOLATION
    An attribute value specified or an operation started violates some server-side constraint (e.g., a postalAddress has too many lines or a line that is too long or a password is expired).

exception  ldap.CONTROL_NOT_FOUND

exception  ldap.DECODING_ERROR
    An error was encountered decoding a result from the LDAP server.

exception  ldap.ENCODING_ERROR
    An error was encountered encoding parameters to send to the LDAP server.

exception  ldap.FILTER_ERROR
    An invalid filter was supplied to search() (e.g. unbalanced parentheses).

exception  ldap.INAPPROPRIATE_AUTH
    Inappropriate authentication was specified (e.g. AUTH_SIMPLE was specified and the entry does not have a userPassword attribute).

exception  ldap.INAPPROPRIATE_MATCHING
    Filter type not supported for the specified attribute.

exception  ldap.INSUFFICIENT_ACCESS
    The user has insufficient access to perform the operation.

exception  ldap.INVALID_CREDENTIALS
    Invalid credentials were presented during bind() or simple_bind(). (e.g., the wrong password).

exception  ldap.INVALID_DN_SYNTAX
    A syntactically invalid DN was specified. (Sets the matched field.)

exception  ldap.INVALID_SYNTAX
    An attribute value specified by the client did not comply to the syntax defined in the server-side schema.
exception `ldap.IS_LEAF`
   The object specified is a leaf of the directory tree. Sets the matched field of the exception dictionary value.

exception `ldap.LOCAL_ERROR`
   Some local error occurred. This is usually due to failed memory allocation.

exception `ldap.LOOP_DETECT`
   A loop was detected.

exception `ldap.MORE_RESULTS_TO_RETURN`

exception `ldap.NAMING_VIOLATION`
   A naming violation occurred. This is raised e.g. if the LDAP server has constraints about the tree naming.

exception `ldap.NO_OBJECT_CLASS_MODS`
   Modifying the objectClass attribute as requested is not allowed (e.g. modifying structural object class of existing entry).

exception `ldap.NOT_ALLOWED_ON_NONLEAF`
   The operation is not allowed on a non-leaf object.

exception `ldap.NOT_ALLOWED_ON_RDN`
   The operation is not allowed on an RDN.

exception `ldap.NOT_SUPPORTED`

exception `ldap.NO_MEMORY`

exception `ldap.NO_RESULTS_RETURNED`

exception `ldap.NO_SUCH_ATTRIBUTE`
   The attribute type specified does not exist in the entry.

exception `ldap.NO_SUCH_OBJECT`
   The specified object does not exist in the directory. Sets the matched field of the exception dictionary value.

exception `ldap.OBJECT_CLASS_VIOLATION`
   An object class violation occurred when the LDAP server checked the data sent by the client against the server-side schema (e.g. a “must” attribute was missing in the entry data).

exception `ldap.OPERATIONS_ERROR`
   An operations error occurred.

exception `ldap.OTHER`
   An unclassified error occurred.

exception `ldap.PARAM_ERROR`
   An ldap routine was called with a bad parameter.

exception `ldap.PARTIAL_RESULTS`
   Partial results only returned. This exception is raised if a referral is received when using LDAPv2. (This exception should never be seen with LDAPv3.)

exception `ldap.PROTOCOL_ERROR`
   A violation of the LDAP protocol was detected.

exception `ldap.RESULTS_TOO_LARGE`
   The result does not fit into a UDP packet. This happens only when using UDP-based CLDAP (connection-less LDAP) which is not supported anyway.

exception `ldap.SASL_BIND_IN_PROGRESS`

exception `ldap.SERVER_DOWN`
   The LDAP library can’t contact the LDAP server.
**exception ldap.SIZELIMIT_EXCEEDED**
An LDAP size limit was exceeded. This could be due to a sizelimit configuration on the LDAP server.

**exception ldap.STRONG_AUTH_NOT_SUPPORTED**
The LDAP server does not support strong authentication.

**exception ldap.STRONG_AUTH_REQUIRED**
Strong authentication is required for the operation.

**exception ldap.TIMELIMIT_EXCEEDED**
An LDAP time limit was exceeded.

**exception ldap.TIMEOUT**
A timelimit was exceeded while waiting for a result from the server.

**exception ldap.TYPE_OR_VALUE_EXISTS**
An attribute type or attribute value specified already exists in the entry.

**exception ldap.UNAVAILABLE**
The DSA is unavailable.

**exception ldap.UNAVAILABLE_CRITICAL_EXTENSION**
Indicates that the LDAP server was unable to satisfy a request because one or more critical extensions were not available. Either the server does not support the control or the control is not appropriate for the operation type.

**exception ldap.UNDEFINED_TYPE**
An attribute type used is not defined in the server-side schema.

**exception ldap.UNWILLING_TO_PERFORM**
The DSA is unwilling to perform the operation.

**exception ldap.USER_CANCELLED**
The operation was cancelled via the abandon() method.

The above exceptions are raised when a result code from an underlying API call does not indicate success.

**Warnings**

**class ldap.LDAPBytesWarning**
This warning is deprecated. python-ldap no longer raises it.

It used to be raised under Python 2 when bytes/text mismatch in non-strict bytes mode. See *Bytes/text management* for details.

New in version 3.0.0.

Changed in version 3.4.0: Deprecated.

**LDAPObject classes**

**class ldap.ldapobject.LDAPObject**
Instances of LDAPObject are returned by initialize(). The connection is automatically unbound and closed when the LDAP object is deleted.

LDAPObject is an alias of SimpleLDAPObject, the default connection class. If you wish to use a different class, instantiate it directly instead of calling initialize().

(It is also possible, but not recommended, to change the default by setting ldap.ldapobject. LDAPObject to a different class.)
class ldap.ldapobject.SimpleLDAPObject

This basic class wraps all methods of the underlying C API object.

The arguments are same as for the initialize() function.

class ldap.ldapobject.ReconnectLDAPObject

SimpleLDAPObject subclass whose synchronous request methods automatically reconnect and re-try in case of server failure (ldap.SERVER_DOWN).

The first arguments are same as for the initialize() function. For automatic reconnects it has additional arguments:

- retry_max: specifies the number of reconnect attempts before re-raising the ldap.SERVER_DOWN exception.
- retry_delay: specifies the time in seconds between reconnect attempts.

This class also implements the pickle protocol.

Arguments for LDAPv3 controls

The ldap.controls module can be used for constructing and decoding LDAPv3 controls. These arguments are available in the methods with names ending in _ext or _ext_s:

- serverctrls is a list of ldap.controls.LDAPControl instances sent to the server along with the LDAP request (see module ldap.controls). These are controls which alter the behaviour of the server when processing the request if the control is supported by the server. The effect of controls might differ depending on the type of LDAP request or controls might not be applicable with certain LDAP requests at all.

- clientctrls is a list of ldap.controls.LDAPControl instances passed to the client API and alter the behaviour of the client when processing the request.

Sending LDAP requests

Most methods on LDAP objects initiate an asynchronous request to the LDAP server and return a message id that can be used later to retrieve the result with result().

Methods with names ending in _s are the synchronous form and wait for and return with the server’s result, or with None if no data is expected.

LDAPObject instances have the following methods:

- LDAPObject.abandon (msgid) → None
- LDAPObject.abandon_ext (msgid[, serverctrls=None[, clientctrls=None ]]) → None
  Abandons an LDAP operation in progress without waiting for a LDAP response. The msgid argument should be the message ID of an outstanding LDAP operation as returned by the asynchronous methods search(), modify(), etc. The caller can expect that the result of an abandoned operation will not be returned from a future call to result().

  serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

- LDAPObject.add (dn, modlist) → int
- LDAPObject.add_s (dn, modlist) → None

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LDAPObject.add_ext(dn, modlist[, serverctrls=None[, clientctrls=None ]]) → int

LDAPObject.add_ext_s(dn, modlist[, serverctrls=None[, clientctrls=None ]]) → tuple

Performs an LDAP add operation. The dn argument is the distinguished name (DN) of the entry to add, and modlist is a list of attributes to be added. The modlist is similar the one passed to modify(), except that the operation integer is omitted from the tuples in modlist. You might want to look into sub-module refmodule{ldap.modlist} for generating the modlist.

The asynchronous methods add() and add_ext() return the message ID of the initiated request.

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

The dn argument, and mod_type (second item) of modlist are text strings; see Bytes/text management.

LDAPObject.bind(who, cred, method) → int

LDAPObject.bind_s(who, cred, method) → None

LDAPObject.cancel(cancelid[, serverctrls=None[, clientctrls=None ]]) → None

Send cancels extended operation for an LDAP operation specified by cancelid. The cancelid should be the message id of an outstanding LDAP operation as returned by the asynchronous methods search(), modify() etc. The caller can expect that the result of an abandoned operation will not be returned from a future call to result(). In opposite to abandon() this extended operation gets an result from the server and thus should be preferred if the server supports it.

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.


LDAPObject.compare(dn, attr, value) → int

LDAPObject.compare_s(dn, attr, value) → bool

LDAPObject.compare_ext(dn, attr, value[, serverctrls=None[, clientctrls=None ]]) → int

LDAPObject.compare_ext_s(dn, attr, value[, serverctrls=None[, clientctrls=None ]]) → bool

Perform an LDAP comparison between the attribute named attr of entry dn, and the value value. The synchronous forms returns True or False. The asynchronous forms returns the message ID of the initiated request, and the result of the asynchronous compare can be obtained using result(). The operation can fail with an exception, e.g. ldap.NO_SUCH_OBJECT when dn does not exist or ldap.UNDEFINED_TYPE for an invalid attribute.

Note that the asynchronous technique yields the answer by raising the exception objects ldap.COMPARE_TRUE or ldap.COMPARE_FALSE.

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

The dn and attr arguments are text strings; see Bytes/text management.

LDAPObject.delete(dn) → int

LDAPObject.delete_s(dn) → None

LDAPObject.delete_ext(dn[, serverctrls=None[, clientctrls=None ]]) → int

LDAPObject.delete_ext_s(dn[, serverctrls=None[, clientctrls=None ]]) → tuple

Performs an LDAP delete operation on dn. The asynchronous form returns the message id of the initiated request, and the result can be obtained from a subsequent call to result().

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

The dn argument is text string; see Bytes/text management.

LDAPObject.extop(extreq[, serverctrls=None[, clientctrls=None ]]) → int
Performs an LDAP extended operation. The asynchronous form returns the message id of the initiated request, and the result can be obtained from a subsequent call to `extop_result()`.

The `extreq` is an instance of class `ldap.extop.ExtendedRequest` containing the parameters for the extended operation request.

`serverctrls` and `clientctrls` like described in section Arguments for LDAPv3 controls.

If argument `extop_resp_class` is set to a sub-class of `ldap.extop.ExtendedResponse` this class is used to return an object of this class instead of a raw BER value in `respvalue`.

Perform a modify RDN operation, (i.e. a renaming operation). These routines take `dn` (the DN of the entry whose RDN is to be changed, and `newrdn`, the new RDN to give to the entry. The optional parameter `delold` is used to specify whether the old RDN should be kept as an attribute of the entry or not. The asynchronous version returns the initiated message id.

This operation is emulated by `rename()` and `rename_s()` methods since the `modrdn2*` routines in the C library are deprecated.

The `dn` and `newrdn` arguments are text strings; see Bytes/text management.

Perform a LDAP Password Modify Extended Operation operation on the entry specified by `user`. The old password in `oldpw` is replaced with the new password in `newpw` by a LDAP server supporting this operation.

If `oldpw` is not None it has to match the old password of the specified `user` which is sometimes used when a user changes his own password.
respoid is always None. respvalue is also None unless newpw was None. This requests that the server generate a new random password. If extract_newpw is True, this password is a bytes object available through respvalue.genPasswd, otherwise respvalue is the raw ASN.1 response (this is deprecated and only for backwards compatibility).

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

The asynchronous version returns the initiated message id.

The user, oldpw and newpw arguments are text strings; see Bytes/text management.

See also:
RFC 3062 - LDAP Password Modify Extended Operation
ldap.extop.passwd

LDAPObject.rename (dn, newrdn[, newsuperior=None[, delold=l[, serverctrls=None[, clientctrls=None]]]]) → int

LDAPObject.rename_s (dn, newrdn[, newsuperior=None[, delold=l[, serverctrls=None[, clientctrls=None]]]]) → None

Perform a Rename operation, (i.e. a renaming operation). These routines take dn (the DN of the entry whose RDN is to be changed, and newrdn, the new RDN to give to the entry. The optional parameter newsuperior is used to specify a new parent DN for moving an entry in the tree (not all LDAP servers support this). The optional parameter delold is used to specify whether the old RDN should be kept as an attribute of the entry or not.

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

The dn and newdn arguments are text strings; see Bytes/text management.

LDAPObject.result ([msgid=RES_ANY[, all=l[, timeout=None]]]) → 2-tuple

This method is used to wait for and return the result of an operation previously initiated by one of the LDAP asynchronous operations (e.g. search(), modify(), etc.)

The msgid parameter is the integer identifier returned by that method. The identifier is guaranteed to be unique across an LDAP session, and tells the result() method to request the result of that specific operation.

If a result is desired from any one of the in-progress operations, msgid should be specified as the constant RES_ANY and the method result2() should be used instead.

The all parameter only has meaning for search() responses and is used to select whether a single entry of the search response should be returned, or to wait for all the results of the search before returning.

A search response is made up of zero or more search entries followed by a search result. If all is 0, search entries will be returned one at a time as they come in, via separate calls to result(). If all is 1, the search response will be returned in its entirety, i.e. after all entries and the final search result have been received.

For all set to 0, result tuples trickle in (with the same message id), and with the result types RES_SEARCH_ENTRY and RES_SEARCH_REFERENCE, until the final result which has a result type of RES_SEARCH_RESULT and a (usually) empty data field. When all is set to 1, only one result is returned, with a result type of RES_SEARCH_RESULT, and all the result tuples listed in the data field.

The timeout parameter is a limit on the number of seconds that the method will wait for a response from the server. If timeout is negative (which is the default), the method will wait indefinitely for a response. The timeout can be expressed as a floating-point value, and a value of 0 effects a poll. If a timeout does occur, a ldap.TIMEOUT exception is raised, unless polling, in which case (None, None) is returned.

The result() method returns a tuple of the form (result-type, result-data). The first element, result-type is a string, being one of these module constants: RES_BIND, RES_SEARCH_ENTRY, RES_SEARCH_REFERENCE, RES_SEARCH_RESULT, RES_MODIFY, RES_ADD, RES_DELETE, RES_MODRDN, or RES_COMPARE.
If `all` is 0, one response at a time is returned on each call to `result()`, with termination indicated by `result-data` being an empty list.

See `search()` for a description of the search result’s `result-data`, otherwise the `result-data` is normally meaningless.

**LDAPObject.result2**

```python
LDAPObject.result2(
    [msgid=RES_ANY[, all=1[, timeout=None ]]],
) → 3-tuple
```

This method behaves almost exactly like `result()`. But it returns a 3-tuple also containing the message id of the outstanding LDAP operation a particular result message belongs to. This is especially handy if one needs to dispatch results obtained with `msgid=RES_ANY` to several consumer threads which invoked a particular LDAP operation.

**LDAPObject.result3**

```python
LDAPObject.result3(
    [msgid=RES_ANY[, all=1[, timeout=None ]]],
) → 4-tuple
```

This method behaves almost exactly like `result2()`. But it returns an extra item in the tuple, the decoded server controls.

**LDAPObject.result4**

```python
LDAPObject.result4(
    [msgid=RES_ANY[], all=1[, timeout=None[, add_ctrls=0[, add_intermediates=0[, add_extop=0[, resp_ctrl_classes=None ]]]]]],
) → 6-tuple
```

This method behaves almost exactly like `result3()`. But it returns an extra items in the tuple, the decoded results of an extended response.

The additional arguments are:

- `add_ctrls` (integer flag) specifies whether response controls are returned.
- `add_intermediates` (integer flag) specifies whether response controls of intermediate search results are returned.
- `add_extop` (integer flag) specifies whether the response of an extended operation is returned. If using extended operations you should consider using the method `extop_result()` or `extop_s()` instead.
- `resp_ctrl_classes` is a dictionary mapping the OID of a response controls to a `ldap.controls.ResponseControl` class of response controls known by the application. So the response control value will be automatically decoded. If None the global dictionary `ldap.controls.KNOWN_RESPONSE_CONTROLS` is used instead.

**LDAPObject.sasl_interactive_bind_s**

```python
LDAPObject.sasl_interactive_bind_s(
    [who, auth[, serverctrls=None[, clientctrls=None[, sasl_flags=ldap.SASL_QUIET ]]]]],
) → None
```

This call is used to bind to the directory with a SASL bind request.

- `auth` is an `ldap.sasl.sasl()` instance.
- `serverctrls` and `clientctrls` like described in section Arguments for LDAPv3 controls.

**LDAPObject.sasl_non_interactive_bind_s**

```python
LDAPObject.sasl_non_interactive_bind_s(
    [sasl_mech[, serverctrls=None[, clientctrls=None[, sasl_flags=ldap.SASL_QUIET[, authz_id="] ]]]]],
) → None
```

This call is used to bind to the directory with a non-interactive SASL mechanism defined with argument `sasl_mech` and internally calls `sasl_interactive_bind_s()`.

- `serverctrls` and `clientctrls` like described in section Arguments for LDAPv3 controls.

**LDAPObject.sasl_external_bind_s**

```python
LDAPObject.sasl_external_bind_s(
    [serverctrls=None[, clientctrls=None[, sasl_flags=ldap.SASL_QUIET[, authz_id="] ]]]],
) → None
```

This call is used to bind to the directory with a SASL bind request with mechanism EXTERNAL and internally calls `sasl_non_interactive_bind_s()`.

- `serverctrls` and `clientctrls` like described in section Arguments for LDAPv3 controls.

**LDAPObject.sasl_gssapi_bind_s**

```python
LDAPObject.sasl_gssapi_bind_s(
    [serverctrls=None[, clientctrls=None[, sasl_flags=ldap.SASL_QUIET[, authz_id="] ]]]],
) → None
```

This call is used to bind to the directory with a SASL bind request with mechanism GSSAPI and internally calls `sasl_non_interactive_bind_s()`.

- `serverctrls` and `clientctrls` like described in section Arguments for LDAPv3 controls.
serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

LDAPObject.simple_bind([who=None, cred=None, serverctrls=None, clientctrls=None]) \rightarrow int

LDAPObject.simple_bind_s([who=None, cred=None, serverctrls=None, clientctrls=None]) \rightarrow None

After an LDAP object is created, and before any other operations can be attempted over the connection, a bind operation must be performed.

This method attempts to bind with the LDAP server using either simple authentication, or Kerberos (if available). The first and most general method, bind(), takes a third parameter, method which can currently solely be AUTH_SIMPLE.

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

The who and cred arguments are text strings; see Bytes/text management.

Changed in version 3.0: simple_bind() and simple_bind_s() now accept None for who and cred, too.

LDAPObject.search(base, scope[, filterstr='(objectClass=*)'[, attrlist=None[, attrsonly=0]]]) \rightarrow int

LDAPObject.search_s(base, scope[, filterstr='(objectClass=*)'[, attrlist=None[, attrsonly=0]]]) \rightarrow list|None

LDAPObject.search_st(base, scope[, filterstr='(objectClass=*)'[, attrlist=None[, attrsonly=0[, timeout=-1]_]]]) \rightarrow list|None

LDAPObject.search_ext(base, scope[, filterstr='(objectClass=*)'[, attrlist=None[, attrsonly=0[, serverctrls=None[, clientctrls=None[, timeout=-1[, sizelimit=0]]]]]]]) \rightarrow int

LDAPObject.search_ext_s(base, scope[, filterstr='(objectClass=*)'[, attrlist=None[, attrsonly=0[, serverctrls=None[, clientctrls=None[, timeout=-1[, sizelimit=0]]]]]]]) \rightarrow list|None

Perform an LDAP search operation, with base as the DN of the entry at which to start the search, scope being one of SCOPE_BASE (to search the object itself), SCOPE_ONELEVEL (to search the object’s immediate children), or SCOPE_SUBTREE (to search the object and all its descendants).

The filterstr argument is a string representation of the filter to apply in the search.

See also:


Each result tuple is of the form (dn, attrs), where dn is a string containing the DN (distinguished name) of the entry, and attrs is a dictionary containing the attributes associated with the entry. The keys of attrs are strings, and the associated values are lists of strings.

The DN in dn is automatically extracted using the underlying libldap function ldap_get_dn(), which may raise an exception if the DN is malformed.

If attrsonly is non-zero, the values of attrs will be meaningless (they are not transmitted in the result).

The retrieved attributes can be limited with the attrlist parameter. If attrlist is None, all the attributes of each entry are returned.

serverctrls and clientctrls like described in section Arguments for LDAPv3 controls.

The synchronous form with timeout, search_st() or search_ext_s(), will block for at most timeout seconds (or indefinitely if timeout is negative). A ldap.TIMEOUT exception is raised if no result is received within the specified time.
The amount of search results retrieved can be limited with the `sizelimit` parameter when using `search_ext()` or `search_ext_s()` (client-side search limit). If non-zero not more than `sizelimit` results are returned by the server.

The `base` and `filterstr` arguments, and `attrlist` contents, are text strings; see `Bytes/text management`.

Changed in version 3.0: `filterstr=None` is equivalent to `filterstr='(objectClass=*')`.

```
LDAPObject.start_tls_s() → None
```

    Negotiate TLS with server. The `version` attribute must have been set to `VERSION3` (which it is by default) before calling this method. If TLS could not be started an exception will be raised.

See also:


```
LDAPObject.unbind() → int
```

```
LDAPObject.unbind_s() → None
```

```
LDAPObject.unbind_ext([serverctrls=None[, clientctrls=None ]]) → int
```

```
LDAPObject.unbind_ext_s([serverctrls=None[, clientctrls=None ]]) → None
```

This call is used to unbind from the directory, terminate the current association, and free resources. Once called, the connection to the LDAP server is closed and the LDAP object is marked invalid. Further invocation of methods on the object will yield exceptions.

`serverctrls` and `clientctrls` like described in section `Arguments for LDAPv3 controls`.

These methods are all synchronous in nature.

```
LDAPObject.whoami_s() → string
```

    This synchronous method implements the LDAP “Who Am I?” extended operation.

    It is useful for finding out to find out which identity is assumed by the LDAP server after a SASL bind.

See also:


### Connection-specific LDAP options

```
LDAPObject.get_option(option) → int|string
```

    This method returns the value of the LDAPObject option specified by `option`.

```
LDAPObject.set_option(option, invalue) → None
```

    This method sets the value of the LDAPObject option specified by `option` to `invalue`.

### Object attributes

If the underlying library provides enough information, each LDAP object will also have the following attributes. These attributes are mutable unless described as read-only.

```
LDAPObject.deref → int
```

    Controls whether aliases are automatically dereferenced. This must be one of `DEREF_NEVER`, `DEREF_SEARCHING`, `DEREF_FINDING` or `DEREF_ALWAYS`. This option is mapped to option constant `OPT_DEREF` and used in the underlying OpenLDAP client lib.
LDAPObject.network_timeout -> int
Limit on waiting for a network response, in seconds. Defaults to NO_LIMIT. This option is mapped to option constant OPT_NETWORK_TIMEOUT and used in the underlying OpenLDAP client lib.

Changed in version 3.0.0: A timeout of -1 or None resets timeout to infinity.

LDAPObject.protocol_version -> int
Version of LDAP in use (either VERSION2 for LDAPv2 or VERSION3 for LDAPv3). This option is mapped to option constant OPT_PROTOCOL_VERSION and used in the underlying OpenLDAP client lib.

Note: It is highly recommended to set the protocol version after establishing a LDAP connection with ldap.initialize() and before submitting the first request.

LDAPObject.sizelimit -> int
Limit on size of message to receive from server. Defaults to NO_LIMIT. This option is mapped to option constant OPT_SIZELIMIT and used in the underlying OpenLDAP client lib. Its use is deprecated in favour of sizelimit parameter when using search_ext().

LDAPObject.timelimit -> int
Limit on waiting for any response, in seconds. Defaults to NO_LIMIT. This option is mapped to option constant OPT_TIMELIMIT and used in the underlying OpenLDAP client lib. Its use is deprecated in favour of using timeout.

LDAPObject.timeout -> int
Limit on waiting for any response, in seconds. Defaults to NO_LIMIT. This option is used in the wrapper module.

Example

The following example demonstrates how to open a connection to an LDAP server using the ldap module and invoke a synchronous subtree search.

```python
>>> import ldap
>>> l = ldap.initialize('ldap://localhost:1390')
>>> l.search_s('ou=Testing,dc=stroeder,dc=de', ldap.SCOPE_SUBTREE, '(cn=fred*)', ['cn', '→ mail'])
[('cn=Fred Feuerstein,ou=Testing,dc=stroeder,dc=de', {'cn': ['Fred Feuerstein']})]
>>> r = l.search_s('ou=Testing,dc=stroeder,dc=de', ldap.SCOPE_SUBTREE, '(objectClass=*)
→ ', ['cn', 'mail'])
>>> for dn,entry in r:
>>>      print('Processing',repr(dn))
>>>      handle ldap_entry(entry)
```

5.3.2 ldap.asyncsearch Stream-processing of large search results

With newer Python versions one might want to consider using ldap.resiter instead.

Changed in version 3.0: In Python 3.7 async is a reserved keyword. The module ldap.async has been renamed to ldap.asyncsearch. The old name ldap.async is still available for backwards compatibility.

Deprecated since version 3.0: The old name ldap.async is deprecated, but will not be removed until Python 3.6 reaches end-of-life.
Classes

class ldap.asyncsearch.AsyncSearchHandler (l)
Class for stream-processing LDAP search results

Arguments:
1 LDAPObject instance

afterFirstResult ()
  Do anything you want right after successfully receiving but before processing first result

postProcessing ()
  Do anything you want after receiving and processing all results

preProcessing ()
  Do anything you want after starting search but before receiving and processing results

processResults (ignoreResultsNumber=0, processResultsCount=0, timeout=-1)
  ignoreResultsNumber  Don’t process the first ignoreResultsNumber results.
  processResultsCount  If non-zero this parameters indicates the number of results processed is limited to
  timeout  See parameter timeout of ldap.LDAPObject.result()

startSearch (searchRoot, searchScope, filterStr, attrList=None, attrsOnly=0, timeout=-1, sizeLimit=0, serverctrls=None, clientctrls=None)
  searchRoot  See parameter base of method LDAPObject.search()
  searchScope  See parameter scope of method LDAPObject.search()
  filterStr  See parameter filter of method LDAPObject.search()
  attrList=None  See parameter attrlist of method LDAPObject.search()
  attrsOnly  See parameter attrsonly of method LDAPObject.search()
  timeout  Maximum time the server shall use for search operation
  sizeLimit  Maximum number of entries a server should return (request client-side limit)
  serverctrls  list of server-side LDAP controls
  clientctrls  list of client-side LDAP controls

class ldap.asyncsearch.List (l)
Class for collecting all search results.

This does not seem to make sense in the first place but think of retrieving exactly a certain portion of the available
search results.

class ldap.asyncsearch.Dict (l)
Class for collecting all search results into a dictionary {dn:entry}

class ldap.asyncsearch.IndexedDict (l, indexed_attrs=None)
Class for collecting all search results into a dictionary {dn:entry} and maintain case-sensitive equality indexes
to entries

class ldap.asyncsearch.LDIFWriter (l, writer_obj, headerStr=", footerStr=")
Class for writing a stream LDAP search results to a LDIF file

Arguments:
1 LDAPObject instance
writer_obj  Either a file-like object or a ldif.LDIFWriter instance used for output

Examples

Using ldap.asyncsearch.List

This example demonstrates how to use class ldap.asyncsearch.List for retrieving partial search results even though the exception `ldap.SIZELIMIT_EXCEEDED` was raised because a server side limit was hit.

```python
import sys, ldap, ldap.asyncsearch

s = ldap.asyncsearch.List(
    ldap.initialize('ldap://localhost'),
)

s.startSearch(
    'dc=stroeder,dc=com',
    ldap.SCOPE_SUBTREE,
    '(objectClass=*)',
)

try:
    partial = s.processResults()
except ldap.SIZELIMIT_EXCEEDED:
    sys.stderr.write('Warning: Server-side size limit exceeded.
')
else:
    if partial:
        sys.stderr.write('Warning: Only partial results received.
')

sys.stdout.write(
    '%d results received.
' % (len(s.allResults)
)
)
```

Using ldap.asyncsearch.LDIFWriter

This example demonstrates how to use class ldap.asyncsearch.LDIFWriter for writing search results as LDIF to stdout.

```python
import sys, ldap, ldap.asyncsearch

s = ldap.asyncsearch.LDIFWriter(
    ldap.initialize('ldap://localhost:1390'),
    sys.stdout
)

s.startSearch(
    'dc=stroeder,dc=com',
    ldap.SCOPE_SUBTREE,
    '(objectClass=*)',
)

try:
    partial = s.processResults()
```

(continues on next page)
except ldap.SIZELIMIT_EXCEEDED:
    sys.stderr.write('Warning: Server-side size limit exceeded.
')
else:
    if partial:
        sys.stderr.write('Warning: Only partial results received.
')

sys.stderr.write({
    '%d results received.
' %
    s.endResultBreak-s.beginResultsDropped
})

5.3.3 `ldap.controls` High-level access to LDAPv3 extended controls

Variables

`ldap.controls.KNOWN_RESPONSE_CONTROLS`
Dictionary mapping the OIDs of known response controls to the accompanying `ResponseControl` classes. This is used by `DecodeControlTuples()` to automatically decode control values. Calling application can also register their custom `ResponseControl` classes in this dictionary possibly overriding pre-registered classes.

Classes

This module defines the following classes:

```python
class ldap.controls.RequestControl (controlType=None, criticality=False, encodedControlValue=None)
    Base class for all request controls
    controlType OID as string of the LDAPv3 extended request control
criticality sets the criticality of the control (boolean)
encodedControlValue control value of the LDAPv3 extended request control (here it is the BER-encoded ASN.1 control value)
    encodeControlValue()
        sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before

class ldap.controls.ResponseControl (controlType=None, criticality=False)
    Base class for all response controls
    controlType OID as string of the LDAPv3 extended response control
criticality sets the criticality of the received control (boolean)
    decodeControlValue (encodedControlValue)
        decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes

class ldap.controls.LDAPControl (controlType=None, criticality=False, controlValue=None, encodedControlValue=None)
    Base class for combined request/response controls mainly for backward-compatibility to python-ldap 2.3.x
```
Functions

This module defines the following functions:

\[ \text{ldap.controls.} \text{RequestControlTuples (ldapControls)} \]
\[ \text{Return list of readily encoded 3-tuples which can be directly passed to C module _ldap} \]
\[ \text{ldapControls sequence-type of RequestControl objects} \]

\[ \text{ldap.controls.} \text{DecodeControlTuples (ldapControlTuples, knownLDAPControls=None)} \]
\[ \text{Returns list of readily decoded ResponseControl objects} \]
\[ \text{ldapControlTuples Sequence-type of 3-tuples returned by _ldap.result4() containing the encoded ASN.1 control values of response controls.} \]
\[ \text{knownLDAPControls Dictionary mapping extended control’s OID to ResponseControl class of response controls known by the application. If None ldap.controls.KNOWN_RESPONSE_CONTROLS is used here.} \]

Sub-modules

Various sub-modules implement specific LDAPv3 extended controls. The classes therein are derived from the base-classes \text{ldap.controls.RequestControl}, \text{ldap.controls.ResponseControl} or \text{ldap.controls.LDAPControl}.

Some of them require \text{pyasn1} and \text{pyasn1_modules} to be installed:

Usually the names of the method arguments and the class attributes match the ASN.1 identifiers used in the specification. So looking at the referenced RFC or Internet-Draft is very helpful to understand the API.

\text{ldap.controls.simple Very simple controls}

\textbf{class} \text{ldap.controls.simple.ValueLessRequestControl (controlType=None, criticality=False)}
\[ \text{Base class for controls without a controlValue. The presence of the control in a LDAPv3 request changes the server’s behaviour when processing the request simply based on the controlType.} \]
\[ \text{controlType OID of the request control} \]
\[ \text{criticality criticality request control} \]
\[ \text{encodeControlValue()} \]
\[ \text{sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before} \]

\textbf{class} \text{ldap.controls.simple.OctetStringInteger (controlType=None, criticality=False, integerValue=None)}
\[ \text{Base class with controlValue being unsigend integer values} \]
\[ \text{integerValue Integer to be sent as OctetString} \]
\[ \text{decodeControlValue (encodedControlValue)} \]
\[ \text{decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes} \]
\[ \text{encodeControlValue()} \]
\[ \text{sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before} \]

\textbf{class} \text{ldap.controls.simple.BooleanControl (controlType=None, criticality=False, booleanValue=False)}
\[ \text{Base class for simple request controls with boolean control value.} \]
Constructor argument and class attribute:

**booleanValue** Boolean (True/False or 1/0) which is the boolean controlValue.

**decodeControlValue**(encodedControlValue)
decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes

**encodeControlValue()**
sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class
attributes set before

class **ldap.controls.simple.ManageDsaITControl**(criticality=False)
Manage DSA IT Control

See also:


class **ldap.controls.simple.RelaxRulesControl**(criticality=False)
Relax Rules Control

See also:

draft-zeilenga-ldap-relax

class **ldap.controls.simple.ProxyAuthzControl**(criticality, authzId)
Proxy Authorization Control

**authzId** string containing the authorization ID indicating the identity on behalf which the server should process
the request

See also:


class **ldap.controls.simple.AuthorizationIdentityRequestControl**(criticality)
Authorization Identity Request and Response Controls

See also:


class **ldap.controls.simple.AuthorizationIdentityResponseControl**(controlType=None, criticality=False)
Authorization Identity Request and Response Controls

Class attributes:

**authzId** decoded authorization identity

See also:


**decodeControlValue**(encodedControlValue)
decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes

class **ldap.controls.simple.GetEffectiveRightsControl**(criticality, authzId=None)
Get Effective Rights Control
ldap.controls.libldap Various controls implemented in OpenLDAP libs

This module wraps C functions in OpenLDAP client libs which implement various request and response controls into Python classes.

class ldap.controls.libldap.AssertionControl(criticality=True, filterstr='(objectClass=*)')

LDAP Assertion control, as defined in RFC 4528

filterstr LDAP filter string specifying which assertions have to match so that the server processes the operation

See also:
RFC 4528 - Lightweight Directory Access Protocol (LDAP) Assertion Control

encodeControlValue()
sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before

class ldap.controls.libldap.MatchedValuesControl(criticality=False, filterstr='(objectClass=*)')

LDAP Matched Values control, as defined in RFC 3876

filterstr LDAP filter string specifying which attribute values should be returned

See also:
RFC 3876 - Returning Matched Values with the Lightweight Directory Access Protocol version 3 (LDAPv3)

encodeControlValue()
sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before

class ldap.controls.libldap.SimplePagedResultsControl(criticality=False, size=None, cookie=None)

LDAP Control Extension for Simple Paged Results Manipulation

size Page size requested (number of entries to be returned)

cookie Cookie string received with last page

See also:
RFC 2696 - LDAP Control Extension for Simple Paged Results Manipulation

decodeControlValue(encodedControlValue)
decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes

encodeControlValue()
sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before

ldap.controls.psearch LDAP Persistent Search

This module implements request and response controls for LDAP persistent search.

See also:
draft-ietf-ldapext-psearch
class ldap.controls.psearch.PersistentSearchControl(criticality=True,
    changeTypes=None,
    changesOnly=False,
    returnECs=True)

Implements the request control for persistent search.

changeTypes  List of strings specifying the types of changes returned by the server. Setting to None requests all changes.

changesOnly  Boolean which indicates whether only changes are returned by the server.

returnECs  Boolean which indicates whether the server should return an Entry Change Notification response control

class PersistentSearchControlValue(**kwargs)

encodeControlValue()
    sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before

class ldap.controls.psearch.EntryChangeNotificationControl(controlType=None,
    criticality=False)

Implements the response control for persistent search.

Class attributes with values extracted from the response control:

changeType  String indicating the type of change causing this result to be returned by the server

previousDN  Old DN of the entry in case of a modrdn change

changeNumber  A change serial number returned by the server (optional).

decodeControlValue(encodedControlValue)
    decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes

ldap.controls.sessiontrack Session tracking control

See also:

draft-wahl-ldap-session

class ldap.controls.sessiontrack.SessionTrackingControl(sessionSourceIp, sessionSourceName, formatOID, sessionTrackingIdentifier)

Class for Session Tracking Control

Because criticality MUST be false for this control it cannot be set from the application.

sessionSourceIp  IP address of the request source as string

sessionSourceName  Name of the request source as string

formatOID  OID as string specifying the format

sessionTrackingIdentifier  String containing a specific tracking ID

class SessionIdentifierControlValue(**kwargs)

encodeControlValue()
    sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before
**ldap.controls.readentry** Read entry control

See also:


Changed in version 4.0: The attribute values of the entry now consists of bytes instead of ISO8859-1 decoded str.

class ldap.controls.readentry.ReadEntryControl (criticality=False, attrList=None)

Base class for read entry control described in RFC 4527

attrList list of attribute type names requested

Class attributes with values extracted from the response control:

dn string holding the distinguished name of the LDAP entry

entry dictionary holding the LDAP entry

decodeControlValue (encodedControlValue)

decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes

encodeControlValue ()

sets class attribute encodedControlValue to the BER-encoded ASN.1 control value composed by class attributes set before

class ldap.controls.readentry.PreReadControl (criticality=False, attrList=None)

Class for pre-read control described in RFC 4527

attrList list of attribute type names requested

Class attributes with values extracted from the response control:

dn string holding the distinguished name of the LDAP entry before the operation was done by the server

entry dictionary holding the LDAP entry before the operation was done by the server

class ldap.controls.readentry.PostReadControl (criticality=False, attrList=None)

Class for post-read control described in RFC 4527

attrList list of attribute type names requested

Class attributes with values extracted from the response control:

dn string holding the distinguished name of the LDAP entry after the operation was done by the server

entry dictionary holding the LDAP entry after the operation was done by the server

**ldap.controls.ppolicy** Password Policy Control

See also:

draft-behera-ldap-password-policy

class ldap.controls.ppolicy.PasswordPolicyControl (criticality=False)

Indicates the errors and warnings about the password policy.

**timeBeforeExpiration**

The time before the password expires.

Type int

**graceAuthNsRemaining**

The number of grace authentications remaining.
Type  int

error
The password and authentication errors.

Type  int

decodeControlValue (encodedControlValue)
decodes the BER-encoded ASN.1 control value and sets the appropriate class attributes

5.3.4 ldap.dn LDAP Distinguished Name handling

See also:
For LDAPv3 DN syntax see:

See also:
For deprecated LDAPv2 DN syntax (obsoleted by LDAPv3) see:
RFC 1779 - A String Representation of Distinguished Names

The ldap.dn module defines the following functions:

ldap.dn.escape_dn_chars (s) → string
This function escapes characters in string s which are special in LDAP distinguished names. You should use this function when building LDAP DN strings from arbitrary input.

ldap.dn.str2dn (s[, flags=0]) → list
This function takes s and breaks it up into its component parts down to AVA level. The optional parameter flags describes the DN format of s (see DN format flags). Note that hex-encoded non-ASCII chars are decoded to the raw bytes.

Internally this function is implemented by calling OpenLDAP C function ldap_str2dn(3).

ldap.dn.dn2str (dn) → string
This function takes a decomposed DN in dn and returns a single string. It’s the inverse to str2dn(). Special characters are escaped with the help of function escape_dn_chars().

ldap.dn.explode_dn (dn[, notypes=False[, flags=0]]) → list
This function takes dn and breaks it up into its component parts. Each part is known as an RDN (Relative Distinguished Name). The optional notypes parameter is used to specify that only the RDN values be returned and not their types. The optional parameter flags describes the DN format of s (see DN format flags). This function is emulated by function str2dn() since the function ldap_explode_dn() in the C library is deprecated.

ldap.dn.explode_rdn (rdn[, notypes=False[, flags=0]]) → list
This function takes a (multi-valued) rdn and breaks it up into a list of characteristic attributes. The optional notypes parameter is used to specify that only the RDN values be returned and not their types. The optional flags parameter describes the DN format of s (see DN format flags). This function is emulated by function str2dn() since the function ldap_explode_rdn() in the C library is deprecated.

ldap.dn.is_dn (dn[, flags=0]) → boolean
This function checks whether dn is a valid LDAP distinguished name by passing it to function str2dn().

Examples

Splitting a LDAPv3 DN to AVA level. Note that both examples have the same result but in the first example the non-ASCII chars are passed as is (byte buffer string) whereas in the second example the hex-encoded DN representation
are passed to the function.

```
>>> ldap.dn.str2dn('cn=Michael Ströder,dc=example,dc=com', flags=ldap.DN_FORMAT_LDAPV3)
[['('cn', 'Michael Ströder', 4)]]

>>> ldap.dn.str2dn('cn=Michael Ströder,dc=example,dc=com', flags=ldap.DN_FORMAT_LDAPV3)
[['('cn', 'Michael Ströder', 4)]]
```

Splitting a LDAPv2 DN into RDN parts:

```
>>> ldap.dn.explode_dn('cn=John Doe;dc=example;dc=com', flags=ldap.DN_FORMAT_LDAPV2)
['cn=John Doe', 'dc=example', 'dc=com']
```

Splitting a multi-valued RDN:

```
>>> ldap.dn.explode_rdn('cn=John Doe+mail=John.Doe@example.com', flags=ldap.DN_FORMAT_LDAPV2)
['cn=John Doe', 'mail=John.Doe@example.com']
```

Splitting a LDAPv3 DN with a multi-valued RDN into its AVA parts:

```
>>> ldap.dn.str2dn('cn=John Doe+mail=John.Doe@example.com,dc=example,dc=com')
[['('cn', 'John Doe', 1), ('mail', 'John.Doe@example.com', 1)]]
```

### 5.3.5 `ldap.extop` High-level access to LDAPv3 extended operations

#### Classes

This module defines the following classes:

- **class `ldap.extop.ExtendedRequest`**
  
  Generic base class for a LDAPv3 extended operation request

  - `requestName` OID as string of the LDAPv3 extended operation request
  - `requestValue` value of the LDAPv3 extended operation request (here it is the BER-encoded ASN.1 request value)

  - `encodedRequestValue()` returns the BER-encoded ASN.1 request value composed by class attributes set before

- **class `ldap.extop.ExtendedResponse`**
  
  Generic base class for a LDAPv3 extended operation response

  - `requestName` OID as string of the LDAPv3 extended operation response
  - `encodedResponseValue` BER-encoded ASN.1 value of the LDAPv3 extended operation response

  - `decodeResponseValue` decodes the BER-encoded ASN.1 extended operation response value and sets the appropriate class attributes

### `ldap.extop.dds` Classes for Dynamic Entries extended operations

This requires `pyasn1` and `pyasn1_modules` to be installed.
See also:


```python
class ldap.extop.dds.RefreshRequest(requestName=None, entryName=None, requestTtl=None)

class RefreshRequestValue(**kwargs)

encodedRequestValue()

returns the BER-encoded ASN.1 request value composed by class attributes set before

class ldap.extop.dds.RefreshResponse(responseName, encodedResponseValue)

class RefreshResponseValue(**kwargs)

decodeResponseValue(value)

decodes the BER-encoded ASN.1 extended operation response value and sets the appropriate class attributes
```

### 5.3.6 *ldap.filter* LDAP filter handling

See also:


The *ldap.filter* module defines the following functions:

```python
ldap.filter.escape_filter_chars(assertion_value[, escape_mode=0])

This function escapes characters in assertion_value which are special in LDAP filters. You should use this function when building LDAP filter strings from arbitrary input. escape_mode means: If 0 only special chars mentioned in RFC 4515 are escaped. If 1 all NON-ASCII chars are escaped. If 2 all chars are escaped.

ldap.filter.filter_format(filter_template, assertion_values)

This function applies escape_filter_chars() to each of the strings in list assertion_values. After that filter_template containing as many %s placeholders as count of assertion values is used to build the whole filter string.
```

### 5.3.7 *ldap.modlist* Generate modify lists

The *ldap.modlist* module defines the following functions:

```python
ldap.modlist.addModlist(entry[, ignore_attr_types=[]]) → list

This function builds a list suitable for passing it directly as argument modlist to method ldap.ldapobject.LDAPObject.add() or its synchronous counterpart ldap.ldapobject.LDAPObject.add_s().

entry is a dictionary like returned when receiving search results.

ignore_attr_types is a list of attribute type names which shall be ignored completely. Attributes of these types will not appear in the result at all.

ldap.modlist.modifyModlist(old_entry, new_entry[, ignore_attr_types=[], ignore_oldexistent=0[, case_ignore_attr_types=None]]) → list

This function builds a list suitable for passing it directly as argument modlist to method ldap.ldapobject.LDAPObject.modify() or its synchronous counterpart ldap.ldapobject.LDAPObject.modify_s().
```
Roughly when applying the resulting modify list to an entry holding the data `old_entry` it will be modified in such a way that the entry holds `new_entry` after the modify operation. It is handy in situations when it is impossible to track user changes to an entry’s data or for synchronizing operations.

`old_entry` and `new_entry` are dictionaries like returned when receiving search results.

`ignore_attr_types` is a list of attribute type names which shall be ignored completely. These attribute types will not appear in the result at all.

If `ignore_oldexistent` is non-zero attribute type names which are in `old_entry` but are not found in `new_entry` at all are not deleted. This is handy for situations where your application sets attribute value to an empty string for deleting an attribute. In most cases leave zero.

If `case_ignore_attr_types` is a list of attribute type names for which the comparison will be conducted case-insensitive. It is useful in situations where a LDAP server normalizes values and one wants to avoid unnecessary changes (e.g. case of attribute type names in DNs).

Note: Replacing attribute values is always done with a `ldap.MOD_DELETE/ldap.MOD_ADD` pair instead of `ldap.MOD_REPLACE` to work-around potential issues with attributes for which no EQUALITY matching rule are defined in the server’s subschema. This works correctly in most situations but rarely fails with some LDAP servers implementing (schema) checks on transient state entry during processing the modify operation.

5.3.8 ldap.resiter Generator for stream-processing of large search results

**class ldap.resiter.ResultProcessor**

This is a mix-in class to be used with class `ldap.LDAPObject` or derived classes which has these methods:

- `ResultProcessor.allresults(msgid, timeout=-1, addCtrls=0)`

  Generator function which returns an iterator for processing all LDAP operation results of the given `msgid` like retrieved with `LDAPObject.result3() -> 4-tuple`

**Examples**

**Using ldap.resiter.ResultProcessor**

This example demonstrates how to use mix-in class `ldap.resiter.ResultProcessor` for retrieving results formerly requested with `ldap.LDAPObject.search()` and processing them in a for-loop.

```python
import sys, ldap, ldap.resiter

class MyLDAPObject(ldap.ldapobject.LDAPObject, ldap.resiter.ResultProcessor):
    pass

l = MyLDAPObject('ldap://localhost')

# Asynchronous search method
msg_id = l.search('dc=stroeder,dc=com', ldap.SCOPE_SUBTREE, '(objectClass=*)')

for res_type, res_data, res_msgid, res_controls in l.allresults(msg_id):
    for dn, entry in res_data:
        # process dn and entry
        print(dn, entry['objectClass'])
```
5.3.9 `ldap.schema` Handling LDAPv3 schema

This module deals with schema information usually retrieved from a special subschema subentry provided by the server. It is closely modeled along the directory information model described in the following RFC with which you should make yourself familiar when trying to use this module:

See also:


`ldap.schema.subentry` Processing LDAPv3 subschema subentry

`ldap.schema.subentry.NOT_HUMAN_READABLE_LDAP_SYNTAXES`

Dictionary where the keys are the OIDs of LDAP syntaxes known to be not human-readable when displayed to a console without conversion and which cannot be decoded to a `types.UnicodeType`.

Functions

`ldap.schema.subentry.urlfetch(uri, trace_level=0)`

Fetches a parsed schema entry by uri.

If uri is a LDAP URL the LDAP server is queried directly. Otherwise uri is assumed to point to a LDIF file which is loaded with urllib.

Classes

class `ldap.schema.subentry.SubSchema(sub_schema_sub_entry, check_uniqueness=1)`

Arguments:

`sub_schema_sub_entry` Dictionary usually returned by LDAP search or the LDIF parser containing the subschema sub entry

`check_uniqueness` Defines whether uniqueness of OIDs and NAME is checked.

0  no check
1  check but add schema description with work-around
2  check and raise exception if non-unique OID or NAME is found

Class attributes:

`sed` Dictionary holding the subschema information as pre-parsed SchemaElement objects (do not access directly!)

`name2oid` Dictionary holding the mapping from NAMEs to OIDs (do not access directly!)

`non_unique_oids` List of OIDs used at least twice in the subschema

`non_unique_names` List of NAMEs used at least twice in the subschema for the same schema element

`attribute_types(object_class_list, attr_type_filter=None, raise_keyerror=1, ignore_dit_content_rule=0)`

Returns a 2-tuple of all must and may attributes including all inherited attributes of superior object classes by walking up classes along the SUP attribute.

The attributes are stored in a `ldap.cidict.cidict` dictionary.

`object_class_list` list of strings specifying object class names or OIDs
attr_type_filter  list of 2-tuples containing lists of class attributes which has to be matched
raise_keyerror  All KeyError exceptions for non-existent schema elements are ignored
ignore_dit_content_rule  A DIT content rule governing the structural object class is ignored

get_applicable_aux_classes (nameoroid)
Return a list of the applicable AUXILIARY object classes for a STRUCTURAL object class specified by ‘nameoroid’ if the object class is governed by a DIT content rule. If there’s no DIT content rule all available AUXILIARY object classes are returned.

get_inheritedattr (se_class, nameoroid, name)
Get a possibly inherited attribute specified by name of a schema element specified by nameoroid. Returns None if class attribute is not set at all.

Raises KeyError if no schema element is found by nameoroid.

get_inheritedobj (se_class, nameoroid, inherited=None)
Get a schema element by name or OID with all class attributes set including inherited class attributes

get_obj (se_class, nameoroid, default=None, raise_keyerror=0)
Get a schema element by name or OID

get_structural_oc (oc_list)
Returns OID of structural object class in oc_list if any is present. Returns None else.

get_syntax (nameoroid)
Get the syntax of an attribute type specified by name or OID

getoid (se_class, nameoroid, raise_keyerror=0)
Get an OID by name or OID

ldap_entry()
Returns a dictionary containing the sub schema sub entry

listall (schema_element_class, schema_element_filters=None)
Returns a list of OIDs of all available schema elements of a given schema element class.

tree (schema_element_class, schema_element_filters=None)
Returns a ldap.cidict.cidict dictionary representing the tree structure of the schema elements.

ldap.schema.models Schema elements

class ldap.schema.models.Entry (schema, dn, entry)
Schema-aware implementation of an LDAP entry class.

Mainly it holds the attributes in a string-keyed dictionary with the OID as key.

attribute_types (attr_type_filter=None, raise_keyerror=1)
Convenience wrapper around SubSchema.attribute_types() which passes object classes of this particular entry as argument to SubSchema.attribute_types()

items () → a set-like object providing a view on D’s items

keys () → a set-like object providing a view on D’s keys

update ([E], **F) → None. Update D from mapping/iterable E and F.
If E present and has a .keys() method, does: for k in E: D[k] = E[k] If E present and lacks .keys() method, does: for (k, v) in E: D[k] = v In either case, this is followed by: for k, v in F.items(): D[k] = v

class ldap.schema.models.SchemaElement (schema_element_str=None)
Base class for all schema element classes. Not used directly!
Arguments:

**schema_element_str** String which contains the schema element description to be parsed. (Bytestrings are decoded using UTF-8)

Class attributes:

**schema_attribute** LDAP attribute type containing a certain schema element description

**token_defaults** Dictionary internally used by the schema element parser containing the defaults for certain schema description key-words

class ldap.schema.models.AttributeType(*schema_element_str=*)

Arguments:

**schema_element_str** String containing an AttributeTypeDescription

Class attributes:

**oid** OID assigned to the attribute type (string)

**names** All NAMES of the attribute type (tuple of strings)

**desc** Description text (DESC) of the attribute type (string, or None if missing)

**obsolete** Integer flag (0 or 1) indicating whether the attribute type is marked as OBSOLETE in the schema

**single_value** Integer flag (0 or 1) indicating whether the attribute must have only one value

**syntax** OID of the LDAP syntax assigned to the attribute type

**no_user_mod** Integer flag (0 or 1) indicating whether the attribute is modifiable by a client application

**equality** NAME or OID of the matching rule used for checking whether attribute values are equal (string, or None if missing)

**substr** NAME or OID of the matching rule used for checking whether an attribute value contains another value (string, or None if missing)

**ordering** NAME or OID of the matching rule used for checking whether attribute values are lesser-equal than (string, or None if missing)

**usage** USAGE of an attribute type: 0 = userApplications 1 = directoryOperation, 2 = distributedOperation, 3 = dSAOperation

**sup** NAMES or OIDs of attribute types this attribute type is derived from (tuple of strings)

**x_origin** Value of the X-ORIGIN extension flag (tuple of strings).

Although it’s not official, X-ORIGIN is used in several LDAP server implementations to indicate the source of the associated schema element

class ldap.schema.models.ObjectClass(*schema_element_str=*)

Arguments:

**schema_element_str** String containing an ObjectClassDescription

Class attributes:

**oid** OID assigned to the object class

**names** All NAMES of the object class (tuple of strings)

**desc** Description text (DESC) of the object class (string, or None if missing)

**obsolete** Integer flag (0 or 1) indicating whether the object class is marked as OBSOLETE in the schema

**must** NAMES or OIDs of all attributes an entry of the object class must have (tuple of strings)
may  NAMEs or OIDs of additional attributes an entry of the object class may have (tuple of strings)
kind  Kind of an object class: 0 = STRUCTURAL, 1 = ABSTRACT, 2 = AUXILIARY
sup  NAMEs or OIDs of object classes this object class is derived from (tuple of strings)
x_origin  Value of the X-ORIGIN extension flag (tuple of strings)

Although it’s not official, X-ORIGIN is used in several LDAP server implementations to indicate the source of the associated schema element

class ldap.schema.models.MatchingRule(schema_element_str=None)
    Arguments:
        schema_element_str  String containing an MatchingRuleDescription
    Class attributes:
        oid  OID assigned to the matching rule
        names  All NAMEs of the matching rule (tuple of strings)
        desc  Description text (DESC) of the matching rule
        obsolete  Integer flag (0 or 1) indicating whether the matching rule is marked as OBSOLETE in the schema
        syntax  OID of the LDAP syntax this matching rule is usable with (string, or None if missing)

class ldap.schema.models.MatchingRuleUse(schema_element_str=None)
    Arguments:
        schema_element_str  String containing an MatchingRuleUseDescription
    Class attributes:
        oid  OID of the accompanying matching rule
        names  All NAMEs of the matching rule (tuple of strings)
        desc  Description text (DESC) of the matching rule (string, or None if missing)
        obsolete  Integer flag (0 or 1) indicating whether the matching rule is marked as OBSOLETE in the schema
        applies  NAMEs or OIDs of attribute types for which this matching rule is used (tuple of strings)

class ldap.schema.models.DITContentRule(schema_element_str=None)
    Arguments:
        schema_element_str  String containing an DITContentRuleDescription
    Class attributes:
        oid  OID of the accompanying structural object class
        names  All NAMEs of the DIT content rule (tuple of strings)
        desc  Description text (DESC) of the DIT content rule (string, or None if missing)
        obsolete  Integer flag (0 or 1) indicating whether the DIT content rule is marked as OBSOLETE in the schema
        aux  NAMEs or OIDs of all auxiliary object classes usable in an entry of the object class (tuple of strings)
        must  NAMEs or OIDs of all attributes an entry of the object class must have, which may extend the list of required attributes of the object classes of an entry. (tuple of strings)
        may  NAMEs or OIDs of additional attributes an entry of the object class may have. which may extend the list of optional attributes of the object classes of an entry. (tuple of strings)
        nots  NAMEs or OIDs of attributes which may not be present in an entry of the object class. (tuple of strings)
class ldap.schema.models.NameForm(schema_element_str=None)
Arguments:
schema_element_str  String containing a NameFormDescription
Class attributes:
od  OID of the name form
names  All NAMEs of the name form (tuple of strings)
desc  Description text (DESC) of the name form (string, or None if missing)
obsolete  Integer flag (0 or 1) indicating whether the name form is marked as OBSOLETE in the schema
form  NAMEs or OIDs of associated name forms (tuple of strings)
oc  NAME or OID of structural object classes this name form is usable with (string)
must  NAMEs or OIDs of all attributes an RDN must contain (tuple of strings)
may  NAMEs or OIDs of additional attributes an RDN may contain (tuple of strings)

class ldap.schema.models.DITStructureRule(schema_element_str=None)
Arguments:
schema_element_str  String containing a DITStructureRuleDescription
Class attributes:
ruleid  rule ID of the DIT structure rule (only locally unique)
names  All NAMEs of the DIT structure rule (tuple of strings)
desc  Description text (DESC) of the DIT structure rule (string, or None if missing)
obsolete  Integer flag (0 or 1) indicating whether the DIT content rule is marked as OBSOLETE in the schema
form  NAMEs or OIDs of associated name forms (tuple of strings)
sup  NAMEs or OIDs of allowed structural object classes of superior entries in the DIT (tuple of strings)

Examples for ldap.schema

```python
import ldap.schema
```

5.3.10 ldap.syncrepl Implementation of a syncrepl consumer

See also:
This requires pyasn1 and pyasn1_modules to be installed.

Classes

This module defines the following classes:

class ldap.syncrepl.SyncreplConsumer
    SyncreplConsumer - LDAP syncrepl consumer object.
**syncrepl_delete** *(uuids)*  
Called by syncrepl_poll() to delete entries. A list of UUIDs of the entries to be deleted is given in the uuids parameter.

**syncrepl_entry** *(dn, attrs, uuid)*  
Called by syncrepl_poll() for any added or modified entries.

The provided uuid is used to identify the provided entry in any future modification (including dn modification), deletion, and presentation operations.

**syncrepl_get_cookie** ()  
Called by syncrepl_poll() to retrieve the cookie stored by syncrepl_set_cookie()

**syncrepl_poll** *(msgid=-1, timeout=None, all=0)*  
polls for and processes responses to the syncrepl_search() operation. Returns False when operation finishes, True if it is in progress, or raises an exception on error.

If timeout is specified, raises ldap.TIMEOUT in the event of a timeout.

If all is set to a nonzero value, poll() will return only when finished or when an exception is raised.

**syncrepl_present** *(uuids, refreshDeletes=False)*  
Called by syncrepl_poll() whenever entry UUIDs are presented to the client. syncrepl_present() is given a list of entry UUIDs (uuids) and a flag (refreshDeletes) which indicates whether the server explicitly deleted non-present entries during the refresh operation.

If called with a list of uuids, the syncrepl_present() implementation should record those uuids as present in the directory.

If called with uuids set to None and refreshDeletes set to False, syncrepl_present() should delete all non-present entries from the local mirror, and reset the list of recorded uuids.

If called with uuids set to None and refreshDeletes set to True, syncrepl_present() should reset the list of recorded uuids, without deleting any entries.

**syncrepl_refreshdone** ()  
Called by syncrepl_poll() between refresh and persist phase.

It indicates that initial synchronization is done and persist phase follows.

**syncrepl_search** *(base, scope, mode='refreshOnly', cookie=None, **search_args)*  
Starts syncrepl search operation.

base, scope, and search_args are passed along to self.search_ext unmodified (aside from adding a Sync Request control to any serverctrls provided).

mode provides syncrepl mode. Can be 'refreshOnly' to finish after synchronization, or 'refreshAndPersist' to persist (continue to receive updates) after synchronization.

cookie: an opaque value representing the replication state of the client. Subclasses should override the syncrepl_set_cookie() and syncrepl_get_cookie() methods to store the cookie appropriately, rather than passing it.

Only a single syncrepl search may be active on a SyncreplConsumer object. Multiple concurrent syncrepl searches require multiple separate SyncreplConsumer objects and thus multiple connections (LDAPObject instances).

**syncrepl_set_cookie** *(cookie)*  
Called by syncrepl_poll() to store a new cookie provided by the server.
5.3.11 ldap.sasl SASL Authentication Methods

This module implements various authentication methods for SASL bind.

See also:

Constants

ldap.sasl.CB_USER
ldap.sasl.CB_AUTHNAME
ldap.sasl.CB_LANGUAGE
ldap.sasl.CB_PASS
ldap.sasl.CB_ECHOPROMPT
ldap.sasl.CB_NOECHOPROMPT
ldap.sasl.CB_GETREALM

Classes

class ldap.sasl.sasl(cb_value_dict, mech)
   This class handles SASL interactions for authentication. If an instance of this class is passed to ldap's
   sasl_bind_s() method, the library will call its callback() method. For specific SASL authentication mechanisms,
   this method can be overridden
   This class is used with ldap.LDAPObject.sasl_interactive_bind_s().

   callback(cb_id, challenge, prompt, defresult)
   The callback method will be called by the sasl_bind_s() method several times. Each time it will provide
   the id, which tells us what kind of information is requested (the CB_* constants above). The challenge
   might be a short (English) text or some binary string, from which the return value is calculated. The prompt
   argument is always a human-readable description string; The defresult is a default value provided by the
   sasl library
   Currently, we do not use the challenge and prompt information, and return only information which is stored
   in the self.cb_value_dict cb_value_dictionary. Note that the current callback interface is not very useful
   for writing generic sasl GUIs, which would need to know all the questions to ask, before the answers are
   returned to the sasl lib (in contrast to one question at a time).
   Unicode strings are always converted to bytes.

class ldap.sasl.cram_md5(authc_id, password, authz_id="")
   This class handles SASL CRAM-MD5 authentication.

class ldap.sasl.digest_md5(authc_id, password, authz_id="")
   This class handles SASL DIGEST-MD5 authentication.

class ldap.sasl.gssapi(authz_id="")
   This class handles SASL GSSAPI (i.e. Kerberos V) authentication.
   You might consider using convenience method ldap.LDAPObject.sasl_gssapi_bind_s().
class ldap.sasl.external(\texttt{authz\_id=\textasciitilde})

This class handles SASL EXTERNAL authentication (i.e. X.509 client certificate)

You might consider using convenience method $\texttt{ldap.LDAPObject.sasl\_external\_bind\_s()}$.

Examples for ldap.sasl

This example connects to an OpenLDAP server via LDAP over IPC (see draft-chu-ldap-ldapi) and sends a SASL external bind request.

```python
import ldap, ldap.sasl, urllib

ldapi_path = '/tmp/openldap-socket'
ldap_conn = ldap.initialize('ldapi://%s' % (urllib.quote_plus(ldapi_path))

# Send SASL bind request for mechanism EXTERNAL
ldap_conn.sasl_non_interactive_bind_s('EXTERNAL')

# Find out the SASL Authorization Identity
print ldap_conn.whoami_s()
```

5.3.12 ldif LDIF parser and generator

This module parses and generates LDAP data in the format LDIF. It is implemented in pure Python and does not rely on any non-standard modules. Therefore it can be used stand-alone without the rest of the python-ldap package.

See also:

**RFC 2849** - The LDAP Data Interchange Format (LDIF) - Technical Specification

Functions

\texttt{ldif.CreateLDIF} \texttt{(dn, record, base64\_attrs=None, cols=76)}

Create LDIF single formatted record including trailing empty line. This is a compatibility function.

\texttt{dn} string-representation of distinguished name

\texttt{record} Either a dictionary holding the LDAP entry \{attrtype:record\} or a list with a modify list like for LDAPObject.modify().

\texttt{base64\_attrs} list of attribute types to be base64-encoded in any case

\texttt{cols} Specifies how many columns a line may have before it’s folded into many lines.

Deprecated since version 3.0: \texttt{ldif.CreateLDIF()} is deprecated. It will be removed in version 3.1. Use \texttt{ldif.LDIFWriter.unparse()} with a file or \texttt{io.StringIO} instead.

\texttt{ldif.ParseLDIF} \texttt{(f, ignore\_attrs=None, maxentries=0)}

Parse LDIF records read from file. This is a compatibility function.

Deprecated since version 3.0: \texttt{ldif.ParseLDIF()} is deprecated. It will be removed in version 3.1. Use the \texttt{all\_records attribute of the returned value of ldif.LDIFRecordList.parse()} instead.
Classes

```python
class ldif.LDIFWriter(output_file, base64_attrs=None, cols=76, line_sep='n')
    Write LDIF entry or change records to file object Copy LDIF input to a file output object containing all data retrieved via URLs

unparse(dn, record)
    dn  string-representation of distinguished name
    record Either a dictionary holding the LDAP entry {attrtype:record} or a list with a modify list like for LDAPObject.modify().

class ldif.LDIFParser(input_file, ignored_attr_types=None, max_entries=0, process_url_schemes=None, line_sep='n')
    Base class for a LDIF parser. Applications should sub-class this class and override method handle() to implement something meaningful.

Public class attributes:
    records_read  Counter for records processed so far

handle(dn, entry)
    Process a single content LDIF record. This method should be implemented by applications using LDIFParser.

handle_modify(dn, modops, controls=None)
    Process a single LDIF record representing a single modify operation. This method should be implemented by applications using LDIFParser.

parse()
    Invokes LDIFParser.parse_entry_records() for backward compatibility

parse_entry_records()
    Continuously read and parse LDIF entry records

class ldif.LDIFRecordList(input_file, ignored_attr_types=None, max_entries=0, process_url_schemes=None)
    Collect all records of a LDIF file. It can be a memory hog!

Records are stored in all_records as a single list of 2-tuples (dn, entry), after calling parse().

all_records = None
    List storing parsed records.

handle(dn, entry)
    Append a single record to the list of all records (all_records).

handle_modify(dn, modops, controls=None)
    Process a single LDIF record representing a single modify operation. This method should be implemented by applications using LDIFParser.

class ldif.LDIFCopy(input_file, output_file, ignored_attr_types=None, max_entries=0, process_url_schemes=None, base64_attrs=None, cols=76, line_sep='n')
    Copy LDIF input to LDIF output containing all data retrieved via URLs

handle(dn, entry)
    Write single LDIF record to output file.
```

Example

The following example demonstrates how to write LDIF output of an LDAP entry with `ldif` module.
The following example demonstrates how to parse an LDIF file with `ldif` module, skip some entries and write the result to stdout.

```python
import sys
from ldif import LDIFParser, LDIFWriter

SKIP_DN = ["uid=foo,ou=People,dc=example,dc=com",
           "uid=bar,ou=People,dc=example,dc=com"]

class MyLDIF(LDIFParser):
    def __init__(self,input,output):
        LDIFParser.__init__(self,input)
        self.writer = LDIFWriter(output)

    def handle(self,dn,entry):
        if dn in SKIP_DN:
            return
        self.writer.unparse(dn,entry)

parser = MyLDIF(open("input.ldif", 'rb'), sys.stdout)
parser.parse()
```

### 5.3.13 ldapurl LDAP URL handling

This module parses and generates LDAP URLs. It is implemented in pure Python and does not rely on any non-standard modules. Therefore it can be used stand-alone without the rest of the python-ldap package.

See also:

**RFC 4516** - The LDAP URL Format

#### Constants

The `ldapurl` module exports the following constants:

- **SEARCH_SCOPE**
  - This dictionary maps a search scope string identifier to the corresponding integer value used with search operations in `ldap`.

- **SEARCH_SCOPE_STR**
  - This dictionary is the inverse to `SEARCH_SCOPE`. It maps a search scope integer value to the corresponding string identifier used in a LDAP URL string representation.

- **LDAP_SCOPE_BASE**
ldapurl.LDAP_SCOPE_ONELEVEL
ldapurl.LDAP_SCOPE_SUBTREE

Functions

ldapurl.isLDAPUrl(s)
Returns True if s is a LDAP URL, else False

ldapurl.ldapUrlEscape(s)
Returns URL encoding of string s

Classes

LDAP URLs

A LDAPUrl object represents a complete LDAP URL.

class ldapurl.LDAPUrl(ldapUrl=None, urlscheme='ldap', hostport='', dn='', attrs=None, scope=None, filterstr=None, extensions=None, who=None, cred=None)
Class for parsing and unparsing LDAP URLs as described in RFC 4516.

Usable class attributes:

urlscheme URL scheme (either ldap, ldaps or ldapi)
hostport LDAP host (default '')
dn String holding distinguished name (default '')
attrs list of attribute types (default None)
scope integer search scope for ldap-module
filterstr String representation of LDAP Search Filters (see RFC 4515)
extensions Dictionary used as extensions store
who Maps automagically to bindname LDAP URL extension
cred Maps automagically to X-BINDPW LDAP URL extension

Changed in version 3.4.0: The urlscheme is now case insensitive and always converted to lower case. LDAP://localhost is equivalent to ldap://localhost.

applyDefaults (defaults)
Apply defaults to all class attributes which are None.

defaults Dictionary containing a mapping from class attributes to default values

htmlHREF (urlPrefix='', hrefText=None, hrefTarget=None)
Returns a string with HTML link for this LDAP URL.

urlPrefix Prefix before LDAP URL (e.g. for addressing another web-based client)
hrefText link text/description
hrefTarget string added as link target attribute

initializeUrl ()
Returns LDAP URL suitable to be passed to ldap.initialize()
unparse()

Returns LDAP URL depending on class attributes set.

LDAP URL extensions

A LDAPUrlExtension object represents a single LDAP URL extension whereas LDAPUrlExtensions represents a list of LDAP URL extensions.

class ldapurl.LDAPUrlExtension(\texttt{extensionStr=None, critical=0, extype=None, exvalue=None})

Class for parsing and unparsing LDAP URL extensions as described in RFC 4516.

**Usable class attributes:**
- \texttt{critical} Boolean integer marking the extension as critical
- \texttt{extype} Type of extension
- \texttt{exvalue} Value of extension

class ldapurl.LDAPUrlExtensions(\texttt{default=None})

Models a collection of LDAP URL extensions as a mapping type

Example

Important security advice: For security reasons you should not specify passwords in LDAP URLs unless you really know what you are doing.

The following example demonstrates how to parse a LDAP URL with \texttt{ldapurl} module.

```python
>>> import ldapurl
>>> ldap_url = ldapurl.LDAPUrl('ldap://localhost:1389/dc=stroeder,dc=com?cn,mail???
˓→bindname=cn=Michael%2c dc=stroeder%2c dc=com,X-BINDPW=secret')

# Using the parsed LDAP URL by reading the class attributes
>>> ldap_url.dn
'dc=stroeder,dc=com'
>>> ldap_url.hostport
'localhost:1389'
>>> ldap_url.attrs
['cn','mail']
>>> ldap_url.filterstr
'(objectclass=*)'
>>> ldap_url.who
'cn=Michael,dc=stroeder,dc=com'
>>> ldap_url.cred
'secret'
>>> ldap_url.scope
0
```

The following example demonstrates how to generate a LDAP URL with module \texttt{ldapurl} module.

```python
>>> import ldapurl
>>> ldap_url = ldapurl.LDAPUrl(hostport='localhost:1389',dn='dc=stroeder,dc=com',
˓→attrs=['cn','mail'],who='cn=Michael,dc=stroeder,dc=com',cred='secret')

>>> ldap_url.unparse()
'ldap://localhost:1389/dc=stroeder,dc=com?cn,mail?base?(objectclass=*)?
˓→bindname=cn=Michael%2cCdc=stroeder%2cCdc=com,X-BINDPW=secret'
```
5.3.14 slapdtest Spawning test instances of OpenLDAP’s slapd server

The module is used for testing python-ldap itself but can be used for automatically testing any OpenLDAP-based configuration setup.

This module is pure Python and does not rely on any non-standard modules. Therefore it can be used stand-alone without the rest of the python-ldap package.

Test fixtures for the popular pytest framework are developed in an external project, pytest-ldap.

**Functions**

**Classes**

```python
class slapdtest.SlapdObject
    Controller class for a slapd instance, OpenLDAP’s server.

    This class creates a temporary data store for slapd, runs it listening on a private Unix domain socket and TCP port, and initializes it with a top-level entry and the root user.

    When a reference to an instance of this class is lost, the slapd server is shut down.

    An instance can be used as a context manager. When exiting the context manager, the slapd server is shut down and the temporary data store is removed.

    Parameters openldap_schema_files – A list of schema names or schema paths to load at startup. By default this only contains core.

    Changed in version 3.1: Added context manager functionality

gen_config()
    generates a slapd.conf and returns it as one string

    for generating specific static configuration files you have to override this method

ldapadd(ldif, extra_args=None)
    Runs ldapadd on this slapd instance, passing it the ldif content

ldapdelete(dn, recursive=False, extra_args=None)
    Runs ldapdelete on this slapd instance, deleting ‘dn’

ldapmodify(ldif, extra_args=None)
    Runs ldapmodify on this slapd instance, passing it the ldif content

ldapwhoami(extra_args=None)
    Runs ldapwhoami on this slapd instance

restart()
    Restarts the slapd server with same data

setup_rundir()
    creates rundir structure

    for setting up a custom directory structure you have to override this method

slapadd(ldif, extra_args=None)
    Runs slapadd on this slapd instance, passing it the ldif content

start()
    Starts the slapd server process running, and waits for it to come up.

stop()
    Stops the slapd server, and waits for it to terminate and cleans up
```
wait()
    Waits for the slapd process to terminate by itself.

class slapdtest.SlapdTestCase(methodName='runTest')
    test class which also clones or initializes a running slapd

    server_class
      alias of SlapdObject

classmethod setUpClass()
    Hook method for setting up class fixture before running tests in the class.

classmethod tearDownClass()
    Hook method for deconstructing the class fixture after running all tests in the class.

5.4 Third-party documentation

The following documents referenced are not written by python-ldap project members. Therefore some information might be outdated or links might be broken.

5.4.1 Python LDAP Applications articles by Matt Butcher

- Part 1 - Installing and Configuring the Python-LDAP Library and Binding to an LDAP Directory
  This also covers SASL.
- Part 2 - LDAP Operations
- Part 3 - More LDAP Operations and the LDAP URL Library
- Part 4 - LDAP Schema
  Gee, someone waded through the badly documented mysteries of module `ldap.schema`.

5.4.2 LDAP Programming in Python

Another article for getting started with python-ldap.

5.4.3 RFC 1823

The LDAP Application Program Interface, mainly for LDAPv2.

5.4.4 LDAPEXT draft

The Internet draft of the discontinued IETF working group LDAPEXT is of interest here since the OpenLDAP 2 libs implement this (expired) draft.

5.4.5 OpenLDAP

It’s worth to have a look at the manual pages and the Developer’s FAQ.
5.4.6 VSLDAP

VSLDAP Interoperability Test Suite.

5.5 Contributing to python-ldap

Thank you for your interest in python-ldap! If you’d like to contribute (be it code, documentation, maintenance effort, or anything else), this guide is for you.

5.5.1 Sample workflow for python-ldap development

This document will guide you through the process of contributing a change to python-ldap.

We assume that, as a user of python-ldap, you’re not new to software development in general, so these instructions are terse. If you need additional detail, please do ask on the mailing list.

Note: The following instructions are for Linux. If you can translate them to another system, please contribute your translation!

Install Git, tox and the Build prerequisites.

Clone the repository:

```
$ git clone https://github.com/python-ldap/python-ldap
$ cd python-ldap
```

Create a virtual environment to ensure you in-development python-ldap won’t affect the rest of your system:

```
$ python3 -m venv __venv__
```

Activate the virtual environment:

```
$ source __venv__/bin/activate
```

Install python-ldap to it in editable mode:

```
(__venv__)$ python -m pip install -e .
```

This way, importing a Python module from python-ldap will directly use the code from your source tree. If you change C code, you will still need to recompile (using the pip install command again).

Change the code as desired.

To run tests, install and run tox:

```
(__venv__)$ python -m pip install tox
(__venv__)$ tox --skip-missing-interpreters
```

This will run tests on all supported versions of Python that you have installed, skipping the ones you don’t. To run a subset of test environments, run for example:

```
(__venv__)$ tox -e py36,py39
```

In addition to pyXY environments, we have extra environments for checking things independent of the Python version:
• **doc** checks syntax and spelling of the documentation

• **coverage-report** generates a test coverage report for Python code. It must be used last, e.g. `tox -e py36,py39,coverage-report`.

• **py3-nosasl** check functionality without SASL and TLS bindings compiled in.

When your change is ready, commit to Git, and submit a pull request on GitHub. You can take a look at the Instructions for core committers to see what we are looking for in a pull request.

If you don’t want to open a GitHub account, please send patches as attachments to the python-ldap mailing list.

### 5.5.2 Communication

Always keep in mind that python-ldap is developed and maintained by volunteers. We’re happy to share our work, and to work with you to make the library better, but (until you pay someone), there’s obligation to provide assistance. So, keep it friendly, respectful, and supportive!

#### Mailing list

Discussion about the use and future of python-ldap occurs in the python-ldap@python.org mailing list.

It’s also the channel to use if documentation (including this guide) is not clear to you. Do try searching around before you ask on the list, though!

You can subscribe or unsubscribe to this list or browse the list archive.

#### Issues

Please report bugs, missing features and other issues to the bug tracker at GitHub. You will need a GitHub account for that.

If you prefer not to open a GitHub account, you’re always welcome to use the mailing list.

#### Security Contact

If you found a security issue that should not be discussed publicly, please e-mail the maintainer at pviktori@redhat.com. If required, write to coordinate a more secure channel.

All other communication should be public.

### 5.5.3 Contributing code

If you’re used to open-source Python development with Git, here’s the gist:

• `git clone https://github.com/python-ldap/python-ldap`

• Use GitHub for the bug tracker and pull requests.

• Run tests with tox; ignore Python interpreters you don’t have locally.

Or, if you prefer to avoid closed-source services:

• `git clone https://pagure.io/python-ldap`

• Send bug reports and patches to the mailing list.
• Run tests with tox; ignore Python interpreters you don’t have locally.
• Read the documentation directly at Read the Docs.

If you’re new to some aspect of the project, you’re welcome to use (or adapt) our sample workflow.

5.5.4 Additional tests and scripts

We use several specialized tools for debugging and maintenance.

Make targets

Make targets currently use the python3 executable. Specify a different one using, for example:

```bash
make PYTHON=/usr/local/bin/python
```

Notable targets are:

- **make autoformat** Automatically re-formats C and Python code to conform to Python style guides (PEP 7 and PEP 8). Note that no backups are made – please commit any other changes before using this target.
  
  Requires the indent program and the black Python module.

- **make lcov lcov-open** Generate and view test coverage for C code. Requires LCOV.

- **make scan-build** Run static analysis. Requires clang.

- **make valgrind** Run Valgrind to check for memory leaks. Requires valgrind and a Python suppression file, which you can specify as PYTHON_SUPP, e.g.:

  ```bash
  make valgrind PYTHON_SUPP=/your/path/to/valgrind-python.supp
  ```

  The suppression file is Misc/valgrind-python.supp in the Python source distribution, and it’s frequently packaged together with Python development headers.

Reference leak tests

Reference leak tests require a pydebug build of CPython and pytest with pytest-leaks plugin. A pydebug build has a global reference counter, which keeps track of all reference increments and decrements. The leak plugin runs each test multiple times and checks if the reference count increases.

Download and compile the pydebug build:

```bash
$ curl -O https://www.python.org/ftp/python/3.6.3/Python-3.6.3.tar.xz
$ tar xJf Python-3.6.3.tar.xz
$ cd Python-3.6.3
$ ./configure --with-pydebug
$ make
```

Create a virtual environment with the pydebug build:

```bash
$ ./python -m venv /tmp/refleak
$ /tmp/refleak/bin/pip install pytest pytest-leaks
```

Run reference leak tests:
Run `cd path/to/python-ldap`
```
$ /tmp/refleak/bin/pip install --upgrade .
$ /tmp/refleak/bin/pytest -v -R:
```

5.5.5 Instructions for core committers

If you have the authority (and responsibility) of merging changes from others, remember:

- All code changes need to be reviewed by someone other than the author.
- Tests must always pass. New features without tests shall *not* pass review.
- Make sure commit messages don’t use GitHub-specific link syntax. Use the full URL, e.g. [https://github.com/python-ldap/python-ldap/issues/50](https://github.com/python-ldap/python-ldap/issues/50) instead of #20.
  - Exception: it’s fine to use the short form in the summary line of a merge commit, if the full URL appears later.
  - It’s OK to use shortcuts in GitHub *discussions*, where they are not hashed into immutable history.
- Make a merge commit if the contribution contains several well-isolated separate commits with good descriptions. Use *squash-and-merge* (or *fast-forward* from a command line) for all other cases.
- It’s OK to push small changes into a pull request. If you do this, document what you have done (so the contributor can learn for the future), and get their ACK (confirmation) before merging.
- When squashing, do edit commit messages to add references to the pull request and relevant discussions/issues, and to conform to Git best practices.
  - Consider making the summary line suitable for the *CHANGES* document, and starting it with a prefix like `Lib:` or `Tests:`.
- Push to Pagure as well.

If you have good reason to break the “rules”, go ahead and break them, but mention why.

5.5.6 Instructions for release managers

If you are tasked with releasing python-ldap, remember to:

- Bump all instances of the version number.
- Go through all changes since last version, and add them to *CHANGES*.
- Run *Additional tests and scripts* as appropriate, fix any regressions.
- Change the release date in *CHANGES*.
- Update `__version__` tags where appropriate (each module `ldap`, `ldif`, `ldapurl`, `slapdtest` has its own copy).
- Merge all that (using pull requests).
- Run `python setup.py sdist`, and smoke-test the resulting package (install in a clean virtual environment, import `ldap`).
- Create GPG-signed Git tag: `git tag -s python-ldap-(version)`. Push it to GitHub and Pagure.
- Release the sdist on PyPI.
• Announce the release on the mailing list. Mention the Git hash.
• Add the release’s log from CHANGES on the GitHub release page.
• Check that python-ldap.org shows the latest version; if not, adjust things at readthedocs.org

5.6 python-ldap FAQ

5.6.1 Project

Q: Is python-ldap yet another abandon-ware project?
A1: “Jump on in.”
A2: “Jump into the C ;-)”
A3: see file CHANGES in source distribution or repository.

5.6.2 Usage

Q: Does it work with Python 3?
A0: Yes, from 3.0 on.
A1: For earlier versions, there’s pyldap, an independent fork now merged into python-ldap.

Q: Does it work with Python 2.7? (1.5|2.0|2.1|2.2|2.3|2.4|2.5|2.6|2.7)?
A: No. Old versions of python-ldap are still available from PyPI, though.

Q: My code imports module _ldap. That used to work, but after an upgrade it does not work anymore. Why?
A: Despite some outdated programming examples, the extension module _ldap MUST NOT be imported directly, unless you really know what you’re doing (e.g. for internal regression testing).

Import ldap instead, which is a Python wrapper around _ldap providing the full functionality.

Q: My script bound to MS Active Directory but a search operation results in the exception ldap.
OPERATIONS_ERROR with the diagnostic message text “In order to perform this operation a successful bind must be completed on the connection.” Alternatively, a Samba 4 AD returns the diagnostic message “Operation unavailable without authentication.” What’s happening here?
A: When searching from the domain level, MS AD returns referrals (search continuations) for some objects to indicate to the client where to look for these objects. Client-chasing of referrals is a broken concept, since LDAPv3 does not specify which credentials to use when chasing the referral. Windows clients are supposed to simply use their Windows credentials, but this does not work in general when chasing referrals received from and pointing to arbitrary LDAP servers.

Therefore, per default, libldap automatically chases the referrals internally with an anonymous access which fails with MS AD.

So, the best thing to do is to switch this behaviour off:

```
l = ldap.initialize('ldap://foobar')
l.set_option(ldap.OPT_REFERRALS, 0)
```

Note that setting the above option does NOT prevent search continuations from being returned, rather only that libldap won’t attempt to resolve referrals.

Q: Why am I seeing a ldap.SUCCESS traceback as output?
A: Most likely, you are using one of the non-synchronous calls, and probably mean to be using a synchronous call (see detailed explanation in Sending LDAP requests).

Q: Can I use LDAPv2 via python-ldap?
A: Yes, by explicitly setting the class attribute protocol_version.

You should not do that nowadays since LDAPv2 is considered historic since many years.

Q: My TLS settings are ignored/TLS isn’t working?
A: Make sure you call set_option(ldap.OPT_X_TLS_NEWCTX, 0) after changing any of the OPT_X_TLS_* options.

5.6.3 Installing

Q: Does it work with Windows 32?
A: Yes. You can find links to unofficial pre-compiled packages for Windows on the Installing python-ldap page.

Q: Can python-ldap be built against OpenLDAP 2.3 libs or older?
A: No. The needed minimal version of OpenLDAP is documented in Build prerequisites. Patched builds of python-ldap linked to older libs are not supported by the python-ldap project.

Q: During build there are warning messages displayed telling Lib/ldap.py and Lib/ldap/schema.py are not found:

```
warning: build_py: file Lib/ldap.py (for module ldap) not found
warning: build_py: file Lib/ldap/schema.py (for module ldap.schema) not found
```

A: ldap and ldap.schema are both module packages (directories containing various sub-modules). The messages above are falsely produced by DistUtils. Don’t worry about it.

Q: What’s the correct way to install on macOS?
A:

```
xcode-select --install
pip install python-ldap \
  --global-option=build_ext \
  --global-option="-I$(xcrun --show-sdk-path)/usr/include/sasl"
```

Q: While importing module ldap, some shared lib files are not found. The error message looks similar to this:

```
ImportError: ld.so.1: /usr/local/bin/python: fatal: liblber.so.2: open failed: No such file or directory
```

A1: You need to make sure that the path to liblber.so.2 and libldap.so.2 is in your LD_LIBRARY_PATH environment variable.

A2: Alternatively, if you’re on Linux, you can add the path to liblber.so.2 and libldap.so.2 to /etc/ld.so.conf and invoke the command ldconfig afterwards.

5.6.4 Historic

Q: Can python-ldap 2.x be built against Netscape, Mozilla or Novell libs?
A: Nope.
Q: My binary version of python-ldap was build with LDAP libs 3.3. But the python-ldap docs say LDAP libs 2.x are needed. I’m confused!

Short answer: See answer above and the Installing python-ldap page for a more recent version.

Long answer: E.g. some Win32 DLLs floating around for download are based on the old Umich LDAP code which is not maintained anymore for many years! Last Umich 3.3 release was 1997 if I remember correctly.

The OpenLDAP project took over the Umich code and started releasing OpenLDAP 1.x series mainly fixing bugs and doing some improvements to the database backend. Still, only LDAPv2 was supported at server and client side. (Many commercial vendors also derived their products from the Umich code.)

OpenLDAP 2.x is a full-fledged LDAPv3 implementation. It has its roots in Umich code but has many more features/improvements.

Q: While importing module ldap, there are undefined references reported. The error message looks similar to this:

```python
ImportError: /usr/local/lib/libldap.so.2: undefined symbol: res_query
```

A: Especially on older Linux systems, you might have to explicitly link against libresolv.

Tweak `setup.cfg` to contain this line:

```ini
libs = lber ldap resolv
```
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