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# pyDAL Documentation

*Release 15.9*

**web2py-developers**

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## Indices and tables

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## 1.1 Subpackages

### 1.1.1 pydal.adapters package

#### Submodules

#### pydal.adapters.base module

**class** `pydal.adapters.base.AdapterMeta`

Bases: `type`

Metaclass to support manipulation of adapter classes.

At the moment is used to intercept *entity\_quoting* argument passed to DAL.

**class** `pydal.adapters.base.BaseAdapter` (*db, uri, pool\_size=0, folder=None, db\_codec='UTF-8', credential\_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver\_args={}, adapter\_args={}, do\_connect=True, after\_connection=None*)

Bases: `pydal.connection.ConnectionPool`

**ADD** (*first, second*)

**AGGREGATE** (*first, what*)

**ALLOW\_NULL** ()

**AND** (*first, second*)

**AS** (*first, second*)

**BELONGS** (*first, second*)

**CASE** (*query, t, f*)

**CAST** (*first, second*)

**COALESCE** (*first, second*)

**COALESCE\_ZERO** (*first*)

**COMMA** (*first, second*)

**CONCAT** (*\*items*)

**CONTAINS** (*first, second, case\_sensitive=True*)

**COUNT** (*first, distinct=None*)

**DIV** (*first, second*)

**ENDSWITH** (*first, second*)

**EPOCH** (*first*)

**EQ** (*first, second=None*)

**EXPAND\_CASE** (*query, true\_false*)

**EXTRACT** (*first, what*)

**FALSE = 'F'**

**FALSE\_exp = '0'**

**GE** (*first, second=None*)

**GT** (*first, second=None*)

**ILIKE** (*first, second, escape=None*)  
Case insensitive like operator

**INVERT** (*first*)

**JOIN** ()

**LE** (*first, second=None*)

**LEFT\_JOIN** ()

**LENGTH** (*first*)

**LIKE** (*first, second, escape=None*)  
Case sensitive like operator

**LOWER** (*first*)

**LT** (*first, second=None*)

**MOD** (*first, second*)

**MUL** (*first, second*)

**NE** (*first, second=None*)

**NOT** (*first*)

**NOT\_NULL** (*default, field\_type*)

**ON** (*first, second*)

**OR** (*first, second*)

**PRIMARY\_KEY** (*key*)

**QUOTE\_TEMPLATE = "%s"**

**RANDOM** ()

**RAW** (*first*)



---

**REGEXP** (*first, second*)  
Regular expression operator

**REPLACE** (*first, tup*)

**STARTSWITH** (*first, second*)

**SUB** (*first, second*)

**SUBSTRING** (*field, parameters*)

**TRUE** = 'T'

**TRUE\_exp** = '1'

**T\_SEP** = ' '

**UPPER** (*first*)

**adapt** (*obj*)

**alias** (*table, alias*)  
Given a table object, makes a new table object with alias name.

**build\_parsemap** ()

**bulk\_insert** (*table, items*)

**can\_join** ()

**can\_select\_for\_update** = True

**close\_connection** ()

**commit** ()

**commit\_on\_alter\_table** = False

**commit\_prepared** (*key*)

**common\_filter** (*query, tablename*)

**concat\_add** (*tablename*)

**connection** = None

**connector** (*\*args, \*\*kwargs*)

**constraint\_name** (*table, fieldname*)

**count** (*query, distinct=None*)

**create\_sequence\_and\_triggers** (*query, table, \*\*args*)

**create\_table** (*table, migrate=True, fake\_migrate=False, polymodel=None*)

**current\_cursor\_in\_use** = False

**cursors\_in\_use** = []

**dbpath** = None

**delete** (*tablename, query*)

**distributed\_transaction\_begin** (*key*)

**driver** = None

**driver\_auto\_json** = []

**driver\_name** = None

**drivers** = ()

**drop** (*table*, *mode*='')

**execute** (\**a*, \*\**b*)

**execute\_test\_query** ()

**expand** (*expression*, *field\_type*=None, *colnames*=False)

**expand\_all** (*fields*, *tablenames*)

**file\_close** (*fileobj*)

**file\_delete** (*filename*)

**file\_exists** (*filename*)

**file\_open** (*filename*, *mode*='rb', *lock*=True)

**find\_driver** (*adapter\_args*, *uri*=None)

**folder** = None

**get\_cursor** ()

**get\_table** (\**queries*)

**id\_query** (*table*)

**insert** (*table*, *fields*)

**isOperationalError** (*exception*)

**isProgrammingError** (*exception*)

**is\_numerical\_type** (*ftype*)

**iterparse** (*sql*, *fields*, *colnames*, *blob\_decode*=True, *cacheable*=False)  
Iterator to parse one row at a time. It doesn't support the old style virtual fields

**iterselect** (*query*, *fields*, *attributes*)

**lastrowid** (*table*)

**like\_escaper\_default** (*term*)

**log** (*message*, *table*=None)  
Logs migrations  
It will not log changes if logfile is not specified. Defaults to sql.log

**log\_execute** (\**a*, \*\**b*)

**migrate\_table** (*table*, *sql\_fields*, *sql\_fields\_old*, *sql\_fields\_aux*, *logfile*, *fake\_migrate*=False)

**parse** (*rows*, *fields*, *colnames*, *blob\_decode*=True, *cacheable*=False)

**parse\_blob** (*value*, *field\_type*)

**parse\_boolean** (*value*, *field\_type*)

**parse\_date** (*value*, *field\_type*)

**parse\_datetime** (*value*, *field\_type*)

**parse\_decimal** (*value*, *field\_type*)

**parse\_double** (*value*, *field\_type*)

**parse\_id** (*value*, *field\_type*)

**parse\_integer** (*value, field\_type*)  
**parse\_json** (*value, field\_type*)  
**parse\_list\_integers** (*value, field\_type*)  
**parse\_list\_references** (*value, field\_type*)  
**parse\_list\_strings** (*value, field\_type*)  
**parse\_reference** (*value, field\_type*)  
**parse\_time** (*value, field\_type*)  
**parse\_value** (*value, field\_type, blob\_decode=True*)  
**prepare** (*key*)  
**represent** (*obj, fieldtype*)  
**represent\_exceptions** (*obj, fieldtype*)  
**rollback** ()  
**rollback\_prepared** (*key*)  
**rowslice** (*rows, minimum=0, maximum=None*)  
 By default this function does nothing; overload when db does not do slicing.  
**save\_dbt** (*table, sql\_fields\_current*)  
**select** (*query, fields, attributes*)  
 Always returns a Rows object, possibly empty.  
**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)  
**sequence\_name** (*tablename*)  
**smart\_adapt** (*obj*)  
**sqlsafe\_field** (*fieldname*)  
**sqlsafe\_table** (*tablename, ot=None*)  
**support\_distributed\_transaction = False**  
**table\_alias** (*tbl*)  
**tables** (*\*queries*)  
**test\_query = 'SELECT 1;'**  
**trigger\_name** (*tablename*)  
**truncate** (*table, mode=' '*)  
**types = {'reference': 'INTEGER REFERENCES %(foreign\_key)s ON DELETE %(on\_delete\_action)s %(null)s %(unic**  
**update** (*tablename, query, fields*)  
**uploads\_in\_blob = False**  
**varquote** (*name*)

**class** pydal.adapters.base.NoSQLAdapter (*db, uri, pool\_size=0, folder=None, db\_codec='UTF-8', credential\_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver\_args={}, adapter\_args={}, do\_connect=True, after\_connection=None*)  
 Bases: pydal.adapters.base.BaseAdapter

**ADD** (*first, second*)

**AGGREGATE** (*first, what*)

**AND** (*first, second*)

**AS** (*first, second*)

**DIV** (*first, second*)

**ENDSWITH** (*first, second=None*)

**EXTRACT** (*first, what*)

**ILIKE** (*first, second*)

**LEFT\_JOIN** ()

**LENGTH** (*first*)

**LOWER** (*first*)

**MUL** (*first, second*)

**ON** (*first, second*)

**OR** (*first, second*)

**PRIMARY\_KEY** (*key*)

**QUOTE\_TEMPLATE** = '%s'

**RANDOM** ()

**STARTSWITH** (*first, second=None*)

**SUB** (*first, second*)

**SUBSTRING** (*field, parameters*)

**UPPER** (*first*)

**can\_join** ()

**can\_select\_for\_update** = False

**close\_connection** ()  
remember: no transactions on many NoSQL

**commit** ()  
remember: no transactions on many NoSQL

**commit\_prepared** (*key*)

**concat\_add** (*table*)

**constraint\_name** (*table, fieldname*)

**create\_sequence\_and\_triggers** (*query, table, \*\*args*)

**distributed\_transaction\_begin** (*key*)

**drop** (*table, mode*)

**execute** (*\*a, \*\*b*)

**execute\_test\_query** ()  
NoSql DBs don't have a universal query language. Override this specific driver if need to test connection status. Throw exception on failure.

**id\_query** (*table*)  
**lastrowid** (*table*)  
**log\_execute** (*\*a, \*\*b*)  
**migrate\_table** (*\*a, \*\*b*)  
**parse\_list\_integers** (*value, field\_type*)  
**parse\_list\_references** (*value, field\_type*)  
**parse\_list\_strings** (*value, field\_type*)  
**prepare** (*key*)  
**represent** (*obj, fieldtype*)  
**represent\_exceptions** (*obj, fieldtype*)  
**rollback** ()  
     remember: no transactions on many NoSQL  
**rollback\_prepared** (*key*)  
**rowslice** (*rows, minimum=0, maximum=None*)

### pydal.adapters.couchdb module

```

class pydal.adapters.couchdb.CouchDBAdapter (db, uri='couchdb://127.0.0.1:5984',
                                             pool_size=0, folder=None, db_codec='UTF-8',
                                             credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={},
                                             adapter_args={}, do_connect=True, after_connection=None)
  
```

Bases: `pydal.adapters.base.NoSQLAdapter`

**AND** (*first, second*)  
**COMMA** (*first, second*)  
**EQ** (*first, second*)  
**NE** (*first, second*)  
**OR** (*first, second*)  
**count** (*query, distinct=None*)  
**create\_table** (*table, migrate=True, fake\_migrate=False, polymodel=None*)  
**delete** (*tablename, query*)  
**drivers** = ('couchdb',)  
**expand** (*expression, field\_type=None*)  
**file\_close** (*fileobj*)  
**file\_exists** (*filename*)  
**file\_open** (*filename, mode='rb', lock=True*)  
**insert** (*table, fields*)  
**represent** (*obj, fieldtype*)

```
select (query, fields, attributes)
types = {'string': <type 'str'>, 'reference': <type 'long'>, 'text': <type 'str'>, 'id': <type 'long'>, 'float': <type 'float'>},
update (tablename, query, fields)
uploads_in_blob = True
```

### pydal.adapters.cubrid module

```
class pydal.adapters.cubrid.CubridAdapter (db, uri, pool_size=0, folder=None,  
                                           db_codec='UTF-8', credential_decoder=<function IDENTITY at  
                                           0x7f0e31b4e398>, driver_args={},  
                                           adapter_args={}, do_connect=True, af-  
                                           ter_connection=None)
```

Bases: `pydal.adapters.mysql.MySQLAdapter`

**REGEX\_URI** = <\_sre.SRE\_Pattern object at 0x2a77e10>

**after\_connection** ()

**drivers** = ('cubridb',)

### pydal.adapters.db2 module

```
class pydal.adapters.db2.DB2Adapter (db, uri, pool_size=0, folder=None, db_codec='UTF-  
                                       8', credential_decoder=<function IDENTITY at  
                                       0x7f0e31b4e398>, driver_args={}, adapter_args={},  
                                       do_connect=True, after_connection=None)
```

Bases: `pydal.adapters.base.BaseAdapter`

**LEFT\_JOIN** ()

**RANDOM** ()

**drivers** = ('ibm\_db\_dbi', 'pyodbc')

**execute** (*command, placeholders=None*)

**lastrowid** (*table*)

**represent\_exceptions** (*obj, fieldtype*)

**rowslice** (*rows, minimum=0, maximum=None*)

**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)

**types** = {'reference': 'INT, FOREIGN KEY (%(field\_name)s) REFERENCES %(foreign\_key)s ON DELETE %(on\_del

### pydal.adapters.firebird module

```
class pydal.adapters.firebird.FireBirdAdapter (db, uri, pool_size=0, folder=None,  
                                                db_codec='UTF-8', credential_decoder=<function IDENTITY  
                                                at 0x7f0e31b4e398>, driver_args={},  
                                                adapter_args={}, do_connect=True, af-  
                                                ter_connection=None)
```

Bases: `pydal.adapters.base.BaseAdapter`

**CONTAINS** (*first, second, case\_sensitive=False*)

```

EPOCH (first)
LENGTH (first)
NOT_NULL (default, field_type)
RANDOM ()
REGEX_URI = <_sre.SRE_Pattern object at 0x2b28a60>
SUBSTRING (field, parameters)
commit_on_alter_table = True
create_sequence_and_triggers (query, table, **args)
drivers = ('kinterbasdb', 'firebirdsql', 'fdb', 'pyodbc')
lastrowid (table)
select_limitby (sql_s, sql_f, sql_t, sql_w, sql_o, limitby)
sequence_name (tablename)
support_distributed_transaction = True
trigger_name (tablename)
types = {'reference': 'INTEGER REFERENCES %(foreign_key)s ON DELETE %(on_delete_action)s', 'text': 'BLOB'}
class pydal.adapters.firebird.FireBirdEmbeddedAdapter (db, uri, pool_size=0,
                                                       folder=None,
                                                       db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>,
                                                       driver_args={},
                                                       adapter_args={},
                                                       do_connect=True, after_connection=None)
Bases: pydal.adapters.firebird.FireBirdAdapter
REGEX_URI = <_sre.SRE_Pattern object at 0x2b47700>
drivers = ('kinterbasdb', 'firebirdsql', 'fdb', 'pyodbc')

```

## pydal.adapters.google\_adapters module

Adapter for GAE

## pydal.adapters.imap module

```

class pydal.adapters.imap.IMAPAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8',
                                       credential_decoder=<function IDENTITY at 0x7f0e31b4e398>,
                                       driver_args={}, adapter_args={},
                                       do_connect=True, after_connection=None)
Bases: pydal.adapters.base.NoSQLAdapter

```

IMAP server adapter

This class is intended as an interface with email IMAP servers to perform simple queries in the web2py DAL query syntax, so email read, search and other related IMAP mail services (as those implemented by brands like Google(r), and Yahoo!(r) can be managed from web2py applications.

The code uses examples by Yuji Tomita on this post: <http://yuji.wordpress.com/2011/06/22/python-imaplib-imap-example-with-gmail/#comment-1137> and is based in docs for Python imaplib, python email and email IETF's (i.e. RFC2060 and RFC3501)

This adapter was tested with a small set of operations with Gmail(r). Other services requests could raise command syntax and response data issues.

It creates its table and field names “statically”, meaning that the developer should leave the table and field definitions to the DAL instance by calling the adapter's .define\_tables() method. The tables are defined with the IMAP server mailbox list information.

.define\_tables() returns a dictionary mapping dal tablenames to the server mailbox names with the following structure:

```
{<tablename>: str <server mailbox name>}
```

Here is a list of supported fields:

Field	Type	Description
uid	string	
answered	boolean	Flag
created	date	
content	list:string	A list of dict text or html parts
to	string	
cc	string	
bcc	string	
size	integer	the amount of octets of the message*
deleted	boolean	Flag
draft	boolean	Flag
flagged	boolean	Flag
sender	string	
recent	boolean	Flag
seen	boolean	Flag
subject	string	
mime	string	The mime header declaration
email	string	The complete RFC822 message (*)
attachments	list	Each non text part as dict
encoding	string	The main detected encoding

(\*) At the application side it is measured as the length of the RFC822 message string

WARNING: As row id's are mapped to email sequence numbers, make sure your imap client web2py app does not delete messages during select or update actions, to prevent updating or deleting different messages. Sequence numbers change whenever the mailbox is updated. To avoid this sequence numbers issues, it is recommended the use of uid fields in query references (although the update and delete in separate actions rule still applies).

```
# This is the code recommended to start imap support
# at the app's model:
```

```
imapdb = DAL("imap://user:password@server:port", pool_size=1) # port 993 for ssl
imapdb.define_tables()
```

Here is an (incomplete) list of possible imap commands:

```
# Count today's unseen messages
# smaller than 6000 octets from the
# inbox mailbox

q = imapdb.INBOX.seen == False
```



```

q &= imapdb.INBOX.created == datetime.date.today()
q &= imapdb.INBOX.size < 6000
unread = imapdb(q).count()

# Fetch last query messages
rows = imapdb(q).select()

# it is also possible to filter query select results with limitby and
# sequences of mailbox fields

set.select(<fields sequence>, limitby=<int>, <int>))

# Mark last query messages as seen
messages = [row.uid for row in rows]
seen = imapdb(imapdb.INBOX.uid.belongs(messages)).update(seen=True)

# Delete messages in the imap database that have mails from mr. Gumby

deleted = 0
for mailbox in imapdb.tables
    deleted += imapdb(imapdb[mailbox].sender.contains("gumby")).delete()

# It is possible also to mark messages for deletion instead of erasing them
# directly with set.update(deleted=True)

# This object give access
# to the adapter auto mailbox
# mapped names (which native
# mailbox has what table name)

imapdb.mailboxes <dict> # tablename, server native name pairs

# To retrieve a table native mailbox name use:
imapdb.<table>.mailbox

### New features v2.4.1:

# Declare mailboxes statically with tablename, name pairs
# This avoids the extra server names retrieval

imapdb.define_tables({"inbox": "INBOX"})

# Selects without content/attachments/email columns will only
# fetch header and flags

imapdb(q).select(imapdb.INBOX.sender, imapdb.INBOX.subject)

AND (first, second)
BELONGS (first, second)
CONTAINS (first, second, case_sensitive=False)
EQ (first, second)
GE (first, second)
GT (first, second)
LE (first, second)

```

**LT** (*first, second*)

**NE** (*first, second=None*)

**NOT** (*first*)

**OR** (*first, second*)

**REGEX\_URI** = `<_sre.SRE_Pattern object at 0x7f0e313943a0>`

**convert\_date** (*date, add=None, imf=False*)

**count** (*query, distinct=None*)

**create\_table** (*\*args, \*\*kwargs*)

**dbengine** = 'imap'

**define\_tables** (*mailbox\_names=None*)

Auto create common IMAP files

This function creates fields definitions “statically” meaning that custom fields as in other adapters should not be supported and definitions handled on a service/mode basis (local syntax for Gmail(r), Ymail(r))

Returns a dictionary with tablename, server native mailbox name pairs.

**delete** (*tablename, query*)

**drivers** = ('imaplib',)

**encode\_text** (*text, charset, errors='replace'*)

convert text for mail to unicode

**get\_charset** (*message*)

**get\_last\_message** (*tablename*)

**get\_mailboxes** ()

Query the mail database for mailbox names

**get\_query\_mailbox** (*query*)

**get\_uid\_bounds** (*tablename*)

**static header\_represent** (*f, r*)

**insert** (*table, fields*)

**is\_flag** (*flag*)

**reconnect** (*f=None*)

IMAP4 Pool connection method

imap connection lacks of self cursor command. A custom command should be provided as a replacement for connection pooling to prevent uncaught remote session closing

**select** (*query, fields, attributes*)

Searches and Fetches records and return web2py rows

**types** = {'boolean': <type 'bool'>, 'string': <type 'str'>, 'list:string': <type 'str'>, 'integer': <type 'int'>, 'date': <type 'date'>}

**update** (*tablename, query, fields*)

**uri** = None

MESSAGE is an identifier for sequence number

**pydal.adapters.informix module**

```
class pydal.adapters.informix.InformixAdapter(db, uri, pool_size=0, folder=None,
                                              db_codec='UTF-8', credential_decoder=<function IDENTITY
                                              at 0x7f0e31b4e398>, driver_args={},
                                              adapter_args={}, do_connect=True, after_connection=None)
```

Bases: `pydal.adapters.base.BaseAdapter`

**NOT\_NULL** (*default, field\_type*)

**RANDOM** ()

**REGEX\_URI** = <\_sre.SRE\_Pattern object at 0x7f0e31b9fc30>

**drivers** = ('informixdb',)

**execute** (*command*)

**lastrowid** (*table*)

**represent\_exceptions** (*obj, fieldtype*)

**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)

**types** = {'reference': 'INTEGER REFERENCES %(foreign\_key)s ON DELETE %(on\_delete\_action)s', 'text': 'BLOB'}

```
class pydal.adapters.informix.InformixSEAdapter(db, uri, pool_size=0, folder=None,
                                              db_codec='UTF-8', credential_decoder=<function IDENTITY
                                              at 0x7f0e31b4e398>, driver_args={},
                                              adapter_args={}, do_connect=True, after_connection=None)
```

Bases: `pydal.adapters.informix.InformixAdapter`

work in progress

**rowslice** (*rows, minimum=0, maximum=None*)

**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)

**pydal.adapters.ingres module**

```
class pydal.adapters.ingres.IngresAdapter(db, uri, pool_size=0, folder=None,
                                              db_codec='UTF-8', credential_decoder=<function IDENTITY
                                              at 0x7f0e31b4e398>, driver_args={},
                                              adapter_args={}, do_connect=True, after_connection=None)
```

Bases: `pydal.adapters.base.BaseAdapter`

**LEFT\_JOIN** ()

**RANDOM** ()

**create\_sequence\_and\_triggers** (*query, table, \*\*args*)

**drivers** = ('pyodbc',)

**lastrowid** (*table*)

**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)

```

types = {'reference': 'INT, FOREIGN KEY (%(field_name)s) REFERENCES %(foreign_key)s ON DELETE %(on_del
class pydal.adapters.ingres.IngresUnicodeAdapter(db, uri, pool_size=0, folder=None,
                                                db_codec='UTF-8', credential
                                                tial_decoder=<function IDENTITY
                                                at 0x7f0e31b4e398>, driver_args={},
                                                adapter_args={}, do_connect=True,
                                                after_connection=None)

Bases: pydal.adapters.ingres.IngresAdapter

drivers = ('pyodbc',)

types = {'reference': 'INTEGER4, FOREIGN KEY (%(field_name)s) REFERENCES %(foreign_key)s ON DELETE %

```

### pydal.adapters.mongo module

```

class pydal.adapters.mongo.Binary
    Bases: object

class pydal.adapters.mongo.MongoBlob
    Bases: pydal.adapters.mongo.Binary

    MONGO_BLOB_BYTES = 0

    MONGO_BLOB_NON_UTF8_STR = 1

    static decode (value)

class pydal.adapters.mongo.MongoDBAdapter(db, uri='mongodb://127.0.0.1:5984/db',
                                           pool_size=0, folder=None, db_codec='UTF-
                                           8', credential_decoder=<function IDEN-
                                           TITY at 0x7f0e31b4e398>, driver_args={},
                                           adapter_args={}, do_connect=True, af-
                                           ter_connection=None)

Bases: pydal.adapters.base.NoSQLAdapter

ADD (first, *args, **kwargs)

AGGREGATE (first, *args, **kwargs)

AND (first, second)

AS (first, *args, **kwargs)

AS_MARK = '__#AS#__'

BELONGS (first, second)

CMP_OPS_AGGREGATION_PIPELINE (op, first, second)

COALESCE (first, *args, **kwargs)

COMMA (first, second)

CONTAINS (first, second, case_sensitive=True)

COUNT (first, *args, **kwargs)

DIV (first, *args, **kwargs)

ENDSWITH (first, second)

EPOCH (first, *args, **kwargs)

EQ (first, second=None, *args, **kwargs)

```

**EXPAND\_CASE** (*first, \*args, \*\*kwargs*)

**EXTRACT** (*first, \*args, \*\*kwargs*)

**class Expanded** (*adapter, crud, query, fields=(), tablename=None, groupby=None, distinct=False, having=None*)

Bases: `object`

Class to encapsulate a pydal expression and track the parse expansion and its results.

Two different MongoDB mechanisms are targeted here. If the query is sufficiently simple, then simple queries are generated. The bulk of the complexity here is however to support more complex queries that are targeted to the MongoDB Aggregation Pipeline.

This class supports four operations: ‘count’, ‘select’, ‘update’ and ‘delete’.

Behavior varies somewhat for each operation type. However building each pipeline stage is shared where the behavior is the same (or similar) for the different operations.

In general an attempt is made to build the query without using the pipeline, and if that fails then the query is rebuilt with the pipeline.

**QUERY constructed in `_build_pipeline_query()`:** `$project` : used to calculate expressions if needed  
`$match`: filters out records

**FIELDS constructed in `_expand_fields()`:**

**FIELDS:COUNT** `$group` : filter for distinct if needed `$group`: count the records remaining

**FIELDS:SELECT** `$group` : implement aggregations if needed `$project`: implement expressions (etc) for select

**FIELDS:UPDATE** `$project`: implement expressions (etc) for update

**HAVING constructed in `_add_having()`:** `$project` : used to calculate expressions `$match`: filters out records `$project` : used to filter out previous expression fields

**`annotate_expression`** (*expression*)

**`get_collection`** (*safe=None*)

`MongoDBAdapter`.**GE** (*\*args, \*\*kwargs*)

`MongoDBAdapter`.**GROUP\_MARK** = ‘`__#GROUP#__`’

`MongoDBAdapter`.**GT** (*\*args, \*\*kwargs*)

`MongoDBAdapter`.**ILIKE** (*first, second, escape=None*)

`MongoDBAdapter`.**INVERT** (*first*)

`MongoDBAdapter`.**LE** (*\*args, \*\*kwargs*)

`MongoDBAdapter`.**LENGTH** (*first*)

<https://jira.mongodb.org/browse/SERVER-5319> <https://github.com/afchin/mongo/commit/f52105977e4d0ccb53bddd9c45>

`MongoDBAdapter`.**LIKE** (*first, second, case\_sensitive=True, escape=None*)

`MongoDBAdapter`.**LOWER** (*first, \*args, \*\*kwargs*)

`MongoDBAdapter`.**LT** (*\*args, \*\*kwargs*)

`MongoDBAdapter`.**MOD** (*first, \*args, \*\*kwargs*)

`MongoDBAdapter`.**MUL** (*first, \*args, \*\*kwargs*)

`MongoDBAdapter`.**NE** (*first, second=None, \*args, \*\*kwargs*)

`MongoDBAdapter`.**NOT** (*first*)

**exception** `MongoDBAdapter.NotOnNoSqlError` (*message=None*)  
Bases: `exceptions.NotImplementedError`

`MongoDBAdapter.ON` (*first, second*)

`MongoDBAdapter.OR` (*first, second*)

`MongoDBAdapter.RANDOM` ()  
`ORDER BY RANDOM()`

<https://github.com/mongodb/cookbook/blob/master/content/patterns/random-attribute.txt>  
<https://jira.mongodb.org/browse/SERVER-533> <http://stackoverflow.com/questions/19412/how-to-request-a-random-row-in-sql>

`MongoDBAdapter.REGEXP` (*first, second, case\_sensitive=True*)  
MongoDB provides regular expression capabilities for pattern matching strings in queries. MongoDB uses Perl compatible regular expressions (i.e. 'PCRE') version 8.36 with UTF-8 support.

`MongoDBAdapter.REGEXP_MARK1` = `'_#REGEXP_1#_'`

`MongoDBAdapter.REGEXP_MARK2` = `'_#REGEXP_2#_'`

`MongoDBAdapter.REGEX_SELECT_AS_PARSER` = `<_sre.SRE_Pattern object at 0x7f0e31b3b1b8>`

`MongoDBAdapter.STARTSWITH` (*first, second*)

`MongoDBAdapter.SUB` (*first, \*args, \*\*kwargs*)

`MongoDBAdapter.SUBSTRING` (*first, \*args, \*\*kwargs*)

`MongoDBAdapter.UPPER` (*first, \*args, \*\*kwargs*)

`MongoDBAdapter.bulk_insert` (*table, items*)

`MongoDBAdapter.check_fields_for_cmp` (*f*)

`MongoDBAdapter.count` (*query, distinct=None, snapshot=True*)

`MongoDBAdapter.create_table` (*table, migrate=True, fake\_migrate=False, polymodel=None*)

`MongoDBAdapter.delete` (*tablename, query, safe=None*)

`MongoDBAdapter.driver_auto_json` = `['loads', 'dumps']`

`MongoDBAdapter.drivers` = `('pymongo',)`

`MongoDBAdapter.drop` (*table, mode=''*)

`MongoDBAdapter.expand` (*expression, field\_type=None*)

**static** `MongoDBAdapter.has_field` (*expression*)

`MongoDBAdapter.insert` (*table, fields, safe=None*)  
Safe determines whether a asynchronous request is done or a synchronous action is done For safety, we use by default synchronous requests

`MongoDBAdapter.needs_mongodb_aggregation_pipeline` (*f*)

`MongoDBAdapter.object_id` (*arg=None*)  
Convert input to a valid Mongodb ObjectId instance  
`self.object_id("<random>") -> ObjectId (not unique) instance`

`MongoDBAdapter.parse_blob` (*value, field\_type*)

**static** `MongoDBAdapter.parse_data` (*expression, attribute, value=None*)

`MongoDBAdapter.parse_id` (*value, field\_type*)

```

MongoDBAdapter.parse_reference (value, field_type)
MongoDBAdapter.represent (obj, fieldtype)
MongoDBAdapter.select (query, fields, attributes, snapshot=False)
MongoDBAdapter.truncate (table, mode, safe=None)
MongoDBAdapter.types = {'string': <type 'str'>, 'reference': <type 'long'>, 'text': <type 'str'>, 'id': <type 'long'>, 'f
MongoDBAdapter.update (tablename, query, fields, safe=None)
MongoDBAdapter.uploads_in_blob = False
MongoDBAdapter.validate_second (f)

```

### pydal.adapters.mssql module

```

class pydal.adapters.mssql.MSSQL2Adapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQLAdapter
    ILIKE (first, second, escape=None)
        Case insensitive like operator
    drivers = ('pyodbc',)
    execute (*a, **b)
    represent (obj, fieldtype)
    types = {'reference': 'INT %(null)s %(unique)s, CONSTRAINT %(constraint_name)s FOREIGN KEY (%(field_name)s

class pydal.adapters.mssql.MSSQL3Adapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQLAdapter
    Experimental support for pagination in MSSQL
    Requires MSSQL >= 2005, uses ROW_NUMBER()
    rowslice (rows, minimum=0, maximum=None)
    select_limitby (sql_s, sql_f, sql_t, sql_w, sql_o, limitby)
    types = {'reference': 'INT %(null)s %(unique)s, CONSTRAINT %(constraint_name)s FOREIGN KEY (%(field_name)s

class pydal.adapters.mssql.MSSQL3NAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQLNAdapter
    drivers = ('pyodbc',)
    Experimental support for pagination in MSSQL Experimental: see MSSQLNAdapter docstring for warnings

```

Requires MSSQL >= 2005, uses *ROW\_NUMBER()*

**rowslice** (*rows, minimum=0, maximum=None*)

**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)

**types** = {'reference': 'INT %(null)s %(unique)s, CONSTRAINT %(constraint\_name)s FOREIGN KEY %(field\_name)s

```
class pydal.adapters.mssql.MSSQL4Adapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8',
                                          credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={},
                                          adapter_args={}, do_connect=True, srid=4326,
                                          after_connection=None)
```

Bases: `pydal.adapters.mssql.MSSQLAdapter`

Support for “native” pagination

Requires MSSQL >= 2012, uses *OFFSET ... ROWS ... FETCH NEXT ... ROWS ONLY*

**rowslice** (*rows, minimum=0, maximum=None*)

**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)

**types** = {'reference': 'INT %(null)s %(unique)s, CONSTRAINT %(constraint\_name)s FOREIGN KEY %(field\_name)s

```
class pydal.adapters.mssql.MSSQL4NAdapter (db, uri, pool_size=0, folder=None,
                                           db_codec='UTF-8', credential_decoder=<function IDENTITY at
                                           0x7f0e31b4e398>, driver_args={},
                                           adapter_args={}, do_connect=True, srid=4326,
                                           after_connection=None)
```

Bases: `pydal.adapters.mssql.MSSQLNAdapter`

Experimental: see `MSSQLNAdapter` docstring for warnings Support for “native” pagination

Unicode-compatible version Requires MSSQL >= 2012, uses *OFFSET ... ROWS ... FETCH NEXT ... ROWS ONLY* After careful testing, this should be the de-facto adapter for recent MSSQL backends

**rowslice** (*rows, minimum=0, maximum=None*)

**select\_limitby** (*sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby*)

**types** = {'reference': 'INT %(null)s %(unique)s, CONSTRAINT %(constraint\_name)s FOREIGN KEY %(field\_name)s

```
class pydal.adapters.mssql.MSSQLAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8',
                                          credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={},
                                          adapter_args={}, do_connect=True, srid=4326,
                                          after_connection=None)
```

Bases: `pydal.adapters.base.BaseAdapter`

**AGGREGATE** (*first, what*)

**ALLOW\_NULL** ()

**CAST** (*first, second*)

**CONCAT** (*\*items*)

**CONTAINS** (*first, second, case\_sensitive=True*)

**ENDSWITH** (*first, second*)

**EPOCH** (*first*)

**EXTRACT** (*field, what*)



```

FALSE = 0
ILIKE (first, second, escape=None)
    Case insensitive like operator
LEFT_JOIN ()
LENGTH (first)
LIKE (first, second, escape=None)
    Case sensitive like operator
PRIMARY_KEY (key)
QUOTE_TEMPLATE = "%s"
RANDOM ()
REGEXP (first, second)
REGEX_ARGPATTERN = <_sre.SRE_Pattern object at 0x7f0e313b4370>
REGEX_DSN = <_sre.SRE_Pattern object at 0x7f0e318fea08>
REGEX_URI = <_sre.SRE_Pattern object at 0x2b3f9d0>
STARTSWITH (first, second)
ST_ASTEXT (first)
ST_CONTAINS (first, second)
ST_DISTANCE (first, second)
ST_EQUALS (first, second)
ST_INTERSECTS (first, second)
ST_OVERLAPS (first, second)
ST_TOUCHES (first, second)
ST_WITHIN (first, second)
SUBSTRING (field, parameters)
TRUE = 1
T_SEP = 'T'
concat_add (tablename)
drivers = ('pyodbc',)
lastrowid (table)
like_escaper_default (term)
mssql_like_normalizer (term)
represent (obj, fieldtype)
rowslice (rows, minimum=0, maximum=None)
select_limitby (sql_s, sql_f, sql_t, sql_w, sql_o, limitby)
types = {'reference': 'INT %(null)s %(unique)s, CONSTRAINT %(constraint_name)s FOREIGN KEY (%(field_name)s'
varquote (name)

```

```
class pydal.adapters.mssql.MSSQLNAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
```

Bases: `pydal.adapters.mssql.MSSQLAdapter`

**ILIKE** (*first, second, escape=None*)  
Case insensitive like operator

**drivers** = ('pyodbc',)

*Experimental* – base class for handling unicode in MSSQL by default. Needs lots of testing. Try this on a fresh (or on a legacy) database. Using this in a database handled previously with non-unicode aware adapter is NOT supported

**execute** (\*a, \*\*b)

**represent** (obj, fieldtype)

**types** = {'reference': 'INT %(null)s %(unique)s, CONSTRAINT %(constraint\_name)s FOREIGN KEY (%(field\_name)s

```
class pydal.adapters.mssql.SybaseAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
```

Bases: `pydal.adapters.mssql.MSSQLAdapter`

**drivers** = 'Sybase'

**types** = {'reference': 'INT NULL, CONSTRAINT %(constraint\_name)s FOREIGN KEY (%(field\_name)s) REFERENC

```
class pydal.adapters.mssql.VerticaAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
```

Bases: `pydal.adapters.mssql.MSSQLAdapter`

**EXTRACT** (*first, what*)

**T\_SEP** = ''

**drivers** = ('pyodbc',)

**execute** (a)

**lastrowid** (table)

**select\_limitby** (sql\_s, sql\_f, sql\_t, sql\_w, sql\_o, limitby)

**types** = {'big-reference': 'BIGINT REFERENCES %(foreign\_key)s ON DELETE %(on\_delete\_action)s', 'string': 'VA

## pydal.adapters.mysql module

```
class pydal.adapters.mysql.MySQLAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, after_connection=None)
```

Bases: `pydal.adapters.base.BaseAdapter`

**CAST** (*first, second*)

```

CONCAT (*items)
EPOCH (first)
QUOTE_TEMPLATE = “%s”
RANDOM ()
REGEXP (first, second)
REGEX_URI = <_sre.SRE_Pattern object at 0x2a77e10>
SUBSTRING (field, parameters)
after_connection ()
commit_on_alter_table = True
commit_prepared (key)
distributed_transaction_begin (key)
drivers = ('MySQLdb', 'pymysql', 'mysqlconnector')
prepare (key)
rollback_prepared (key)
support_distributed_transaction = True
types = {'reference': 'INT %(null)s %(unique)s, INDEX %(index_name)s %(field_name)s, FOREIGN KEY %(field_name)s %(table_name)s', 'int': 'INT', 'float': 'FLOAT', 'string': 'VARCHAR', 'text': 'TEXT', 'blob': 'BLOB', 'date': 'DATE', 'time': 'TIME', 'datetime': 'DATETIME', 'timestamp': 'TIMESTAMP', 'boolean': 'BOOLEAN', 'enum': 'ENUM', 'set': 'SET', 'json': 'JSON'}
varquote (name)

```

## pydal.adapters.oracle module

```

class pydal.adapters.oracle.OracleAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={}, do_connect=True, after_connection=None)

```

Bases: `pydal.adapters.base.BaseAdapter`

```

LEFT_JOIN ()
NOT_NULL (default, field_type)
RANDOM ()
REGEXP (first, second)
after_connection ()
commit_on_alter_table = False
constraint_name (tablename, fieldname)
create_sequence_and_triggers (query, table, **args)
drivers = ('cx_Oracle',)
execute (command, args=None)
insert (table, fields)
lastrowid (table)

```

```

oracle_fix = <_sre.SRE_Pattern object at 0x7f0e313ca030>
represent_exceptions (obj, fieldtype)
select_limitby (sql_s, sql_f, sql_t, sql_w, sql_o, limitby)
sqlsafe_table (tablename, ot=None)
trigger_name (tablename)
types = {'reference': 'NUMBER, CONSTRAINT %(constraint_name)s FOREIGN KEY (%(field_name)s) REFERENC

```

## pydal.adapters.postgres module

```

class pydal.adapters.postgres.JDBCPostgreSQLAdapter (db, uri, pool_size=0, folder=None,
                                                    db_codec='UTF-8', credential_decoder=<function IDENTITY
                                                    at 0x7f0e31b4e398>, driver_args={}, adapter_args={},
                                                    do_connect=True, after_connection=None)

```

Bases: `pydal.adapters.postgres.PostgreSQLAdapter`

```

REGEX_URI = <_sre.SRE_Pattern object at 0x7f0e31b9fc30>

```

```

after_connection ()

```

```

drivers = ('zJDBC',)

```

```

class pydal.adapters.postgres.NewPostgreSQLAdapter (db, uri, pool_size=0, folder=None,
                                                    db_codec='UTF-8', credential_decoder=<function IDENTITY
                                                    at 0x7f0e31b4e398>, driver_args={}, adapter_args={},
                                                    do_connect=True, srid=4326, after_connection=None)

```

Bases: `pydal.adapters.postgres.PostgreSQLAdapter`

```

ANY (first)

```

```

CONTAINS (first, second, case_sensitive=True)

```

```

EQ (first, second=None)

```

```

ILIKE (first, second, escape=None)

```

```

drivers = ('psycpg2', 'pg8000')

```

```

parse_list_integers (value, field_type)

```

```

parse_list_references (value, field_type)

```

```

parse_list_strings (value, field_type)

```

```

represent (obj, fieldtype)

```

```

types = {'reference': 'INTEGER REFERENCES %(foreign_key)s ON DELETE %(on_delete_action)s %(null)s %(unic

```

```

class pydal.adapters.postgres.PostgreSQLAdapter (db, uri, pool_size=0, folder=None,
                                                    db_codec='UTF-8', credential_decoder=<function IDENTITY
                                                    at 0x7f0e31b4e398>, driver_args={}, adapter_args={},
                                                    do_connect=True, srid=4326, after_connection=None)

```

Bases: `pydal.adapters.base.BaseAdapter`

**ADD** (*first, second*)

**ILIKE** (*first, second, escape=None*)  
Case sensitive like operator

**LIKE** (*first, second, escape=None*)  
Case sensitive like operator

**QUOTE\_TEMPLATE** = “%s”

**RANDOM** ()

**REGEXP** (*first, second*)

**REGEX\_URI** = <\_sre.SRE\_Pattern object at 0x2b511a0>

**ST\_ASJSON** (*first, second*)  
[http://postgis.org/docs/ST\\_AsGeoJSON.html](http://postgis.org/docs/ST_AsGeoJSON.html)

**ST\_ASTEXT** (*first*)  
[http://postgis.org/docs/ST\\_AsText.html](http://postgis.org/docs/ST_AsText.html)

**ST\_CONTAINS** (*first, second*)  
[http://postgis.org/docs/ST\\_Contains.html](http://postgis.org/docs/ST_Contains.html)

**ST\_DISTANCE** (*first, second*)  
[http://postgis.org/docs/ST\\_Distance.html](http://postgis.org/docs/ST_Distance.html)

**ST\_DWITHIN** (*first, tup*)  
[http://postgis.org/docs/ST\\_DWithin.html](http://postgis.org/docs/ST_DWithin.html)

**ST\_EQUALS** (*first, second*)  
[http://postgis.org/docs/ST\\_Equals.html](http://postgis.org/docs/ST_Equals.html)

**ST\_INTERSECTS** (*first, second*)  
[http://postgis.org/docs/ST\\_Intersects.html](http://postgis.org/docs/ST_Intersects.html)

**ST\_OVERLAPS** (*first, second*)  
[http://postgis.org/docs/ST\\_Overlaps.html](http://postgis.org/docs/ST_Overlaps.html)

**ST\_SIMPLIFY** (*first, second*)  
[http://postgis.org/docs/ST\\_Simplify.html](http://postgis.org/docs/ST_Simplify.html)

**ST\_SIMPLIFYPRESERVE\_TOPOLOGY** (*first, second*)  
[http://postgis.org/docs/ST\\_SimplifyPreserveTopology.html](http://postgis.org/docs/ST_SimplifyPreserveTopology.html)

**ST\_TOUCHES** (*first, second*)  
[http://postgis.org/docs/ST\\_Touches.html](http://postgis.org/docs/ST_Touches.html)

**ST\_WITHIN** (*first, second*)  
[http://postgis.org/docs/ST\\_Within.html](http://postgis.org/docs/ST_Within.html)

**ST\_X** (*first*)  
[http://postgis.org/docs/ST\\_X.html](http://postgis.org/docs/ST_X.html)

**ST\_Y** (*first*)  
[http://postgis.org/docs/ST\\_Y.html](http://postgis.org/docs/ST_Y.html)

**adapt** (*obj*)

**after\_connection** ()

**commit\_prepared** (*key*)

**create\_sequence\_and\_triggers** (*query, table, \*\*args*)

```
distributed_transaction_begin (key)
drivers = ('psycpg2', 'pg8000')
execute (*a, **b)
lastrowid (table=None)
prepare (key)
represent (obj, fieldtype)
rollback_prepared (key)
sequence_name (table)
support_distributed_transaction = True
try_json ()
types = {'reference': 'INTEGER REFERENCES %(foreign_key)s ON DELETE %(on_delete_action)s %(null)s %(unicod
varquote (name)
```

### pydal.adapters.sapdb module

```
class pydal.adapters.sapdb.SAPDBAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-8',
credential_decoder=<function IDENTITY at 0x7f0e31b4e398>, driver_args={}, adapter_args={},
do_connect=True, after_connection=None)
Bases: pydal.adapters.base.BaseAdapter
REGEX_URI = <_sre.SRE_Pattern object at 0x2b511a0>
create_sequence_and_triggers (query, table, **args)
drivers = ('sapdb',)
lastrowid (table)
select_limitby (sql_s, sql_f, sql_t, sql_w, sql_o, limitby)
sequence_name (table)
support_distributed_transaction = False
types = {'reference': 'INT, FOREIGN KEY (%(field_name)s) REFERENCES %(foreign_key)s ON DELETE %(on_del
```

### pydal.adapters.sqlite module

```
class pydal.adapters.sqlite.JDBCSQLiteAdapter (db, uri, pool_size=0, folder=None,
db_codec='UTF-8', credential_decoder=<function IDENTITY
at 0x7f0e31b4e398>, driver_args={},
adapter_args={}, do_connect=True, after_connection=None)
Bases: pydal.adapters.sqlite.SQLiteAdapter
after_connection ()
drivers = ('zxJDBC_sqlite',)
execute (a)
```

```
class pydal.adapters.sqlite.SQLiteAdapter (db, uri, pool_size=0, folder=None,
                                           db_codec='UTF-8', credential_decoder=<function IDENTITY at
                                           0x7f0e31b4e398>, driver_args={},
                                           adapter_args={}, do_connect=True, after_
                                           connection=None)
```

Bases: `pydal.adapters.base.BaseAdapter`

**EXTRACT** (*field, what*)

**REGEXP** (*first, second*)

**after\_connection** ()

**can\_select\_for\_update** = None

**delete** (*tablename, query*)

**drivers** = ('sqlite2', 'sqlite3')

**select** (*query, fields, attributes*)

Simulate *SELECT ... FOR UPDATE* with *BEGIN IMMEDIATE TRANSACTION*. Note that the entire database, rather than one record, is locked (it will be locked eventually anyway by the following UPDATE).

**static web2py\_extract** (*lookup, s*)

**static web2py\_regexp** (*expression, item*)

```
class pydal.adapters.sqlite.SpatialLiteAdapter (db, uri, pool_size=0, folder=None,
                                                  db_codec='UTF-8', credential_decoder=<function IDENTITY
                                                  at 0x7f0e31b4e398>, driver_args={},
                                                  adapter_args={}, do_connect=True,
                                                  srid=4326, after_connection=None)
```

Bases: `pydal.adapters.sqlite.SQLiteAdapter`

**ST\_ASJSON** (*first, second*)

**ST\_ASTEXT** (*first*)

**ST\_CONTAINS** (*first, second*)

**ST\_DISTANCE** (*first, second*)

**ST\_EQUALS** (*first, second*)

**ST\_INTERSECTS** (*first, second*)

**ST\_OVERLAPS** (*first, second*)

**ST\_SIMPLIFY** (*first, second*)

**ST\_TOUCHES** (*first, second*)

**ST\_WITHIN** (*first, second*)

**after\_connection** ()

**drivers** = ('sqlite3', 'sqlite2')

**represent** (*obj, fieldtype*)

**types** = {'string': 'CHAR(%(length)s)', 'reference': 'INTEGER REFERENCES %(foreign\_key)s ON DELETE %(on\_c

## pydal.adapters.teradata module

```
class pydal.adapters.teradata.TeradataAdapter (db, uri, pool_size=0, folder=None,
                                              db_codec='UTF-8', credential_decoder=<function IDENTITY
                                              at 0x7f0e31b4e398>, driver_args={},
                                              adapter_args={}, do_connect=True, af-
                                              ter_connection=None)

Bases: pydal.adapters.base.BaseAdapter

LEFT_JOIN ()

close (action='commit', really=True)

drivers = ('pyodbc',)

select_limitby (sql_s, sql_f, sql_t, sql_w, sql_o, limitby)

types = {'reference': 'INT', 'text': 'VARCHAR(2000)', 'float': 'REAL', 'datetime': 'TIMESTAMP', 'bigint': 'BIGINT'}
```

## Module contents

```
pydal.adapters.GoogleDatastoreAdapter = None
make the import available for BaseAdapter
```

## 1.1.2 pydal.helpers package

### Submodules

#### pydal.helpers.classes module

```
class pydal.helpers.classes.BasicStorage (*args, **kwargs)
Bases: object

clear (*args, **kwargs)

copy (*args, **kwargs)

get (key, default=None)

has_key (key)

items ()

iteritems ()

iterkeys ()

itervalues ()

keys ()

pop (*args, **kwargs)

update (*args, **kwargs)

values ()

class pydal.helpers.classes.DatabaseStoredFile (db, filename, mode)

close ()
```



```

close_connection ()
escape (obj)
static exists (db, filename)
read (bytes)
readline ()
static try_create_web2py_filesystem (db)
web2py_filesystems = set([])
write (data)

```

**class** `pydal.helpers.classes.FakeCursor`  
 Bases: `object`

The Python Database API Specification has a `cursor()` method, which NoSql drivers generally don't support. If the exception in this function is taken then it likely means that some piece of functionality has not yet been implemented in the driver. And something is using the cursor.

<https://www.python.org/dev/peps/pep-0249/>

```

warn_bad_usage (attr)

```

**class** `pydal.helpers.classes.FakeDriver` (*\*args, \*\*kwargs*)  
 Bases: `pydal.helpers.classes.BasicStorage`

```

close ()
commit ()
cursor ()

```

**class** `pydal.helpers.classes.MethodAdder` (*table*)  
 Bases: `object`

```

register (method_name=None)

```

**class** `pydal.helpers.classes.NullCursor`  
 Bases: `pydal.helpers.classes.FakeCursor`

```

lastrowid = 1

```

**class** `pydal.helpers.classes.NullDriver` (*\*args, \*\*kwargs*)  
 Bases: `pydal.helpers.classes.FakeDriver`

**class** `pydal.helpers.classes.RecordDeleter` (*table, id*)  
 Bases: `object`

**class** `pydal.helpers.classes.RecordUpdater` (*colset, table, id*)  
 Bases: `object`

**class** `pydal.helpers.classes.Reference`  
 Bases: `long`

```

get (key, default=None)

```

`pydal.helpers.classes.Reference_pickler` (*data*)

`pydal.helpers.classes.Reference_unpickler` (*data*)

**class** `pydal.helpers.classes.SQLALL` (*table*)  
 Bases: `object`

Helper class providing a comma-separated string having all the field names (prefixed by table name and '.')

normally only called from within gluon.dal

**class** `pydal.helpers.classes.SQLCallableList`  
 Bases: `list`

**class** `pydal.helpers.classes.SQLCustomType` (*type='string', native=None, encoder=None, decoder=None, validator=None, \_class=None, widget=None, represent=None*)  
 Bases: `object`

Allows defining of custom SQL types

#### Parameters

- **type** – the web2py type (default = 'string')
- **native** – the backend type
- **encoder** – how to encode the value to store it in the backend
- **decoder** – how to decode the value retrieved from the backend
- **validator** – what validators to use ( default = None, will use the default validator for type)

**Example::** Define as:

```
decimal = SQLCustomType( type = 'double', native = 'integer', encoder =(lambda x:
    int(float(x) * 100)), decoder = (lambda x: Decimal("0.00") + Decimal(str(float(x)/100)) )
)
db.define_table( 'example', Field('value', type=decimal) )
```

**endswith** (*text=None*)

**startswith** (*text=None*)

**class** `pydal.helpers.classes.Serializable`  
 Bases: `object`

**as\_dict** (*flat=False, sanitize=True*)

**as\_json** (*sanitize=True*)

**as\_xml** (*sanitize=True*)

**as\_yaml** (*sanitize=True*)

**class** `pydal.helpers.classes.UseDatabaseStoredFile`

**file\_close** (*fileobj*)

**file\_delete** (*filename*)

**file\_exists** (*filename*)

**file\_open** (*filename, mode='rb', lock=True*)

`pydal.helpers.classes.pickle_basicstorage` (*s*)

### pydal.helpers.methods module

`pydal.helpers.methods.archive_record` (*qset, fs, archive\_table, current\_record*)

`pydal.helpers.methods.auto_represent` (*field*)

```

pydal.helpers.methods.auto_validators (field)
pydal.helpers.methods.bar_decode_integer (value)
pydal.helpers.methods.bar_decode_string (value)
pydal.helpers.methods.bar_encode (items)
pydal.helpers.methods.bar_escape (item)
pydal.helpers.methods.cleanup (text)
    Validates that the given text is clean: only contains [0-9a-zA-Z_]
pydal.helpers.methods.geoLine (*line)
pydal.helpers.methods.geoPoint (x, y)
pydal.helpers.methods.geoPolygon (*line)
pydal.helpers.methods.hide_password (uri)
pydal.helpers.methods.int2uuid (n)
pydal.helpers.methods.list_represent (values, row=None)
pydal.helpers.methods.pluralize (singular, rules=[(<_sre.SRE_Pattern object at
    0x7f0e34dbed30>, <_sre.SRE_Pattern object at
    0x7f0e34dbed30>, 'children'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e31b6b190>, <_sre.SRE_Pattern object
    at 0x7f0e31b6b190>, 'et'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e34e31e70>, <_sre.SRE_Pattern object
    at 0x7f0e34e31e70>, 'eeth'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e34e31f30>, <_sre.SRE_Pattern object at
    0x7f0e34dbee00>, '\Nlaves'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e31b6b240>, <_sre.SRE_Pattern object
    at 0x7f0e31b6b240>, 'ses'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e31b6b2f0>, <_sre.SRE_Pattern object
    at 0x7f0e31b6b2f0>, 'men'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e31b6b3a0>, <_sre.SRE_Pattern object
    at 0x7f0e31b6b3a0>, 'ives'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e31b6b450>, <_sre.SRE_Pattern object
    at 0x7f0e31b6b450>, 'eaux'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e34d9acb0>, <_sre.SRE_Pattern object
    at 0x7f0e34d9acb0>, 'lves'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e34dbeed0>, <_sre.SRE_Pattern object
    at 0x7f0e322b6578>, 'es'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e31b622d0>, <_sre.SRE_Pattern object
    at 0x7f0e322b6578>, 'es'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e34d797f0>, <_sre.SRE_Pattern object
    at 0x7f0e31b525d0>, 'ies'), (<_sre.SRE_Pattern ob-
    ject at 0x7f0e322b6578>, <_sre.SRE_Pattern object at
    0x7f0e322b6578>, 's')]])
pydal.helpers.methods.smart_query (fields, text)
pydal.helpers.methods.use_common_filters (query)
pydal.helpers.methods.uuid2int (uuidv)
pydal.helpers.methods.varquote_aux (name, quotestr='%s')
pydal.helpers.methods.xorify (orderby)

```

## pydal.helpers.regex module

### Module contents

## 1.2 Submodules

## 1.3 pydal.base module

This file is part of the web2py Web Framework  
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This file contains the DAL support for many relational databases, including:

- SQLite & SpatiaLite
- MySQL
- Postgres
- Firebird
- Oracle
- MS SQL
- DB2
- Interbase
- Ingres
- Informix (9+ and SE)
- SapDB (experimental)
- Cubrid (experimental)
- CouchDB (experimental)
- MongoDB (in progress)
- Google:nosql
- Google:sql
- Teradata
- IMAP (experimental)

Example of usage:

```
>>> # from dal import DAL, Field

### create DAL connection (and create DB if it doesn't exist)
>>> db = DAL(('sqlite://storage.sqlite', 'mysql://a:b@localhost/x'),
... folder=None)

### define a table 'person' (create/alter as necessary)
>>> person = db.define_table('person', Field('name', 'string'))
```

```

### insert a record
>>> id = person.insert(name='James')

### retrieve it by id
>>> james = person(id)

### retrieve it by name
>>> james = person(name='James')

### retrieve it by arbitrary query
>>> query = (person.name=='James') & (person.name.startswith('J'))
>>> james = db(query).select(person.ALL)[0]

### update one record
>>> james.update_record(name='Jim')
<Row {'id': 1, 'name': 'Jim'}>

### update multiple records by query
>>> db(person.name.like('J%')).update(name='James')
1

### delete records by query
>>> db(person.name.lower() == 'jim').delete()
0

### retrieve multiple records (rows)
>>> people = db(person).select(orderby=person.name,
... groupby=person.name, limitby=(0,100))

### further filter them
>>> james = people.find(lambda row: row.name == 'James').first()
>>> print james.id, james.name
1 James

### check aggregates
>>> counter = person.id.count()
>>> print db(person).select(counter).first()(counter)
1

### delete one record
>>> james.delete_record()
1

### delete (drop) entire database table
>>> person.drop()

```

#### Supported DAL URI strings:

```

'sqlite://test.db'
'spatialite://test.db'
'sqlite:memory'
'spatialite:memory'
'jdbc:sqlite://test.db'
'mysql://root:none@localhost/test'
'postgres://mdipierro:password@localhost/test'
'postgres:psycopg2://mdipierro:password@localhost/test'
'postgres:pg8000://mdipierro:password@localhost/test'
'jdbc:postgres://mdipierro:none@localhost/test'

```

```
'mssql://web2py:none@A64X2/web2py_test'
'mssql2://web2py:none@A64X2/web2py_test' # alternate mappings
'mssql3://web2py:none@A64X2/web2py_test' # better pagination (requires >= 2005)
'mssql4://web2py:none@A64X2/web2py_test' # best pagination (requires >= 2012)
'oracle://username:password@database'
'firebird://user:password@server:3050/database'
'db2:ibm_db_dbi://DSN=dsn;UID=user;PWD=pass'
'db2:pyodbc://driver=DB2;hostname=host;database=database;uid=user;pwd=password;port=port'
'firebird://username:password@hostname/database'
'firebird_embedded://username:password@c://path'
'informix://user:password@server:3050/database'
'informixu://user:password@server:3050/database' # unicode informix
'ingres://database' # or use an ODBC connection string, e.g. 'ingres://dsn=dsn_name'
'google:datastore' # for google app engine datastore (uses ndb by default)
'google:sql' # for google app engine with sql (mysql compatible)
'teradata://DSN=dsn;UID=user;PWD=pass; DATABASE=database' # experimental
'imap://user:password@server:port' # experimental
'mongodb://user:password@server:port/database' # experimental
```

For more info:

```
help(DAL)
help(Field)
```

```
class pydal.base.DAL (uri='sqlite://dummy.db', pool_size=0, folder=None, db_codec='UTF-8',
                      check_reserved=None, migrate=True, fake_migrate=False, migrate_enabled=True,
                      fake_migrate_all=False, decode_credentials=False, driver_args=None,
                      adapter_args=None, attempts=5, auto_import=False, bigint_id=False,
                      debug=False, lazy_tables=False, db_uid=None, do_connect=True,
                      after_connection=None, tables=None, ignore_field_case=True,
                      entity_quoting=False, table_hash=None)
```

Bases: `pydal.helpers.classes.Serializable`, `pydal.helpers.classes.BasicStorage`

An instance of this class represents a database connection

### Parameters

- **uri** (*str*) – contains information for connecting to a database. Defaults to `'sqlite://dummy.db'`

---

**Note:** experimental: you can specify a dictionary as uri parameter i.e. with:

```
db = DAL({"uri": "sqlite://storage.sqlite",
         "tables": {...}, ...})
```

for an example of dict input you can check the output of the scaffolding db model with

```
db.as_dict()
```

Note that for compatibility with Python older than version 2.6.5 you should cast your dict input keys to str due to a syntax limitation on kwargs names. for proper DAL dictionary input you can use one of:

```
obj = serializers.cast_keys(dict, [encoding="utf-8"])
#or else (for parsing json input)
obj = serializers.loads_json(data, unicode_keys=False)
```

- 
- **pool\_size** – How many open connections to make to the database object.

- **folder** – where .table files will be created. Automatically set within web2py. Use an explicit path when using DAL outside web2py
- **db\_codec** – string encoding of the database (default: ‘UTF-8’)
- **table\_hash** – database identifier with .tables. If your connection hash change you can still using old .tables if they have db\_hash as prefix
- **check\_reserved** – list of adapters to check tablename and column names against sql/nosql reserved keywords. Defaults to *None*
  - ‘common’ List of sql keywords that are common to all database types such as “SELECT, INSERT”. (recommended)
  - ‘all’ Checks against all known SQL keywords
  - ‘<adaptername>’ Checks against the specific adapters list of keywords
  - ‘<adaptername>\_nonreserved’ Checks against the specific adapters list of nonreserved keywords. (if available)
- **migrate** – sets default migrate behavior for all tables
- **fake\_migrate** – sets default fake\_migrate behavior for all tables
- **migrate\_enabled** – If set to False disables ALL migrations
- **fake\_migrate\_all** – If set to True fake migrates ALL tables
- **attempts** – Number of times to attempt connecting
- **auto\_import** – If set to True, tries import automatically table definitions from the databases folder (works only for simple models)
- **bigint\_id** – If set, turn on bigint instead of int for id and reference fields
- **lazy\_tables** – delays table definition until table access
- **after\_connection** – can a callable that will be executed after the connection

### Example

Use as:

```
db = DAL('sqlite://test.db')
```

or:

```
db = DAL(**{"uri": ..., "tables": [...]...}) # experimental
```

```
db.define_table('tablename', Field('fieldname1'),
               Field('fieldname2'))
```

```
class Row(*args, **kwargs)
```

Bases: `pydal.helpers.classes.BasicStorage`

A dictionary that lets you do `d['a']` as well as `d.a` this is only used to store a *Row*

**as\_dict** (*datetime\_to\_str=False, custom\_types=None*)

**as\_json** (*mode='object', default=None, colnames=None, serialize=True, \*\*kwargs*)

serializes the row to a JSON object *kwargs* are passed to `.as_dict` method only “object” mode supported

*serialize = False* used by Rows.as\_json

TODO: return array mode with query column order

mode and colnames are not implemented

**as\_xml** (*row\_name='row', colnames=None, indent=' '*)

**get** (*key, default=None*)

**class DAL.Table** (*db, tablename, \*fields, \*\*args*)

Bases: `pydal.helpers.classes.Serializable`, `pydal.helpers.classes.BasicStorage`

Represents a database table

**Example::**

**You can create a table as::** `db = DAL(...)` `db.define_table('users', Field('name'))`

And then:

```
db.users.insert(name='me') # print db.users._insert(...) to see SQL
db.users.drop()
```

**as\_dict** (*flat=False, sanitize=True*)

**bulk\_insert** (*items*)

here items is a list of dictionaries

**drop** (*mode=''*)

**fields**

**import\_from\_csv\_file** (*csvfile, id\_map=None, null='<NULL>', unique='uuid', id\_offset=None, \*args, \*\*kwargs*)

Import records from csv file. Column headers must have same names as table fields. Field 'id' is ignored. If column names read 'table.file' the 'table.' prefix is ignored.

- 'unique' argument is a field which must be unique (typically a uuid field)
- 'restore' argument is default False; if set True will remove old values in table first.
- 'id\_map' if set to None will not map ids

The import will keep the id numbers in the restored table. This assumes that there is an field of type id that is integer and in incrementing order. Will keep the id numbers in restored table.

**insert** (*\*\*fields*)

**on** (*query*)

**sqlsafe**

**sqlsafe\_alias**

**truncate** (*mode=None*)

**update** (*\*args, \*\*kwargs*)

**update\_or\_insert** (*\_key=<function <lambda> at 0x7f0e31b4e320>, \*\*values*)

**validate\_and\_insert** (*\*\*fields*)

**validate\_and\_update** (*\_key=<function <lambda> at 0x7f0e31b4e320>, \*\*fields*)

**validate\_and\_update\_or\_insert** (*\_key=<function <lambda> at 0x7f0e31b4e320>, \*\*fields*)

**with\_alias** (*alias*)

DAL.as\_dict (*flat=False, sanitize=True*)



`DAL.can_join()`

`DAL.check_reserved_keyword(name)`  
Validates *name* against SQL keywords Uses `self.check_reserve` which is a list of operators to use.

`DAL.close()`

`DAL.commit()`

`DAL.define_table(tablename, *fields, **args)`

`static DAL.distributed_transaction_begin(*instances)`

`static DAL.distributed_transaction_commit(*instances)`

`DAL.executesql(query, placeholders=None, as_dict=False, fields=None, colnames=None, as_ordered_dict=False)`  
Executes an arbitrary query

#### Parameters

- **query** (*str*) – the query to submit to the backend
- **placeholders** – is optional and will always be None. If using raw SQL with placeholders, placeholders may be a sequence of values to be substituted in or, (if supported by the DB driver), a dictionary with keys matching named placeholders in your SQL.
- **as\_dict** – will always be None when using DAL. If using raw SQL can be set to True and the results cursor returned by the DB driver will be converted to a sequence of dictionaries keyed with the db field names. Results returned with `as_dict=True` are the same as those returned when applying `.to_list()` to a DAL query. If `“as_ordered_dict”=True` the behaviour is the same as when `“as_dict”=True` with the keys (field names) guaranteed to be in the same order as returned by the select name executed on the database.
- **fields** – list of DAL Fields that match the fields returned from the DB. The Field objects should be part of one or more Table objects defined on the DAL object. The “fields” list can include one or more DAL Table objects in addition to or instead of including Field objects, or it can be just a single table (not in a list). In that case, the Field objects will be extracted from the table(s).

---

**Note:** if either *fields* or *colnames* is provided, the results will be converted to a DAL *Rows* object using the `db_adapter.parse()` method

---

- **colnames** – list of field names in `tablename.fieldname` format

---

**Note:** It is also possible to specify both “fields” and the associated “colnames”. In that case, “fields” can also include DAL Expression objects in addition to Field objects. For Field objects in “fields”, the associated “colnames” must still be in `tablename.fieldname` format. For Expression objects in “fields”, the associated “colnames” can be any arbitrary labels.

---

DAL Table objects referred to by “fields” or “colnames” can be dummy tables and do not have to represent any real tables in the database. Also, note that the “fields” and “colnames” must be in the same order as the fields in the results cursor returned from the DB.

`DAL.export_to_csv_file(ofile, *args, **kwargs)`

`static DAL.get_instances()`  
Returns a dictionary with uri as key with timings and defined tables:

```
{'sqlite://storage.sqlite': {
    'dbstats': [(select auth_user.email from auth_user, 0.02009)],
```

```
'databases': {
    'defined': ['auth_cas', 'auth_event', 'auth_group',
               'auth_membership', 'auth_permission', 'auth_user'],
    'lazy': '[]'
}
}
```

DAL.**has\_representer** (*name*)

DAL.**import\_from\_csv\_file** (*ifile*, *id\_map=None*, *null='<NULL>'*, *unique='uuid'*,  
*map\_tablenames=None*, *ignore\_missing\_tables=False*, *\*args*,  
*\*\*kwargs*)

DAL.**import\_table\_definitions** (*path*, *migrate=False*, *fake\_migrate=False*, *tables=None*)

DAL.**lazy\_define\_table** (*tablename*, *\*fields*, *\*\*args*)

DAL.**logger** = <logging.Logger object at 0x7f0e31b29610>

DAL.**parse\_as\_rest** (*patterns*, *args*, *vars*, *queries=None*, *nested\_select=True*)

### Example

Use as:

```
db.define_table('person', Field('name'), Field('info'))
db.define_table('pet',
    Field('ownedby', db.person),
    Field('name'), Field('info')
)
```

```
@request.restful()
```

```
def index():
```

```
    def GET(*args, **vars):
```

```
        patterns = [
```

```
            "/friends[person]",
```

```
            "/{person.name}/:field",
```

```
            "/{person.name}/pets[pet.ownedby]",
```

```
            "/{person.name}/pets[pet.ownedby]/{pet.name}",
```

```
            "/{person.name}/pets[pet.ownedby]/{pet.name}/:field",
```

```
            ("/dogs[pet]", db.pet.info=='dog'),
```

```
            ("/dogs[pet]/{pet.name.startswith}", db.pet.info=='dog'),
```

```
        ]
```

```
        parser = db.parse_as_rest(patterns, args, vars)
```

```
        if parser.status == 200:
```

```
            return dict(content=parser.response)
```

```
        else:
```

```
            raise HTTP(parser.status, parser.error)
```

```
    def POST(table_name, **vars):
```

```
        if table_name == 'person':
```

```
            return db.person.validate_and_insert(**vars)
```

```
        elif table_name == 'pet':
```

```
            return db.pet.validate_and_insert(**vars)
```

```
        else:
```

```
            raise HTTP(400)
```

```
    return locals()
```

```

DAL.represent (name, *args, **kwargs)
DAL.representers = {}
DAL.rollback ()
DAL.serializers = None
static DAL.set_folder (folder)
DAL.smart_query (fields, text)
DAL.tables
DAL.uuid (x)
DAL.validators = None
DAL.validators_method = None
DAL.where (query=None, ignore_common_filters=None)
pydal.base.DAL_pickler (db)
pydal.base.DAL_unpickler (db_uid)
class pydal.base.MetaDAL
    Bases: type

```

## 1.4 pydal.connection module

```

class pydal.connection.ConnectionPool
    Bases: object
    POOLS = {}
    after_connection ()
    after_connection_hook ()
        Hook for the after_connection parameter
    check_active_connection = True
    close (action='commit', really=True)
    static close_all_instances (action)
        to close cleanly databases in a multithreaded environment
    find_or_make_work_folder ()
    reconnect (f=None)
        Defines: self.connection and self.cursor if self.pool_size>0 it will try pull the connection from the pool if
        the connection is not active (closed by db server) it will loop if not self.pool_size or no active connections
        in pool makes a new one
    static set_folder (folder)

```

## 1.5 pydal.objects module

```

class pydal.objects.BasicRows
    Bases: object

```

Abstract class for Rows and IterRows

**\_\_str\_\_** ()

Serializes the table into a csv file

**as\_csv** ()

Serializes the table into a csv file

**as\_dict** (*key='id', compact=True, storage\_to\_dict=True, datetime\_to\_str=False, custom\_types=None*)

Returns the data as a dictionary of dictionaries (storage\_to\_dict=True) or records (False)

#### Parameters

- **key** – the name of the field to be used as dict key, normally the id
- **compact** – ? (default True)
- **storage\_to\_dict** – when True returns a dict, otherwise a list (default True)
- **datetime\_to\_str** – convert datetime fields as strings (default False)

**as\_json** (*mode='object', default=None*)

Serializes the rows to a JSON list or object with objects mode='object' is not implemented (should return a nested object structure)

**as\_list** (*compact=True, storage\_to\_dict=True, datetime\_to\_str=False, custom\_types=None*)

Returns the data as a list or dictionary.

#### Parameters

- **storage\_to\_dict** – when True returns a dict, otherwise a list
- **datetime\_to\_str** – convert datetime fields as strings

**as\_trees** (*parent\_name='parent\_id', children\_name='children', render=False*)

returns the data as list of trees.

#### Parameters

- **parent\_name** – the name of the field holding the reference to the parent (default parent\_id).
- **children\_name** – the name where the children of each row will be stored as a list (default children).
- **render** – whether we will render the fields using their represent (default False) can be a list of fields to render or True to render all.

**as\_xml** (*row\_name='row', rows\_name='rows'*)

**export\_to\_csv\_file** (*ofile, null='<NULL>', \*args, \*\*kwargs*)

Exports data to csv, the first line contains the column names

#### Parameters

- **ofile** – where the csv must be exported to
- **null** – how null values must be represented (default '<NULL>')
- **delimiter** – delimiter to separate values (default ',')
- **quotechar** – character to use to quote string values (default '"')
- **quoting** – quote system, use csv.QUOTE\_\*\*\* (default csv.QUOTE\_MINIMAL)
- **represent** – use the fields .represent value (default False)

- **colnames** – list of column names to use (default self.colnames)

This will only work when exporting rows objects!!!! DO NOT use this with db.export\_to\_csv()

**json** (*mode='object', default=None*)

Serializes the rows to a JSON list or object with objects mode='object' is not implemented (should return a nested object structure)

**xml** (*strict=False, row\_name='row', rows\_name='rows'*)

Serializes the table using sqlhtml.SQLTABLE (if present)

**class** pydal.objects.**Expression** (*db, op, first=None, second=None, type=None, \*\*optional\_args*)

Bases: object

**abs** ()

**avg** ()

**belongs** (*\*value, \*\*kwattr*)

Accepts the following inputs:

```
field.belongs(1,2)
field.belongs((1,2))
field.belongs(query)
```

Does NOT accept:

```
field.belongs(1)
```

If the set you want back includes *None* values, you can do:

```
field.belongs((1,None), null=True)
```

**coalesce** (*\*others*)

**coalesce\_zero** ()

**contains** (*value, all=False, case\_sensitive=False*)

For GAE contains() is always case sensitive

**day** ()

**endswith** (*value*)

**epoch** ()

**hour** ()

**ilike** (*value, escape=None*)

**len** ()

**like** (*value, case\_sensitive=True, escape=None*)

**lower** ()

**max** ()

**min** ()

**minutes** ()

**month** ()

**regexp** (*value*)

**replace** (*a, b*)

`seconds ()`  
`st_asgeojson (precision=15, options=0, version=1)`  
`st_astext ()`  
`st_contains (value)`  
`st_distance (other)`  
`st_dwithin (value, distance)`  
`st_equals (value)`  
`st_intersects (value)`  
`st_overlaps (value)`  
`st_simplify (value)`  
`st_simplifypreservetopology (value)`  
`st_touches (value)`  
`st_within (value)`  
`st_x ()`  
`st_y ()`  
`startswith (value)`  
`sum ()`  
`upper ()`  
`with_alias (alias)`  
`year ()`

`class pydal.objects.Field (fieldname, type='string', length=None, default=<function <lambda> at 0x7f0e31b4e320>, required=False, requires=<function <lambda> at 0x7f0e31b4e320>, ondelete='CASCADE', notnull=False, unique=False, uploadfield=True, widget=None, label=None, comment=None, writable=True, readable=True, update=None, authorize=None, autodelete=False, represent=None, uploadfolder=None, uploadseparate=False, uploadfs=None, compute=None, custom_store=None, custom_retrieve=None, custom_retrieve_file_properties=None, custom_delete=None, filter_in=None, filter_out=None, custom_qualifier=None, map_none=None, rname=None)`

Bases: `pydal.objects.Expression`, `pydal.helpers.classes.Serializable`

#### Lazy

Represents a database field

#### Example

Usage:

```
a = Field(name, 'string', length=32, default=None, required=False,
         requires=IS_NOT_EMPTY(), ondelete='CASCADE',
         notnull=False, unique=False,
         uploadfield=True, widget=None, label=None, comment=None,
         uploadfield=True, # True means store on disk,
```

```

        # 'a_field_name' means store in this field in db
        # False means file content will be discarded.
writable=True, readable=True, update=None, authorize=None,
autodelete=False, represent=None, uploadfolder=None,
uploadseparate=False # upload to separate directories by uuid_keys
                        # first 2 character and tablename.fieldname
                        # False - old behavior
                        # True - put uploaded file in
                        # <uploaddir>/<tablename>.<fieldname>/uuid_key[:2]
                        #     directory)
uploaddfs=None        # a pyfilesystem where to store upload
)

```

to be used as argument of `DAL.define_table`

alias of `FieldMethod`

#### Method

alias of `FieldMethod`

#### Virtual

alias of `FieldVirtual`

**as\_dict** (*flat=False, sanitize=True*)

**clone** (*point\_self\_references\_to=False, \*\*args*)

**count** (*distinct=None*)

**formatter** (*value*)

**retrieve** (*name, path=None, nameonly=False*)

If *nameonly==True* return (filename, fullfilename) instead of (filename, stream)

**retrieve\_file\_properties** (*name, path=None*)

**set\_attributes** (*\*args, \*\*attributes*)

**sqlsafe**

**sqlsafe\_name**

**store** (*file, filename=None, path=None*)

**validate** (*value*)

**class** `pydal.objects.FieldMethod` (*name, f=None, handler=None*)

Bases: `object`

**class** `pydal.objects.FieldVirtual` (*name, f=None, ftype='string', label=None, table\_name=None*)

Bases: `object`

**class** `pydal.objects.IterRows` (*db, sql, fields, colnames, blob\_decode, cacheable*)

Bases: `pydal.objects.BasicRows`

**first** ()

**next** ()

**class** `pydal.objects.LazyReferenceGetter` (*table, id*)

Bases: `object`

**class** `pydal.objects.LazySet` (*field, id*)

Bases: `object`

**count** (*distinct=None, cache=None*)

```
delete ()
delete_uploaded_files (upload_fields=None)
isempty ()
nested_select (*fields, **attributes)
select (*fields, **attributes)
update (**update_fields)
update_naive (**update_fields)
validate_and_update (**update_fields)
where (query, ignore_common_filters=False)
```

```
class pydal.objects.Query (db, op, first=None, second=None, ignore_common_filters=False, **op-
    tional_args)
Bases: pydal.helpers.classes.Serializable
```

Necessary to define a set. It can be stored or can be passed to `DAL.__call__()` to obtain a *Set*

### Example

Use as:

```
query = db.users.name=='Max'
set = db(query)
records = set.select()
```

```
as_dict (flat=False, sanitize=True)
    Experimental stuff
```

This allows to return a plain dictionary with the basic query representation. Can be used with json/xml services for client-side db I/O

### Example

Usage:

```
q = db.auth_user.id != 0
q.as_dict(flat=True)
{
  "op": "NE",
  "first": {
    "tablename": "auth_user",
    "fieldname": "id"
  },
  "second": 0
}
```

```
case (t=1, f=0)
```

```
class pydal.objects.Row (*args, **kwargs)
Bases: pydal.helpers.classes.BasicStorage
```

A dictionary that lets you do `d['a']` as well as `d.a` this is only used to store a *Row*

```
as_dict (datetime_to_str=False, custom_types=None)
```



**as\_json** (*mode='object', default=None, colnames=None, serialize=True, \*\*kwargs*)  
 serializes the row to a JSON object *kwargs* are passed to `.as_dict` method only “object” mode supported  
*serialize = False* used by `Rows.as_json`

TODO: return array mode with query column order

mode and *colnames* are not implemented

**as\_xml** (*row\_name='row', colnames=None, indent=' '*)

**get** (*key, default=None*)

**class** `pydal.objects.Rows` (*db=None, records=[], colnames=[], compact=True, rawrows=None*)  
 Bases: `pydal.objects.BasicRows`

A wrapper for the return value of a select. It basically represents a table. It has an iterator and each row is represented as a *Row* dictionary.

**\_\_iter\_\_** ()

Iterator over records

**column** (*column=None*)

**exclude** (*f*)

Removes elements from the calling `Rows` object, filtered by the function *f*, and returns a new `Rows` object containing the removed elements

**find** (*f, limitby=None*)

Returns a new `Rows` object, a subset of the original object, filtered by the function *f*

**first** ()

**group\_by\_value** (*\*fields, \*\*args*)

Regroups the rows, by one of the fields

**last** ()

**render** (*i=None, fields=None*)

Takes an index and returns a copy of the indexed row with values transformed via the “represent” attributes of the associated fields.

#### Parameters

- **i** – index. If not specified, a generator is returned for iteration over all the rows.
- **fields** – a list of fields to transform (if `None`, all fields with “represent” attributes will be transformed)

**setvirtualfields** (*\*\*keyed\_virtualfields*)

For reference:

```
db.define_table('x', Field('number', 'integer'))
if db(db.x).isempty(): [db.x.insert(number=i) for i in range(10)]

from gluon.dal import lazy_virtualfield

class MyVirtualFields(object):
    # normal virtual field (backward compatible, discouraged)
    def normal_shift(self): return self.x.number+1
    # lazy virtual field (because of @staticmethod)
    @lazy_virtualfield
    def lazy_shift(instance, row, delta=4): return row.x.number+delta
db.x.virtualfields.append(MyVirtualFields())
```

```
for row in db(db.x).select():
    print row.number, row.normal_shift, row.lazy_shift(delta=7)
```

**sort** (*f*, *reverse=False*)

Returns a list of sorted elements (not sorted in place)

**class** `pydal.objects.Set` (*db*, *query*, *ignore\_common\_filters=None*)

Bases: `pydal.helpers.classes.Serializable`

Represents a set of records in the database. Records are identified by the *query=Query(...)* object. Normally the Set is generated by *DAL.\_\_call\_\_(Query(...))*

Given a set, for example:

```
myset = db(db.users.name=='Max')
```

you can:

```
myset.update(db.users.name='Massimo')
myset.delete() # all elements in the set
myset.select(orderby=db.users.id, groupby=db.users.name, limitby=(0,10))
```

and take subsets:

```
subset = myset(db.users.id<5)
```

**as\_dict** (*flat=False*, *sanitize=True*)

**build** (*d*)

Experimental: see `.parse()`

**count** (*distinct=None*, *cache=None*)

**delete** ()

**delete\_uploaded\_files** (*upload\_fields=None*)

**isempty** ()

**iterselect** (*\*fields*, *\*\*attributes*)

**nested\_select** (*\*fields*, *\*\*attributes*)

**parse** (*dquery*)

Experimental: Turn a dictionary into a Query object

**select** (*\*fields*, *\*\*attributes*)

**update** (*\*\*update\_fields*)

**update\_naive** (*\*\*update\_fields*)

Same as update but does not call `table._before_update` and `_after_update`

**validate\_and\_update** (*\*\*update\_fields*)

**where** (*query*, *ignore\_common\_filters=False*)

**class** `pydal.objects.Table` (*db*, *tablename*, *\*fields*, *\*\*args*)

Bases: `pydal.helpers.classes.Serializable`, `pydal.helpers.classes.BasicStorage`

Represents a database table

**Example::**

**You can create a table as::** `db = DAL(...) db.define_table('users', Field('name'))`

And then:

```
db.users.insert(name='me') # print db.users._insert(...) to see SQL
db.users.drop()
```

**as\_dict** (*flat=False, sanitize=True*)

**bulk\_insert** (*items*)

here items is a list of dictionaries

**drop** (*mode=''*)

**fields**

**import\_from\_csv\_file** (*csvfile, id\_map=None, null='<NULL>', unique='uuid', id\_offset=None, \*args, \*\*kwargs*)

Import records from csv file. Column headers must have same names as table fields. Field 'id' is ignored. If column names read 'table.file' the 'table.' prefix is ignored.

- 'unique' argument is a field which must be unique (typically a uuid field)
- 'restore' argument is default False; if set True will remove old values in table first.
- 'id\_map' if set to None will not map ids

The import will keep the id numbers in the restored table. This assumes that there is a field of type id that is integer and in incrementing order. Will keep the id numbers in restored table.

**insert** (*\*\*fields*)

**on** (*query*)

**sqlsafe**

**sqlsafe\_alias**

**truncate** (*mode=None*)

**update** (*\*args, \*\*kwargs*)

**update\_or\_insert** (*\_key=<function <lambda> at 0x7f0e31b4e320>, \*\*values*)

**validate\_and\_insert** (*\*\*fields*)

**validate\_and\_update** (*\_key=<function <lambda> at 0x7f0e31b4e320>, \*\*fields*)

**validate\_and\_update\_or\_insert** (*\_key=<function <lambda> at 0x7f0e31b4e320>, \*\*fields*)

**with\_alias** (*alias*)

**class** `pydal.objects.VirtualCommand` (*method, row*)

Bases: `object`

`pydal.objects.pickle_row` (*s*)

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