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# pyDAL Documentation

*Release 17.11*

**web2py-developers**

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## 1.1 Subpackages

### 1.1.1 `pydal.adapters` package

#### 1.1.1.1 Submodules

#### 1.1.1.2 `pydal.adapters.base` module

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

Bases: `pydal.connection.ConnectionPool`

**adapt** (*value*)

**close\_connection** (*\*\*kwargs*)

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

**connector** ()

**dbengine** = 'None'

**drivers** = ()

**drop\_table** (*table, mode=""*)

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

```
find_driver ()  
get_table (*queries)  
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  
parse (rows, fields, colnames, blob_decode=True, cacheable=False)  
parse_value (value, field_itype, field_type, blob_decode=True)  
represent (obj, field_type)  
rowslice (rows, minimum=0, maximum=None)  
sqlsafe_field (fieldname)  
sqlsafe_table (tablename, original_tablename=None)  
support_distributed_transaction = False  
tables (*queries)  
test_connection ()  
types  
uploads_in_blob = False  
class pydal.adapters.base.DebugHandler (adapter)  
    Bases: pydal.helpers.classes.ExecutionHandler  
    before_execute (command)  
class pydal.adapters.base.NoSQLAdapter (db, uri, pool_size=0, folder=None,  
    db_codec='UTF-8', credential_decoder=<function  
    IDENTITY>, driver_args={}, adapter_args={},  
    do_connect=True, after_connection=None, en-  
    tity_quoting=False)  
    Bases: pydal.adapters.base.BaseAdapter  
    can_select_for_update = False  
    commit ()  
    commit_prepared (key)  
    create_table (table, migrate=True, fake_migrate=False, polymodel=None)  
    drop (**kwargs)  
    drop_table (table, mode="")  
    id_query (table)  
    nested_select (*args, **kwargs)  
    prepare ()  
    rollback ()  
    rollback_prepared (key)  
class pydal.adapters.base.NullAdapter (db, uri, pool_size=0, folder=None, db_codec='UTF-  
    8', credential_decoder=<function IDENTITY>,  
    driver_args={}, adapter_args={}, do_connect=True,  
    after_connection=None, entity_quoting=False)  
    Bases: pydal.adapters.base.BaseAdapter
```



```

connector ()
find_driver ()
class pydal.adapters.base.SQLAdapter (*args, **kwargs)
    Bases: pydal.adapters.base.BaseAdapter
    adapt (obj)
    bulk_insert (table, items)
    can_select_for_update = True
    commit (**kwargs)
    commit_on_alter_table = False
    commit_prepared (**kwargs)
    count (query, distinct=None)
    create_index (table, index_name, *fields, **kwargs)
    create_sequence_and_triggers (query, table, **args)
    create_table (*args, **kwargs)
    delete (table, query)
    distributed_transaction_begin (key)
    drop (**kwargs)
    drop_index (table, index_name)
    drop_table (table, mode="")
    execute (**kwargs)
    execution_handlers = []
    fetchall ()
    fetchone ()
    filter_sql_command (command)
    id_query (table)
    index_expander (**kwds)
    insert (table, fields)
    itersselect (query, fields, attributes)
    lastrowid (table)
    migrator_cls
        alias of pydal.migrator.Migrator
    nested_select (query, fields, attributes)
    prepare (**kwargs)
    represent (obj, field_type)
    rollback (**kwargs)
    rollback_prepared (**kwargs)
    select (query, fields, attributes)

```

```
smart_adapt (obj)
sqlsafe_field (fieldname)
sqlsafe_table (tablename, original_tablename=None)
table_alias (tbl, current_scope=[])
test_connection ()
truncate (table, mode="")
update (table, query, fields)
```

### 1.1.1.3 pydal.adapters.couchdb module

```
class pydal.adapters.couchdb.CouchDB (db, uri, pool_size=0, folder=None, db_codec='UTF-8',
                                       credential_decoder=<function IDENTITY>,
                                       driver_args={}, adapter_args={}, do_connect=True,
                                       after_connection=None, entity_quoting=False)
Bases: pydal.adapters.base.NoSQLAdapter

connector ()
count (query, distinct=None)
create_table (table, migrate=True, fake_migrate=False, polymodel=None)
dbengine = 'couchdb'
delete (table, query)
drivers = ('couchdb',)
insert (table, fields)
select (query, fields, attributes)
update (table, query, fields)
uploads_in_blob = True
```

### 1.1.1.4 pydal.adapters.cubrid module

### 1.1.1.5 pydal.adapters.db2 module

```
class pydal.adapters.db2.DB2 (*args, **kwargs)
Bases: pydal.adapters.base.SQLAdapter

dbengine = 'db2'
execute (**kwargs)
lastrowid (table)
rowslice (rows, minimum=0, maximum=None)

class pydal.adapters.db2.DB2IBM (*args, **kwargs)
Bases: pydal.adapters.db2.DB2

connector ()
drivers = ('ibm_db_dbi',)
```

```

class pydal.adapters.db2.DB2Pyodbc(*args, **kwargs)
    Bases: pydal.adapters.db2.DB2

    connector()

    drivers = ('pyodbc',)

```

#### 1.1.1.6 pydal.adapters.firebird module

```

class pydal.adapters.firebird.FireBird(*args, **kwargs)
    Bases: pydal.adapters.base.SQLAdapter

    REGEX_URI = <_sre.SRE_Pattern object at 0x16109b0>

    commit_on_alter_table = True

    connector()

    create_sequence_and_triggers(query, table, **args)

    dbengine = 'firebird'

    drivers = ('kinterbasdb', 'firebirdsql', 'fdb', 'pyodbc')

    lastrowid(table)

    support_distributed_transaction = True

class pydal.adapters.firebird.FireBirdEmbedded(*args, **kwargs)
    Bases: pydal.adapters.firebird.FireBird

    REGEX_URI = <_sre.SRE_Pattern object at 0x15f7dc0>

```

#### 1.1.1.7 pydal.adapters.google\_adapters module

Adapter for GAE

#### 1.1.1.8 pydal.adapters.imap module

#### 1.1.1.9 pydal.adapters.informix module

```

class pydal.adapters.informix.Informix(*args, **kwargs)
    Bases: pydal.helpers.classes.ConnectionConfigurationMixin, pydal.adapters.base.SQLAdapter

    connector()

    dbengine = 'informix'

    drivers = ('informixdb',)

    execute(**kwargs)

    lastrowid(table)

    test_connection()

class pydal.adapters.informix.InformixSE(*args, **kwargs)
    Bases: pydal.adapters.informix.Informix

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

```

### 1.1.1.10 pydal.adapters.ingres module

```
class pydal.adapters.ingres.Ingres (*args, **kwargs)
    Bases: pydal.adapters.base.SQLAdapter

    connector ()

    create_sequence_and_triggers (query, table, **args)

    dbengine = 'ingres'

    drivers = ('pyodbc',)

class pydal.adapters.ingres.IngresUnicode (*args, **kwargs)
    Bases: pydal.adapters.ingres.Ingres
```

### 1.1.1.11 pydal.adapters.mongo module

```
class pydal.adapters.mongo.Binary
    Bases: object

class pydal.adapters.mongo.Expansion (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*)

**dialect**

**get\_collection** (*safe=None*)

```

class pydal.adapters.mongo.Mongo(db, uri, pool_size=0, folder=None, db_codec='UTF-8',
    credential_decoder=<function IDENTITY>, driver_args={},
    adapter_args={}, do_connect=True, after_connection=None,
    entity_quoting=False)

Bases: pydal.helpers.classes.ConnectionConfigurationMixin, pydal.adapters.
base.NoSQLAdapter

bulk_insert (table, items)

check_notnull (table, values)

check_unique (table, values)

connector ()

count (query, distinct=None, snapshot=True)

dbengine = 'mongodb'

delete (table, query, safe=None)

drivers = ('pymongo',)

find_driver ()

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

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

represent (obj, field_type)

select (query, fields, attributes, snapshot=False)

truncate (table, mode, safe=None)

update (table, query, fields, safe=None)

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

MONGO_BLOB_BYTES = 0

MONGO_BLOB_NON_UTF8_STR = 1

static decode (value)

```

#### 1.1.1.12 pydal.adapters.mssql module

```

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

Bases: pydal.adapters.base.SQLAdapter

REGEX_ARGPATTERN = <_sre.SRE_Pattern object>

REGEX_DSN = <_sre.SRE_Pattern object>

REGEX_URI = <_sre.SRE_Pattern object at 0x1588910>

connector ()

```

```
dbengine = 'mssql'
drivers = ('pyodbc',)

lastrowid(table)

class pydal.adapters.mssql.MSSQL1(db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQL, pydal.adapters.mssql.Slicer

class pydal.adapters.mssql.MSSQL1N(db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQLN, pydal.adapters.mssql.Slicer

class pydal.adapters.mssql.MSSQL3(db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQL

class pydal.adapters.mssql.MSSQL3N(db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQLN

class pydal.adapters.mssql.MSSQL4(db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQL

class pydal.adapters.mssql.MSSQL4N(db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQLN

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

execute(**kwargs)

represent(obj, field_type)

class pydal.adapters.mssql.Slicer
    Bases: object

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

class pydal.adapters.mssql.Sybase(db, uri, pool_size=0, folder=None, db_codec='UTF-8', credential_decoder=<function IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326, after_connection=None)
    Bases: pydal.adapters.mssql.MSSQL1
```

```

connector()
dbengine = 'sybase'
class pydal.adapters.mssql.Vertica(db, uri, pool_size=0, folder=None, db_codec='UTF-
8', credential_decoder=<function IDENTITY>,
driver_args={}, adapter_args={}, do_connect=True,
srid=4326, after_connection=None)
Bases: pydal.adapters.mssql.MSSQL1
lastrowid(table)

```

### 1.1.1.13 pydal.adapters.mysql module

```

class pydal.adapters.mysql.Cubrid(*args, **kwargs)
Bases: pydal.adapters.mysql.MySQL
dbengine = 'cubrid'
drivers = ('cubriddb',)
class pydal.adapters.mysql.MySQL(*args, **kwargs)
Bases: pydal.adapters.base.SQLAdapter
REGEX_URI = <_sre.SRE_Pattern object at 0x155b860>
after_connection()
commit_on_alter_table = True
commit_prepared(**kwargs)
connector()
dbengine = 'mysql'
distributed_transaction_begin(key)
drivers = ('MySQLdb', 'pymysql', 'mysqlconnector')
prepare(**kwargs)
rollback_prepared(**kwargs)
support_distributed_transaction = True

```

### 1.1.1.14 pydal.adapters.oracle module

```

class pydal.adapters.oracle.Oracle(*args, **kwargs)
Bases: pydal.adapters.base.SQLAdapter
after_connection()
cmd_fix = <_sre.SRE_Pattern object>
connector()
create_sequence_and_triggers(query, table, **args)
dbengine = 'oracle'
drivers = ('cx_Oracle',)
execute(**kwargs)

```

```
fetchall()
insert(table, fields)
lastrowid(table)
sqlsafe_table(tablename, original_tablename=None)
test_connection()
```

#### 1.1.1.15 pydal.adapters.postgres module

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

Bases: `pydal.adapters.postgres.Postgre`

```
REGEX_URI = <_sre.SRE_Pattern object at 0x15f5a70>
```

```
after_connection()
```

```
connector()
```

```
drivers = ('zxJDBC',)
```

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

Bases: `pydal.helpers.classes.ConnectionConfigurationMixin`, `pydal.adapters.base.SQLAdapter`

```
REGEX_URI = <_sre.SRE_Pattern object at 0x1579750>
```

```
after_connection()
```

```
commit_prepared(**kwargs)
```

```
connector()
```

```
dbengine = 'postgres'
```

```
drivers = ('psycopg2', 'pg8000')
```

```
lastrowid(table)
```

```
prepare(**kwargs)
```

```
rollback_prepared(**kwargs)
```

```
support_distributed_transaction = True
```

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

Bases: `pydal.adapters.postgres.PostgreNew`



```

class pydal.adapters.postgres.PostgreMeta
    Bases: pydal.adapters.AdapterMeta

class pydal.adapters.postgres.PostgreNew(db, uri, pool_size=0, folder=None,
    db_codec='UTF-8', credential_decoder=<function IDENTITY>,
    driver_args={}, adapter_args={}, do_connect=True, srid=4326, af-
    ter_connection=None)
    Bases: pydal.adapters.postgres.Postgre

class pydal.adapters.postgres.PostgrePG8000(db, uri, pool_size=0, folder=None,
    db_codec='UTF-8', credential_decoder=<function IDENTITY>,
    driver_args={}, adapter_args={}, do_connect=True, srid=4326, af-
    ter_connection=None)
    Bases: pydal.adapters.postgres.Postgre

    adapt (obj)

    drivers = ('pg8000',)

    execute (**kwargs)

class pydal.adapters.postgres.PostgrePG8000Boolean(db, uri, pool_size=0,
    folder=None, db_codec='UTF-8', credential_decoder=<function
    IDENTITY>, driver_args={}, adapter_args={}, do_connect=True, srid=4326,
    after_connection=None)
    Bases: pydal.adapters.postgres.PostgrePG8000New, pydal.adapters.postgres.
    PostgreBoolean

class pydal.adapters.postgres.PostgrePG8000New(db, uri, pool_size=0, folder=None,
    db_codec='UTF-8', credential_decoder=<function IDENTITY>,
    driver_args={}, adapter_args={}, do_connect=True, srid=4326, af-
    ter_connection=None)
    Bases: pydal.adapters.postgres.PostgrePG8000, pydal.adapters.postgres.
    PostgreNew

class pydal.adapters.postgres.PostgrePsyco(db, uri, pool_size=0, folder=None,
    db_codec='UTF-8', credential_decoder=<function IDENTITY>,
    driver_args={}, adapter_args={}, do_connect=True, srid=4326, af-
    ter_connection=None)
    Bases: pydal.adapters.postgres.Postgre

    adapt (obj)

    drivers = ('psycopg2',)

```

```
class pydal.adapters.postgres.PostgrePsycoBoolean (db, uri, pool_size=0, folder=None,
                                                    db_codec='UTF-8', credential_decoder=<function
IDENTITY>, driver_args={},
                                                    adapter_args={},
                                                    do_connect=True, srid=4326,
                                                    after_connection=None)
    Bases: pydal.adapters.postgres.PostgrePsycoNew, pydal.adapters.postgres.
PostgreBoolean
```

```
class pydal.adapters.postgres.PostgrePsycoNew (db, uri, pool_size=0, folder=None,
                                                    db_codec='UTF-8', credential_decoder=<function
IDENTITY>,
                                                    driver_args={}, adapter_args={},
                                                    do_connect=True, srid=4326, af-
ter_connection=None)
    Bases: pydal.adapters.postgres.PostgrePsyco, pydal.adapters.postgres.
PostgreNew
```

#### 1.1.1.16 pydal.adapters.sapdb module

#### 1.1.1.17 pydal.adapters.sqlite module

```
class pydal.adapters.sqlite.JDBCSQLite (*args, **kwargs)
    Bases: pydal.adapters.sqlite.SQLite
```

```
    after_connection()
    connector()
    drivers = ('zxJDBC_sqlite',)
```

```
class pydal.adapters.sqlite.SQLite (*args, **kwargs)
    Bases: pydal.adapters.base.SQLiteAdapter
```

```
    after_connection()
    connector()
    dbengine = 'sqlite'
    delete (table, query)
    drivers = ('sqlite2', 'sqlite3')
    select (query, fields, attributes)
    static web2py_extract (lookup, s)
    static web2py_regexp (expression, item)
```

```
class pydal.adapters.sqlite.Spatialite (*args, **kwargs)
    Bases: pydal.adapters.sqlite.SQLite
```

```
    SPATIALLIBS = {'Darwin': 'libspatialite.dylib', 'Linux': 'libspatialite.so', 'Windows': 'libspatialite.dll'}
    after_connections()
    dbengine = 'spatialite'
```

### 1.1.1.18 pydal.adapters.teradata module

```
class pydal.adapters.teradata.Teradata (*args, **kwargs)
    Bases: pydal.adapters.base.SQLAdapter

    close()

    connector()

    dbengine = ''

    drivers = ('pyodbc',)

    lastrowid(table)
```

### 1.1.1.19 Module contents

```
class pydal.adapters.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.Adapters (namespace=None)
    Bases: pydal.helpers._internals.Dispatcher

    get_for(uri)

    register_for(*uris)

pydal.adapters.with_connection(f)

pydal.adapters.with_connection_or_raise(f)
```

## 1.1.2 pydal.helpers package

### 1.1.2.1 Submodules

#### 1.1.2.2 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.ConnectionConfigurationMixin
    Bases: object

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

    close ()
    close_connection ()
    escape (obj)
    static exists (db, filename)
    static is_operational_error (db, error)
    static is_programming_error (db, error)
    read (bytes=None)
    readline ()
    static try_create_web2py_filesystem (db)
    web2py_filesystems = set ([])
    write (data)

class pydal.helpers.classes.ExecutionHandler (adapter)
    Bases: object

    after_execute (command)
    before_execute (command)

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.OpRow (table)
    Bases: object

    del_value (key)

    get (key, default=None)

    items ()

    iteritems ()

    iterkeys ()

    itervalues ()

    keys ()

    op_values ()

    set_value (key, value, field=None)

    values ()

class pydal.helpers.classes.RecordDeleter (colset, table, id)
    Bases: pydal.helpers.classes.RecordOperator

class pydal.helpers.classes.RecordOperator (colset, table, id)
    Bases: object

class pydal.helpers.classes.RecordUpdater (colset, table, id)
    Bases: pydal.helpers.classes.RecordOperator

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, de-
    coder=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.TimingHandler (adapter)
```

```
    Bases: pydal.helpers.classes.ExecutionHandler
```

```
    MAXSTORAGE = 100
```

```
    after_execute (command)
```

```
    before_execute (command)
```

```
    timings
```

```
class pydal.helpers.classes.cachedprop (fget, doc=None)
```

```
    Bases: object
```

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

### 1.1.2.3 pydal.helpers.methods module

```
pydal.helpers.methods.archive_record (qset, fs, archive_table, current_record)
```

```
pydal.helpers.methods.attempt_upload (table, fields)
```

```
pydal.helpers.methods.attempt_upload_on_insert (table)
```

```
pydal.helpers.methods.attempt_upload_on_update (table)
```

```
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.bar_unescape (item)
pydal.helpers.methods.cleanup (text)
    Validates that the given text is clean: only contains [0-9a-zA-Z_]
pydal.helpers.methods.delete_uploaded_files (dbset, upload_fields=None)
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.merge_tablemaps (*maplist)
    Merge arguments into a single dict, check for name collisions.
pydal.helpers.methods.pluralize (singular, rules=[(<_sre.SRE_Pattern object>,
    <_sre.SRE_Pattern object>, 'children'), (<_sre.SRE_Pattern
    object>, <_sre.SRE_Pattern object>, 'eet'),
    (<_sre.SRE_Pattern object>, <_sre.SRE_Pattern object>,
    'eeth'), (<_sre.SRE_Pattern object>, <_sre.SRE_Pattern
    object>, '\\aves'), (<_sre.SRE_Pattern object>,
    <_sre.SRE_Pattern object>, 'ses'), (<_sre.SRE_Pattern ob-
    ject>, <_sre.SRE_Pattern object>, 'men'), (<_sre.SRE_Pattern
    object>, <_sre.SRE_Pattern object>, 'ives'),
    (<_sre.SRE_Pattern object>, <_sre.SRE_Pattern object>,
    'eaux'), (<_sre.SRE_Pattern object>, <_sre.SRE_Pattern ob-
    ject>, 'lves'), (<_sre.SRE_Pattern object>, <_sre.SRE_Pattern
    object>, 'es'), (<_sre.SRE_Pattern object>,
    <_sre.SRE_Pattern object>, 'es'), (<_sre.SRE_Pattern ob-
    ject>, <_sre.SRE_Pattern object>, 'ies'), (<_sre.SRE_Pattern
    object>, <_sre.SRE_Pattern object>, '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)

```

#### 1.1.2.4 pydal.helpers.regex module

#### 1.1.2.5 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'))
```

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```

>>> 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'

```

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```
'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=True, 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 Rows** (*db=None*, *records=[]*, *colnames=[]*, *compact=True*, *rawrows=None*, *fields=[]*)

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.

**append** (*row*)

**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

**insert** (*position*, *row*)

**join** (*field*, *name=None*, *constraint=None*, *fields=[]*, *orderby=None*)

**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 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

**create\_index** (*name, \*fields, \*\*kwargs*)

**drop** (*mode=""*)

**drop\_index** (*name*)

**fields**

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

**query\_name** (*\*args, \*\*kwargs*)

**sql\_fullref**

**sql\_shortref**

**sqlsafe**

**sqlsafe\_alias**

**truncate** (*mode=""*)

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

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

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

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

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

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

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

`can_join()`

`check_reserved_keyword(name)`

Validates *name* against SQL keywords Uses `self._check_reserved` which is a list of operators to use.

`close()`

`commit()`

`define_table(tablename, *fields, **kwargs)`

`static distributed_transaction_begin(*instances)`

`static distributed_transaction_commit(*instances)`

`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.

`execution_handlers = [<class 'pydal.helpers.classes.TimingHandler'>]`

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

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

**has\_representer** (*name*)

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

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

**lazy\_define\_table** (*tablename*, *\*fields*, *\*\*kwargs*)

**logger** = <logging.Logger object>

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

**record\_operators** = {'delete\_record': <class 'pydal.helpers.classes.RecordDeleter'>, '...

**represent** (*name*, *\*args*, *\*\*kwargs*)

**representers** = {}

**rollback** ()

**serializers** = None

**static set\_folder** (*folder*)

**smart\_query** (*fields*, *text*)

**tables**

**uuid** ()

**validators** = None

**validators\_method** = None

**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

**close\_cursor** (*cursor*)

**connection**

**cursor**

**cursors**

**lock\_cursor** (*cursor*)

**reconnect** ()  
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

**release\_cursor** (*cursor*)

**static set\_folder** (*folder*)

## 1.5 pydal.objects module

**class** `pydal.objects.BasicRows`

Bases: `object`

Abstract class for Rows and IterRows

**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)
```

**cast** (*cast\_as*, *\*\*kwargs*)

**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>>, required=False, requires=<function <lambda>>,
ondelete='CASCADE', notnull=False, unique=False, up-
loadfield=True, widget=None, label=None, comment=None,
writable=True, readable=True, searchable=True, listable=True,
regex=None, options=None, update=None, authorize=None, au-
todelete=False, represent=None, uploadfolder=None, uploadsepa-
rate=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, cus-
tom_qualifier=None, map_none=None, rname=None, **others)

```

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,
regex=None, options=None,
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, searchable=True, listable=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)
uploadfs=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`)

```
bind (table)
clone (point_self_references_to=False, **args)
count (distinct=None)
formatter (value)
longname
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, ta-
    ble_name=None, readable=True, listable=True)
    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 ()
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, fields=[]*)

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.

**append** (*row*)

**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

**insert** (*position*, *row*)

**join** (*field*, *name*=None, *constraint*=None, *fields*=[], *orderby*=None)

**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.Select` (*db*, *query*, *fields*, *attributes*)

Bases: `pydal.helpers.classes.BasicStorage`

**fields**

**on** (*query*)

**query\_name** (*outer\_scoped*=[])

**sql\_shortref**

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

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

**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** ()

**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

**create\_index** (*name*, *\*fields*, *\*\*kwargs*)

**drop** (*mode*=")

**drop\_index** (*name*)

**fields**

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

**query\_name** (*\*args*, *\*\*kwargs*)

**sql\_fullref**

**sql\_shortref**

**sqlsafe**

**sqlsafe\_alias**

**truncate** (*mode*=")

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

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

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

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

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

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

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

Bases: object

pydal.objects.pickle\_row (*s*)

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