



## **Splunk Release Notes**

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# What's New

## What's new in Splunk 3.1

### What's new in Splunk 3.1

#### Form search

Search strings can now contain variables that are rendered as form elements in the SplunkWeb interface. When used with Saved searches, inexperienced users can search efficiently without knowing the details of the search language. This feature simplifies searching by asking the user to input exactly the parameters he is looking for, instead of a complete and potentially complex search.

#### Search language simplification

As part of a general effort to simplify the search language, equal signs can now be used where double colons were required. In prior releases, search field syntax required a double colon but extracted field syntax required an equal sign. For example, `host::splunker` for the host search field and `myfield=value` for the extracted field `myfield`. Now search and extracted fields can both be used with equal signs in searches.

#### Archiving

With the introduction of enhanced archiving and export, customers now have the capability to flexibly archive their Splunk data based on time and size, critical for large and long-term data storage issues common with compliance mandates. This data can be easily resurrected back into Splunk for historical searches, and data can be exported simply and easily to put Splunk-gathered data anywhere an operator desires.

# Known Issues

## Known Issues

### Known Issues

For release 3.1.1.

### General Issues and Recommendations

- A recent vulnerability was discovered with Splunk's webserver, which could allow a user to read files without authenticating based on the permissions of the splunkweb process. To patch this vulnerability, place this updated Dispatcher.py in your `$SPLUNK_HOME/lib/python2.4/site-packages/splunk/search_oxiclean/search/` directory and restart Splunk.
- If you are using Splunk in a distributed search cluster, Splunk recommends that you upgrade each node to exactly the same version of Splunk.
  - ◆ Mixing 3.1.x and 3.0.x nodes in a distributed search cluster is not supported. You must upgrade all 3.0.x nodes to 3.1.x.
- Splunk 3.1.x requires Flash 9. You can check which version of Flash you are running here.
- Automated migration from 2.x to 3.1x is currently not supported. For instructions on manual migration, see [Upgrading from 2.x versions in the Installation manual](#). The instructions to migrate to 3.0.x are also suitable for migration to 3.1.x.
- Use props.conf to alter Splunk's settings. The `properties.xml` file is still included with the product, but its settings have no effect.

### Search & Navigation

- Reports require Adobe Flash, and run best in the latest version, currently Flash 9 (download). Flash is available for Firefox 1.5 and 2.0, and Internet Explorer 6 and 7. See the [Adobe Flash system requirements](#).
- Searches using a literal equal sign (=) in the search command itself to match a literal equal sign in the indexed data will no longer work due to changes in the search syntax. This may cause some saved searches to fail.
  - ◆ You can alter your saved searches to address this by enclosing the search expression in double quotes. For example, "user=foo" .
- SplunkWeb does not support some advanced 3.x search syntax, such as reporting on the results of a subsearch, set operations, etc.
- Some SUSE 10.x users might experience incorrectly displayed dialog boxes and searches may return the message "Unable to get a properly formatted response from the server; canceling the current search." This is a problem with the `mime.types` configuration. Instructions on how to correct this problem can be found [here](#).
- Some searches may be very slow to return. You can, however, make SplunkWeb search faster with three changes.
- The format command does not accept `nil()`. The workaround is to append " " (" "AND" ") " " " .
- Event loss may occur for network inputs when shutting down Splunk.

- Setting too many LDAP roles may cause a slight performance loss when searching.
- SplunkWeb can display a maximum of 499 LDAP groups.
  - ◆ To view and configure more than 499 groups: manually configure them by editing `auth.conf`.
- Using time-based search modifiers in the format: `modifier::value` in a `savedsearch` will break links that are sent in alerts via RSS or email.
  - ◆ Fix this by changing all custom time-based modifiers used in `savedsearches.conf` to: `timebasedmodifier=value` or `timebasedmodifier="value"` format.
- When using any time-based search modifier (exceptions listed below) in a saved search, links sent via RSS and email will work correctly, but the time range of events returned will be relative to when you view the alert rather than when the alert was triggered. The following time-based search modifiers are exceptions to this issue:
  - ◆ `startminutesago`
  - ◆ `starthoursago`
  - ◆ `startdaysago`
  - ◆ `startmonthsago`
  - ◆ `starttime`
  - ◆ `endtime`
  - ◆ `alltimes`
- Defining properties for `fifo` does not work based on source.
- Reconstituting logs from a specific source/host/sourcetype currently does not work. Administrators need to use the CLI search option in the interim.
- If you are using distributed search you can be logged into 3.0.x instance and distribute requests to a 3.1 instance but you cannot do the inverse.
- If you create a saved search with punctuation characters in its name, the punctuation characters will be displayed as HTML-escaped characters in the `savedsearch` box.

#### Administration

- 2.0.x licenses will NEVER work with 3.x+. If you have a current Plus Support contract you are entitled to upgrade your license to 3.x. If you do not have a current support agreement in place please contact [sales@splunk.com](mailto:sales@splunk.com).
- Export and import of user data may not work properly.
- In the deployment server, the 'default' class is supposed to target all deployment clients; however, configuration files placed in the default directory on the deployment server do not get pushed properly.
- Splunk's authentication module does not work with Domino LDAP.
- The following admin searches currently do not work:
  - ◆ `admin deployment`
  - ◆ `admin eventdiscoverer`
  - ◆ `admin fieldactions`
  - ◆ `admin metaevents`
  - ◆ `admin metrics`
  - ◆ `admin modules`
  - ◆ `admin outputs`
  - ◆ `admin user-seed`
  - ◆ `admin breakers`
- Specifying a wildcard at the end of a tail configuration does not properly anchor the underlying whitelist rule. In the interim you should explicitly define your whitelist rule in your `inputs.conf`.

- Log file rotation does not currently work while tailing SMB mounts.

#### Toolbar

- The toolbar sometimes incorrectly displays two drop-down arrows in the search box. This has no effect on functionality.
- When running a free Splunk license, or an unlicensed copy of Splunk, the toolbar may not get past the "Welcome to Splunk" start page.
- Occasionally a search done in the toolbar will not return results. This may cause the browser to hang. The searches will work correctly if run directly in SplunkWeb or the command line (CLI).
- In some cases, the toolbar will prevent "Find in this page" functionality from running multiple times on the same page. These reports have been limited to users running multiple browser add-ons (e.g. colorful tabs, dom inspector, user agent switcher).
- Autologin does not work if the Autologin is set to **off** prior to configuring a Splunk server in the toolbar.
  - ◆ To login automatically set Autologin to **on** prior to configuring the server.
- The toolbar does not have a mechanism for alerting if its credentials are invalid.
  - ◆ When a Splunk server is configured to talk to an LDAP server that locks accounts after N failed login attempts, users should verify that their credentials are correct.
- There are some cases where the toolbar may take over the current user session if the toolbar is configured to talk to a Splunk instance that is different than the one a user is currently logged into.
- There may be conflicts if a user is logged into one Splunk instance and runs a toolbar search on a different Splunk instance.

#### Platforms

# Changelogs by Version

## 3.1.1

### 3.1.1

#### New features

- 64-bit Free BSD is now supported.

#### Resolved issues from 3.1

- OSX dmg install no longer incorrectly sets the file permissions to the default license file.
- The 64-bit RPM install no longer sets incorrect file permissions for /opt/splunk/share. They are now set to 755 (was previously set to 555).
- Power users can now create saved searches that are globally shared.
- Adding a forwarding server via SplunkWeb will no longer occasionally cause an error message to be displayed.
- Moving from a free license to an evaluation license will no longer cause a webserver exception to be displayed while in SplunkWeb.
- While in SplunkWeb, clicking on a tag next to an eventtype now adds the correct syntax of "eventtypetag=" to your search.
- The followTail option in inputs.conf now functions as expected.
- References to Splunk-2-cool, Splunk-2-Nagio were removed the Splunk binary and moved to SplunkBase where they can be downloaded as add-ons.
  - ◆ Spunk-2-Netcool add-on
  - ◆ Splunk-2-Nagios add-on
- Fixed typos in some of the init scripts.
- Fixed anomaly where a long path name in props.conf causes splunkd to crash.
- Fixed cosmetic issue in SplunkWeb where text would change positions when adding multiple tags.
- Alerts now work in distributed search.
- Mousing over dashboards now correctly displays a cursor hand in SplunkWeb.
- You can now share dashboards with other users.
- Default permissions in native packages are now more secure.
- Pressing "ctrl-R" now correctly refreshes SplunkWeb.
- The "lines per event" setting now is persisted with other user preferences.
- The directory monitor now correctly crawls directories.
- Changed the default values of settings in indexes.conf to allow you to tune Splunk to more efficiently use system resources.
  - ◆ `maxQueryIds = <non-negative number>` now has an increased default value of 10000000.
  - ◆ `maxResults = <non-negative number>` now has a default of 50000. It is recommended to set this key to 50000 for 32-bit systems, and 500000 for 64-bit systems.
- Added the key to indexes.conf: `maxConcurrentOptimizes = <number of concurrent optimize processes that can be run>`, to allow you the ability to change the number of concurrent optimize processes that can be run against the hot shard. You should increase the number if there are always many small tsidx files in hot, or when there are many tsidx files

in warm and cold after a roll. the default for this key is 3.

- Added the key to indexes.conf: `waitForOptimize = < 0 = no, !0 = yes >`, to allow you the ability to control whether or not to let kill optimize processes during a roll. If you are seeing pauses in your indexing and searching, set this key to 0. The default for this key is 0.

#### New issues in this release

- In a distributed search cluster, it is recommended that you have every node upgraded to an identical version of Splunk.
  - ◆ If you are using LDAP authentication you must update every node in a distributed search cluster to 3.1.1 if you want distributed search to work. You cannot mix 3.1.1 and 3.1 nodes because of an access control fix.
  - ◆ You can mix 3.1 and 3.1.1 in a distributed search cluster if you are using Splunk's standard authentication.

## 3.1

### 3.1

#### New features

- "=" is now interchangeable with "::" when using search fields in a search.
- Users can now type values in a form search.
- New commands **resurrect**, **unresurrect**, and **export** are available in the CLI:
  - ◆ **resurrect**: makes data available that has previously been archived.
  - ◆ **unresurrect**: used to delete directories that have been resurrected.
  - ◆ **export**: exports user data, global data, or event data for archiving.
  - ◆ For help with these commands, access the CLI help pages through the command line:  
`./splunk help resurrect or ./splunk help unresurrect or ./splunk help export.`

#### Resolved issues from 3.0.x

- SplunkWeb now performs searches faster with smaller result sets.
- SplunkWeb no longer elevates user privileges without warning.
- Whitelisting and blacklisting now work correctly.
- Distributed searches now access events in parallel across all servers.
- SplunkWeb **show source** now displays correctly.
- Dashboard Saved searches in SplunkWeb now display correctly.
- When selecting fields in a search in SplunkWeb, the selected fields show correctly.
- Splunk no longer suffers a performance loss when extracted and search fields are enabled.
- Unprintable characters no longer cause errors in the CLI.
  - ◆ Unprintable characters return as "?".
  - ◆ Original data is not lost. Use the `extract` command to retrieve the raw data.
- Entries are no longer dropped for LDAP servers running Active Directory.
- Splunk's log volume is now significantly smaller.
- Setting sourcetypes of archived files works properly.
- Fixed small bugs with saved searches and alerts in distributed search deployments.

- Splunkd is more efficient.
- Event type tagging works correctly in SplunkWeb.
- Deleting events while a source is being indexed no longer causes an incorrect event count to be reported.
- Splunk runs correctly on AIX 5.2 and 5.3.
- Splunk has Improved handling of TCP inputs.
- Shutting down Splunk does not cause TCP event loss.
- Splunk functions correctly with the gzip environment variable set.
- CSV files with common headers no longer cause Splunk's tail to miss events.
- Splunk has increased functionality with Internet Explorer 6.
- Fixed cosmetic bugs in SplunkWeb.
- eventtypetag:: typeahead is corrected.
- hosttag:: typeahead is corrected.
- Runtime field extraction works with host::.
- Improved user role capabilities.
- Enhanced search performance on 64-bit systems.
- Dashboard creation now works correctly in SplunkWeb.
- Selecting "table" from drop-down in the SplunkWeb dashboard does not produce both a chart and a table.
- Alerts created by power users now can perform all actions as expected
- Compressed files now correctly handle sourcetypes manually set in inputs.conf
- Dashboard no longer displays duplicate sets of example searches for every distributed data source.
- Full TCP input queues no longer drops events.
- The search command outputs csv outputs fields in the proper order.

#### New issues in this release

- In a distributed search cluster, it is recommended that you have every node upgraded to an identical version of Splunk.
  - ◆ You can never mix 3.1.x and 3.0.x nodes in a distributed search cluster. You must upgrade all 3.0.x nodes to 3.1.x.
- When shutting down Splunk, there is a risk that network inputs can experience event loss.
- Having too many LDAP roles set might cause searching to suffer a performance loss.
- Using time-based search modifiers in the format: `modifier::value` in a saved search will break links that are sent in alerts via RSS or email.
  - ◆ Fix this by changing all custom time-based modifiers used in savedsearches.conf to: `timebasedmodifier=value` or `timebasedmodifier="value"` format.
- Searches using a literal equal sign (=) will no longer work due to changes in the search syntax. This may cause saved searches to fail.
  - ◆ Fix this by enclosing the search expression in double quotes. For example, "user=foo" .

# Credits

## Credits

### Credits

Splunk contains some libraries that were written by others, and are being redistributed as part of Splunk under their respective open source licenses. We wish to thank the contributors to these projects.

Licenses can be viewed by selecting a library name on the left.

## APSW

### APSW

- Another Python SQLite Wrapper

apsw-3.2.2-r1 7th July 2005

APSW provides an SQLite 3 wrapper that provides the thinnest layer over SQLite 3 possible. Everything you can do from the C API to SQLite 3, you can do from Python. Although APSW looks vaguely similar to the DBAPI, it is not compliant with that API and instead works the way SQLite 3 does. (pysqlite is DBAPI compliant - differences between apsw and pysqlite 2).

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## Download

You can download APSW from SourceForge. Debian users can grab the package python-apsw

## Example

This is an example of how to use apsw, and also demonstrates all the features.

```
import apsw

###

### Opening/creating database

###

connection=apsw.Connection("dbfile")

cursor=connection.cursor()
```

```
###
```

```
### simple statement
```

```
###
```

```
cursor.execute("create table foo(x,y,z)")
```

```
###
```

```
### multiple statements
```

```
###
```

```
cursor.execute("insert into foo values(1,2,3); create table bar(a,b,c) ; insert into foo val
```

```
###
```

```
### iterator
```

```
###
```

```
for x,y,z in cursor.execute("select x,y,z from foo"):
```

```
    print cursor.getdescription() # shows column names and declared types
```

```

print x,y,z

###

### iterator - multiple statements

###

for m,n,o in cursor.execute("select x,y,z from foo ; select a,b,c from bar"):

    print m,n,o

###

### bindings - sequence

###

cursor.execute("insert into foo values(?,?,?)", (7, 'eight', False))

cursor.execute("insert into foo values(?,?,?1)", ('one', 'two')) # nb sqlite does the number

###

### bindings - dictionary

```

```
###
```

```
cursor.execute("insert into foo values(:alpha, :beta, :gamma)", {'alpha': 1, 'beta': 2, 'gamma': 3})
```

```
###
```

```
### tracing execution
```

```
###
```

```
def mytrace(statement, bindings):
```

```
    "Called just before executing each statement"
```

```
    print "SQL:", statement
```

```
    if bindings:
```

```
        print "Bindings:", bindings
```

```
    return True # if you return False then execution is aborted
```

```
cursor.setexectrace(mytrace)
```

```
cursor.execute("create table bar(x,y,z); select * from foo where x=?", (3,))
```

```
SQL: create table bar(x,y,z);
```

```
SQL: select * from foo where x=?
```

```
Bindings: (3,)
```

```
###
```

```
### tracing results
```

```
###
```

```
def rowtrace(*results):
```

```
    """Called with each row of results before they are handed off.  You can return None to
```

```
    cause the row to be skipped or a different set of values to return"""
```

```
    print "Row:", results
```

```
    return results
```

```
cursor.setrowtrace(rowtrace)
```

```
for row in cursor.execute("select x,y from foo where x>3"):
```

```
pass
```

```
Row: (4, 'five')
```

```
Row: (7, 'eight')
```

```
###
```

```
### executemany
```

```
###
```

```
# (This will work correctly with multiple statements, as well as statements that
```

```
# return data. The second argument can be anything that is iterable.)
```

```
cursor.executemany("insert into foo (x) values(?)", ( [1], [2], [3] ) )
```

```
# You can also use it for statements that return data
```

```
for row in cursor.executemany("select * from foo where x=?", ( [1], [2], [3] ) ):
```

```
    print row
```

```
###
```

```
### defining your own functions

###

def ilove7(*args):

    "a scalar function"

    print "ilove7 got",args,"but I love 7"

    return 7

connection.createscalarfunction("seven", ilove7)

for row in cursor.execute("select seven(x,y) from foo"):

    print row

###

### aggregate functions are more complex

###

# here we return the longest item when represented as a string
```

```

def longeststep(context, *args):

    "are any of the arguments longer than our current candidate"

    for arg in args:

        if len( str(arg) ) > len( context['longest'] ):

            context['longest']=str(arg)

def longestfinal(context):

    "return the winner"

    return context['longest']

def longestfactory():

    """called for a new query. The first item returned can be

    anything and is passed as the context to the step

    and final methods. We use a dict."""

    return ( { 'longest': }, longeststep, longestfinal)

```

```

connection.createaggregatefunction("longest", longestfactory)

for row in cursor.execute("select longest(x) from foo"):

    print row

###

### Defining collations.

###

# The default sorting mechanisms don't understand numbers at the end of strings

# so here we define a collation that does

cursor.execute("create table s(str)")

cursor.executemany("insert into s values(?)",

                    ( ["file1"], ["file7"], ["file17"], ["file20"], ["file3"] ) )

for row in cursor.execute("select * from s order by str"):

    print row

```

```
('file1',)
```

```
('file17',)
```

```
('file20',)
```

```
('file3',)
```

```
('file7',)
```

```
def strnumcollate(s1, s2):
```

```
    # return -1 if s1<s2, +1 if s1>s2 else 0
```

```
    # split values into two parts - the head and the numeric tail
```

```
    values=[s1, s2]
```

```
    for vn,v in enumerate(values):
```

```
        for i in range(len(v), 0, -1):
```

```
            if v[i-1] not in "01234567890":
```

```
                break
```

```

try:

    v=( v[:i], int(v[i:]) )

except ValueError:

    v=( v[:i], None )

values[vn]=v

# compare

if values[0]<values[1]:

    return -1

if values[0]>values[1]:

    return 1

return 0

connection.createcollation("strnum", strnumcollate)

for row in cursor.execute("select * from s order by str collate strnum"):

```

```

print row

('file1',)

('file3',)

('file7',)

('file17',)

('file20',)

###

### Authorizer (eg if you want to control what user supplied SQL can do)

###

def authorizer(operation, paramone, paramtwo, databasename, triggerorview):

    """Called when each operation is prepared. We can return SQLITE_OK, SQLITE_DENY or

    SQLITE_IGNORE"""

    # find the operation name

```

```

ign=["SQLITE_OK", "SQLITE_DENY", "SQLITE_IGNORE"] # not operation names but have same v

print "AUTHORIZER:",

for i in dir(apsw):

    if getattr(apsw,i)==operation:

        print i,

        break

print paramone, paramtwo, databasename, triggerorview

if operation==apsw.SQLITE_CREATE_TABLE and paramone.startswith("private"):

    return apsw.SQLITE_DENY # not allowed to create tables whose names start with priva

return apsw.SQLITE_OK # always allow

connection.setauthorizer(authorizer)

###

### progress handler (SQLite 3 experimental feature)

```

```
###

# something to give us large numbers of random numbers

import random

def randomintegers(howmany):

    for i in xrange(howmany):

        yield (random.randint(0,9999999999),)

# create a table with 10,000 random numbers

cursor.execute("begin ; create table bigone(x)")

cursor.executemany("insert into bigone values(?)", randomintegers(10000))

cursor.execute("commit")

# display an ascii spinner

_phcount=0

_phspinner="|/-\\\"
```

```

def progresshandler():

    global _phcount

    sys.stdout.write(_phspinner[_phcount%len(_phspinner)]+chr(8)) # chr(8) is backspace

    sys.stdout.flush()

    _phcount+=1

    time.sleep(0.1) # deliberate delay so we can see the spinner (SQLite is too fast otherwise)

    return 0 # returning non-zero aborts

# register progresshandler every 20 instructions

connection.setprogresshandler(progresshandler, 20)

# see it in action

print "spiny thing -> ",

for i in cursor.execute("select max(x) from bigone"):

    print # newline

```

```
print i # and the maximum number

###

### commit hook (SQLite3 experimental feature)

###

def mycommithook():

    print "in commit hook"

    hour=time.localtime()[3]

    if hour<8 or hour>17:

        print "no commits our of hours"

        return 1 # abort commits outside of 8am through 6pm

    print "commits okay at this time"

    return 0 # let commit go ahead

connection.setcommithook(mycommithook)
```

```
cursor.execute("begin; create table example(x,y,z); insert into example values (3,4,5) ; com
```

## Building

The simple way is:

```
python setup.py install
```

On Windows the above command uses Visual C++. You can use MinGW with the command below. (If MinGW complains about missing Python functions starting with `_imp__Py_` then run `mingwsetup.bat` which will ensure your Python distribution is initialized for MinGW compilation).

```
python setup.py build --compile=mingw32 install
```

By default whatever SQLite 3 you already have on your system is used. If you place a copy of the headers and library in a `sqlite3` subdirectory then that will be used instead. Here is a quick and easy way of doing everything on Linux/Mac or Windows with MinGW, including the SQLite library statically into the extension (ie no external DLLs/shared libraries will needed at runtime).

Download the SQLite 3 code. Use the version that has already been preprocessed. (It will com

```
$ mkdir sqlite3
```

```
$ cd sqlite3
```

```
$ unzip sqlite-source-3.2.2.zip
```

```
$ rm tclsqlite.c # Linux/Mac
```

```
$ del tclsqlite.c # Windows
```

```
$ gcc -DTHREADSAFE -O3 -c *.c # Adding -DNDEBUG will turn off assertions
# improve performance (about 25%) at the expense of assertions

$ ar r libsqlite3.a *.o

$ ranlib libsqlite3.a

$ cd ..

$ python setup.py install # Linux/Mac

$ python setup.py build --compile=mingw32 install # Windows
```

The extension just turns into a single file `apsw.so` (Linux/Mac) or `apsw.pyd` (Windows). You don't need to install it and can drop it into any directory that is more convenient for you and that your code can reach. To just do the build and not install, leave out `install` from the lines above and add `build` if it isn't already there.

## API Reference

Everything you can do from the SQLite 3 C API you can do from Python. The documentation below notes which C API functions are called where you can get further details on what happens. The only C function not implemented is `sqlite3_collation_needed`. (You can still add collations, you just can't use this function to find out about them on-demand.) Additionally `sqlite3_trace` is not wrapped but instead tracers are provided that have more functionality.

Some functions are marked experimental in the SQLite API. These have also been made available, but as the SQLite documentation notes these functions may change form or disappear in future

versions of SQLite. You can exclude these functions by commenting out the relevant line in the setup.py when building aspw.

Various methods create functions, collations and set various hooks and handlers. To remove the relevant function/collation/hook/handler, pass in None as the callable method.

## Module methods

### sqlitelibversion()

Returns the version of the SQLite library as a string. This function calls `sqlite3_libversion`

## Connection class

The connection class wraps a `sqlite3` pointer.

### Connection(filename)

Opens an SQLite database named `filename`. (This calls `sqlite3_open` behind the scenes and `sqlite3`

### cursor()

Creates a new cursor object on this database.

### changes()

This function returns the number of database rows that were changed (or inserted or deleted)

### totalchanges()

This function returns the total number of database rows that have be modified, inserted, or

## `last_insert_rowid()`

Returns the integer key of the most recent insert in the database. (This calls `sqlite3_last_insert_rowid`.)

## `complete(statement)`

Calls `sqlite3_complete` which tells you if the input string comprises one or more complete SQL statements.

## `setbusytimetype(milliseconds)`

Sets the busy timeout. (This calls `sqlite3_busy_timeout`.)

## `setbusyhandler(callable)`

Sets the busy handler to `callable`. `callable` will be called with one integer argument which is the number of times the database is busy.

## `interrupt()`

Causes any pending operations on the database to abort at the earliest opportunity. (This calls `sqlite3_interrupt`.)

## `createscalarfunction(name, callable, numargs=-1)`

Registers a scalar function. The `callable` will be called. You can specify how many arguments the function takes.

## `createaggregatefunction(name, factorycallback, numargs=-1)`

Registers an aggregate function. (This calls `sqlite3_create_function`.) You can specify how many arguments the function takes.

\*

a context object (of any type)

\*

a step function which is called for each row. The context object will be the first parameter

\*

a final function which is called at the end. The only parameter will be the context object

### **createcollation(name, callable)**

Creates a collation with the specified name and callable. The callable will be passed two strings

### **setauthorizer(callable)**

The callable is invoked while SQL statements are being prepared. The intent is to allow applications

\*

an integer representing the operation (the constants are available on the apsw module)

\*

A string (or None) dependent on the operation

\*

Another string (or None) dependent on the operation

\*

The string name of the database (or None)

\*

Name of the innermost trigger or view doing the access (or None)

You should return `apsw.SQLITE_OK` to allow the operation or `apsw.SQLITE_DENY` or `apsw.SQLITE_I`

This calls `sqlite3_set_authorizer` which contains more detailed documentation.

### **setcommithook(callable) (SQLite 3 experimental feature)**

Sets a callable which is invoked just before a commit. It should return zero for the commit

### **setprogresshandler(callable, nsteps=20) (SQLite 3 experimental feature)**

Sets a callable which is invoked every `nsteps` SQLite instructions. The callable should ret

## **Cursor class**

The Cursor class creates and executes SQLite prepared statements.

## Cursor()

You cannot create cursors directly. They are created by calling `Connection.cursor()`.

## getconnection()

Returns the `Connection` object to which this cursor belongs.

## execute(statements, bindings=())

Executes the statements using the supplied bindings. The bindings can be supplied as a tuple.

## executemany(statements, sequenceofbindings=())

Repeatedly executes statements using each element of `sequenceofbindings` for the bindings each time.

## next()

The `Cursor` object is an iterator, and so you can use it in a `for` loop or similar situations.

## getdescription()

Returns a list describing each column in the current result set. Each item is a tuple of (column name, data type, etc.).

## setexectrace(callable)

## setrowtrace(callable)

## getexectrace()

## getrowtrace()

Sets or gets the tracers.

## Exceptions

All exception types have `apsw.Error` as a parent. The following exceptions can happen:

### ThreadingViolationError

You have used an object allocated in one thread in a different thread. All objects (`Connection`

### IncompleteExecutionError

You have tried to start a new SQL execute call before executing all the previous ones. See t

### BindingsError

There is an incorrect number of bindings when using tuples. Or you supplied a dictionary of

### ExecutionCompleteError

A statement is complete but you try to run it more anyway!

### ExecTraceAbort

The execution tracer returned `False` so execution was aborted.

The following Exception classes correspond to SQLite error codes.

## General Errors

SQLITE\_ERROR SQLError

SQLITE\_MISMATCH MismatchError

## Internal Errors

SQLITE\_INTERNAL InternalError

SQLITE\_PROTOCOL ProtocolError

SQLITE\_MISUSE MisuseError

SQLITE\_RANGE RangeError

## Permissions etc

SQLITE\_PERM PermissionsError

SQLITE\_READONLY ReadOnlyError

SQLITE\_CANTOPEN CantOpenError

SQLITE\_AUTH AuthError

Abort/Busy/etc

SQLITE\_ABORT AbortError

SQLITE\_BUSY BusyError

SQLITE\_LOCKED LockedError

SQLITE\_INTERRUPT InterruptError

SQLITE\_SCHEMA SchemaChangeError

SQLITE\_CONSTRAINT ConstraintError

Memory/Disk/etc

SQLITE\_NOMEM NoMemError

SQLITE\_IOERR IOError

SQLITE\_CORRUPT CorruptError

SQLITE\_FULL FullError

SQLITE\_TOOBIG TooBigError

SQLITE\_NOLFS NoLFSError

SQLITE\_EMPTY EmptyError

SQLITE\_FORMAT FormatError

SQLITE\_NOTADB NotADBError

## Types

Read about SQLite 3 types. ASPW always maintains the correct type for values, and never converts them to something else. Note however that SQLite may convert types based on column affinity as described in that link. ASPW requires that all values supplied are one of the corresponding Python/SQLite types (or a subclass).

\*

None in Python is NULL in SQLite

\*

Python int or long is INTEGER in SQLite. The value represented must fit within a 64 bit si

\*

Python's float type is used for REAL in SQLite. (At the C level they are both 8 byte quantities)

\*

Python's string or unicode is used for TEXT in SQLite. (ASPW automatically uses Python's string type)

\*

Python's buffer class is used for BLOB in SQLite.

## Unicode

All SQLite strings are Unicode. The actual binary representations can be UTF8, or UTF16 in either byte order. ASPW uses the UTF8 interface to SQLite which results in the binary string representation in your database defaulting to UTF8 as well. All this is totally transparent to your Python code.

Everywhere strings are used (eg as database values, SQL statements, bindings names, user defined functions) you can use Unicode strings. You can also use the bare Python string class, and ASPW will automatically call the unicode converter if any non-ascii characters are present.

When reading values from SQLite, ASPW uses the Python string class for any pure ASCII text, else it uses the Python unicode class.

## Multi-threading and re-entrancy

ASPW lets you use SQLite in multi-threaded programs and will let other threads execute while SQLite is working. (Technically the GIL is released when `sqlite3_step` or `sqlite3_open` are running. The GIL is re-acquired while user defined functions, collations and the various hooks/handlers run.)

Note that you cannot use the same Connection object in multiple threads. You must allocate a new Connection object per thread. (This is a requirement of SQLite). A cursor object can only be used in

the same thread as it was allocated. (Also an SQLite requirement). Fortunately ASPW will check this for you and throw a `ThreadingViolationError` if you try to use objects in the wrong thread. Note that your destructors also need to run in the creation thread.

If you have multiple threads and/or multiple programs accessing the same database then there may be contention for the file. SQLite will return `SQLITE_BUSY` which will be raised as `BusyError`. You can call the `Cursor.next()` method to resume execution. Alternately you can call `Connection.setbusytimeout` to set how long SQLite will retry for or `Connection.setbusyhandler` to install your own busy handler. SQLite's locking and concurrency is described here

A cursor object can only be executing one query at a time. You cannot issue a new query from inside a trace function or from a user defined function or collation since these are called while executing a query. You can however make new cursors and use those without issue. You may want to remember the `Connection` object when you set your trace or user defined functions.

## Tracing

You can install tracers on a cursor as an easy way of seeing exactly what gets executed and what is returned. The tracers can also abort execution and cause different values to be returned. This is very useful for diagnostics and testing without having to modify your main code.

Note: You cannot issue new execute statements against the cursor your tracer was called from. If you would like to make more queries in the tracer then do them from a new cursor object.

## Execution Tracer

The execution tracer is called after an SQL statement has been prepared. (ie syntax errors will have caused an exception during preparation so you won't see them with a tracer). It is called with two arguments. The first is a string which is the SQL statement about to be executed, and the second is the bindings used for that statement (and can be `None`). If the return value evaluates to `False/None` then execution is aborted with an `ExecTraceAbort` exception. See the example above.

## Row Tracer

The row tracer is called before each row is returned. The arguments are the items about to be returned. Whatever you return from the tracer is what is actually returned. If you return `None` then the whole row is skipped. See the example above.

## Execution model

This section only matters if you give multiple SQL statements in one go to `cursor.execute()`. (Statements are separated by semi-colons.)

SQLite does execution in two steps. First a statement is prepared, which verifies the syntax, tables and fields and converts the statement into an internal representation. The prepared statement is then run. Execution stops when a row is available, there is an error or the statement is complete.

The `cursor.execute()` method automatically does the preparing and starts execution. If none of the statements return rows then execution will go to the end. If a row is returned then you need to call `cursor.next()` to get the row values. Execution will resume as necessary to satisfy `next()` calls.

However this means that if you don't read the rows returned then the rest of your statements won't be executed. APSW will detect unexecuted previous statements and generate an exception. For example:

```
>>> cursor.execute("select * from foo ; create table bar(x,y,z)")
```

```
>>> cursor.execute("create table bam(x,y,z)")
```

```
Traceback (most recent call last):
```

```
File "<stdin>", line 1, in ?
```

```
apsw.IncompleteExecutionError: Error: there are still remaining sql statements to execute
```

Because I didn't read the results of `select * from foo` then the following `create table` command didn't have a chance to get executed. On the next `execute` that condition is detected and an exception raised.

## DBAPI notes

DBAPI is defined in PEP 249. This section describes how APSW complies or differs from it.

## Module Interface

There is no connect method. Use the Connection constructor instead, which only takes one parameter - the name of the database.

The Connection object and any cursors must all be used in the same thread they were allocated from. You cannot use them in different threads even if you protect them with mutexes.

Three different paramstyles are supported. You can use qmark ('... WHERE name=?'), numeric ('... WHERE name=?4') and named ('... WHERE name=:name'). Note that SQLite numbers parameters from one not zero.

The DBAPI exceptions are not used.

## Connection Objects

There is no close method

There are no commit or rollback methods. You should use cursor.execute("COMMIT") etc. The SQLite documentation has more details.

Several methods that are defined in DBAPI to be on the cursor are instead on the Connection object, since this is where SQLite actually stores the information. Doing operations in any other cursor attached to the same Connection object does update their values, and this makes you aware of that.

## Cursor Objects

Use getdescription() instead of description. This information is only obtained on request.

There is no rowcount.

callproc is not implemented as SQLite doesn't support stored procedures.

There is no close method.

`execute` returns the `Cursor` object and you can use it as an iterator to get the results (if any).

`executemany` returns the `Cursor` object and you can use it as an iterator to get the results (if any).

`fetchone` is not available. Use the cursor as an iterator, or call `next()` which raises `StopIteration` when there are no more results.

`fetchmany` is not available. Call `next()` for however many results you want.

`fetchall` is not available. Call `next()` or use a list comprehension such as `[row for row in cursor.execute("....")]`.

`nextset` is not applicable or implemented.

`arraysize` is not available as `fetchmany` isn't.

Neither `setinputsizes` or `setoutputsize` are applicable or implemented.

Type objects

None of the date or time methods are available since SQLite 3 does not have a native date or time type.

Use the standard Python buffer class for BLOBs.

Optional DB API Extensions

`rownumber` is not available.

Exception classes are not available as attributes of `Connection`.

Use `Cursor.getconnection()` to get the associated `Connection` object.

scroll and messages are not available.

The Cursor object supports the iterator protocol and this is the only way of getting information back.

To get the last inserted row id, call `Connection.last_insert_rowid()`. That stores the id from the last insert on any Cursor associated with the the Connection. You can also add `select last_insert_rowid()` to the end of your execute statements.

There is no errorhandler attribute.

### pysqlite differences

pysqlite already provides a DBAPI compliant wrapper over SQLite 2 and 3. APSW only wraps SQLite 3 has the following enhancements/differences over pysqlite 3:

\*

- ♦ Nothing\* happens behind your back (such as pysqlite trying to manage transactions for you)

\*

Blobs are supported - the standard Python buffer class is used. (pysqlite 2 appears to sup

\*

SQLite's Manifest typing is used, which limits values to being supplied as integer (32/64

\*

Strings are handled correctly (pysqlite has some issues with Unicode strings).

\*

apsw ensures that precision is maintained for integers. This means that 64 bit integers do

\*

A threading safety check is used - an exception happens if an sqlite object is used in a t

\*

While SQLite is executing the Python Global Interpreter Lock is released so other threads

\*

SQLITE\_BUSY is handled well. Although it is returned as an exception, you can call cursor.

\*

You can use semi-colons at the end of commands and you can have multiple commands in the e

\*

The cursor object is an iterator and returns itself from execute.

\*

No information is fetched that wasn't requested (eg there is no 'description' field that i

\*

You can have bindings supplied as a sequence type (tuple/list etc) for replacing ? in sql

\*

You can have bindings supplied as a dictionary type.

\*

cursor.executemany() also works with statements that return data such as selects, and you

\*

You can set the busy timeout by calling Connection.setbusyttimeout with the amount of time

\*

You can define your own SQL functions in Python.

\*

You can define your own collations in Python.

\*

You can implement tracers, authorizers and various hooks in Python.

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## Version History

## 1. 2.2-r1

You can use this release against any release of SQLite 3.

SQLite 3.2.2 API removed `sqlite3_global_recover`. That function was not wrapped in APSW. Note that SQLite 3.2.2 contains a bug fix that applies when you use 64 bit integer primary keys (32 bit ints are fine).

## 1. 2.1-r1

You can use this release against any release of SQLite 3.

- ♦ There are no changes in APSW except to correct an error in the example code (collations are registered against the connection not the cursor)

SQLite 3.2.1 had one addition in the stable C API, which was a new function named `sqlite3_global_recover`. That function is not applicable for wrapping in APSW.

## 1. 1.3-r1

You can use this release against any release of SQLite 3.

- ♦ The text string returned by `apsw.Error` used to say "apsw.APSWException" and has been changed to "apsw.Error". This is purely cosmetic and helps make clear what the class is. (The old string was what the original class name was in an earlier version of the code.)
  - ♦ Added `SQLITE_ALTER_TABLE` and `SQLITE_REINDEX` constants for the authorizer function. (These constants were introduced in SQLite 3.1.3).
  - ♦ Changed various C++-isms into standard C (eg // comments and the placing of some `CHECK_THREAD` macro calls)
  - ♦ Added module level function `apswversion` which returns the version of APSW.

SQLite 3.1.3 had no changes in the stable C API other than what is mentioned above. There were some new experimental functions added which are not currently documented on the SQLite website, which are not wrapped by APSW. Please contact me if you believe they will remain in SQLite and you would like them wrapped:

- ◆ `sqlite3_sleep` An alternative function which sleeps for a specified number of milliseconds can be provided. By default SQLite just uses the standard operating system call.
- ◆ `sqlite3_expired` This function is internal to statement execution. It would apply to the implementation of `Cursor.executemany` and could in theory provide a marginal improvement in performance.
- ◆ A global variable `sqlite3_temp_directory` can be used before any databases are opened to set where temporary files are created. By default SQLite just uses the standard operating system mechanisms.

### 1. 0.8-r3

There are no functional changes. The only changes were to correct some variable names in the example code (they were cut and pasted from the test code which used different names) and to make the source zip file extract its contents into a sub-directory which is the more typical way of packaging that sort of thing.

### 1. 0.8-r2

All remaining functionality in the C API for SQLite 3.0.8 is now available.

Finished this documentation.

### 1. 0.8-r1

Initial release

Last modified: Thu Jul 07 21:47:50 Pacific Standard Time 2005

## **boost**

**boost**

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# elementree

elementree

\$Id: README 2326 2005-03-17 07:45:21Z fredrik \$

=====

The elementtree library

=====

This kit contains the ElementTree library, a light-weight toolkit for

XML processing in Python.

For more information on this library, see:

<docs/index.html>

<http://effbot.org/zone/element.htm>

The modules are designed to work with Python 2.1 and newer. The core

ElementTree module and the SimpleXMLTreeBuilder class also works under

1. 5.2 and 2.0.

Enjoy /F

fredrik@pythonware.com

<http://www.pythonware.com>

---

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---

release info

---

This is release 1.2.6 of the ElementTree library.

For a list of changes in this release, see the CHANGES document.

The latest version of this library can be downloaded from:

<http://effbot.org/downloads>

Comments, bug reports, and patches are welcome. Send them to

[fredrik@pythonware.com](mailto:fredrik@pythonware.com).

Note that this is free software, with limited support. If you need

commercial support on this module, contact [fredrik@pythonware.com](mailto:fredrik@pythonware.com).

---

## contents

---

README This file

CHANGES List of changes in this release.

### elementtree/

ElementTree.py	Element tree implementation. For a minimal install, this file is all you need.
ElementPath.py	Element path support module. Adds limited XPath support to find/findtext/findall.
ElementInclude.py	Element include support module. Adds limited XInclude support.
HTMLTreeBuilder.py	Element tree builder for HTML. This only works for mostly well-formed HTML; if you need something that can parse arbitrary

HTML at least as good as your browser, use

TidyHTMLTreeBuilder or TidyTools (see below).

XMLTreeBuilder.py

Element tree builder for XML (compatibility;

new code should use the tree builder in the

ElementTree module).

TidyHTMLTreeBuilder.py

Element tree builder for HTML, based on the

tidylib library. This tree builder requires

the `_elementtidy` extension module (available

from <http://effbot.org/downloads>).

SimpleXMLTreeBuilder.py

Old element tree builder for XML, based on

`xmllib`, for Python versions where "expat" is

not available. Due to bugs in `xmllib`, the

namespace support is not reliable (run the

module as a script to find out exactly how

unreliable it is on your Python version...)

SgmlopXMLTreeBuilder.py Simple element tree builder based on the  
SGMLOP parser. Note: The current version  
does not support namespaces.

SimpleXMLWriter.py Simple XML writer

TidyTools.py Build element trees from HTML, using the  
external 'tidy' utility.

setup.py Build/installation script

docs/index.html API reference pages.

docs/\*

demo\*.py Sample scripts

samples/\* Sample data

selftest.py Selftest (requires Python 2.1 or later)

tidytest.py Selftest for TidyHTMLTreeBuilder components.

benchmark.py Benchmark script (usage: benchmark.py file)

## **expat**

**expat**

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## **fpconst**

**fpconst**

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Version 2.0, January 2004

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Version 1.3a

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gadfly

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pcre

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## THE BASIC LIBRARY FUNCTIONS

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Written by: Philip Hazel

Email local part: ph10

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popt1.7

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If such an object file uses only numerical parameters, data

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Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6.

Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

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**Random Hacker.**

<signature of Ty Coon>, 1 April 1990

Ty Coon, President of Vice

That's all there is to it!

## **pysqlite**

**pysqlite**

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## **python**

**python**

### A. HISTORY OF THE SOFTWARE

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Python was created in the early 1990s by Guido van Rossum at Stichting

Mathematisch Centrum (CWI, see <http://www.cwi.nl>) in the Netherlands

as a successor of a language called ABC. Guido remains Python's

principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for

National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>)

in Reston, Virginia where he released several versions of the

software.

In May 2000, Guido and the Python core development team moved to

BeOpen.com to form the BeOpen PythonLabs team. In October of the same

year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see <http://www.zope.com>). In 2001, the Python Software Foundation (PSF, see <http://www.python.org/psf/>) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of the PSF.

All Python releases are Open Source (see <http://www.opensource.org> for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

Release	Derived from	Year	Owner	GPL- compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no

2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
2.2.3	2.2.2	2003	PSF	yes
2.3	2.2.2	2002-2003	PSF	yes
2.3.1	2.3	2002-2003	PSF	yes

2.3.2	2.3.1	2002-2003	PSF	yes
2.3.3	2.3.2	2002-2003	PSF	yes
2.3.4	2.3.3	2004	PSF	yes
2.3.5	2.3.4	2005	PSF	yes
2.4	2.3	2004	PSF	yes
2.4.1	2.4.1	2005	PSF	yes
2.4.2	2.4.1	2005	PSF	yes

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(2) According to Richard Stallman, 1.6.1 is not GPL-compatible,

because its license has a choice of law clause. According to

CNRI, however, Stallman's lawyer has told CNRI's lawyer that 1.6.1

is "not incompatible" with the GPL.

Thanks to the many outside volunteers who have worked under Guido's

direction to make these releases possible.

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**pyxml**

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setupext/install\_data.py:

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schema/trex.py

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test/domapi/ (and test/test\_pyxmldom.py)

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## **SOAPppy 0.11.6**

**SOAPppy 0.11.6**

=====

SOAPpy - Simple to use SOAP library for Python

=====

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for integrating SOAPpy into Zope)

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**zlib**

zlib

## ZLIB DATA COMPRESSION LIBRARY

zlib 1.2.3 is a general purpose data compression library. All the code is

thread safe. The data format used by the zlib library is described by RFCs

(Request for Comments) 1950 to 1952 in the files

<http://www.ietf.org/rfc/rfc1950.txt> (zlib format), [rfc1951.txt](http://www.ietf.org/rfc/rfc1951.txt) (deflate format)

and [rfc1952.txt](http://www.ietf.org/rfc/rfc1952.txt) (gzip format). These documents are also available in other

formats from <ftp://ftp.uu.net/graphics/png/documents/zlib/zdoc-index.html>

All functions of the compression library are documented in the file `zlib.h`

(volunteer to write man pages welcome, contact [zlib@gzip.org](mailto:zlib@gzip.org)). A usage example

of the library is given in the file `example.c` which also tests that the library

is working correctly. Another example is given in the file `minigzip.c`. The

compression library itself is composed of all source files except `example.c` and

`minigzip.c`.

To compile all files and run the test program, follow the instructions given at

the top of `Makefile`. In short "make test; make install" should work for most

machines. For Unix: `./configure; make test; make install`. For MSDOS, use one

of the special makefiles such as Makefile.msc. For VMS, use make\_vms.com.

Questions about zlib should be sent to <zlib@gzip.org>, or to Gilles Vollant

<info@winimage.com> for the Windows DLL version. The zlib home page is

<http://www.zlib.org> or <http://www.gzip.org/zlib/> Before reporting a problem,

please check this site to verify that you have the latest version of zlib;

otherwise get the latest version and check whether the problem still exists or

not.

PLEASE read the zlib FAQ [http://www.gzip.org/zlib/zlib\\_faq.html](http://www.gzip.org/zlib/zlib_faq.html) before asking

for help.

Mark Nelson <markn@ieee.org> wrote an article about zlib for the Jan. 1997

issue of Dr. Dobb's Journal; a copy of the article is available in

<http://dogma.net/markn/articles/zlibtool/zlibtool.htm>

The changes made in version 1.2.3 are documented in the file ChangeLog.

Unsupported third party contributions are provided in directory "contrib".

A Java implementation of zlib is available in the Java Development Kit

<http://java.sun.com/j2se/1.4.2/docs/api/java/util/zip/package-summary.html>

See the zlib home page <http://www.zlib.org> for details.

A Perl interface to zlib written by Paul Marquess <pmqs@cpan.org> is in the

CPAN (Comprehensive Perl Archive Network) sites

<http://www.cpan.org/modules/by-module/Compress/>

A Python interface to zlib written by A.M. Kuchling <amk@amk.ca> is

available in Python 1.5 and later versions, see

<http://www.python.org/doc/lib/module-zlib.html>

A zlib binding for TCL written by Andreas Kupries <a.kupries@westend.com> is

available at [http://www.oche.de/~akupries/soft/trf/trf\\_zip.html](http://www.oche.de/~akupries/soft/trf/trf_zip.html)

An experimental package to read and write files in .zip format, written on top

of zlib by Gilles Vollant <info@winimage.com>, is available in the

contrib/minizip directory of zlib.

Notes for some targets:

- For Windows DLL versions, please see win32/DLL\_FAQ.txt

- For 64-bit Irix, deflate.c must be compiled without any optimization. With

`-O`, one libpng test fails. The test works in 32 bit mode (with the `-n32`

compiler flag). The compiler bug has been reported to SGI.

- zlib doesn't work with gcc 2.6.3 on a DEC 3000/300LX under OSF/1 2.1 it works

when compiled with cc.

- On Digital Unix 4.0D (formely OSF/1) on AlphaServer, the cc option -std1 is

necessary to get gzprintf working correctly. This is done by configure.

- zlib doesn't work on HP-UX 9.05 with some versions of /bin/cc. It works with

other compilers. Use "make test" to check your compiler.

- gzdopen is not supported on RISCOS, BEOS and by some Mac compilers.

- For PalmOs, see <http://palmzlib.sourceforge.net/>

- When building a shared, i.e. dynamic library on Mac OS X, the library must be

installed before testing (do "make install" before "make test"), since the

library location is specified in the library.

## Acknowledgments:

The deflate format used by zlib was defined by Phil Katz. The deflate

and zlib specifications were written by L. Peter Deutsch. Thanks to all the

people who reported problems and suggested various improvements in zlib;

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