
aerospike Documentation

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`aerospike` is a package which provides a Python client for Aerospike database clusters. The Python client is a CPython module, built on the Aerospike C client.

- `aerospike` - the module containing the Client, Query, and Scan Classes.
- `aerospike.predicates` is a submodule containing predicate helpers for use with the Query class.
- `aerospike.predexp` is a submodule containing predicate expression helpers for use with the Query class.
- `aerospike.exception` is a submodule containing the exception hierarchy for `AerospikeError` and its subclasses.
- *Data Mapping — Python Data Mappings* How Python types map to Aerospike Server types
- `aerospike_helpers.operations` Operation helper functions.

See also:

The [Python Client Manual](#) for a quick guide.

1.1 aerospike — Aerospike Client for Python

The Aerospike client enables you to build an application in Python with an Aerospike cluster as its database. The client manages the connections to the cluster and handles the transactions performed against it.

Data Model

At the top is the `namespace`, a container that has one set of policy rules for all its data, and is similar to the *database* concept in an RDBMS, only distributed across the cluster. A namespace is subdivided into `sets`, similar to *tables*.

Pairs of key-value data called `bins` make up *records*, similar to *columns* of a *row* in a standard RDBMS. Aerospike is schema-less, meaning that you do not need to define your bins in advance.

Records are uniquely identified by their key, and record metadata is contained in an in-memory primary index.

See also:

[Architecture Overview](#) and [Aerospike Data Model](#) for more information about Aerospike.

`aerospike.client` (*config*)

Creates a new instance of the Client class. This client can `connect ()` to the cluster and perform operations against it, such as `put ()` and `get ()` records.

Parameters `config` (*dict*) – the client’s configuration.

- **hosts** a required `list` of (address, port, [tls-name]) tuples identifying a node (or multiple nodes) in the cluster. The client will connect to the first available node in the list, the *seed node*, and will learn about the cluster and partition map from it. If `tls-name` is specified, it must match the `tls-name` specified in the node’s server configuration file and match the server’s CA certificate. **Note: use of TLS requires Aerospike Enterprise Edition**
- **lua** an optional `dict` containing the paths to two types of Lua modules

system_path the location of the system modules such as `aerospike.lua` (default: `/usr/local/aerospike/lua`)

- user_path** the location of the user's record and stream UDFs . (default: ./)
- **policies a dict of policies**
 - read** A dictionary containing read policies. See *Read Policies* for available policy fields and values.
 - write** A dictionary containing write policies. See *Write Policies* for available policy fields and values.
 - apply** A dictionary containing apply policies. See *Apply Policies* for available policy fields and values.
 - operate** A dictionary containing operate policies. See *Operate Policies* for available policy fields and values.
 - remove** A dictionary containing remove policies. See *Remove Policies* for available policy fields and values.
 - query** A dictionary containing query policies. See *Query Policies* for available policy fields and values.
 - scan** A dictionary containing scan policies. See *Scan Policies* for available policy fields and values.
 - batch** A dictionary containing batch policies. See *Batch Policies* for available policy fields and values.
 - total_timeout** default connection timeout in milliseconds (**Deprecated**: set this the individual policy dictionaries)
 - auth_mode** a value defining how to authenticate with the server such as *aerospike.AUTH_INTERNAL* .
 - login_timeout_ms** An integer representing Node login timeout in milliseconds. Default: 5000.
 - key** default key policy, with values such as *aerospike.POLICY_KEY_DIGEST* (**Deprecated**: set this individually in the 'read', 'write', 'apply', 'operate', 'remove' policy dictionaries)
 - exists** default exists policy, with values such as *aerospike.POLICY_EXISTS_CREATE* (**Deprecated**: set in the 'write' policies dictionary)
 - max_retries** a `int` representing the number of times to retry a transaction (**Deprecated**: set this the individual policy dictionaries)
 - consistency_level** default consistency level policy, with values such as *aerospike.POLICY_CONSISTENCY_ONE* (**Deprecated**: set this individually as needed in the 'read', 'operate', 'batch' policy dictionaries)
 - replica** default replica policy, with values such as *aerospike.POLICY_REPLICA_MASTER* (**Deprecated**: set this in one or all of the 'read', 'write', 'apply', 'operate', 'remove' policy dictionaries)
 - commit_level** default commit level policy, with values such as *aerospike.POLICY_COMMIT_LEVEL_ALL* (**Deprecated**: set this as needed individually in the 'write', 'apply', 'operate', 'remove' policy dictionaries)
- **shm a dict with optional shared-memory cluster tending parameters. Shared-memory cluster tending is on**
 - max_nodes** maximum number of nodes allowed. Pad so new nodes can be added without configuration changes (default: 16)

max_namespaces similarly pad (default: 8)

takeover_threshold_sec take over tending if the cluster hasn't been checked for this many seconds (default: 30)

shm_key explicitly set the shm key for this client. If **use_shared_connection** is not set, or set to *False*, the user must provide a value for this field in order for shared memory to work correctly. If , and only if, **use_shared_connection** is set to *True*, the key will be implicitly evaluated per unique hostname, and can be inspected with `shm_key()` . It is still possible to specify a key when using **use_shared_connection** = *True*. (default: 0xA7000000)

- **use_shared_connection** `bool` indicating whether this instance should share its connection to the Aerospike cluster with other client instances in the same process. (default: *False*)
- **tls** a `dict` of optional TLS configuration parameters. TLS usage requires Aerospike Enterprise Edition

enable a `bool` indicating whether tls should be enabled or not. Default: *False*

cafile `str` Path to a trusted CA certificate file. By default TLS will use system standard trusted CA certificates

capath `str` Path to a directory of trusted certificates. See the OpenSSL SSL_CTX_load_verify_locations manual page for more information about the format of the directory.

protocols Specifies enabled protocols. This format is the same as Apache's SSLProtocol documented at https://httpd.apache.org/docs/current/mod/mod_ssl.html#sslprotocol . If not specified the client will use "-all +TLSv1.2".

cipher_suite `str` Specifies enabled cipher suites. The format is the same as OpenSSL's Cipher List Format documented at <https://www.openssl.org/docs/manmaster/apps/ciphers.html> .If not specified the OpenSSL default cipher suite described in the ciphers documentation will be used. If you are not sure what cipher suite to select this option is best left unspecified

keyfile `str` Path to the client's key for mutual authentication. By default mutual authentication is disabled.

keyfile_pw `str` Decryption password for the client's key for mutual authentication. By default the key is assumed not to be encrypted.

cert_blacklist `str` Path to a certificate blacklist file. The file should contain one line for each blacklisted certificate. Each line starts with the certificate serial number expressed in hex. Each entry may optionally specify the issuer name of the certificate (serial numbers are only required to be unique per issuer). Example records: 867EC87482B2 /C=US/ST=CA/O=Acme/OU=Engineering/CN=Test Chain CA E2D4B0E570F9EF8E885C065899886461

certfile `str` Path to the client's certificate chain file for mutual authentication. By default mutual authentication is disabled.

crl_check `bool` Enable CRL checking for the certificate chain leaf certificate. An error occurs if a suitable CRL cannot be found. By default CRL checking is disabled.

crl_check_all `bool` Enable CRL checking for the entire certificate chain. An error occurs if a suitable CRL cannot be found. By default CRL checking is disabled.

log_session_info `bool` Log session information for each connection.

for_login_only `bool` Log session information for each connection. Use TLS connections only for login authentication. All other communication with the server will be done with

non-TLS connections. Default: `False` (Use TLS connections for all communication with server.)

- **serialization** an optional instance-level `tuple()` of (serializer, deserializer). Takes precedence over a class serializer registered with `set_serializer()`.
- **thread_pool_size** number of threads in the pool that is used in batch/scan/query commands (default: 16)
- **max_socket_idle** **Maximum socket idle time in seconds. Connection pools will discard sockets that have** been idle longer than the maximum. The value is limited to 24 hours (86400). It's important to set this value to a few seconds less than the server's `proto-fd-idle-ms` (default 60000 milliseconds or 1 minute), so the client does not attempt to use a socket that has already been reaped by the server. Default: 0 seconds (disabled) for non-TLS connections, 55 seconds for TLS connections.
- **max_conns_per_node** maximum number of pipeline connections allowed for each node
- **batch_direct** whether to use the batch-direct protocol (default: `False`, so will use batch-index if available) (**Deprecated**: set `'use_batch_direct'` in the batch policy dictionary)
- **tend_interval** polling interval in milliseconds for tending the cluster (default: 1000)
- **compression_threshold** compress data for transmission if the object size is greater than a given number of bytes (default: 0, meaning 'never compress') (**Deprecated**, set this in the `'write'` policy dictionary)
- **cluster_name** only server nodes matching this name will be used when determining the cluster

Returns an instance of the `aerospike.Client` class.

See also:

Shared Memory and Per-Transaction Consistency Guarantees.

```
import aerospike

# configure the client to first connect to a cluster node at 127.0.0.1
# the client will learn about the other nodes in the cluster from the
# seed node.
# in this configuration shared-memory cluster tending is turned on,
# which is appropriate for a multi-process context, such as a webserver
config = {
    'hosts': [ ('127.0.0.1', 3000) ],
    'policies': {'read': {'total_timeout': 1000}},
    'shm': { }}
client = aerospike.client(config)
```

Changed in version 2.0.0.

```
import aerospike
import sys

# NOTE: Use of TLS Requires Aerospike Enterprise Server Version >= 3.11 and
↳ Python Client version 2.1.0 or greater
# To view Instructions for server configuration for TLS see https://www.aerospike.
↳ com/docs/guide/security/tls.html
tls_name = "some-server-tls-name"
tls_ip = "127.0.0.1"
tls_port = 4333

# If tls-name is specified, it must match the tls-name specified in the node's
↳ server configuration file
# and match the server's CA certificate.
```

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```

tls_host_tuple = (tls_ip, tls_port, tls_name)
hosts = [tls_host_tuple]

# Example configuration which will use TLS with the specified cafile
tls_config = {
    "cafile": "/path/to/cacert.pem",
    "enable": True
}

client = aerospike.client({
    "hosts": hosts,
    "tls": tls_config
})
try:
    client.connect()
except Exception as e:
    print(e)
    print("Failed to connect")
    sys.exit()

key = ('test', 'demo', 1)
client.put(key, {'aerospike': 'aerospike'})
print(client.get(key))

```

`aerospike.null()`

A type for distinguishing a server-side null from a Python `None`. Replaces the constant `aerospike.null`.

Returns a type representing the server-side type as `_null`.

New in version 2.0.1.

`aerospike.calc_digest(ns, set, key) → bytearray`

Calculate the digest of a particular key. See: *Key Tuple*.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.
- **key** (*str, int or bytearray*) – the primary key identifier of the record within the set.

Returns a RIPEMD-160 digest of the input tuple.

Return type `bytearray`

```

import aerospike
import pprint

digest = aerospike.calc_digest("test", "demo", 1 )
pp.pprint(digest)

```

Serialization

Note: By default, the `aerospike.Client` maps the supported types `int`, `str`, `float`, `bytearray`, `list`, `dict` to matching aerospike server types (`int`, `string`, `double`, `bytes`, `list`, `map`). When an unsupported type is en-

countered, the module uses `cPickle` to serialize and deserialize the data, storing it into `as_bytes` of type 'Python' (`AS_BYTES_PYTHON`).

The functions `set_serializer()` and `set_deserializer()` allow for user-defined functions to handle serialization, instead. The serialized data is stored as 'Generic' `as_bytes` of type (`AS_BYTES_BLOB`). The `serialization` config param of `aerospike.client()` registers an instance-level pair of functions that handle serialization.

`aerospike.set_serializer(callback)`

Register a user-defined serializer available to all `aerospike.Client` instances.

Parameters `callback` (*callable*) – the function to invoke for serialization.

See also:

To use this function with `put()` the argument to `serializer` should be `aerospike.SERIALIZER_USER`.

```
import aerospike
import json

def my_serializer(val):
    return json.dumps(val)

aerospike.set_serializer(my_serializer)
```

New in version 1.0.39.

`aerospike.set_deserializer(callback)`

Register a user-defined deserializer available to all `aerospike.Client` instances. Once registered, all read methods (such as `get()`) will run bins containing 'Generic' `as_bytes` of type (`AS_BYTES_BLOB`) through this deserializer.

Parameters `callback` (*callable*) – the function to invoke for deserialization.

`aerospike.unset_serializers()`

Deregister the user-defined de/serializer available from `aerospike.Client` instances.

New in version 1.0.53.

Note: Serialization Examples

The following example shows the three modes of serialization - built-in, class-level user functions, instance-level user functions:

```
from __future__ import print_function
import aerospike
import marshal
import json

def go_marshal(val):
    return marshal.dumps(val)

def demarshal(val):
    return marshal.loads(val)

def jsonize(val):
    return json.dumps(val)

def dejsonize(val):
    return json.loads(val)
```

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```

aerospike.set_serializer(go_marshal)
aerospike.set_deserializer(demarshal)
config = {'hosts':[('127.0.0.1', 3000)]}
client = aerospike.client(config).connect()
config['serialization'] = (jsonize,dejsonize)
client2 = aerospike.client(config).connect()

for i in xrange(1, 4):
    try:
        client.remove(('test', 'demo', 'foo' + i))
    except:
        pass

bin_ = {'t': (1, 2, 3)} # tuple is an unsupported type
print("Use the built-in serialization (cPickle)")
client.put(('test','demo','foo1'), bin_)
(key, meta, bins) = client.get(('test','demo','foo1'))
print(bins)

print("Use the class-level user-defined serialization (marshal)")
client.put(('test','demo','foo2'), bin_, serializer=aerospike.SERIALIZER_USER)
(key, meta, bins) = client.get(('test','demo','foo2'))
print(bins)

print("Use the instance-level user-defined serialization (json)")
client2.put(('test','demo','foo3'), bin_, serializer=aerospike.SERIALIZER_USER)
# notice that json-encoding a tuple produces a list
(key, meta, bins) = client2.get(('test','demo','foo3'))
print(bins)
client.close()

```

The expected output is:

```

Use the built-in serialization (cPickle)
{'i': 321, 't': (1, 2, 3)}
Use the class-level user-defined serialization (marshal)
{'i': 321, 't': (1, 2, 3)}
Use the instance-level user-defined serialization (json)
{'i': 321, 't': [1, 2, 3]}

```

While AQL shows the records as having the following structure:

```

aql> select i,t from test.demo where PK='foo1'
+-----+-----+
| i | t |
+-----+-----+
| 321 | 28 49 31 0A 49 32 0A 49 33 0A 74 70 31 0A 2E |
+-----+-----+
1 row in set (0.000 secs)

aql> select i,t from test.demo where PK='foo2'
+-----+-----+
| i | t |
+-----+-----+
| 321 | 28 03 00 00 00 69 01 00 00 00 69 02 00 00 00 69 03 00 00 00 |
+-----+-----+

```

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```

1 row in set (0.000 secs)

aql> select i,t from test.demo where PK='foo3'
+-----+-----+
| i   | t   |
+-----+-----+
| 321 | 5B 31 2C 20 32 2C 20 33 5D |
+-----+-----+
1 row in set (0.000 secs)

```

Logging

`aerospike.set_log_handler` (*callback*)

Set a user-defined function as the log handler for all aerospike objects. The *callback* is invoked whenever a log event passing the logging level threshold is encountered.

Parameters `callback` (*callable*) – the function used as the logging handler.

Note: The callback function must have the five parameters (level, func, path, line, msg)

```

from __future__ import print_function
import aerospike

def as_logger(level, func, path, line, msg):
def as_logger(level, func, myfile, line, msg):
    print("***", myfile, line, func, ' :: ', msg, "***")

aerospike.set_log_level(aerospike.LOG_LEVEL_DEBUG)
aerospike.set_log_handler(as_logger)

```

`aerospike.set_log_level` (*log_level*)

Declare the logging level threshold for the log handler.

Parameters `log_level` (*int*) – one of the *Log Level* constant values.

Geospatial

`aerospike.geodata` (*[geo_data]*)

Helper for creating an instance of the *GeoJSON* class. Used to wrap a geospatial object, such as a point, polygon or circle.

Parameters `geo_data` (*dict*) – a *dict* representing the geospatial data.

Returns an instance of the `aerospike.GeoJSON` class.

```

import aerospike

# Create GeoJSON point using WGS84 coordinates.
latitude = 45.920278
longitude = 63.342222
loc = aerospike.geodata({'type': 'Point',
                        'coordinates': [longitude, latitude]})

```

New in version 1.0.54.

`aerospike.geojson` (`[geojson_str]`)

Helper for creating an instance of the `GeoJSON` class from a raw GeoJSON `str`.

Parameters `geojson_str` (`dict`) – a `str` of raw GeoJSON.

Returns an instance of the `aerospike.GeoJSON` class.

```
import aerospike

# Create GeoJSON point using WGS84 coordinates.
loc = aerospike.geojson({'type': "Point", "coordinates": [-80.604333, 28.608389]}
↪')
```

New in version 1.0.54.

1.1.1 Operators

Operators for the multi-ops method `operate()`.

Note: Beginning in version 3.4.0, it is recommended to use the operation helpers module `aerospike_helpers.operations` package To create the arguments for the `operate()` and `operate()`

`aerospike.OPERATOR_WRITE`

Write a value into a bin

```
{
  "op" : aerospike.OPERATOR_WRITE,
  "bin": "name",
  "val": "Peanut"
}
```

`aerospike.OPERATOR_APPEND`

Append to a bin with `str` type data

```
{
  "op" : aerospike.OPERATOR_APPEND,
  "bin": "name",
  "val": "Mr. "
}
```

`aerospike.OPERATOR_PREPEND`

Prepend to a bin with `str` type data

```
{
  "op" : aerospike.OPERATOR_PREPEND,
  "bin": "name",
  "val": " Esq."
}
```

`aerospike.OPERATOR_INCR`

Increment a bin with `int` or `float` type data

```
{
  "op" : aerospike.OPERATOR_INCR,
  "bin": "age",
  "val": 1
}
```

aerospike.OPERATOR_READ

Read a specific bin

```
{
  "op" : aerospike.OPERATOR_READ,
  "bin": "name"
}
```

aerospike.OPERATOR_TOUCH

Touch a record, setting its TTL. May be combined with *OPERATOR_READ*

```
{
  "op" : aerospike.OPERATOR_TOUCH
}
```

aerospike.OP_LIST_APPEND

Append an element to a bin with *list* type data

```
{
  "op" : aerospike.OP_LIST_APPEND,
  "bin": "events",
  "val": 1234,
  "list_policy": {"write_flags": aerospike.LIST_WRITE_ADD_UNIQUE} # Optional, ↵
  ↪new in client 3.4.0
}
```

Changed in version 3.4.0.

aerospike.OP_LIST_APPEND_ITEMS

Extend a bin with *list* type data with a list of items

```
{
  "op" : aerospike.OP_LIST_APPEND_ITEMS,
  "bin": "events",
  "val": [ 123, 456 ],
  "list_policy": {"write_flags": aerospike.LIST_WRITE_ADD_UNIQUE} # Optional, ↵
  ↪new in client 3.4.0
}
```

Changed in version 3.4.0.

aerospike.OP_LIST_INSERT

Insert an element at a specified index of a bin with *list* type data

```
{
  "op" : aerospike.OP_LIST_INSERT,
  "bin": "events",
  "index": 2,
  "val": 1234,
  "list_policy": {"write_flags": aerospike.LIST_WRITE_ADD_UNIQUE} # Optional, ↵
  ↪new in client 3.4.0
}
```


Changed in version 3.4.0.

aerospike.OP_LIST_INSERT_ITEMS

Insert the items at a specified index of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_INSERT_ITEMS,
  "bin": "events",
  "index": 2,
  "val": [ 123, 456 ]
  "list_policy": {"write_flags": aerospike.LIST_WRITE_ADD_UNIQUE} # Optional,
  ↳new in client 3.4.0
}
```

Changed in version 3.4.0.

aerospike.OP_LIST_INCREMENT

Increment the value of an item at the given index in a list stored in the specified bin

```
{
  "op": aerospike.OP_LIST_INCREMENT,
  "bin": "bin_name",
  "index": 2,
  "val": 5,
  "list_policy": {"write_flags": aerospike.LIST_WRITE_ADD_UNIQUE} # Optional,
  ↳new in client 3.4.0
}
```

Changed in version 3.4.0.

aerospike.OP_LIST_POP

Remove and return the element at a specified index of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_POP, # removes and returns a value
  "bin": "events",
  "index": 2
}
```

aerospike.OP_LIST_POP_RANGE

Remove and return a list of elements at a specified index range of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_POP_RANGE,
  "bin": "events",
  "index": 2,
  "val": 3 # remove and return 3 elements starting at index 2
}
```

aerospike.OP_LIST_REMOVE

Remove the element at a specified index of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_REMOVE, # remove a value
  "bin": "events",
  "index": 2
}
```

aerospike.OP_LIST_REMOVE_RANGE

Remove a list of elements at a specified index range of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_REMOVE_RANGE,
  "bin": "events",
  "index": 2,
  "val": 3 # remove 3 elements starting at index 2
}
```

aerospike.OP_LIST_CLEAR

Remove all the elements in a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_CLEAR,
  "bin": "events"
}
```

aerospike.OP_LIST_SET

Set the element `val` in a specified index of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_SET,
  "bin": "events",
  "index": 2,
  "val": "latest event at index 2" # set this value at index 2,
  "list_policy": {"write_flags": aerospike.LIST_WRITE_ADD_UNIQUE} # Optional,
  ↳new in client 3.4.0
}
```

Changed in version 3.4.0.

aerospike.OP_LIST_GET

Get the element at a specified index of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_GET,
  "bin": "events",
  "index": 2
}
```

aerospike.OP_LIST_GET_RANGE

Get the list of elements starting at a specified index of a bin with `list` type data

```
{
  "op" : aerospike.OP_LIST_GET_RANGE,
  "bin": "events",
  "index": 2,
  "val": 3 # get 3 elements starting at index 2
}
```

aerospike.OP_LIST_TRIM

Remove elements from a bin with `list` type data which are not within the range starting at a given `index` plus `val`

```
{
  "op" : aerospike.OP_LIST_TRIM,
  "bin": "events",
```

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```

    "index": 2,
    "val": 3 # remove all elements not in the range between index 2 and index 2 + 3
    ↪3
  }

```

aerospike.OP_LIST_SIZE

Count the number of elements in a bin with list type data

```

{
  "op" : aerospike.OP_LIST_SIZE,
  "bin": "events" # gets the size of a list contained in the bin
}

```

aerospike.OP_LIST_GET_BY_INDEX

Get the item at the specified index from a list bin. Server selects list item identified by index and returns selected data specified by return_type.

```

{
  "op" : aerospike.OP_LIST_GET_BY_INDEX,
  "bin": "events",
  "index": 2, # Index of the item to fetch
  "return_type": aerospike.LIST_RETURN_VALUE
}

```

New in version 3.4.0.

aerospike.OP_LIST_GET_BY_INDEX_RANGE

Server selects count list items starting at specified index and returns selected data specified by return_type. If count is omitted, the server returns all items from index to the end of list.

If inverted is set to True, return all items outside of the specified range.

```

{
  "op" : aerospike.OP_LIST_GET_BY_INDEX_RANGE,
  "bin": "events",
  "index": 2, # Beginning index of range,
  "count": 2, # Optional Count.
  "return_type": aerospike.LIST_RETURN_VALUE,
  "inverted": False # Optional.
}

```

New in version 3.4.0.

aerospike.OP_LIST_GET_BY_RANK

Server selects list item identified by rank and returns selected data specified by return_type.

```

{
  "op" : aerospike.OP_LIST_GET_BY_RANK,
  "bin": "events",
  "rank": 2, # Rank of the item to fetch
  "return_type": aerospike.LIST_RETURN_VALUE
}

```

New in version 3.4.0.

aerospike.OP_LIST_GET_BY_RANK_RANGE

Server selects count list items starting at specified rank and returns selected data specified by return_type. If count is not specified, the server returns items starting at the specified rank to the last ranked item.

If `inverted` is set to `True`, return all items outside of the specified range.

```
{
  "op" : aerospike.OP_LIST_GET_BY_RANK_RANGE,
  "bin": "events",
  "rank": 2, # Rank of the item to fetch
  "count": 3,
  "return_type": aerospike.LIST_RETURN_VALUE,
  "inverted": False # Optional, defaults to False
}
```

New in version 3.4.0.

aerospike.OP_LIST_GET_BY_VALUE

Server selects list items identified by `val` and returns selected data specified by `return_type`.

```
{
  "op" : aerospike.OP_LIST_GET_BY_VALUE,
  "bin": "events",
  "val": 5,
  "return_type": aerospike.LIST_RETURN_COUNT
}
```

New in version 3.4.0.

aerospike.OP_LIST_GET_BY_VALUE_LIST

Server selects list items contained in `value_list` and returns selected data specified by `return_type`.

If `inverted` is set to `True`, returns items not included in `value_list`

```
{
  "op" : aerospike.OP_LIST_GET_BY_VALUE_LIST,
  "bin": "events",
  "value_list": [5, 6, 7],
  "return_type": aerospike.LIST_RETURN_COUNT,
  "inverted": False # Optional, defaults to False
}
```

New in version 3.4.0.

aerospike.OP_LIST_GET_BY_VALUE_RANGE

Create list get by value range operation. Server selects list items identified by value range (begin inclusive, end exclusive). If `value_begin` is not present the range is less than `value_end`. If `value_end` is not specified, the range is greater than or equal to `value_begin`.

If `inverted` is set to `True`, returns items not included in the specified range.

```
{
  "op" : aerospike.OP_LIST_GET_BY_VALUE_RANGE,
  "bin": "events",
  "value_begin": 3, # Optional
  "value_end": 6, Optional
  "return_type": aerospike.LIST_RETURN_VALUE,
  "inverted": False # Optional, defaults to False
}
```

New in version 3.4.0.

aerospike.OP_LIST_REMOVE_BY_INDEX

Remove and return the item at the specified index from a list bin. Server selects list item identified by index and

returns selected data specified by `return_type`.

```
{
  "op" : aerospike.OP_LIST_REMOVE_BY_INDEX,
  "bin": "events",
  "index": 2, # Index of the item to fetch
  "return_type": aerospike.LIST_RETURN_VALUE
}
```

New in version 3.4.0.

`aerospike.OP_LIST_REMOVE_BY_INDEX_RANGE`

Server remove count list items starting at specified index and returns selected data specified by `return_type`. if count is omitted, the server removes and returns all items from `index` to the end of list.

If `inverted` is set to `True`, remove and return all items outside of the specified range.

```
{
  "op" : aerospike.OP_LIST_REMOVE_BY_INDEX_RANGE,
  "bin": "events",
  "index": 2, # Beginning index of range,
  "count": 2, # Optional Count.
  "return_type": aerospike.LIST_RETURN_VALUE,
  "inverted": False # Optional.
}
```

New in version 3.4.0.

`aerospike.OP_LIST_REMOVE_BY_RANK`

Server removes and returns list item identified by `rank` and returns selected data specified by `return_type`.

```
{
  "op" : aerospike.OP_LIST_REMOVE_BY_RANK,
  "bin": "events",
  "rank": 2, # Rank of the item to fetch
  "return_type": aerospike.LIST_RETURN_VALUE
}
```

New in version 3.4.0.

`aerospike.OP_LIST_REMOVE_BY_RANK_RANGE`

Server removes and returns count list items starting at specified rank and returns selected data specified by `return_type`. If `count` is not specified, the server removes and returns items starting at the specified rank to the last ranked item.

If `inverted` is set to `True`, removes return all items outside of the specified range.

```
{
  "op" : aerospike.OP_LIST_REMOVE_BY_RANK_RANGE,
  "bin": "events",
  "rank": 2, # Rank of the item to fetch
  "count": 3,
  "return_type": aerospike.LIST_RETURN_VALUE,
  "inverted": False # Optional, defaults to False
}
```

New in version 3.4.0.

`aerospike.OP_LIST_REMOVE_BY_VALUE`

Server removes and returns list items identified by `val` and returns selected data specified by `return_type`.

If `inverted` is set to `True`, removes and returns list items with a value not equal to `val`.

```
{
  "op" : aerospike.OP_LIST_REMOVE_BY_VALUE,
  "bin": "events",
  "val": 5,
  "return_type": aerospike.LIST_RETURN_COUNT,
  "inverted", # Optional, defaults to False
}
```

New in version 3.4.0.

`aerospike.OP_LIST_REMOVE_BY_VALUE_LIST`

Server removes and returns list items contained in `value_list` and returns selected data specified by `return_type`.

If `inverted` is set to `True`, removes and returns items not included in `value_list`

```
{
  "op" : aerospike.OP_LIST_REMOVE_BY_VALUE_LIST,
  "bin": "events",
  "value_list": [5, 6, 7],
  "return_type": aerospike.LIST_RETURN_COUNT,
  "inverted": False # Optional, defaults to False
}
```

New in version 3.4.0.

`aerospike.OP_LIST_REMOVE_BY_VALUE_RANGE`

Create list remove by value range operation. Server removes and returns list items identified by value range (begin inclusive, end exclusive). If `value_begin` is not present the range is less than `value_end`. If `value_end` is not specified, the range is greater than or equal to `value_begin`.

If `inverted` is set to `True`, removes and returns items not included in the specified range.

```
{
  "op" : aerospike.OP_LIST_REMOVE_BY_VALUE_RANGE,
  "bin": "events",
  "value_begin": 3, # Optional
  "value_end": 6, Optional
  "return_type": aerospike.LIST_RETURN_VALUE,
  "inverted": False # Optional, defaults to False
}
```

New in version 3.4.0.

`aerospike.OP_LIST_SET_ORDER`

Assign an ordering to the specified list bin. `list_order` should be one of `aerospike.LIST_ORDERED`, `aerospike.LIST_UNORDERED`.

```
{
  "op": aerospike.OP_LIST_SET_ORDER,
  "list_order": aerospike.LIST_ORDERED,
  "bin": "events"
}
```

New in version 3.4.0.

`aerospike.OP_LIST_SORT`

Perform a sort operation on the bin. `sort_flags`, if provided, can be one of: `aerospike.LIST_SORT_DROP_DUPLICATES` indicating that duplicate elements should be removed from the sorted list.

```
{
  'op': aerospike.OP_LIST_SORT,
  'sort_flags': aerospike.LIST_SORT_DROP_DUPLICATES, # Optional flags or'd_
  ↪together specifying behavior
  'bin': self.test_bin
}
```

New in version 3.4.0.

`aerospike.OP_MAP_SET_POLICY`

Set the policy for a map bin. The policy controls the write mode and the ordering of the map entries.

```
{
  "op" : aerospike.OP_MAP_SET_POLICY,
  "bin": "scores",
  "map_policy": {"map_write_mode": Aerospike.MAP_UPDATE, "map_order": Aerospike.
  ↪MAP_KEY_VALUE_ORDERED}
}
```

`aerospike.OP_MAP_PUT`

Put a key/value pair into a map. Operator accepts an optional `map_policy` dictionary (see `OP_MAP_SET_POLICY` for an example)

```
{
  "op" : aerospike.OP_MAP_PUT,
  "bin": "my_map",
  "key": "age",
  "val": 97
}
```

`OP_MAP_PUT_ITEMS`. Operator accepts an optional `map_policy` dictionary (see `OP_MAP_SET_POLICY`)

Put a dictionary of key/value pairs into a map.

```
{
  "op" : aerospike.OP_MAP_PUT_ITEMS,
  "bin": "my_map",
  "val": {"name": "bubba", "occupation": "dancer"}
}
```

`OP_MAP_INCREMENT`. Operator accepts an optional `map_policy` dictionary (see `OP_MAP_SET_POLICY`)

Increment the value of map entry by the given “val” argument.

```
{
  "op" : aerospike.OP_MAP_INCREMENT,
  "bin": "my_map",
  "key": "age",
  "val": 1
}
```

`OP_MAP_DECREMENT`. Operator accepts an optional `map_policy` dictionary (see `OP_MAP_SET_POLICY`)

Decrement the value of map entry by the given “val” argument.

```
{
  "op" : aerospike.OP_MAP_DECREMENT,
  "bin": "my_map",
}
```

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```
"key": "age",
"val": 1
}
```

aerospike.OP_MAP_SIZE

Return the number of entries in the given map bin.

```
{
  "op" : aerospike.OP_MAP_SIZE,
  "bin": "my_map"
}
```

aerospike.OP_MAP_CLEAR

Remove all entries from the given map bin.

```
{
  "op" : aerospike.OP_MAP_CLEAR,
  "bin": "my_map"
}
```

Note that if “return_type” is not specified in the parameters for a map operation, the default is aerospike.MAP_RETURN_NONE

aerospike.OP_MAP_REMOVE_BY_KEY

Remove the first entry from the map bin that matches the given key.

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_KEY,
  "bin": "my_map",
  "key": "age",
  "return_type": aerospike.MAP_RETURN_VALUE
}
```

aerospike.OP_MAP_REMOVE_BY_KEY_LIST

Remove the entries from the map bin that match the list of given keys.

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_KEY_LIST,
  "bin": "my_map",
  "val": ["name", "rank", "serial"]
}
```

aerospike.OP_MAP_REMOVE_BY_KEY_RANGE

Remove the entries from the map bin that have keys which fall between the given “key” (inclusive) and “val” (exclusive).

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_KEY_RANGE,
  "bin": "my_map",
  "key": "i",
  "val": "j",
  "return_type": aerospike.MAP_RETURN_KEY_VALUE
}
```

aerospike.OP_MAP_REMOVE_BY_VALUE

Remove the entry or entries from the map bin that have values which match the given “val” parameter.


```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_VALUE,
  "bin" : "my_map",
  "val" : 97,
  "return_type" : aerospike.MAP_RETURN_KEY
}
```

aerospike.OP_MAP_REMOVE_BY_VALUE_LIST

Remove the entries from the map bin that have values which match the list of values given in the “val” parameter.

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_VALUE_LIST,
  "bin" : "my_map",
  "val" : [97, 98, 99],
  "return_type" : aerospike.MAP_RETURN_KEY
}
```

aerospike.OP_MAP_REMOVE_BY_VALUE_RANGE

Remove the entries from the map bin that have values starting with the given “val” parameter (inclusive) up to the given “range” parameter (exclusive).

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_VALUE_RANGE,
  "bin" : "my_map",
  "val" : 97,
  "range" : 100,
  "return_type" : aerospike.MAP_RETURN_KEY
}
```

aerospike.OP_MAP_REMOVE_BY_INDEX

Remove the entry from the map bin at the given “index” location.

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_INDEX,
  "bin" : "my_map",
  "index" : 0,
  "return_type" : aerospike.MAP_RETURN_KEY_VALUE
}
```

aerospike.OP_MAP_REMOVE_BY_INDEX_RANGE

Remove the entries from the map bin starting at the given “index” location and removing “range” items.

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_INDEX_RANGE,
  "bin" : "my_map",
  "index" : 0,
  "val" : 2,
  "return_type" : aerospike.MAP_RETURN_KEY_VALUE
}
```

aerospike.OP_MAP_REMOVE_BY_RANK

Remove the first entry from the map bin that has a value with a rank matching the given “index”.

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_RANK,
  "bin" : "my_map",

```

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```
"index": 10
}
```

aerospike.OP_MAP_REMOVE_BY_RANK_RANGE

Remove the entries from the map bin that have values with a rank starting at the given “index” and removing “range” items.

```
{
  "op" : aerospike.OP_MAP_REMOVE_BY_RANK_RANGE,
  "bin": "my_map",
  "index": 10,
  "val": 2,
  "return_type": aerospike.MAP_RETURN_KEY_VALUE
}
```

aerospike.OP_MAP_GET_BY_KEY

Return the entry from the map bin that which has a key that matches the given “key” parameter.

```
{
  "op" : aerospike.OP_MAP_GET_BY_KEY,
  "bin": "my_map",
  "key": "age",
  "return_type": aerospike.MAP_RETURN_KEY_VALUE
}
```

aerospike.OP_MAP_GET_BY_KEY_RANGE

Return the entries from the map bin that have keys which fall between the given “key” (inclusive) and “val” (exclusive).

```
{
  "op" : aerospike.OP_MAP_GET_BY_KEY_RANGE,
  "bin": "my_map",
  "key": "i",
  "range": "j",
  "return_type": aerospike.MAP_RETURN_KEY_VALUE
}
```

aerospike.OP_MAP_GET_BY_VALUE

Return the entry or entries from the map bin that have values which match the given “val” parameter.

```
{
  "op" : aerospike.OP_MAP_GET_BY_VALUE,
  "bin": "my_map",
  "val": 97,
  "return_type": aerospike.MAP_RETURN_KEY
}
```

aerospike.OP_MAP_GET_BY_VALUE_RANGE

Return the entries from the map bin that have values starting with the given “val” parameter (inclusive) up to the given “range” parameter (exclusive).

```
{
  "op" : aerospike.OP_MAP_GET_BY_VALUE_RANGE,
  "bin": "my_map",
  "val": 97,
  "range": 100,
}
```

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```

"return_type": aerospike.MAP_RETURN_KEY
}

```

aerospike.OP_MAP_GET_BY_INDEX

Return the entry from the map bin at the given “index” location.

```

{
  "op" : aerospike.OP_MAP_GET_BY_INDEX,
  "bin": "my_map",
  "index": 0,
  "return_type": aerospike.MAP_RETURN_KEY_VALUE
}

```

aerospike.OP_MAP_GET_BY_INDEX_RANGE

Return the entries from the map bin starting at the given “index” location and removing “range” items.

```

{
  "op" : aerospike.OP_MAP_GET_BY_INDEX_RANGE,
  "bin": "my_map",
  "index": 0,
  "val": 2,
  "return_type": aerospike.MAP_RETURN_KEY_VALUE
}

```

aerospike.OP_MAP_GET_BY_RANK

Return the first entry from the map bin that has a value with a rank matching the given “index”.

```

{
  "op" : aerospike.OP_MAP_GET_BY_RANK,
  "bin": "my_map",
  "index": 10
}

```

aerospike.OP_MAP_GET_BY_RANK_RANGE

Return the entries from the map bin that have values with a rank starting at the given “index” and removing “range” items.

```

{
  "op" : aerospike.OP_MAP_GET_BY_RANK_RANGE,
  "bin": "my_map",
  "index": 10,
  "val": 2,
  "return_type": aerospike.MAP_RETURN_KEY_VALUE
}

```

Changed in version 2.0.4.

1.1.2 Policies

Commit Level Policy Options

Specifies the number of replicas required to be successfully committed before returning success in a write operation to provide the desired consistency guarantee.

`aerospike.POLICY_COMMIT_LEVEL_ALL`

Return success only after successfully committing all replicas

`aerospike.POLICY_COMMIT_LEVEL_MASTER`

Return success after successfully committing the master replica

Consistency Level Policy Options

Specifies the number of replicas to be consulted in a read operation to provide the desired consistency guarantee.

`aerospike.POLICY_CONSISTENCY_ONE`

Involve a single replica in the operation

`aerospike.POLICY_CONSISTENCY_ALL`

Involve all replicas in the operation

Existence Policy Options

Specifies the behavior for writing the record depending whether or not it exists.

`aerospike.POLICY_EXISTS_CREATE`

Create a record, ONLY if it doesn't exist

`aerospike.POLICY_EXISTS_CREATE_OR_REPLACE`

Completely replace a record if it exists, otherwise create it

`aerospike.POLICY_EXISTS_IGNORE`

Write the record, regardless of existence. (i.e. create or update)

`aerospike.POLICY_EXISTS_REPLACE`

Completely replace a record, ONLY if it exists

`aerospike.POLICY_EXISTS_UPDATE`

Update a record, ONLY if it exists

Generation Policy Options

Specifies the behavior of record modifications with regard to the generation value.

`aerospike.POLICY_GEN_IGNORE`

Write a record, regardless of generation

`aerospike.POLICY_GEN_EQ`

Write a record, ONLY if generations are equal

`aerospike.POLICY_GEN_GT`

Write a record, ONLY if local generation is greater-than remote generation

Key Policy Options

Specifies the behavior for whether keys or digests should be sent to the cluster.

`aerospike.POLICY_KEY_DIGEST`

Calculate the digest on the client-side and send it to the server

`aerospike.POLICY_KEY_SEND`

Send the key in addition to the digest. This policy causes a write operation to store the key on the server

Replica Options

Specifies which partition replica to read from.

`aerospike.POLICY_REPLICA_SEQUENCE`

Always try node containing master partition first. If connection fails and `retry_on_timeout` is true, try node containing prole partition. Currently restricted to master and one prole.

`aerospike.POLICY_REPLICA_MASTER`

Read from the partition master replica node

`aerospike.POLICY_REPLICA_ANY`

Distribute reads across nodes containing key's master and replicated partition in round-robin fashion. Currently restricted to master and one prole.

Retry Policy Options

Specifies the behavior of failed operations.

`aerospike.POLICY_RETRY_NONE`

Only attempt an operation once

`aerospike.POLICY_RETRY_ONCE`

If an operation fails, attempt the operation one more time

Auth Mode Constants

Specifies the type of authentication to be used when communicating with the server

`aerospike.AUTH_INTERNAL`

Use internal authentication only. Hashed password is stored on the server. Do not send clear password. This is the default.

`aerospike.AUTH_EXTERNAL`

Use external authentication (like LDAP). Specific external authentication is configured on server. If TLS defined, send clear password on node login via TLS. Throw exception if TLS is not defined.

`aerospike.AUTH_EXTERNAL_INSECURE`

Use external authentication (like LDAP). Specific external authentication is configured on server. Send clear password on node login whether or not TLS is defined. This mode should only be used for testing purposes because it is not secure authentication.

1.1.3 Scan Constants

`aerospike.SCAN_PRIORITY_AUTO`

`aerospike.SCAN_PRIORITY_HIGH`

`aerospike.SCAN_PRIORITY_LOW`

`aerospike.SCAN_PRIORITY_MEDIUM`

`aerospike.SCAN_STATUS_ABORTED`

Deprecated since version 1.0.50: used by `scan_info()`

`aerospike.SCAN_STATUS_COMPLETED`

Deprecated since version 1.0.50: used by `scan_info()`

`aerospike.SCAN_STATUS_INPROGRESS`

Deprecated since version 1.0.50: used by `scan_info()`

`aerospike.SCAN_STATUS_UNDEF`

Deprecated since version 1.0.50: used by `scan_info()`

New in version 1.0.39.

1.1.4 Job Constants

`aerospike.JOB_SCAN`

Scan job type argument for the module parameter of `job_info()`

`aerospike.JOB_QUERY`

Query job type argument for the module parameter of `job_info()`

`aerospike.JOB_STATUS_UNDEF`

`aerospike.JOB_STATUS_INPROGRESS`

`aerospike.JOB_STATUS_COMPLETED`

New in version 1.0.50.

1.1.5 Serialization Constants

`aerospike.SERIALIZER_PYTHON`

Use the cPickle serializer to handle unsupported types (default)

`aerospike.SERIALIZER_USER`

Use a user-defined serializer to handle unsupported types. Must have been registered for the aerospike class or configured for the Client object

`aerospike.SERIALIZER_NONE`

Do not serialize bins whose data type is unsupported

New in version 1.0.47.

1.1.6 Miscellaneous

`aerospike.__version__`

A `str` containing the module's version.

New in version 1.0.54.

`aerospike.null`

A value for distinguishing a server-side null from a Python `None`.

Deprecated since version 2.0.1: use the function `aerospike.null()` instead.

`aerospike.UDF_TYPE_LUA`

`aerospike.INDEX_STRING`

An index whose values are of the aerospike string data type

`aerospike.INDEX_NUMERIC`

An index whose values are of the aerospike integer data type

`aerospike.INDEX_GEO2DSPHERE`

An index whose values are of the aerospike GetJSON data type

See also:

Data Types.

`aerospike.INDEX_TYPE_LIST`

Index a bin whose contents is an aerospike list

`aerospike.INDEX_TYPE_MAPKEYS`

Index the keys of a bin whose contents is an aerospike map

`aerospike.INDEX_TYPE_MAPVALUES`

Index the values of a bin whose contents is an aerospike map

1.1.7 Log Level

`aerospike.LOG_LEVEL_TRACE`

`aerospike.LOG_LEVEL_DEBUG`

`aerospike.LOG_LEVEL_INFO`

`aerospike.LOG_LEVEL_WARN`

`aerospike.LOG_LEVEL_ERROR`

`aerospike.LOG_LEVEL_OFF`

1.1.8 Privileges

Permission codes define the type of permission granted for a user's role.

`aerospike.PRIV_READ`

The user is granted read access.

`aerospike.PRIV_READ_WRITE`

The user is granted read and write access.

`aerospike.PRIV_READ_WRITE_UDF`

The user is granted read and write access, and the ability to invoke UDFs.

`aerospike.PRIV_SYS_ADMIN`

The user is granted the ability to perform system administration operations. Global scope only.

`aerospike.PRIV_USER_ADMIN`

The user is granted the ability to perform user administration operations. Global scope only.

`aerospike.PRIV_DATA_ADMIN`

User can perform systems administration functions on a database that do not involve user administration. Examples include setting dynamic server configuration. Global scope only.

1.1.9 Map Return Types

Return types used by various map operations

`aerospike.MAP_RETURN_NONE`

Do not return any value.

`aerospike.MAP_RETURN_INDEX`

Return key index order.

`aerospike.MAP_RETURN_REVERSE_INDEX`

Return reverse key order.

`aerospike.MAP_RETURN_RANK`

Return value order.

`aerospike.MAP_RETURN_REVERSE_RANK`

Return reserve value order.

`aerospike.MAP_RETURN_COUNT`

Return count of items selected.

`aerospike.MAP_RETURN_KEY`

Return key for single key read and key list for range read.

`aerospike.MAP_RETURN_VALUE`

Return value for single key read and value list for range read.

`aerospike.MAP_RETURN_KEY_VALUE`

Return key/value items. Note that key/value pairs will be returned as a list of tuples (i.e. [(key1, value1), (key2, value2)])

1.1.10 List Return Types

Return types used by various map operations

`aerospike.LIST_RETURN_NONE`

Do not return any value.

`aerospike.LIST_RETURN_INDEX`

Return key index order.

`aerospike.LIST_RETURN_REVERSE_INDEX`

Return reverse key order.

`aerospike.LIST_RETURN_RANK`

Return value order.

`aerospike.LIST_RETURN_REVERSE_RANK`

Return reserve value order.

`aerospike.LIST_RETURN_COUNT`

Return count of items selected.

`aerospike.LIST_RETURN_VALUE`

Return value for single key read and value list for range read.

1.1.11 Regex Flag Values

Flags used for the `predexp.string_regex` function

`aerospike.REGEX_NONE`

Use default behavior.

`aerospike.REGEX_ICASE`

Do not differentiate case.

`aerospike.REGEX_EXTENDED`

Use POSIX Extended Regular Expression syntax when interpreting regex.

`aerospike.REGEX_NOSUB`

Do not report position of matches.

`aerospike.REGEX_NEWLINE`

Match-any-character operators don't match a newline.

1.2 Data_Mapping — Python Data Mappings

How Python types map to server types

Note: By default, the `aerospike.Client` maps the supported types `int`, `str`, `float`, `bytearray`, `list`, `dict` to matching aerospike server types (`int`, `string`, `double`, `blob`, `list`, `map`). When an unsupported type is encountered, the module uses `cPickle` to serialize and deserialize the data, storing it into a blob of type 'Python' (`AS_BYTES_PYTHON`).

The functions `set_serializer()` and `set_deserializer()` allow for user-defined functions to handle serialization, instead. The user provided function will be run instead of `cPickle`. The serialized data is stored as type (`AS_BYTES_BLOB`). This type allows the storage of binary data readable by Aerospike Clients in other languages. The `serialization` config param of `aerospike.client()` registers an instance-level pair of functions that handle serialization.

Unless a user specified serializer has been provided, all other types will be stored as Python specific bytes. Python specific bytes may not be readable by Aerospike Clients for other languages.

The following table shows which Python types map directly to Aerospike server types.

Python Type	server type
<code>int</code>	<code>integer</code>
<code>long</code>	<code>integer</code>
<code>str</code>	<code>string</code>
<code>unicode</code>	<code>string</code>
<code>float</code>	<code>double</code>
<code>dict</code>	<code>map</code>
<code>list</code>	<code>list</code>
<code>bytearray</code>	<code>blob</code>
<code>aerospike.GeoJSON</code>	<code>GeoJSON</code>

It is possible to nest these datatypes. For example a list may contain a dictionary, or a dictionary may contain a list as a value.

Note: Unless a user specified serializer has been provided, all other types will be stored as Python specific bytes. Python specific bytes may not be readable by Aerospike Clients for other languages.

1.3 Client Class — Client

1.3.1 Client

The client connects through a seed node (the address of a single node) to an Aerospike database cluster. From the seed node, the client learns of the other nodes and establishes connections to them. It also gets the partition map of the cluster, which is how it knows where every record actually lives.

The client handles the connections, including re-establishing them ahead of executing an operation. It keeps track of changes to the cluster through a cluster-tending thread.

See also:

[Client Architecture and Data Distribution.](#)

class aerospike.Client

Example:

```
from __future__ import print_function
# import the module
import aerospike
from aerospike import exception as ex
import sys

# Configure the client
config = {
    'hosts': [ ('127.0.0.1', 3000) ]
}

# Optionally set policies for various method types
write_policies = {'total_timeout': 2000, 'max_retries': 0}
read_policies = {'total_timeout': 1500, 'max_retries': 1}
policies = {'write': write_policies, 'read': read_policies}
config['policies'] = policies

# Create a client and connect it to the cluster
try:
    client = aerospike.client(config).connect()
except ex.ClientError as e:
    print("Error: {0} [{1}].format(e.msg, e.code))
    sys.exit(1)

# Records are addressable via a tuple of (namespace, set, primary key)
key = ('test', 'demo', 'foo')

try:
    # Write a record
    client.put(key, {
        'name': 'John Doe',
        'age': 32
    })
except ex.RecordError as e:
    print("Error: {0} [{1}].format(e.msg, e.code))

# Read a record
(key, meta, record) = client.get(key)
```

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```
# Close the connection to the Aerospike cluster
client.close()
```

Connection

class `aerospike.Client`

connect (`[username, password]`)

Connect to the cluster. The optional *username* and *password* only apply when connecting to the Enterprise Edition of Aerospike.

Parameters

- **username** (*str*) – a defined user with roles in the cluster. See `admin_create_user()`.
- **password** (*str*) – the password will be hashed by the client using bcrypt.

Raises `ClientError`, for example when a connection cannot be established to a seed node (any single node in the cluster from which the client learns of the other nodes).

See also:

[Security features article.](#)

is_connected ()

Tests the connections between the client and the nodes of the cluster. If the result is `False`, the client will require another call to `connect()`.

Return type `bool`

Changed in version 2.0.0.

close ()

Close all connections to the cluster. It is recommended to explicitly call this method when the program is done communicating with the cluster.

Record Operations

class `aerospike.Client`

put (`key, bins[, meta[, policy[, serializer]]]`)

Write a record with a given *key* to the cluster.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bins** (*dict*) – a *dict* of bin-name / bin-value pairs.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Write Policies*.

- **serializer** – optionally override the serialization mode of the client with one of the *Serialization Constants*. To use a class-level user-defined serialization function registered with `aerospike.set_serializer()` use `aerospike.SERIALIZER_USER`.

Raises a subclass of `AerospikeError`.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex

config = {
    'hosts': [ ('127.0.0.1', 3000) ],
    'total_timeout': 1500
}
client = aerospike.client(config).connect()
try:
    key = ('test', 'demo', 1)
    bins = {
        'l': [ "qwertyuiop", 1, bytearray("asd;as[d'as;d", "utf-8") ],
        'm': { "key": "asd;q;l;" },
        'i': 1234,
        'f': 3.14159265359,
        's': '!@##$%QSDAsd;as'
    }
    client.put(key, bins,
              policy={'key': aerospike.POLICY_KEY_SEND},
              meta={'ttl':180})
    # adding a bin
    client.put(key, {'smiley': u"\ud83d\ude04"})
    # removing a bin
    client.put(key, {'i': aerospike.null()})
except ex.AerospikeError as e:
    print("Error: {0} [{1}].format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Note: Using Generation Policy

The generation policy allows a record to be written only when the generation is a specific value. In the following example, we only want to write the record if no change has occurred since `exists()` was called.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [ ('127.0.0.1',3000)] }
client = aerospike.client(config).connect()

try:
    (key, meta) = client.exists(('test','test','key1'))
    print(meta)
    print('=====')
    client.put(('test','test','key1'), {'id':1,'a':2},
              meta={'gen': 33},

```

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```

        policy={'gen':aerospike.POLICY_GEN_EQ})
    print('Record written.')
except ex.RecordGenerationError:
    print("put() failed due to generation policy mismatch")
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
client.close()

```

exists (*key*[, *policy*]) -> (*key*, *meta*)

Check if a record with a given *key* exists in the cluster and return the record as a `tuple()` consisting of *key* and *meta*. If the record does not exist the *meta* data will be `None`.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **policy** (*dict*) – optional *Read Policies*.

Return type `tuple()` (*key*, *meta*)

Raises a subclass of *AerospikeError*.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    # assuming a record with such a key exists in the cluster
    key = ('test', 'demo', 1)
    (key, meta) = client.exists(key)
    print(key)
    print('-----')
    print(meta)
except ex.RecordNotFound:
    print("Record not found:", key)
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Changed in version 2.0.3.

get (*key*[, *policy*]) -> (*key*, *meta*, *bins*)

Read a record with a given *key*, and return the record as a `tuple()` consisting of *key*, *meta* and *bins*.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **policy** (*dict*) – optional *Read Policies*.

Returns a *Record Tuple*. See *Unicode Handling*.

Raises *RecordNotFound*.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = {'hosts': [('127.0.0.1', 3000)]}
client = aerospike.client(config).connect()

try:
    # assuming a record with such a key exists in the cluster
    key = ('test', 'demo', 1)
    (key, meta, bins) = client.get(key)
    print(key)
    print('-----')
    print(meta)
    print('-----')
    print(bins)
except ex.RecordNotFound:
    print("Record not found:", key)
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Warning: The client has been changed to raise a *RecordNotFound* exception when *get()* does not find the record. Code that used to check for `meta != None` should be modified.

Changed in version 2.0.0.

select (*key*, *bins*[, *policy*]) -> (*key*, *meta*, *bins*)

Read a record with a given *key*, and return the record as a `tuple()` consisting of *key*, *meta* and *bins*, with the specified bins projected. Prior to Aerospike server 3.6.0, if a selected bin does not exist its value will be `None`. Starting with 3.6.0, if a bin does not exist it will not be present in the returned *Record Tuple*.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **bins** (*list*) – a list of bin names to select from the record.
- **policy** (*dict*) – optional *Read Policies*.

Returns a *Record Tuple*. See *Unicode Handling*.

Raises *RecordNotFound*.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    # assuming a record with such a key exists in the cluster

```

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```

key = ('test', 'demo', 1)
(key, meta, bins) = client.select(key, ['name'])
print("name: ", bins.get('name'))
except ex.RecordNotFound:
    print("Record not found:", key)
except ex.AerospikeError as e:
    print("Error: {0} [{1}]".format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Warning: The client has been changed to raise a `RecordNotFound` exception when `select()` does not find the record. Code that used to check for `meta != None` should be modified.

Changed in version 2.0.0.

touch (`key` [, `val=0` [, `meta` [, `policy`]]])

Touch the given record, setting its `time-to-live` and incrementing its generation.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **val** (*int*) – the optional ttl in seconds, with 0 resolving to the default value in the server config.
- **meta** (*dict*) – optional record metadata to be set.
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

See also:

[Record TTL and Evictions and FAQ.](#)

```

import aerospike

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

key = ('test', 'demo', 1)
client.touch(key, 120, policy={'total_timeout': 100})
client.close()

```

remove (`key` [, `policy`])

Remove a record matching the `key` from the cluster.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **policy** (*dict*) – optional *Remove Policies*.

Raises a subclass of *AerospikeError*.

```

import aerospike

config = { 'hosts': [('127.0.0.1', 3000)] }

```

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```

client = aerospike.client(config).connect()

key = ('test', 'demo', 1)
client.remove(key, {'retry': aerospike.POLICY_RETRY_ONCE})
client.close()

```

get_key_digest (*ns, set, key*) → bytearray

Calculate the digest of a particular key. See: *Key Tuple*.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.
- **key** (*str* or *int*) – the primary key identifier of the record within the set.

Returns a RIPEMD-160 digest of the input tuple.

Return type bytearray

```

import aerospike
import pprint

pp = pprint.PrettyPrinter(indent=2)
config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

digest = client.get_key_digest("test", "demo", 1)
pp.pprint(digest)
key = ('test', 'demo', None, digest)
(key, meta, bins) = client.get(key)
pp.pprint(bins)
client.close()

```

Deprecated since version 2.0.1: use the function `aerospike.calc_digest()` instead.

Removing a Bin

remove_bin (*key, list[, meta[, policy]]*)

Remove a list of bins from a record with a given *key*. Equivalent to setting those bins to `aerospike.null()` with a `put()`.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **list** (*list*) – the bins names to be removed from the record.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Write Policies*.

Raises a subclass of `AerospikeError`.


```

import aerospike

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

key = ('test', 'demo', 1)
meta = { 'ttl': 3600 }
client.remove_bin(key, ['name', 'age'], meta, {'retry': aerospike.POLICY_
↪RETRY_ONCE})
client.close()

```

Batch Operations

class `aerospike.Client`

get_many (*keys*[, *policy*]) → [(key, meta, bins)]

Batch-read multiple records, and return them as a list. Any record that does not exist will have a `None` value for metadata and bins in the record tuple.

Parameters

- **keys** (*list*) – a list of *Key Tuple*.
- **policy** (*dict*) – optional *Batch Policies*.

Returns a list of *Record Tuple*.

Raises a *ClientError* if the batch is too big.

See also:

More information about the [Batch Index](#) interface new to Aerospike server >= 3.6.0.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    # assume the fourth key has no matching record
    keys = [
        ('test', 'demo', '1'),
        ('test', 'demo', '2'),
        ('test', 'demo', '3'),
        ('test', 'demo', '4')
    ]
    records = client.get_many(keys)
    print(records)
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Note: We expect to see something like:

```
[
  (('test', 'demo', '1', bytearray(b'ev\xb4\x88\x8c\xcf\x92\x9c_
↪\x0b\xbd\x90\xd0\x9d\xf3\xf6\xd1\x0c\xf3')), {'gen': 1, 'ttl': 2592000}, {
↪'age': 1, 'name': u'Name1'}),
  (('test', 'demo', '2', bytearray(b
↪'n\xcd7p\x88\xdcF\xe1\xd6\x0e\x05\xfb\xcb\xsa68I\xf0T\xfd')), {'gen': 1,
↪'ttl': 2592000}, {'age': 2, 'name': u'Name2'}),
  (('test', 'demo', '3', bytearray(b'\x9f\xf2\xe3\xf3\xc0\xc1\xc3q\xb5
↪$n\xf8\xccV\xa9\xed\xd91a\x86')), {'gen': 1, 'ttl': 2592000}, {'age': 3,
↪'name': u'Name3'}),
  (('test', 'demo', '4', bytearray(b'\x8eu\x19\xbe\xe0(\xda ^
↪\xfa\x8ca\x93s\xe8\xb3%\xa8)\x8b')), None, None)
]
```

Warning: The return type changed to `list` starting with version 1.0.50.

exists_many (*keys* [, *policy*]) → [(key, meta)]

Batch-read metadata for multiple keys, and return it as a `list`. Any record that does not exist will have a `None` value for metadata in the result tuple.

Parameters

- **keys** (*list*) – a list of *Key Tuple*.
- **policy** (*dict*) – optional *Batch Policies*.

Returns a list of (key, metadata) `tuple()`.

See also:

More information about the [Batch Index](#) interface new to Aerospike server >= 3.6.0.

```
from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    # assume the fourth key has no matching record
    keys = [
        ('test', 'demo', '1'),
        ('test', 'demo', '2'),
        ('test', 'demo', '3'),
        ('test', 'demo', '4')
    ]
    records = client.exists_many(keys)
    print(records)
except ex.AerospikeError as e:
    print("Error: {0} [{1}]".format(e.msg, e.code))
    sys.exit(1)
```

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```
finally:
    client.close()
```

Note: We expect to see something like:

```
[
  (('test', 'demo', '1', bytearray(b'ev\xb4\x88\x8c\xcf\x92\x9c_
↪\x0b\xbd\x90\xd0\x9d\xf3\xf6\xd1\x0c\xf3')), {'gen': 2, 'ttl': 2592000}),
  (('test', 'demo', '2', bytearray(b
↪'\n\xcd7p\x88\xdcF\xe1\xd6\x0e\x05\xfb\xcb\xa68I\xf0T\xfd')), {'gen': 7,
↪'ttl': 1337}),
  (('test', 'demo', '3', bytearray(b'\x9f\xf2\xe3\xf3\xc0\xc1\xc3q\xb5
↪$\n\xf8\xccV\xa9\xed\xd91a\x86')), {'gen': 9, 'ttl': 543}),
  (('test', 'demo', '4', bytearray(b'\x8eu\x19\xbe\xe0(\xda ^
↪\xfa\x8ca\x93s\xe8\xb3%\xa8]\x8b')), None)
]
```

Warning: The return type changed to `list` starting with version 1.0.50.

select_many (*keys*, *bins*[, *policy*]) → [(key, meta, bins), ...]

Batch-read multiple records, and return them as a `list`. Any record that does not exist will have a `None` value for metadata and bins in the record tuple. The *bins* will be filtered as specified.

Parameters

- **keys** (*list*) – a list of *Key Tuple*.
- **bins** (*list*) – the bin names to select from the matching records.
- **policy** (*dict*) – optional *Batch Policies*.

Returns a `list` of *Record Tuple*.

See also:

More information about the [Batch Index](#) interface new to Aerospike server >= 3.6.0.

```
from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    # assume the fourth key has no matching record
    keys = [
        ('test', 'demo', None, bytearray(b'ev\xb4\x88\x8c\xcf\x92\x9c_
↪\x0b\xbd\x90\xd0\x9d\xf3\xf6\xd1\x0c\xf3')),
        ('test', 'demo', None, bytearray(b
↪'\n\xcd7p\x88\xdcF\xe1\xd6\x0e\x05\xfb\xcb\xa68I\xf0T\xfd')),
        ('test', 'demo', None, bytearray(b'\x9f\xf2\xe3\xf3\xc0\xc1\xc3q\xb5
↪$\n\xf8\xccV\xa9\xed\xd91a\x86')),
        ('test', 'demo', None, bytearray(b'\x8eu\x19\xbe\xe0(\xda ^
↪\xfa\x8ca\x93s\xe8\xb3%\xa8]\x8b'))
```

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```

]
records = client.select_many(keys, [u'name'])
print(records)
except ex.AerospikeError as e:
    print("Error: {0} [{1}].format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Note: We expect to see something like:

```

[
  (('test', 'demo', None, bytearray(b'ev\xb4\x88\x8c\xcf\x92\x9c_
↪\x0b\xbd\x90\xd0\x9d\xf3\xf6\xd1\x0c\xf3'), {'gen': 1, 'ttl': 2592000}, {
↪'name': u'Name1'}),
  (('test', 'demo', None, bytearray(b
↪'\n\xcd7p\x88\xdcF\xe1\xd6\xe0\x05\xfb\xcb\xa68I\xf0T\xfd'), {'gen': 1, 'ttl
↪': 2592000}, {'name': u'Name2'}),
  (('test', 'demo', None, bytearray(b'\x9f\xf2\xe3\xf3\xc0\xc1\xc3q\xb5
↪$\n\xf8\xccv\xa9\xed\xd9la\x86'), {'gen': 1, 'ttl': 2592000}, {'name': u
↪'Name3'}),
  (('test', 'demo', None, bytearray(b'\x8eu\x19\xbe\xe0(\xda ^
↪\xfa\x8ca\x93s\xe8\xb3%\xa8]\x8b'), None, None)
]

```

Warning: The return type changed to `list` starting with version 1.0.50.

String Operations

`class aerospike.Client`

`append(key, bin, val[, meta[, policy]])`

Append the string `val` to the string value in `bin`.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **val** (*str*) – the string to append to the value of `bin`.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to `int` number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of `AerospikeError`.

```

from __future__ import print_function
import aerospike

```

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```

from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    key = ('test', 'demo', 1)
    client.append(key, 'name', ' jr.', policy={'total_timeout': 1200})
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

prepend (*key*, *bin*, *val*[, *meta*[, *policy*]])

Prepend the string value in *bin* with the string *val*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **val** (*str*) – the string to prepend to the value of *bin*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    key = ('test', 'demo', 1)
    client.prepend(key, 'name', 'Dr. ', policy={'total_timeout': 1200})
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Numeric Operations

class `aerospike.Client`

increment (*key*, *bin*, *offset*[, *meta*[, *policy*]])

Increment the integer value in *bin* by the integer *val*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **offset** (*int* or *float*) – the value by which to increment the value in *bin*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*. Note: the `exists` policy option may not be: `aerospike.POLICY_EXISTS_CREATE_OR_REPLACE` nor `aerospike.POLICY_EXISTS_REPLACE`

Raises a subclass of `AerospikeError`.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    client.put(('test', 'cats', 'mr. peppy'), {'breed':'persian'}, policy={
↪ 'exists': aerospike.POLICY_EXISTS_CREATE_OR_REPLACE})
    (key, meta, bins) = client.get(('test', 'cats', 'mr. peppy'))
    print("Before:", bins, "\n")
    client.increment(key, 'lives', -1)
    (key, meta, bins) = client.get(key)
    print("After:", bins, "\n")
    client.increment(key, 'lives', -1)
    (key, meta, bins) = client.get(key)
    print("Poor Kitty:", bins, "\n")
    print(bins)
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

List Operations

class `aerospike.Client`

Note: List operations require server version $\geq 3.7.0$

List operations support negative indexing. If the index is negative, the resolved index starts backwards from end of list.

Index examples:

- 0: first element in the list
- 4: fifth element in the list

- -1: last element in the list

Index range examples:

- 1, count 2: second and third elements in the list
- -3, count 3: last three elements in the list

If an index is out of bounds, a parameter error will be returned. If a range is partially out of bounds, the valid part of the range will be returned.

See also:

[Lists \(Data Types\)](#).

list_append (*key*, *bin*, *val*[, *meta*[, *policy*]])

Append a single element to a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **val** – *int*, *str*, *float*, *bytearray*, *list*, *dict*. An unsupported type will be serialized.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_extend (*key*, *bin*, *items*[, *meta*[, *policy*]])

Extend the list value in *bin* with the given *items*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **items** (*list*) – the items to append the list in *bin*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_insert (*key*, *bin*, *index*, *val*[, *meta*[, *policy*]])

Insert an element at the specified *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the position in the index where the value should be inserted.
- **val** – *int*, *str*, *float*, *bytearray*, *list*, *dict*. An unsupported type will be serialized.

- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_insert_items (*key*, *bin*, *index*, *items*[, *meta*[, *policy*]])

Insert the *items* at the specified *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the position in the index where the items should be inserted.
- **items** (*list*) – the items to insert into the list in *bin*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_pop (*key*, *bin*, *index*[, *meta*[, *policy*]]) → val

Remove and get back a list element at a given *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the index position in the list element which should be removed and returned.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Returns a single list element.

Raises a subclass of *AerospikeError*.

list_pop_range (*key*, *bin*, *index*, *count*[, *meta*[, *policy*]]) → val

Remove and get back list elements at a given *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the index of first element in a range which should be removed and returned.
- **count** (*int*) – the number of elements in the range.

- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Returns a list of elements.

Raises a subclass of *AerospikeError*.

list_remove (*key*, *bin*, *index* [, *meta* [, *policy*]])

Remove a list element at a given *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the index position in the list element which should be removed.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_remove_range (*key*, *bin*, *index*, *count* [, *meta* [, *policy*]])

Remove list elements at a given *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the index of first element in a range which should be removed.
- **count** (*int*) – the number of elements in the range.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_clear (*key*, *bin* [, *meta* [, *policy*]])

Remove all the elements from a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_set (*key*, *bin*, *index*, *val*[, *meta*[, *policy*]])
Set list element *val* at the specified *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the position in the index where the value should be set.
- **val** – *int*, *str*, *float*, *bytearray*, *list*, *dict*. An unsupported type will be serialized.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

list_get (*key*, *bin*, *index*[, *meta*[, *policy*]]) → *val*
Get the list element at the specified *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the position in the index where the value should be set.
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns the list elements at the given index.

list_get_range (*key*, *bin*, *index*, *count*[, *meta*[, *policy*]]) → *val*
Get the list of *count* elements starting at a specified *index* of a list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** (*int*) – the position in the index where the value should be set.
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns a *list* of elements.

list_trim (*key*, *bin*, *index*, *count*[, *meta*[, *policy*]]) → *val*
Remove elements from the list which are not within the range starting at the given *index* plus *count*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.

- **index** (*int*) – the position in the index marking the start of the range.
- **index** – the index position of the first element in a range which should not be removed.
- **count** (*int*) – the number of elements in the range.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns a list of elements.

list_size (*key*, *bin*[, *meta*[, *policy*]]) → count
Count the number of elements in the list value in *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns a *int*.

Map Operations

```
class aerospike.Client
```

Note: Map operations require server version >= 3.8.4

All maps maintain an index and a rank. Map supports negative indexing for index and rank.

An index in the context of the map API is the order of a particular key in a map. The key with the lowest key value has index 0.

A rank is the order of a particular value in a map. If multiple copies of a value exist, the ranks of those copies are based on their key ordering.

Index examples:

- 0: lowest key in the map
- 4: fifth key in the map
- -1: highest key in the map

Index range examples:

- 1, count 2: second and third keys in the map
- -3, count 3: highest three keys in the map

Rank examples:

- 0: element with the lowest value rank in the map

- -1: element with the highest ranked value in the map

Rank range examples:

- 1, count 2: second and third lowest ranked elements in the map
- -3, count 3: top three ranked elements in the map.

The default map order is `aerospike.MAP_UNORDERED`.

```

from __future__ import print_function
import aerospike
from aerospike import exception as e

config = {'hosts': [('127.0.0.1', 3000)]}
try:
    client = aerospike.client(config).connect()
except e.ClientError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(2)

key = ('test', 'demo', 'map-example')
abc = {}
for i in xrange(1, 10, 1):
    abc[chr(64 + i)] = i
for i in xrange(11, 26, 1):
    abc[chr(64 + i)] = i

try:
    if client.exists(key):
        client.remove(key)
    map_policy = {
        'map_write_mode': aerospike.MAP_UPDATE,
        'map_order': aerospike.MAP_KEY_VALUE_ORDERED
    }
    client.map_put_items(key, 'abc', abc, map_policy)
    client.map_put(key, 'abc', 'J', 10, map_policy)
    print(client.map_get_by_key_range(key, 'abc', 'A', 'D', aerospike.MAP_RETURN_
↪KEY_VALUE))
    client.map_put(key, 'abc', 'Z', 26, map_policy)
    print(client.map_get_by_index_range(key, 'abc', -3, 3, aerospike.MAP_RETURN_
↪VALUE))
    print(client.map_get_by_rank_range(key, 'abc', 0, 10, aerospike.MAP_RETURN_
↪KEY))

    print("\nRound 2")
    more = {'AA': 100, 'BB': 200, 'ZZ': 2600}
    client.map_put_items(key, 'abc', more, map_policy)
    print(client.map_get_by_key_range(key, 'abc', 'A', 'D', aerospike.MAP_RETURN_
↪KEY_VALUE))
    print(client.map_get_by_index_range(key, 'abc', -3, 3, aerospike.MAP_RETURN_
↪VALUE))
    print(client.map_get_by_rank_range(key, 'abc', 0, 10, aerospike.MAP_RETURN_
↪KEY))
except e.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))

client.close()

```

Note: We expect to see

```
[('A', 1), ('B', 2), ('C', 3)]
[24, 25, 26]
['A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J']

Round 2
[('A', 1), ('AA', 100), ('B', 2), ('BB', 200), ('C', 3)]
[25, 26, 2600]
['A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J']
```

See also:

Maps (Data Types).

map_set_policy (*key*, *bin*, *map_policy*)

Set the map policy for the given *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **map_policy** (*dict*) – *Map Policies*.

Raises a subclass of *AerospikeError*.

map_put (*key*, *bin*, *map_key*, *val* [, *map_policy* [, *meta* [, *policy*]]])

Add the given *map_key/val* pair to the map at *key* and *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **map_key** – *int*, *str*, *float*, *bytearray*. An unsupported type will be serialized.
- **val** – *int*, *str*, *float*, *bytearray*, *list*, *dict*. An unsupported type will be serialized.
- **map_policy** (*dict*) – optional *Map Policies*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

map_put_items (*key*, *bin*, *items* [, *map_policy* [, *meta* [, *policy*]]])

Add the given *items* dict of key/value pairs to the map at *key* and *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **items** (*dict*) – key/value pairs.

- **map_policy** (*dict*) – optional *Map Policies*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

map_increment (*key, bin, map_key, incr*[, *map_policy*[, *meta*[, *policy*]]])

Increment the value of a numeric map element by *incr*. Element is specified by *key, bin* and *map_key*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **map_key** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **incr** – *int* or *float*
- **map_policy** (*dict*) – optional *Map Policies*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

map_decrement (*key, bin, map_key, decr*[, *map_policy*[, *meta*[, *policy*]]])

Decrement the value of a numeric map element by *decr*. Element is specified by *key, bin* and *map_key*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **map_key** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **decr** – *int* or *float*
- **map_policy** (*dict*) – optional *Map Policies*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

map_size (*key, bin*[, *meta*[, *policy*]]) → *count*

Return the size of the map at *key* and *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns a *int*.

map_clear (*key*, *bin*[, *meta*[, *policy*]])

Remove all elements from the map at *key* and *bin*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

map_remove_by_key (*key*, *bin*, *map_key*, *return_type*[, *meta*[, *policy*]])

Remove and return a map element specified by *key*, *bin* and *map_key*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **map_key** – *int*, *str*, *float*, *bytearray*. An unsupported type will be serialized.
- **return_type** – *int* *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_remove_by_key_list (*key*, *bin*, *list*, *return_type*[, *meta*[, *policy*]][, *meta*[, *policy*]])

Remove and return map elements specified by *key*, *bin* and *list* of keys.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **list** – *list* the list of keys to match
- **return_type** – *int* *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_remove_by_key_range (*key*, *bin*, *map_key*, *range*, *return_type*[, *meta*[, *policy*]])

Remove and return map elements specified by *key*, *bin* and identified by a key range [*map_key* inclusive, *range* exclusive).

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **map_key** – *int*, *str*, *float*, *bytearray*. An unsupported type will be serialized.
- **range** – *int*, *str*, *float*, *bytearray*. An unsupported type will be serialized.
- **return_type** – *int* *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_remove_by_value (*key*, *bin*, *val*, *return_type*[, *meta*[, *policy*]])

Remove and return map elements specified by *key*, *bin* and *val*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **val** – *int*, *str*, *float*, *bytearray*. An unsupported type will be serialized.
- **return_type** – *int* *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_remove_by_value_list (*key*, *bin*, *list*, *return_type*[, *meta*[, *policy*]])

Remove and return map elements specified by *key*, *bin* and *list* of values.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **list** – *list* the list of values to match
- **return_type** – *int* *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on `return_type` parameter

map_remove_by_value_range (*key, bin, val, range, return_type* [, *meta* [, *policy*]])

Remove and return map elements specified by *key*, *bin* and value range [*val* inclusive, *range* exclusive).

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **val** – `int`, `str`, `float`, `bytearray`. An unsupported type will be serialized.
- **range** – `int`, `str`, `float`, `bytearray`. An unsupported type will be serialized.
- **return_type** – `int` *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to `int` number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on `return_type` parameter

map_remove_by_index (*key, bin, index, return_type* [, *meta* [, *policy*]])

Remove and return map elements specified by *key*, *bin* and *index*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** – `int` the index position of the map element
- **return_type** – `int` *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to `int` number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on `return_type` parameter

map_remove_by_index_range (*key, bin, index, range, return_type* [, *meta* [, *policy*]])

Remove and return map elements specified by *key*, *bin* starting at *index* position and removing *range* number of elements.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** – `int` the index position of the first map element to remove
- **range** – `int` the number of items to remove from the map
- **return_type** – `int` *Map Return Types*

- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_remove_by_rank (*key, bin, rank, return_type*[, *meta*[, *policy*]])
Remove and return map elements specified by *key*, *bin* and *rank*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **rank** – *int* the rank of the value of the element in the map
- **return_type** – *int* *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_remove_by_rank_range (*key, bin, rank, range, return_type*[, *meta*[, *policy*]])
Remove and return map elements specified by *key*, *bin* with starting *rank* and removing *range* number of elements.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **rank** – *int* the rank of the value of the first map element to remove
- **range** – *int* the number of items to remove from the map
- **return_type** – *int* *Map Return Types*
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_get_by_key (*key, bin, map_key, return_type*[, *meta*[, *policy*]])
Return map element specified by *key*, *bin* and *map_key*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.

- **map_key** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **return_type** – *int Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_get_by_key_range (*key, bin, map_key, range, return_type* [, *meta* [, *policy*]])

Return map elements specified by *key, bin* and key range [*map_key* inclusive, *range* exclusive).

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **map_key** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **range** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **return_type** – *int Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_get_by_key_list (*key, bin, key_list, return_type* [, *meta* [, *policy*]])

Return map elements specified by *key, bin* and *key_list*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **key_list** – *list* A list of map keys to fetch entries for
- **return_type** – *int Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

Note: Requires server version >= 3.16.0.1

New in version 3.2.0.

map_get_by_value (*key, bin, val, return_type* [, *meta* [, *policy*]])

Return map elements specified by *key, bin* and *val*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.

- **val** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **return_type** – *int Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_get_by_value_range (*key, bin, val, range, return_type* [, *meta* [, *policy*]])

Return map elements specified by *key, bin* and value range [*val* inclusive, *range* exclusive).

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **val** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **range** – *int, str, float, bytearray*. An unsupported type will be serialized.
- **return_type** – *int Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

map_get_by_value_list (*key, bin, value_list, return_type* [, *meta* [, *policy*]])

Return map elements specified by *key, bin* and *value_list*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **value_list** – *list* A list of map values specifying the entries to be retrieved.
- **return_type** – *int Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on *return_type* parameter

Note: Requires server version >= 3.16.0.1

New in version 3.2.0.

map_get_by_index (*key, bin, index, return_type* [, *meta* [, *policy*]])

Return the map element specified by *key, bin* and *index* position.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.

- **index** – `int` the index position of the map element
- **return_type** – `int` *Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on `return_type` parameter

map_get_by_index_range (*key, bin, index, range, return_type* [, *meta* [, *policy*]])

Return a *range* number of elements from the map at *key* and *bin*, starting at the given *index*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **index** – `int` the starting index for the range
- **range** – `int` number of elements in the range
- **return_type** – `int` *Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on `return_type` parameter

map_get_by_rank (*key, bin, rank, return_type* [, *meta* [, *policy*]])

Return the map element specified by *key*, *bin* and *rank*.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **rank** – `int` the rank of the value of the element in the map
- **return_type** – `int` *Map Return Types*
- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on `return_type` parameter

map_get_by_rank_range (*key, bin, rank, range, return_type* [, *meta* [, *policy*]])

Return map elements specified by *key*, *bin* with starting *rank* and *range* number of elements.

Parameters

- **key** (*tuple*) – a *Key Tuple* tuple associated with the record.
- **bin** (*str*) – the name of the bin.
- **rank** – `int` the rank of the value of the first map element to remove
- **range** – `int` the number of items to remove from the map
- **return_type** – `int` *Map Return Types*

- **meta** (*dict*) – unused for this operation
- **policy** (*dict*) – optional *Operate Policies*.

Raises a subclass of *AerospikeError*.

Returns depends on `return_type` parameter

Multi-Ops (Operate)

class `aerospike.Client`

operate (*key, list[, meta[, policy]]*) -> (*key, meta, bins*)

Perform multiple bin operations on a record with a given *key*, In Aerospike server versions prior to 3.6.0, non-existent bins being read will have a `None` value. Starting with 3.6.0 non-existent bins will not be present in the returned *Record Tuple*. The returned record tuple will only contain one element per bin, even if multiple operations were performed on the bin.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **list** (*list*) – a list of one or more bin operations, each structured as the `dict` `{'bin': bin name, 'op': aerospike.OPERATOR_* [, 'val': value]}`. See *Operators*.
- **meta** (*dict*) – optional record metadata to be set, with field `'ttl'` set to `int` number of seconds or one of `aerospike.TTL_NAMESPACE_DEFAULT`, `aerospike.TTL_NEVER_EXPIRE`, `aerospike.TTL_DONT_UPDATE`
- **policy** (*dict*) – optional *Operate Policies*.

Returns a *Record Tuple*. See *Unicode Handling*.

Raises a subclass of *AerospikeError*.

Note: In version 2.1.3 the return format of certain bin entries for this method, **only in cases when a map operation specifying a ‘return_type’ is used**, has changed. Bin entries for map operations using “return_type” of `aerospike.MAP_RETURN_KEY_VALUE` will now return a bin value of a list of keys and corresponding values, rather than a list of key/value tuples. See the following code block for details.

```
# pre 2.1.3 formatting of key/value bin value
[('key1', 'val1'), ('key2', 'val2'), ('key3', 'val3')]

# >= 2.1.3 formatting
['key1', 'val1', 'key2', 'val2', 'key3', 'val3']
```

Note: `operate()` can now have multiple write operations on a single bin.

```
from __future__ import print_function
import aerospike
from aerospike_helpers.operations import operations as op_helpers
from aerospike import exception as ex
import sys
```

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```

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    key = ('test', 'demo', 1)
    client.put(key, {'age': 25, 'career': 'delivery boy'})
    ops = [
        op_helpers.increment("age", 1000),
        op_helpers.write("name", "J."),
        op_helpers.prepend("name", "Phillip "),
        op_helpers.append("name", " Fry"),
        op_helpers.read("name"),
        op_helpers.read("career"),
        op_helpers.read("age")
    ]
    (key, meta, bins) = client.operate(key, ops, {'ttl':360}, {'total_timeout':500})

    print(key)
    print('-----')
    print(meta)
    print('-----')
    print(bins) # will display all bins selected by OPERATOR_READ operations
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Note: `OPERATOR_TOUCH` should only ever combine with `OPERATOR_READ`, for example to implement LRU expiry on the records of a set.

Warning: Having `val` associated with `OPERATOR_TOUCH` is deprecated. Use the meta `ttl` field instead.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

try:
    key = ('test', 'demo', 1)
    ops = [
        {
            "op" : aerospike.OPERATOR_TOUCH,
        },
        {
            "op" : aerospike.OPERATOR_READ,
            "bin": "name"
        }
    ]

```

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```

    }
  ]
  (key, meta, bins) = client.operate(key, ops, {'ttl':1800})
  print("Touched the record for {0}, extending its ttl by 30m".format(bins))
except ex.AerospikeError as e:
  print("Error: {0} [{1}]".format(e.msg, e.code))
  sys.exit(1)
finally:
  client.close()

```

Changed in version 2.1.3.

operate_ordered (*key, list[, meta[, policy]]*) -> (*key, meta, bins*)

Perform multiple bin operations on a record with the results being returned as a list of (bin-name, result) tuples. The order of the elements in the list will correspond to the order of the operations from the input parameters.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **list** (*list*) – a list of one or more bin operations, each structured as the dict {'bin': bin name, 'op': aerospike.OPERATOR_* [, 'val': value]}. See *Operators*.
- **meta** (*dict*) – optional record metadata to be set, with field 'ttl' set to *int* number of seconds or one of aerospike.TTL_NAMESPACE_DEFAULT, aerospike.TTL_NEVER_EXPIRE, aerospike.TTL_DONT_UPDATE
- **policy** (*dict*) – optional *Operate Policies*.

Returns a *Record Tuple*. See *Unicode Handling*.

Raises a subclass of *AerospikeError*.

Note: In version 2.1.3 the return format of bin entries for this method, **only in cases when a map operation specifying a 'return_type' is used**, has changed. Map operations using "return_type" of aerospike.MAP_RETURN_KEY_VALUE will now return a bin value of a list of keys and corresponding values, rather than a list of key/value tuples. See the following code block for details. In addition, some operations which did not return a value in versions <= 2.1.2 will now return a response.

```

# pre 2.1.3 formatting of key/value bin value
[('key1', 'val1'), ('key2', 'val2'), ('key3', 'val3')]

# >= 2.1.3 formatting
['key1', 'val1', 'key2', 'val2', 'key3', 'val3']

```

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
from aerospike_helpers.operations import operations as op_helpers
import sys

config = { 'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

```

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```

try:
    key = ('test', 'demo', 1)
    policy = {
        'total_timeout': 1000,
        'key': aerospike.POLICY_KEY_SEND,
        'commit_level': aerospike.POLICY_COMMIT_LEVEL_MASTER
    }

    llist = [
        op_helpers.append("name", "aa"),
        op_helpers.read("name"),
        op_helpers.increment("age", 3),
        op_helpers.read("age")
    ]

    client.operate_ordered(key, llist, {}, policy)
except ex.AerospikeError as e:
    print("Error: {0} [{1}]".format(e.msg, e.code))
    sys.exit(1)
finally:
    client.close()

```

Changed in version 2.1.3.

Scan and Query

class `aerospike.Client`

scan (*namespace* [, *set*]) → Scan

Return a `aerospike.Scan` object to be used for executing scans over a specified *set* (which can be omitted or `None`) in a *namespace*. A scan with a `None` set returns all the records in the namespace.

Parameters

- **namespace** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – optional specified set name, otherwise the entire *namespace* will be scanned.

Returns an `aerospike.Scan` class.

query (*namespace* [, *set*]) → Query

Return a `aerospike.Query` object to be used for executing queries over a specified *set* (which can be omitted or `None`) in a *namespace*. A query with a `None` set returns records which are **not in any named set**. This is different than the meaning of a `None` set in a scan.

Parameters

- **namespace** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – optional specified set name, otherwise the records which are not part of any *set* will be queried (**Note**: this is different from not providing the *set* in `scan()`).

Returns an `aerospike.Query` class.

User Defined Functions

class `aerospike.Client`

udf_put (*filename* [, *udf_type*=`aerospike.UDF_TYPE_LUA` [, *policy*]])

Register a UDF module with the cluster.

Parameters

- **filename** (*str*) – the path to the UDF module to be registered with the cluster.
- **udf_type** (*int*) – one of `aerospike.UDF_TYPE_*`
- **policy** (*dict*) – currently **timeout** in milliseconds is the available policy.

Raises a subclass of `AerospikeError`.

Note: Register the UDF module and copy it to the Lua ‘user_path’, a directory that should contain a copy of the modules registered with the cluster.

```
config = {
    'hosts': [ ('127.0.0.1', 3000)],
    'lua': { 'user_path': '/path/to/lua/user_path' }
}
client = aerospike.client(config).connect()
client.udf_put('/path/to/my_module.lua')
client.close()
```

udf_remove (*module* [, *policy*])

Remove a previously registered UDF module from the cluster.

Parameters

- **module** (*str*) – the UDF module to be deregistered from the cluster.
- **policy** (*dict*) – currently **timeout** in milliseconds is the available policy.

Raises a subclass of `AerospikeError`.

```
client.udf_remove('my_module.lua')
```

udf_list ([*policy*]) → []

Return the list of UDF modules registered with the cluster.

Parameters **policy** (*dict*) – currently **timeout** in milliseconds is the available policy.

Return type list

Raises a subclass of `AerospikeError`.

```
from __future__ import print_function
import aerospike

config = {'hosts': [ ('127.0.0.1', 3000) ] }
client = aerospike.client(config).connect()
print(client.udf_list())
client.close()
```

Note: We expect to see something like:

```
[{'content': bytearray(b''),
  'hash': bytearray(b'195e39ceb51c110950bd'),
  'name': 'my_udf1.lua',
  'type': 0},
 {'content': bytearray(b''),
  'hash': bytearray(b'8a2528e8475271877b3b'),
  'name': 'stream_udf.lua',
  'type': 0},
 {'content': bytearray(b''),
  'hash': bytearray(b'362ea79c8b64857701c2'),
  'name': 'aggregate_udf.lua',
  'type': 0},
 {'content': bytearray(b''),
  'hash': bytearray(b'635f47081431379baa4b'),
  'name': 'module.lua',
  'type': 0}]
```

udf_get (*module*[, *language=aerospike.UDF_TYPE_LUA*[, *policy*]]) → str
Return the content of a UDF module which is registered with the cluster.

Parameters

- **module** (*str*) – the UDF module to read from the cluster.
- **udf_type** (*int*) – one of `aerospike.UDF_TYPE_*`
- **policy** (*dict*) – currently **timeout** in milliseconds is the available policy.

Return type *str*

Raises a subclass of *AerospikeError*.

apply (*key, module, function, args*[, *policy*])
Apply a registered (see *udf_put* ()) record UDF to a particular record.

Parameters

- **key** (*tuple*) – a *Key Tuple* associated with the record.
- **module** (*str*) – the name of the UDF module.
- **function** (*str*) – the name of the UDF to apply to the record identified by *key*.
- **args** (*list*) – the arguments to the UDF.
- **policy** (*dict*) – optional *Apply Policies*.

Returns the value optionally returned by the UDF, one of *str, int, float, bytearray, list, dict*.

Raises a subclass of *AerospikeError*.

See also:

Record UDF and Developing Record UDFs.

scan_apply (*ns, set, module, function*[, *args*[, *policy*[, *options*]]]) → int
Initiate a background scan and apply a record UDF to each record matched by the scan.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name. Should be `None` if the entire namespace is to be scanned.

- **module** (*str*) – the name of the UDF module.
- **function** (*str*) – the name of the UDF to apply to the records matched by the scan.
- **args** (*list*) – the arguments to the UDF.
- **policy** (*dict*) – optional *Scan Policies*.
- **options** (*dict*) – the *Scan Options* that will apply to the scan.

Return type `int`

Returns a job ID that can be used with `job_info()` to track the status of the aerospike. `JOB_SCAN`, as it runs in the background.

Raises a subclass of *AerospikeError*.

See also:

[Record UDF and Developing Record UDFs](#).

query_apply (*ns, set, predicate, module, function*[, *args*[, *policy*]]) → `int`

Initiate a background query and apply a record UDF to each record matched by the query.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name. Should be `None` if you want to query records in the *ns* which are in no set.
- **predicate** (*tuple*) – the `tuple()` produced by one of the *aerospike.predicates* methods.
- **module** (*str*) – the name of the UDF module.
- **function** (*str*) – the name of the UDF to apply to the records matched by the query.
- **args** (*list*) – the arguments to the UDF.
- **policy** (*dict*) – optional *Write Policies*.

Return type `int`

Returns a job ID that can be used with `job_info()` to track the status of the aerospike. `JOB_QUERY`, as it runs in the background.

Raises a subclass of *AerospikeError*.

See also:

[Record UDF and Developing Record UDFs](#).

job_info (*job_id, module*[, *policy*]) → `dict`

Return the status of a job running in the background.

Parameters

- **job_id** (*int*) – the job ID returned by `scan_apply()` and `query_apply()`.
- **module** – one of `aerospike.JOB_SCAN` or `aerospike.JOB_QUERY`.

Returns a `dict` with keys `status`, `records_read`, and `progress_pct`. The value of `status` is one of `aerospike.JOB_STATUS_*`. See: *Job Constants*.

Raises a subclass of *AerospikeError*.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex
import time

config = {'hosts': [ ('127.0.0.1', 3000)]}
client = aerospike.client(config).connect()
try:
    # run the UDF 'add_val' in Lua module 'simple' on the records of test.demo
    job_id = client.scan_apply('test', 'demo', 'simple', 'add_val', ['age',
↵1])
    while True:
        time.sleep(0.25)
        response = client.job_info(job_id, aerospike.JOB_SCAN)
        if response['status'] == aerospike.JOB_STATUS_COMPLETED:
            break
        print("Job ", str(job_id), " completed")
        print("Progress percentage : ", response['progress_pct'])
        print("Number of scanned records : ", response['records_read'])
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
client.close()

```

scan_info (*scan_id*) → dict

Return the status of a scan running in the background.

Parameters *scan_id* (*int*) – the scan ID returned by *scan_apply()*.

Returns a dict with keys *status*, *records_scanned*, and *progress_pct*. The value of *status* is one of *aerospike.SCAN_STATUS_**. See: *Scan Constants*.

Raises a subclass of *AerospikeError*.

Deprecated since version 1.0.50: Use *job_info()* instead.

```

from __future__ import print_function
import aerospike
from aerospike import exception as ex

config = {'hosts': [ ('127.0.0.1', 3000)]}
client = aerospike.client(config).connect()
try:
    scan_id = client.scan_apply('test', 'demo', 'simple', 'add_val', ['age',
↵1])
    while True:
        response = client.scan_info(scan_id)
        if response['status'] == aerospike.SCAN_STATUS_COMPLETED or \
            response['status'] == aerospike.SCAN_STATUS_ABORTED:
            break
        if response['status'] == aerospike.SCAN_STATUS_COMPLETED:
            print("Background scan successful")
            print("Progress percentage : ", response['progress_pct'])
            print("Number of scanned records : ", response['records_scanned'])
            print("Background scan status : ", "SCAN_STATUS_COMPLETED")
        else:
            print("Scan_apply failed")
except ex.AerospikeError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
client.close()

```

Info Operations

class `aerospike.Client`

`get_nodes()` → []

Return the list of hosts present in a connected cluster.

Returns a list of node address tuples.

Raises a subclass of `AerospikeError`.

```
import aerospike

config = {'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

nodes = client.get_nodes()
print(nodes)
client.close()
```

Note: We expect to see something like:

```
[('127.0.0.1', 3000), ('127.0.0.1', 3010)]
```

Changed in version 3.0.0.

Warning: In versions < 3.0.0 `get_nodes` will not work when using TLS

`info(command[, hosts[, policy]])` → {}

Deprecated since version 3.0.0: Use `info_node()` to send a request to a single node, or `info_all()` to send a request to the entire cluster. Sending requests to specific nodes can be better handled with a simple Python function such as:

```
def info_to_host_list(client, request, hosts, policy=None):
    output = {}
    for host in hosts:
        try:
            response = client.info_node(request, host, policy)
            output[host] = response
        except Exception as e:
            # Handle the error gracefully here
            output[host] = e
    return output
```

Send an `info command` to all nodes in the cluster and filter responses to only include nodes specified in a `hosts` list.

Parameters

- **command** (*str*) – the info command.
- **hosts** (*list*) – a list containing an *address, port* tuple(). Example: `[('127.0.0.1', 3000)]`
- **policy** (*dict*) – optional *Info Policies*.

Return type `dict`

Raises a subclass of `AerospikeError`.

See also:

Info Command Reference.

```
import aerospike

config = {'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

response = client.info(command)
client.close()
```

Note: We expect to see something like:

```
{'BB9581F41290C00': (None, '127.0.0.1:3000\n'), 'BC3581F41290C00': (None,
↪ '127.0.0.1:3010\n')}
```

Changed in version 3.0.0.

info_all (*command*[, *policy*]) → {}

Send an info *command* to all nodes in the cluster to which the client is connected. If any of the individual requests fail, this will raise an exception.

Parameters

- **command** (*str*) – the info command.
- **policy** (*dict*) – optional *Info Policies*.

Return type `dict`

Raises a subclass of `AerospikeError`.

See also:

Info Command Reference.

```
import aerospike

config = {'hosts': [('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

response = client.info_all(command)
client.close()
```

Note: We expect to see something like:

```
{'BB9581F41290C00': (None, '127.0.0.1:3000\n'), 'BC3581F41290C00': (None,
↪ '127.0.0.1:3010\n')}
```

New in version 3.0.0.

info_node (*command*, *host*[, *policy*]) → str

Send an info *command* to a single node specified by *host*.

Parameters

- **command** (*str*) – the info command.
- **host** (*tuple*) – a `tuple()` containing an *address*, *port* , optional *tls-name* . Example: ('127.0.0.1', 3000) or when using TLS ('127.0.0.1', 4333, 'server-tls-name'). In order to send an info request when TLS is enabled, the *tls-name* must be present.
- **policy** (*dict*) – optional *Info Policies*.

Return type *str***Raises** a subclass of *AerospikeError*.**See also:**[Info Command Reference](#).

Changed in version 3.0.0.

Warning: for client versions < 3.0.0 `info_node` will not work when using TLS**has_geo** () → bool

Check whether the connected cluster supports geospatial data and indexes.

Return type *bool***Raises** a subclass of *AerospikeError*.**shm_key** () → intExpose the value of the `shm_key` for this client if shared-memory cluster tending is enabled,**Return type** *int* or *None***truncate** (*namespace*, *set*, *nanos*[, *policy*])Remove records in specified namespace/set efficiently. This method is many orders of magnitude faster than deleting records one at a time. Works with Aerospike Server versions >= 3.12. See [Truncate command reference](#).

This asynchronous server call may return before the truncation is complete. The user can still write new records after the server returns because new records will have last update times greater than the truncate cutoff (set at the time of truncate call)

Parameters

- **namespace** (*str*) – The namespace on which the truncation operation should be performed.
- **set** (*str*) – The set to truncate. Pass in *None* to indicate that all records in the namespace should be truncated.
- **nanos** (*long*) – A cutoff threshold indicating that records last updated before the threshold will be removed. Units are in nanoseconds since unix epoch (1970-01-01). A value of 0 indicates that all records in the set should be truncated regardless of update time. The value must not be in the future.
- **policy** (*dict*) – Optional *Info Policies*

Return type Status indicating the success of the operation.**Raises** a subclass of *AerospikeError*.


```

import aerospike
import time

client = aerospike.client({'hosts': [('localhost', 3000)]}).connect()

# Store 10 items in the database
for i in range(10):
    key = ('test', 'truncate', i)
    record = {'item': i}
    client.put(key, record)

time.sleep(2)
current_time = time.time()
# Convert the current time to nanoseconds since epoch
threshold_ns = int(current_time * 10 ** 9)

time.sleep(2) # Make sure some time passes before next round of additions

# Store another 10 items into the database
for i in range(10, 20):
    key = ('test', 'truncate', i)
    record = {'item': i}
    client.put(key, record)

# Store a record in the 'test' namespace without a set
key = ('test', None, 'no set')
record = ({'item': 'no set'})
client.put(key, record)

# Remove all items created before the threshold time
# The first 10 records we added will be removed by this call.
# The second 10 will remain.
client.truncate('test', 'truncate', threshold_ns)

# Remove all records from test/truncate.
# After this the record with key ('test', None, 'no set') still exists
client.truncate('test', 'truncate', 0)

# Remove all records from the test namespace
client.truncate('test', None, 0)

client.close()

```

Index Operations

class `aerospike.Client`

index_string_create (*ns, set, bin, index_name* [, *policy*])

Create a string index with *index_name* on the *bin* in the specified *ns, set*.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.

- **bin** (*str*) – the name of bin the secondary index is built on.
- **index_name** (*str*) – the name of the index.
- **policy** (*dict*) – optional *Info Policies*.

Raises a subclass of *AerospikeError*.

index_integer_create (*ns, set, bin, index_name*[, *policy*])

Create an integer index with *index_name* on the *bin* in the specified *ns, set*.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.
- **bin** (*str*) – the name of bin the secondary index is built on.
- **index_name** (*str*) – the name of the index.
- **policy** (*dict*) – optional *Info Policies*.

Raises a subclass of *AerospikeError*.

index_list_create (*ns, set, bin, index_datatype, index_name*[, *policy*])

Create an index named *index_name* for numeric, string or GeoJSON values (as defined by *index_datatype*) on records of the specified *ns, set* whose *bin* is a list.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.
- **bin** (*str*) – the name of bin the secondary index is built on.
- **index_datatype** – Possible values are `aerospike.INDEX_STRING`, `aerospike.INDEX_NUMERIC` and `aerospike.INDEX_GEO2DSPHERE`.
- **index_name** (*str*) – the name of the index.
- **policy** (*dict*) – optional *Info Policies*.

Raises a subclass of *AerospikeError*.

Note: Requires server version >= 3.8.0

index_map_keys_create (*ns, set, bin, index_datatype, index_name*[, *policy*])

Create an index named *index_name* for numeric, string or GeoJSON values (as defined by *index_datatype*) on records of the specified *ns, set* whose *bin* is a map. The index will include the keys of the map.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.
- **bin** (*str*) – the name of bin the secondary index is built on.
- **index_datatype** – Possible values are `aerospike.INDEX_STRING`, `aerospike.INDEX_NUMERIC` and `aerospike.INDEX_GEO2DSPHERE`.
- **index_name** (*str*) – the name of the index.
- **policy** (*dict*) – optional *Info Policies*.

Raises a subclass of *AerospikeError*.

Note: Requires server version >= 3.8.0

index_map_values_create (*ns, set, bin, index_datatype, index_name* [, *policy*])

Create an index named *index_name* for numeric, string or GeoJSON values (as defined by *index_datatype*) on records of the specified *ns, set* whose *bin* is a map. The index will include the values of the map.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.
- **bin** (*str*) – the name of bin the secondary index is built on.
- **index_datatype** – Possible values are `aerospike.INDEX_STRING`, `aerospike.INDEX_NUMERIC` and `aerospike.INDEX_GEO2DSPHERE`.
- **index_name** (*str*) – the name of the index.
- **policy** (*dict*) – optional *Info Policies*.

Raises a subclass of *AerospikeError*.

Note: Requires server version >= 3.8.0

```
import aerospike

client = aerospike.client({'hosts': [ ('127.0.0.1', 3000)]}).connect()

# assume the bin fav_movies in the set test.demo bin should contain
# a dict { (str) _title_ : (int) _times_viewed_ }
# create a secondary index for string values of test.demo records whose 'fav_
↪movies' bin is a map
client.index_map_keys_create('test', 'demo', 'fav_movies', aerospike.INDEX_
↪STRING, 'demo_fav_movies_titles_idx')
# create a secondary index for integer values of test.demo records whose 'fav_
↪movies' bin is a map
client.index_map_values_create('test', 'demo', 'fav_movies', aerospike.INDEX_
↪NUMERIC, 'demo_fav_movies_views_idx')
client.close()
```

index_geo2dsphere_create (*ns, set, bin, index_name* [, *policy*])

Create a geospatial 2D spherical index with *index_name* on the *bin* in the specified *ns, set*.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **set** (*str*) – the set name.
- **bin** (*str*) – the name of bin the secondary index is built on.
- **index_name** (*str*) – the name of the index.
- **policy** (*dict*) – optional *Info Policies*.

Raises a subclass of *AerospikeError*.

See also:

aerospike.GeoJSON, *aerospike.predicates*

Note: Requires server version $\geq 3.7.0$

```
import aerospike

client = aerospike.client({'hosts': [ ('127.0.0.1', 3000)]}).connect()
client.index_geo2dsphere_create('test', 'pads', 'loc', 'pads_loc_geo')
client.close()
```

index_remove (*ns*, *index_name* [*, policy*])

Remove the index with *index_name* from the namespace.

Parameters

- **ns** (*str*) – the namespace in the aerospike cluster.
- **index_name** (*str*) – the name of the index.
- **policy** (*dict*) – optional *Info Policies*.

Raises a subclass of *AerospikeError*.

Admin Operations

class `aerospike.Client`

Note: The admin methods implement the security features of the Enterprise Edition of Aerospike. These methods will raise a *SecurityNotSupported* when the client is connected to a Community Edition cluster (see *aerospike.exception*).

A user is validated by the client against the server whenever a connection is established through the use of a username and password (passwords hashed using bcrypt). When security is enabled, each operation is validated against the user's roles. Users are assigned roles, which are collections of *Privilege Objects*.

```
import aerospike
from aerospike import exception as ex
import time

config = {'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect('ipji', 'life is good')

try:
    dev_privileges = [{'code': aerospike.PRIV_READ}, {'code': aerospike.PRIV_READ_
↳WRITE}]
    client.admin_create_role('dev_role', dev_privileges)
    client.admin_grant_privileges('dev_role', [{'code': aerospike.PRIV_READ_WRITE_
↳UDF}])
    client.admin_create_user('dev', 'you young whatchacallit... idiot', ['dev_role
↳'])
    time.sleep(1)
    print(client.admin_query_user('dev'))
    print(admin_query_users())
```

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```

except ex.AdminError as e:
    print("Error [{0}]: {1}".format(e.code, e.msg))
client.close()

```

See also:

[Security features article.](#)

admin_create_role (*role*, *privileges*[, *policy*])

Create a custom, named *role* containing a list of *privileges*.

Parameters

- **role** (*str*) – the name of the role.
- **privileges** (*list*) – a list of *Privilege Objects*.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_drop_role (*role*[, *policy*])

Drop a custom *role*.

Parameters

- **role** (*str*) – the name of the role.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_grant_privileges (*role*, *privileges*[, *policy*])

Add *privileges* to a *role*.

Parameters

- **role** (*str*) – the name of the role.
- **privileges** (*list*) – a list of *Privilege Objects*.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_revoke_privileges (*role*, *privileges*[, *policy*])

Remove *privileges* from a *role*.

Parameters

- **role** (*str*) – the name of the role.
- **privileges** (*list*) – a list of *Privilege Objects*.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_query_role (*role*[, *policy*]) → []

Get the list of privileges associated with a *role*.

Parameters

- **role** (*str*) – the name of the role.
- **policy** (*dict*) – optional *Admin Policies*.

Returns a list of *Privilege Objects*.

Raises one of the *AdminError* subclasses.

admin_query_roles (*[policy]*) → {}

Get all named roles and their privileges.

Parameters **policy** (*dict*) – optional *Admin Policies*.

Returns a *dict* of *Privilege Objects* keyed by role name.

Raises one of the *AdminError* subclasses.

admin_create_user (*username, password, roles[, policy]*)

Create a user with a specified *username* and grant it *roles*.

Parameters

- **username** (*str*) – the username to be added to the aerospike cluster.
- **password** (*str*) – the password associated with the given username.
- **roles** (*list*) – the list of role names assigned to the user.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_drop_user (*username[, policy]*)

Drop the user with a specified *username* from the cluster.

Parameters

- **username** (*str*) – the username to be dropped from the aerospike cluster.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_change_password (*username, password[, policy]*)

Change the *password* of the user *username*. This operation can only be performed by that same user.

Parameters

- **username** (*str*) – the username.
- **password** (*str*) – the password associated with the given username.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_set_password (*username, password[, policy]*)

Set the *password* of the user *username* by a user administrator.

Parameters

- **username** (*str*) – the username to be added to the aerospike cluster.
- **password** (*str*) – the password associated with the given username.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_grant_roles (*username, roles[, policy]*)

Add *roles* to the user *username*.

Parameters

- **username** (*str*) – the username to be granted the roles.
- **roles** (*list*) – a list of role names.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_revoke_roles (*username*, *roles*[, *policy*])
Remove *roles* from the user *username*.

Parameters

- **username** (*str*) – the username to have the roles revoked.
- **roles** (*list*) – a list of role names.
- **policy** (*dict*) – optional *Admin Policies*.

Raises one of the *AdminError* subclasses.

admin_query_user (*username*[, *policy*]) → []
Return the list of roles granted to the specified user *username*.

Parameters

- **username** (*str*) – the username to query for.
- **policy** (*dict*) – optional *Admin Policies*.

Returns a list of role names.

Raises one of the *AdminError* subclasses.

admin_query_users ([*policy*]) → {}
Return the *dict* of users, with their roles keyed by username.

Parameters **policy** (*dict*) – optional *Admin Policies*.

Returns a *dict* of roles keyed by username.

Raises one of the *AdminError* subclasses.

Key Tuple

key

The key tuple, which is sent and returned by various operations, has the structure

```
(namespace, set, primary key[, the record's RIPEMD-160 digest])
```

- *namespace* the *str* name of the namespace, which must be preconfigured on the cluster.
- *set* the *str* name of the set. Will be created automatically if it does not exist.
- *primary key* the value by which the client-side application identifies the record, which can be of type *str*, *int* or *bytearray*.
- *digest* the first three parts of the tuple get hashed through RIPEMD-160, and the digest used by the clients and cluster nodes to locate the record. A key tuple is also valid if it has the digest part filled and the primary key part set to *None*.

```
>>> client = aerospike.client(config).connect()
>>> client.put(('test', 'demo', 'oof'), {'id':0, 'a':1})
>>> (key, meta, bins) = client.get(('test', 'demo', 'oof'))
>>> key
('test', 'demo', None, bytearray(b'\ti\xcb\xb9\xb6V#V\xecI
↪#\xea1u\x05\x00H\x98\xe4='))
```

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```
>>> (key2, meta2, bins2) = client.get(key)
>>> bins2
{'a': 1, 'id': 0}
>>> client.close()
```

See also:

Data Model: Keys and Digests.

Record Tuple

record

The record tuple (*key*, *meta*, *bins*) which is returned by various read operations.

- *key* the *Key Tuple*.
- *meta* a dict containing {'gen' : generation value, 'ttl': ttl value}.
- *bins* a dict containing bin-name/bin-value pairs.

See also:

Data Model: Record.

Unicode Handling

Both `str` and `unicode()` values are converted by the client into UTF-8 encoded strings for storage on the aerospike server. Read methods such as `get()`, `query()`, `scan()` and `operate()` will return that data as UTF-8 encoded `str` values. To get a `unicode()` you will need to manually decode.

Warning: Prior to release 1.0.43 read operations always returned strings as `unicode()`.

```
>>> client.put(key, { 'name': 'Dr. Zeta Alphabeta', 'age': 47})
>>> (key, meta, record) = client.get(key)
>>> type(record['name'])
<type 'str'>
>>> record['name']
'Dr. Zeta Alphabeta'
>>> client.put(key, { 'name': unichr(0x2603), 'age': 21})
>>> (key, meta, record) = client.get(key)
>>> type(record['name'])
<type 'str'>
>>> record['name']
'\xe2\x98\x83'
>>> print(record['name'])

>>> name = record['name'].decode('utf-8')
>>> type(name)
<type 'unicode'>
>>> name
u'\u2603'
>>> print(name)
```


Write Policies

policy

A `dict` of optional write policies, which are applicable to `put()`, `query_apply()`, `remove_bin()`.

- **max_retries**

An `int`. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times

if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes, which sets `max_retries = 0`;

Default: 0

- **sleep_between_retries**

An `int`. Milliseconds to sleep between retries. Enter zero to skip sleep. Default: 0

- **socket_timeout**

An `int`. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: 0.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: 1000

- **key one of the `aerospike.POLICY_KEY_*` values such as `aerospike.POLICY_KEY_DIGEST`**

Default: `aerospike.POLICY_KEY_DIGEST`

- **exists one of the `aerospike.POLICY_EXISTS_*` values such as `aerospike.POLICY_EXISTS_CREATE`**

Default: `aerospike.POLICY_GEN_IGNORE`

- **gen one of the `aerospike.POLICY_GEN_*` values such as `aerospike.POLICY_GEN_IGNORE`**

Default: `aerospike.POLICY_GEN_IGNORE`

- **commit_level** one of the `aerospike.POLICY_COMMIT_LEVEL_*` values such as `aerospike.POLICY_COMMIT`

Default: `aerospike.POLICY_COMMIT_LEVEL_ALL`

- **durable_delete** boolean value: **True to perform durable delete (requires Enterprise server version >= 3.10)**

Default: `False`

Read Policies

policy

A `dict` of optional read policies, which are applicable to `get()`, `exists()`, `select()`.

- **max_retries**

An `int`. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes, which sets `max_retries = 0`;

Default: `2`

- **sleep_between_retries**

An `int`. Milliseconds to sleep between retries. Enter zero to skip sleep. Default: `0`

- **socket_timeout**

An `int`. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: `0`.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: `1000`

- **deserialize**
`bool` Should raw bytes representing a list or map be deserialized to a list or dictionary.
Set to *False* for backup programs that just need access to raw bytes.
Default: `True`
- **linearize_read**
`bool`
Force reads to be linearized for server namespaces that support CP mode. Setting this policy to `True` requires an Enterprise server with version 4.0.0 or greater.
Default: `False`
- **key one of the `aerospike.POLICY_KEY_*` values such as `aerospike.POLICY_KEY_DIGEST`**
Default: `aerospike.POLICY_KEY_DIGEST`
- **consistency_level one of the `aerospike.POLICY_CONSISTENCY_*` values such as `aerospike.POLICY_CONSISTENCY_ONE`**
Default: `aerospike.POLICY_CONSISTENCY_ONE`
- **replica one of the `aerospike.POLICY_REPLICA_*` values such as `aerospike.POLICY_REPLICA_MASTER`**
Default: `aerospike.POLICY_REPLICA_SEQUENCE`

Operate Policies

`policy`

A `dict` of optional operate policies, which are applicable to `append()`, `prepend()`, `increment()`, `operate()`, and atomic list and map operations.

- **max_retries**
An `int`. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes, which sets `max_retries = 0`;

Default: `0`

- **sleep_between_retries**
An `int`. Milliseconds to sleep between retries. Enter zero to skip sleep.

Default: `0`

- **socket_timeout**
An `int`. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: 0.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: 1000

- **linearize_read**

`bool`

Force reads to be linearized for server namespaces that support CP mode. Setting this policy to `True` requires an Enterprise server with version 4.0.0 or greater.

Default: `False`

- **key one of the `aerospike.POLICY_KEY_*` values such as `aerospike.POLICY_KEY_DIGEST`**

Default: `aerospike.POLICY_KEY_DIGEST`

- **gen one of the `aerospike.POLICY_GEN_*` values such as `aerospike.POLICY_GEN_IGNORE`**

Default: `aerospike.POLICY_GEN_IGNORE`

- **replica one of the `aerospike.POLICY_REPLICA_*` values such as `aerospike.POLICY_REPLICA_MASTER`**

Default: `aerospike.POLICY_REPLICA_SEQUENCE`

- **commit_level one of the `aerospike.POLICY_COMMIT_LEVEL_*` values such as `aerospike.POLICY_COMMIT_ALL`**

Default: `aerospike.POLICY_COMMIT_LEVEL_ALL`

- **consistency_level one of the `aerospike.POLICY_CONSISTENCY_*` values such as `aerospike.POLICY_CONSISTENCY_ALL`**

Default: `aerospike.POLICY_CONSISTENCY_ONE`

- **exists one of the `aerospike.POLICY_EXISTS_*` values such as `aerospike.POLICY_EXISTS_CREATE`**

Default: `aerospike.POLICY_EXISTS_CREATE`

- **durable_delete** boolean value: `True` to perform durable delete (requires Enterprise server version ≥ 3.10)

Default: `False`

Apply Policies

`policy`

A `dict` of optional apply policies, which are applicable to `apply()`.

- **max_retries**

An `int`. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes, which sets `max_retries = 0`;

Default: 0

- **sleep_between_retries**

An `int`. Milliseconds to sleep between retries. Enter zero to skip sleep. Default: 0

- **socket_timeout**

An `int`. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: 0.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: 1000

- **linearize_read**

`bool`

Force reads to be linearized for server namespaces that support CP mode. Setting this policy to `True` requires an Enterprise server with version 4.0.0 or greater.

Default: `False`

- **key one of the `aerospike.POLICY_KEY_*` values such as `aerospike.POLICY_KEY_DIGEST`**

Default: `aerospike.POLICY_KEY_DIGEST`

- **replica one of the `aerospike.POLICY_REPLICA_*` values such as `aerospike.POLICY_REPLICA_MASTER`**

Default: `aerospike.POLICY_REPLICA_SEQUENCE`

- **gen one of the `aerospike.POLICY_GEN_*` values such as `aerospike.POLICY_GEN_IGNORE`**

Default: `aerospike.POLICY_GEN_IGNORE`

- **commit_level one of the `aerospike.POLICY_COMMIT_LEVEL_*` values such as `aerospike.POLICY_COMMIT_LEVEL_ALL`**

Default: `aerospike.POLICY_COMMIT_LEVEL_ALL`

- **durable_delete boolean value: `True` to perform durable delete (requires Enterprise server version \geq 3.10)**

Default: False

Remove Policies

policy

A `dict` of optional remove policies, which are applicable to `remove()`.

- **max_retries**

An `int`. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes, which sets `max_retries = 0`;

Default: 0

- **sleep_between_retries**

An `int`. Milliseconds to sleep between retries. Enter zero to skip sleep. Default: 0

- **socket_timeout**

An `int`. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: 0.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: 1000

- **key one of the `aerospike.POLICY_KEY_*` values such as `aerospike.POLICY_KEY_DIGEST`**

Default: `aerospike.POLICY_KEY_DIGEST`

- **commit_level one of the `aerospike.POLICY_COMMIT_LEVEL_*` values such as `aerospike.POLICY_COMMIT_`**

Default: `aerospike.POLICY_COMMIT_LEVEL_ALL`

- **gen one of the aerospike.POLICY_GEN_* values such as `aerospike.POLICY_GEN_IGNORE`**

Default: `aerospike.POLICY_GEN_IGNORE`

- **durable_delete** boolean value: True to perform durable delete (requires Enterprise server version >= 3.10)
Default: `False`
- **replica one of the aerospike.POLICY_REPLICA_* values such as `aerospike.POLICY_REPLICA_MASTER`**

Default: `aerospike.POLICY_REPLICA_SEQUENCE`

Batch Policies

policy

A **dict** of optional batch policies, which are applicable to `get_many()`, `exists_many()` and `select_many()`.

- **max_retries**

An `int`. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times

if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes, which sets `max_retries = 0`;

Default: 2

- **sleep_between_retries**

An `int`. Milliseconds to sleep between retries. Enter zero to skip sleep.

Default: 0

- **socket_timeout**

An `int`. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: 0.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: 1000

- **linearize_read**

`bool`

Force reads to be linearized for server namespaces that support CP mode. Setting this policy to `True` requires an Enterprise server with version 4.0.0 or greater.

Default: `False`

- **consistency_level** one of the `aerospike.POLICY_CONSISTENCY_*` values such as `aerospike.POLICY_CONSI`

Default: `aerospike.POLICY_CONSISTENCY_ONE`

- **concurrent** `bool` Determine if batch commands to each server are run in parallel threads. Default `False`
- **allow_inline** `bool` . Allow batch to be processed immediately in the server's receiving thread when the server deems it to be appropriate. If `False`, the batch will always be processed in separate transaction threads. This field is only relevant for the new batch index protocol. Default `True`.
- **send_set_name** `bool` Send set name field to server for every key in the batch for batch index protocol. This is only necessary when authentication is enabled and security roles are defined on a per set basis. Default: `False`
- **deserialize** `bool` Should raw bytes be deserialized to `as_list` or `as_map`. Set to `False` for backup programs that just need access to raw bytes. Default: `True`

Info Policies

policy

A `dict` of optional info policies, which are applicable to `info()`, `info_node()` and index operations.

- **timeout** read timeout in milliseconds

Admin Policies

policy

A `dict` of optional admin policies, which are applicable to admin (security) operations.

- **timeout** admin operation timeout in milliseconds

List Policies

policy

A `dict` of optional list policies, which are applicable to list operations.

- **write_flags** Write flags for the operation. Valid values: `aerospike.LIST_WRITE_ADD_UNIQUE`, `aerospike.LI`
values should be or'd together: `aerospike.LIST_WRITE_ADD_UNIQUE | aerospike.LI`
`LIST_WRITE_INSERT_BOUNDED`
- **list_order** ordering to maintain for the list. Valid values: values are `aerospike.LIST_ORDERED`,
`aerospike.LIST_UNORDERED`

Example:


```
list_policy = {
    "write_flags": aerospike.LIST_WRITE_ADD_UNIQUE | aerospike.LIST_WRITE_
↪INSERT_BOUNDED,
    "list_order": aerospike.LIST_ORDERED
}
```

Map Policies

policy

A `dict` of optional map policies, which are applicable to map operations.

- **map_write_mode** write mode for the map. Valid values: `aerospike.MAP_UPDATE`, `aerospike.MAP_UPDATE_ONLY`, `aerospike.MAP_CREATE_ONLY`
- **map_order** ordering to maintain for the map entries. Valid values: `aerospike.MAP_UNORDERED`, `aerospike.MAP_KEY_ORDERED`, `aerospike.MAP_KEY_VALUE_ORDERED`

Privilege Objects

privilege

A `dict` describing a privilege associated with a specific role.

- **code** one of the `aerospike.PRIV_*` values such as `aerospike.PRIV_READ`
- **ns** optional namespace, to which the privilege applies, otherwise the privilege applies globally.
- **set** optional set within the `ns`, to which the privilege applies, otherwise to the entire namespace.

Example:

```
{'code': aerospike.PRIV_READ, 'ns': 'test', 'set': 'demo'}
```

1.4 Scan Class — Scan

1.4.1 Scan

class `aerospike.Scan`

The Scan object is used to return all the records in a specified set (which can be omitted or `None`). A Scan with a `None` set returns all the records in the namespace.

The scan is invoked using either `foreach()` or `results()`. The bins returned can be filtered using `select()`.

See also:

[Scans and Managing Scans.](#)

select (`bin1`[, `bin2`[, `bin3`..]])

Set a filter on the record bins resulting from `results()` or `foreach()`. If a selected bin does not exist in a record it will not appear in the `bins` portion of that record tuple.

results (`[policy]`, `nodename`) -> list of (`key`, `meta`, `bins`)

Buffer the records resulting from the scan, and return them as a list of records.

Parameters

- **policy** (`dict`) – optional *Scan Policies*.
- **nodename** (`str`) – optional name of node used to limit the scan to a single node.

Returns a list of *Record Tuple*.

```
import aerospike
import pprint

pp = pprint.PrettyPrinter(indent=2)
config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

client.put(('test', 'test', 'key1'), {'id':1, 'a':1},
          policy={ 'key':aerospike.POLICY_KEY_SEND})
client.put(('test', 'test', 'key2'), {'id':2, 'b':2},
          policy={ 'key':aerospike.POLICY_KEY_SEND})

scan = client.scan('test', 'test')
scan.select('id', 'a', 'zzz')
res = scan.results()
pp.pprint(res)
client.close()
```

Note: We expect to see:

```
[ ( ( 'test',
      'test',
      u'key2',
      bytearray(b'\xb2\x18\n\xd4\xce\xd8\xba:\x96s\xf5\x9ba\xf1j\xa7t\xee\x01
      ↪')),
  { 'gen': 52, 'ttl': 2592000},
  { 'id': 2}),
  ( ( 'test',
      'test',
      u'key1',
      bytearray(b'\x1cJ\xce\xa7\xd4vj\xef+\xdf@W\xa5\xd8o\x8d:\xc9\xf4\xde')),
  { 'gen': 52, 'ttl': 2592000},
  { 'a': 1, 'id': 1})]
```

foreach (*callback*[, *policy*[, *options*[, *nodename*]]])

Invoke the *callback* function for each of the records streaming back from the scan.

Parameters

- **callback** (*callable*) – the function to invoke for each record.
- **policy** (*dict*) – optional *Scan Policies*.
- **options** (*dict*) – the *Scan Options* that will apply to the scan.
- **nodename** (*str*) – optional name of node used to limit the scan to a single node.

Note: A *Record Tuple* is passed as the argument to the callback function.

```
import aerospike
import pprint

pp = pprint.PrettyPrinter(indent=2)
config = { 'hosts': [ ('127.0.0.1', 3000)] }
```

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```

client = aerospike.client(config).connect()

client.put(('test','test','key1'), {'id':1,'a':1},
          policy={ 'key':aerospike.POLICY_KEY_SEND})
client.put(('test','test','key2'), {'id':2,'b':2},
          policy={ 'key':aerospike.POLICY_KEY_SEND})

def show_key((key, meta, bins)):
    print(key)

scan = client.scan('test', 'test')
scan_opts = {
    'concurrent': True,
    'nobins': True,
    'priority': aerospike.SCAN_PRIORITY_MEDIUM
}
scan.foreach(show_key, options=scan_opts)
client.close()

```

Note: We expect to see:

```

('test', 'test', u'key2', bytearray(b
↳ '\xb2\x18\n\xd4\xce\xd8\xba:\x96s\xf5\x9ba\xf1j\xa7t\xeem\x01'))
('test', 'test', u'key1', bytearray(b
↳ '\x1cJ\xce\xa7\xd4vj\xef+\xdf@W\xa5\xd8o\x8d:\xc9\xf4\xde'))

```

Note: To stop the stream return False from the callback function.

```

from __future__ import print_function
import aerospike

config = { 'hosts': [ ('127.0.0.1',3000)] }
client = aerospike.client(config).connect()

def limit(lim, result):
    c = [0] # integers are immutable so a list (mutable) is used for the
↳ counter
    def key_add((key, metadata, bins)):
        if c[0] < lim:
            result.append(key)
            c[0] = c[0] + 1
        else:
            return False
    return key_add

scan = client.scan('test','user')
keys = []
scan.foreach(limit(100, keys))
print(len(keys)) # this will be 100 if the number of matching records > 100
client.close()

```

Scan Policies

policy

A `dict` of optional scan policies which are applicable to `Scan.results()` and `Scan.foreach()`. See *Policies*.

- **max_retries**

An `int`. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times

if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes which sets `max_retries = 0`;

Default: 0

- **sleep_between_retries**

An `int`. Milliseconds to sleep between retries. Enter zero to skip sleep. Default: 0

- **socket_timeout**

An `int`. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: 30000.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: 0

- **fail_on_cluster_change** `bool`: Abort the scan if the cluster is not in a stable state. Default: `False`

- **durable_delete**

A `bool`: If the transaction results in a record deletion, leave a tombstone for the record.

This prevents deleted records from reappearing after node failures.

Valid for Aerospike Server Enterprise Edition only.

Default: `False` (do not tombstone deleted records).

Scan Options

options

A `dict` of optional scan options which are applicable to `Scan.foreach()`.

- **priority** See *Scan Constants* for values. Default `aerospike.SCAN_PRIORITY_AUTO`.
- **nobins** `bool` whether to return the *bins* portion of the *Record Tuple*. Default `False`.
- **concurrent** `bool` whether to run the scan concurrently on all nodes of the cluster. Default `False`.
- **percent** `int` percentage of records to return from the scan. Default `100`.

New in version 1.0.39.

1.5 Query Class — Query

1.5.1 Query

class `aerospike.Query`

The Query object created by calling `aerospike.Client.query()` is used for executing queries over a secondary index of a specified set (which can be omitted or `None`). For queries, the `None` set contains those records which are not part of any named set.

The Query can (optionally) be assigned one of the *predicates* (`between()` or `equals()`) using `where()`. A query without a predicate will match all the records in the given set, similar to a *Scan*.

The query is invoked using either `foreach()` or `results()`. The bins returned can be filtered by using `select()`.

Finally, a *stream UDF* may be applied with `apply()`. It will aggregate results out of the records streaming back from the query.

See also:

[Queries and Managing Queries.](#)

select (`bin1[, bin2[, bin3..]]`)

Set a filter on the record bins resulting from `results()` or `foreach()`. If a selected bin does not exist in a record it will not appear in the *bins* portion of that record tuple.

where (*predicate*)

Set a *where predicate* for the query, without which the query will behave similar to `aerospike.Scan`. The predicate is produced by one of the `aerospike.predicates` methods `equals()` and `between()`.

Parameters predicate (*tuple*) – the `tuple()` produced by one of the `aerospike.predicates` methods.

Note: Currently, you can assign at most one predicate to the query.

results (`[,policy [, options]]`) -> *list of (key, meta, bins)*

Buffer the records resulting from the query, and return them as a `list` of records.

Parameters

- **policy** (*dict*) – optional *Query Policies*.
- **options** (*dict*) – optional *Query Options*.

Returns a list of *Record Tuple*.

```
import aerospike
from aerospike import predicates as p
import pprint

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

pp = pprint.PrettyPrinter(indent=2)
query = client.query('test', 'demo')
query.select('name', 'age') # matched records return with the values of these_
↪bins
# assuming there is a secondary index on the 'age' bin of test.demo
query.where(p.equals('age', 40))
records = query.results( {'total_timeout':2000})
pp.pprint(records)
client.close()
```

Note: Queries require a secondary index to exist on the *bin* being queried.

foreach (*callback* [, *policy* [, *options*]])

Invoke the *callback* function for each of the records streaming back from the query.

Parameters

- **callback** (*callable*) – the function to invoke for each record.
- **policy** (*dict*) – optional *Query Policies*.
- **options** (*dict*) – optional *Query Options*.

Note: A *Record Tuple* is passed as the argument to the callback function.

```
import aerospike
from aerospike import predicates as p
import pprint

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

pp = pprint.PrettyPrinter(indent=2)
query = client.query('test', 'demo')
query.select('name', 'age') # matched records return with the values of these_
↪bins
# assuming there is a secondary index on the 'age' bin of test.demo
query.where(p.between('age', 20, 30))
names = []
def matched_names((key, metadata, bins)):
    pp.pprint(bins)
    names.append(bins['name'])
```

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```

query.foreach(matched_names, {'total_timeout':2000})
pp.pprint(names)
client.close()

```

Note: To stop the stream return `False` from the callback function.

```

from __future__ import print_function
import aerospike
from aerospike import predicates as p

config = { 'hosts': [ ('127.0.0.1',3000)] }
client = aerospike.client(config).connect()

def limit(lim, result):
    c = [0] # integers are immutable so a list (mutable) is used for the
    ↪counter
    def key_add((key, metadata, bins)):
        if c[0] < lim:
            result.append(key)
            c[0] = c[0] + 1
        else:
            return False
    return key_add

query = client.query('test','user')
query.where(p.between('age', 20, 30))
keys = []
query.foreach(limit(100, keys))
print(len(keys)) # this will be 100 if the number of matching records > 100
client.close()

```

apply (*module*, *function*[, *arguments*])

Aggregate the *results()* using a stream UDF. If no predicate is attached to the *Query* the stream UDF will aggregate over all the records in the specified set.

Parameters

- **module** (*str*) – the name of the Lua module.
- **function** (*str*) – the name of the Lua function within the *module*.
- **arguments** (*list*) – optional arguments to pass to the *function*.

Returns one of the supported types, `int`, `str`, `float` (double), `list`, `dict` (map), `bytearray` (bytes).

See also:

Developing Stream UDFs

Note: Assume we registered the following Lua module with the cluster as `stream_udf.lua` using `aerospike.Client.udf_put()`.

```

local function having_ge_threshold(bin_having, ge_threshold)
    return function(rec)
        debug("group_count::thresh_filter: %s > %s ?", tostring(rec[bin_
    ↪having]), tostring(ge_threshold))

```

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```

        if rec[bin_having] < ge_threshold then
            return false
        end
        return true
    end
end

local function count(group_by_bin)
    return function(group, rec)
        if rec[group_by_bin] then
            local bin_name = rec[group_by_bin]
            group[bin_name] = (group[bin_name] or 0) + 1
            debug("group_count::count: bin %s has value %s which has the count of %s
↪", tostring(bin_name), tostring(group[bin_name]))
        end
        return group
    end
end

local function add_values(val1, val2)
    return val1 + val2
end

local function reduce_groups(a, b)
    return map.merge(a, b, add_values)
end

function group_count(stream, group_by_bin, bin_having, ge_threshold)
    if bin_having and ge_threshold then
        local myfilter = having_ge_threshold(bin_having, ge_threshold)
        return stream : filter(myfilter) : aggregate(map{}, count(group_by_bin))
↪: reduce(reduce_groups)
    else
        return stream : aggregate(map{}, count(group_by_bin)) : reduce(reduce_
↪groups)
    end
end

```

Find the first name distribution of users in their twenties using a query aggregation:

```

import aerospike
from aerospike import predicates as p
import pprint

config = {'hosts': [('127.0.0.1', 3000)],
         'lua': {'system_path': '/usr/local/aerospike/lua/',
                'user_path': '/usr/local/aerospike/usr-lua/'}}
client = aerospike.client(config).connect()

pp = pprint.PrettyPrinter(indent=2)
query = client.query('test', 'users')
query.where(p.between('age', 20, 29))
query.apply('stream_udf', 'group_count', [ 'first_name' ])
names = query.results()
# we expect a dict (map) whose keys are names, each with a count value
pp.pprint(names)
client.close()

```


With stream UDFs, the final reduce steps (which ties the results from the reducers of the cluster nodes) executes on the client-side. Explicitly setting the Lua `user_path` in the config helps the client find the local copy of the module containing the stream UDF. The `system_path` is constructed when the Python package is installed, and contains system modules such as `aerospike.lua`, `as.lua`, and `stream_ops.lua`. The default value for the Lua `system_path` is `/usr/local/aerospike/``lua`.

predexp (*predicates*)

Set the predicate expression filters to be used by this query.

Parameters predicates – *list* A list of predicates generated by the `aerospike.predexp` — *Query Predicate Expressions* functions

```
import aerospike
from aerospike import predexp as predexp
query = client.query('test', 'demo')

predexps = [
    predexp.rec_device_size(),
    predexp.integer_value(65 * 1024),
    predexp.integer_greater()
]
query.predexp(predexps)

big_records = query.results()
client.close()
```

Query Policies

policy

A *dict* of optional query policies which are applicable to `Query.results()` and `Query.foreach()`. See *Policies*.

- **max_retries**

An *int*. Maximum number of retries before aborting the current transaction. The initial attempt is not counted as a retry.

If `max_retries` is exceeded, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`.

WARNING: Database writes that are not idempotent (such as “add”) should not be retried because the write operation may be performed multiple times if the client timed out previous transaction attempts. It’s important to use a distinct write policy for non-idempotent writes which sets `max_retries = 0`;

Default: 0

- **sleep_between_retries**

An *int*. Milliseconds to sleep between retries. Enter zero to skip sleep. Default: 0

- **socket_timeout**

An *int*. Socket idle timeout in milliseconds when processing a database command.

If `socket_timeout` is not zero and the socket has been idle for at least `socket_timeout`, both `max_retries` and `total_timeout` are checked. If `max_retries` and `total_timeout` are not exceeded, the transaction is retried.

If both `socket_timeout` and `total_timeout` are non-zero and `socket_timeout > total_timeout`, then `socket_timeout` will be set to `total_timeout`. If `socket_timeout` is zero, there will be no socket idle limit.

Default: 30000.

- **total_timeout**

An `int`. Total transaction timeout in milliseconds.

The `total_timeout` is tracked on the client and sent to the server along with the transaction in the wire protocol. The client will most likely timeout first, but the server also has the capability to timeout the transaction.

If `total_timeout` is not zero and `total_timeout` is reached before the transaction completes, the transaction will return error `AEROSPIKE_ERR_TIMEOUT`. If `total_timeout` is zero, there will be no total time limit.

Default: 0

- **deserialize**

`bool` Should raw bytes representing a list or map be deserialized to a list or dictionary.

Set to *False* for backup programs that just need access to raw bytes.

Default: True

- **fail_on_cluster_change**

`bool` Terminate query if cluster is in migration state. Default *False*

Query Options

options

A `dict` of optional scan options which are applicable to `Query.foreach()` and `Query.results()`.

- **nobins** `bool` whether to return the *bins* portion of the *Record Tuple*. Default *False*.

New in version 3.0.0.

1.6 aerospike.predicates — Query Predicates

`aerospike.predicates.between(bin, min, max)`

Represent a *bin BETWEEN min AND max* predicate.

Parameters

- **bin** (`str`) – the bin name.
- **min** (`int`) – the minimum value to be matched with the between operator.
- **max** (`int`) – the maximum value to be matched with the between operator.

Returns `tuple()` to be used in `aerospike.Query.where()`.

```
from __future__ import print_function
import aerospike
from aerospike import predicates as p
```

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```

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()
query = client.query('test', 'demo')
query.where(p.between('age', 20, 30))
res = query.results()
print(res)
client.close()

```

`aerospike.predicates.equals` (*bin*, *val*)

Represent a $bin = val$ predicate.

Parameters

- **bin** (*str*) – the bin name.
- **val** (*str* or *int*) – the value to be matched with an equals operator.

Returns `tuple()` to be used in `aerospike.Query.where()`.

```

from __future__ import print_function
import aerospike
from aerospike import predicates as p

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()
query = client.query('test', 'demo')
query.where(p.equals('name', 'that guy'))
res = query.results()
print(res)
client.close()

```

`aerospike.predicates.geo_within_geojson_region` (*bin*, *shape*[, *index_type*])

Predicate for finding any point in bin which is within the given shape. Requires a geo2dsphere index (`index_geo2dsphere_create()`) over a *bin* containing *GeoJSON* point data.

Parameters

- **bin** (*str*) – the bin name.
- **shape** (*str*) – the shape formatted as a GeoJSON string.
- **index_type** – Optional. Possible `aerospike.INDEX_TYPE_*` values are detailed in *Miscellaneous*.

Returns `tuple()` to be used in `aerospike.Query.where()`.

Note: Requires server version $\geq 3.7.0$

```

from __future__ import print_function
import aerospike
from aerospike import GeoJSON
from aerospike import predicates as p

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

client.index_geo2dsphere_create('test', 'pads', 'loc', 'pads_loc_geo')
bins = {'pad_id': 1,

```

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```

        'loc': aerospike.geojson('{"type":"Point", "coordinates":[-80.604333, 28.
↪608389]}')})
client.put(('test', 'pads', 'launchpad1'), bins)

# Create a search rectangle which matches screen boundaries:
# (from the bottom left corner counter-clockwise)
scrn = GeoJSON({ 'type': "Polygon",
                  'coordinates': [
                      [[-80.590000, 28.60000],
                      [-80.590000, 28.61800],
                      [-80.620000, 28.61800],
                      [-80.620000, 28.60000],
                      [-80.590000, 28.60000]]]])

# Find all points contained in the rectangle.
query = client.query('test', 'pads')
query.select('pad_id', 'loc')
query.where(p.geo_within_geojson_region('loc', scrn.dumps()))
records = query.results()
print(records)
client.close()

```

New in version 1.0.58.

`aerospike.predicates.geo_within_radius` (*bin*, *long*, *lat*, *radius_meters*[, *index_type*])

Predicate helper builds an `AeroCircle` GeoJSON shape, and returns a ‘within GeoJSON region’ predicate. Requires a `geo2dsphere` index (`index_geo2dsphere_create()`) over a *bin* containing `GeoJSON` point data.

Parameters

- **bin** (*str*) – the bin name.
- **long** (*float*) – the longitude of the center point of the `AeroCircle`.
- **lat** (*float*) – the latitude of the center point of the `AeroCircle`.
- **radius_meters** (*float*) – the radius length in meters of the `AeroCircle`.
- **index_type** – Optional. Possible `aerospike.INDEX_TYPE_*` values are detailed in *Miscellaneous*.

Returns `tuple()` to be used in `aerospike.Query.where()`.

Note: Requires server version `>= 3.8.1`

```

from __future__ import print_function
import aerospike
from aerospike import GeoJSON
from aerospike import predicates as p

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

client.index_geo2dsphere_create('test', 'pads', 'loc', 'pads_loc_geo')
bins = {'pad_id': 1,
        'loc': aerospike.geojson('{"type":"Point", "coordinates":[-80.604333, 28.
↪608389]}')})

```

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```

client.put(('test', 'pads', 'launchpad1'), bins)

query = client.query('test', 'pads')
query.select('pad_id', 'loc')
query.where(p.geo_within_radius('loc', -80.605000, 28.60900, 400.0))
records = query.results()
print(records)
client.close()

```

New in version 1.0.58.

`aerospike.predicates.geo_contains_geojson_point` (*bin*, *point* [, *index_type*])

Predicate for finding any regions in the bin which contain the given point. Requires a geo2dsphere index (`index_geo2dsphere_create()`) over a *bin* containing *GeoJSON* point data.

Parameters

- **bin** (*str*) – the bin name.
- **point** (*str*) – the point formatted as a GeoJSON string.
- **index_type** – Optional. Possible `aerospike.INDEX_TYPE_*` values are detailed in *Miscellaneous*.

Returns `tuple()` to be used in `aerospike.Query.where()`.

Note: Requires server version \geq 3.7.0

```

from __future__ import print_function
import aerospike
from aerospike import GeoJSON
from aerospike import predicates as p

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

client.index_geo2dsphere_create('test', 'launch_centers', 'area', 'launch_area_geo
↪')
rect = GeoJSON({ 'type': "Polygon",
                 'coordinates': [
                     [-80.590000, 28.60000],
                     [-80.590000, 28.61800],
                     [-80.620000, 28.61800],
                     [-80.620000, 28.60000],
                     [-80.590000, 28.60000]]])
bins = {'area': rect}
client.put(('test', 'launch_centers', 'kennedy space center'), bins)

# Find all geo regions containing a point
point = GeoJSON({'type': "Point",
                'coordinates': [-80.604333, 28.608389]})
query = client.query('test', 'launch_centers')
query.where(p.geo_contains_geojson_point('area', point.dumps()))
records = query.results()
print(records)
client.close()

```

New in version 1.0.58.

`aerospike.predicates.geo_contains_point` (*bin*, *long*, *lat*[, *index_type*])

Predicate helper builds a GeoJSON point, and returns a 'contains GeoJSON point' predicate. Requires a `geo2dsphere` index (`index_geo2dsphere_create()`) over a *bin* containing *GeoJSON* point data.

Parameters

- **bin** (*str*) – the bin name.
- **long** (*float*) – the longitude of the point.
- **lat** (*float*) – the latitude of the point.
- **index_type** – Optional. Possible `aerospike.INDEX_TYPE_*` values are detailed in *Miscellaneous*.

Returns `tuple()` to be used in `aerospike.Query.where()`.

Note: Requires server version $\geq 3.7.0$

```

from __future__ import print_function
import aerospike
from aerospike import GeoJSON
from aerospike import predicates as p

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

client.index_geo2dsphere_create('test', 'launch_centers', 'area', 'launch_area_geo
↪')
rect = GeoJSON({ 'type': "Polygon",
                 'coordinates': [
                     [ [-80.590000, 28.60000],
                       [-80.590000, 28.61800],
                       [-80.620000, 28.61800],
                       [-80.620000, 28.60000],
                       [-80.590000, 28.60000] ] ] })
bins = {'area': rect}
client.put(('test', 'launch_centers', 'kennedy space center'), bins)

# Find all geo regions containing a point
query = client.query('test', 'launch_centers')
query.where(p.geo_contains_point('area', -80.604333, 28.608389))
records = query.results()
print(records)
client.close()

```

New in version 1.0.58.

`aerospike.predicates.contains` (*bin*, *index_type*, *val*)

Represent the predicate *bin* CONTAINS *val* for a bin with a complex (list or map) type.

Parameters

- **bin** (*str*) – the bin name.
- **index_type** – Possible `aerospike.INDEX_TYPE_*` values are detailed in *Miscellaneous*.
- **val** (*str* or *int*) – match records whose *bin* is an *index_type* (ex: list) containing *val*.

Returns `tuple()` to be used in `aerospike.Query.where()`.

Note: Requires server version $\geq 3.8.1$

```

from __future__ import print_function
import aerospike
from aerospike import predicates as p

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

# assume the bin fav_movies in the set test.demo bin should contain
# a dict { (str) _title_ : (int) _times_viewed_ }
# create a secondary index for string values of test.demo records whose 'fav_
↪movies' bin is a map
client.index_map_keys_create('test', 'demo', 'fav_movies', aerospike.INDEX_STRING,
↪ 'demo_fav_movies_titles_idx')
# create a secondary index for integer values of test.demo records whose 'fav_
↪movies' bin is a map
client.index_map_values_create('test', 'demo', 'fav_movies', aerospike.INDEX_
↪NUMERIC, 'demo_fav_movies_views_idx')

client.put(('test', 'demo', 'Dr. Doom'), {'age':43, 'fav_movies': {'12 Monkeys': 1,
↪ 'Brasil': 2}})
client.put(('test', 'demo', 'The Hulk'), {'age':38, 'fav_movies': {'Blindness': 1,
↪ 'Eternal Sunshine': 2}})

query = client.query('test', 'demo')
query.where(p.contains('fav_movies', aerospike.INDEX_TYPE_MAPKEYS, '12 Monkeys'))
res = query.results()
print(res)
client.close()

```

`aerospike.predicates.range(bin, index_type, min, max)`

Represent the predicate *bin* **CONTAINS** values **BETWEEN** *min* **AND** *max* for a bin with a complex (list or map) type.

Parameters

- **bin** (*str*) – the bin name.
- **index_type** – Possible `aerospike.INDEX_TYPE_*` values are detailed in *Miscellaneous*.
- **min** (*int*) – the minimum value to be used for matching with the range operator.
- **max** (*int*) – the maximum value to be used for matching with the range operator.

Returns `tuple()` to be used in `aerospike.Query.where()`.

Note: Requires server version $\geq 3.8.1$

```

from __future__ import print_function
import aerospike
from aerospike import predicates as p

```

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```

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()

# create a secondary index for numeric values of test.demo records whose 'age'
↳bin is a list
client.index_list_create('test', 'demo', 'age', aerospike.INDEX_NUMERIC, 'demo_
↳age_nidx')

# query for records whose 'age' bin has a list with numeric values between 20 and
↳30
query = client.query('test', 'demo')
query.where(p.range('age', aerospike.INDEX_TYPE_LIST, 20, 30))
res = query.results()
print(res)
client.close()

```

1.7 aerospike.predexp — Query Predicate Expressions

The following methods allow a user to define a predicate expression filter. Predicate expression filters are applied on the query results on the server. Predicate expression filters may occur on any bin in the record.

aerospike.predexp.**predexp_and**(*nexpr*)

Create an AND logical predicate expression.

Parameters *nexpr* – int Number of expressions to combine with “and”. The value of *nexpr* must be between 1 and 65535.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “c” is between 11 and 20 inclusive:

```

from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("c"),
    predexp.integer_value(11),
    predexp.integer_greatereq(),
    predexp.integer_bin("c"),
    predexp.integer_value(20),
    predexp.integer_lesseq(),
    predexp.predexp_and(2)
]

```

aerospike.predexp.**predexp_or**(*nexpr*)

Create an Or logical predicate expression.

Parameters *nexpr* – int Number of expressions to combine with “or”. The value of *nexpr* must be between 1 and 65535.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “pet” is “dog” or “cat”

```

from aerospike import predexp as predexp
predexps = [

```

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```

predexp.string_bin("pet"),
predexp.string_value("cat"),
predexp.string_equal(),
predexp.string_bin("pet"),
predexp.string_value("dog"),
predexp.string_equal(),
predexp.predexp_or(2)
]

```

`aerospike.predexp.predexp_not()`

Create a not logical predicate expression which negates the previous predicate expression on the stack.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “pet” is not “cat”

```

from aerospike import predexp as predexp
predexps = [
    predexp.string_bin("pet"),
    predexp.string_value("cat"),
    predexp.string_equal(),
    predexp.predexp_not()
]

```

`aerospike.predexp.integer_bin(bin_name)`

Create an integer bin value predicate expression.

Parameters `bin_name` – `str` The name of the bin containing an integer.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “age” is 42

```

from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("age"),
    predexp.integer_value(42),
    predexp.integer_equal()
]

```

`aerospike.predexp.string_bin(bin_name)`

Create a string bin value predicate expression.

Parameters `bin_name` – `str` The name of the bin containing a string.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “name” is “Bob”.

```

from aerospike import predexp as predexp
predexps = [
    predexp.string_bin("name"),
    predexp.string_value("Bob"),
    predexp.string_equal()
]

```

`aerospike.predexp.geojson_bin(bin_name)`

Create a GeoJSON bin value predicate expression.

Parameters `bin_name` – `str` The name of the bin containing a GeoJSON value.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “location” is within a specified region.

```
from aerospike import predexp as predexp
geo_region = aerospike.GeoJSON(
    {"type": "AeroCircle", "coordinates": [[-122.0, 37.5], 1000]}) .dumps()
predexps = [
    predexp.geojson_bin("location"),
    predexp.geojson_value(geo_region),
    predexp.geojson_within()
]
```

`aerospike.predexp.list_bin(bin_name)`

Create a list bin value predicate expression.

Parameters `bin_name` – `str` The name of the bin containing a list.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the list in bin “names” contains an entry equal to “Alice”

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_var("list_entry"),
    predexp.string_value("Alice"),
    predexp.string_equal(),
    predexp.list_bin("names"),
    predexp.list_iterate_or("list_entry")
]
```

`aerospike.predexp.map_bin(bin_name)`

Create a map bin value predicate expression.

Parameters `bin_name` – `str` The name of the bin containing a map value.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the map in bin “pet_count” has an entry with a key equal to “Cat”

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_var("map_key"),
    predexp.string_value("Cat"),
    predexp.string_equal(),
    predexp.map_bin("pet_count"),
    predexp.mapkey_iterate_or("map_key")
]
```

`aerospike.predexp.geojson_value(geo_value)`

Create a GeoJSON value predicate expression.

Parameters `bin_name` – `str` The geojson string.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “location” is within a specified region.

```
from aerospike import predexp as predexp
geo_region = aerospike.GeoJSON(
    {"type": "AeroCircle", "coordinates": [[-122.0, 37.5], 1000]}) .dumps()
predexps = [
    predexp.geojson_bin("location"),
    predexp.geojson_value(geo_region),
    predexp.geojson_within()
]
```

`aerospike.predexp.integer_value(int_value)`

Create an integer value predicate expression.

Parameters `bin_name` – `int` The integer value

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “age” is 42

```
from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("age"),
    predexp.integer_value(42),
    predexp.integer_equal()
]
```

`aerospike.predexp.string_value(string_value)`

Create a string value predicate expression.

Parameters `bin_name` – `str` The string value.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records where the value of bin “name” is “Bob”.

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_bin("name"),
    predexp.string_value("Bob"),
    predexp.string_equal()
]
```

`aerospike.predexp.integer_var(var_name)`

Create an integer iteration variable predicate expression.

Parameters `var_name` – `str` The name of the variable. This should match a value used when specifying the iteration.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example the following selects a record where the list in bin “numbers” contains an entry equal to 42

```
from aerospike import predexp as predexp
predexps = [
    predexp.integer_var("item"),
    predexp.integer_value(42),
    predexp.integer_equal(),
    predexp.list_bin("numbers"),
]
```

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```

    predexp.list_iterate_or("item")
]

```

`aerospike.predexp.string_var(var_name)`

Create a string iteration variable predicate expression.

Parameters `var_name` – `str` The name of the variable. This should match a value used when specifying the iteration.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example the following selects a record where the list in bin “languages” contains an entry equal to “Python”

```

from aerospike import predexp as predexp
predexps = [
    predexp.string_var("item"),
    predexp.string_value("Python"),
    predexp.string_equal(),
    predexp.list_bin("languages"),
    predexp.list_iterate_or("item")
]

```

`aerospike.predexp.geojson_var(var_name)`

Create a GeoJSON iteration variable predicate expression.

Parameters `var_name` – `str` The name of the variable. This should match a value used when specifying the iteration.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

`aerospike.predexp.list_iterate_or(var_name)`

Create a list iteration OR logical predicate expression.

Parameters `bin_name` – `str` The name of the iteration variable

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

The list iteration expression pops two children off the expression stack. The left child (pushed earlier) must contain a logical subexpression containing one or more matching iteration variable expressions. The right child (pushed later) must specify a list bin. The list iteration traverses the list and repeatedly evaluates the subexpression substituting each list element’s value into the matching iteration variable. The result of the iteration expression is a logical OR of all of the individual element evaluations.

If the list bin contains zero elements `list_iterate_or()` will evaluate to false.

For example, the following sequence of predicate expressions selects records where the list in bin “names” contains an entry equal to “Alice”

```

from aerospike import predexp as predexp
predexps = [
    predexp.string_var("list_entry"),
    predexp.string_value("Alice"),
    predexp.string_equal(),
    predexp.list_bin("names"),
    predexp.list_iterate_or("list_entry")
]

```

`aerospike.predexp.list_iterate_and(var_name)`

Create a list iteration And logical predicate expression.

Parameters `var_name` – `str` The name of the iteration variable

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

The list iteration expression pops two children off the expression stack. The left child (pushed earlier) must contain a logical subexpression containing one or more matching iteration variable expressions. The right child (pushed later) must specify a list bin. The list iteration traverses the list and repeatedly evaluates the subexpression substituting each list element’s value into the matching iteration variable. The result of the iteration expression is a logical AND of all of the individual element evaluations.

If the list bin contains zero elements `list_iterate_and()` will evaluate to true. This is useful when testing for exclusion (see example).

For example, the following sequence of predicate expressions selects records where the list in bin “names” contains no entries equal to “Bob”.

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_var("list_entry"),
    predexp.string_value("Bob"),
    predexp.string_equal(),
    predexp.predexp_not(),
    predexp.list_bin("names"),
    predexp.list_iterate_and("list_entry")
]
```

`aerospike.predexp.mapkey_iterate_or(var_name)`

Create an map key iteration Or logical predicate expression.

Parameters `var_name` – `str` The name of the iteration variable

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

The mapkey iteration expression pops two children off the expression stack. The left child (pushed earlier) must contain a logical subexpression containing one or more matching iteration variable expressions. The right child (pushed later) must specify a map bin. The mapkey iteration traverses the map and repeatedly evaluates the subexpression substituting each map key value into The matching iteration variable. The result of the iteration expression is a logical OR of all of the individual element evaluations.

If the map bin contains zero elements `mapkey_iterate_or()` will return false. For example, the following sequence of predicate expressions selects records where the map in bin “pet_count” has an entry with a key equal to “Cat”

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_var("map_key"),
    predexp.string_value("Cat"),
    predexp.string_equal(),
    predexp.map_bin("pet_count"),
    predexp.mapkey_iterate_or("map_key")
]
```

`aerospike.predexp.mapkey_iterate_and(var_name)`

Create an map key iteration AND logical predicate expression.

Parameters `var_name` – `str` The name of the iteration variable

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

The mapkey iteration expression pops two children off the expression stack. The left child (pushed earlier) must contain a logical subexpression containing one or more matching iteration variable expressions. The right child

(pushed later) must specify a map bin. The mapkey iteration traverses the map and repeatedly evaluates the subexpression substituting each map key value into The matching iteration variable. The result of the iteration expression is a logical AND of all of the individual element evaluations.

If the map bin contains zero elements `mapkey_iterate_and()` will return true. This is useful when testing for exclusion (see example).

For example, the following sequence of predicate expressions selects records where the map in bin “pet_count” does not contain an entry with a key equal to “Cat”.

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_var("map_key"),
    predexp.string_value("Cat"),
    predexp.string_equal(),
    predexp.predexp_not(),
    predexp.map_bin("pet_count"),
    predexp.mapkey_iterate_and("map_key")
]
```

`aerospike.predexp.mapval_iterate_or(var_name)`

Create an map value iteration Or logical predicate expression.

Parameters `var_name` – `str` The name of the iteration variable

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

The mapval iteration expression pops two children off the expression stack. The left child (pushed earlier) must contain a logical subexpression containing one or more matching iteration variable expressions. The right child (pushed later) must specify a map bin. The mapval iteration traverses the map and repeatedly evaluates the subexpression substituting each map value into the matching iteration variable. The result of the iteration expression is a logical OR of all of the individual element evaluations.

If the map bin contains zero elements `mapval_iterate_or()` will return false.

For example, the following sequence of predicate expressions selects records where at least one of the values in the map in bin “pet_count” is 0

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_var("map_key"),
    predexp.integer_value(0),
    predexp.integer_equal(),
    predexp.map_bin("pet_count"),
    predexp.mapval_iterate_or("map_key")
]
```

`aerospike.predexp.mapval_iterate_and(var_name)`

Create an map value iteration AND logical predicate expression.

Parameters `var_name` – `str` The name of the iteration variable

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

The mapval iteration expression pops two children off the expression stack. The left child (pushed earlier) must contain a logical subexpression containing one or more matching iteration variable expressions. The right child (pushed later) must specify a map bin. The mapval iteration traverses the map and repeatedly evaluates the subexpression substituting each map value into the matching iteration variable. The result of the iteration expression is a logical AND of all of the individual element evaluations.

If the map bin contains zero elements `mapval_iterate_and()` will return true. This is useful when testing for exclusion (see example).

For example, the following sequence of predicate expressions selects records where none of the values in the map in bin “pet_count” is 0

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_var("map_key"),
    predexp.integer_value(0),
    predexp.integer_equal(),
    predexp.predexp_not(),
    predexp.map_bin("pet_count"),
    predexp.mapval_iterate_and("map_key")
]
```

`aerospike.predexp.rec_digest_modulo(mod)`

Create a digest modulo record metadata value predicate expression.

Parameters `mod` – `int` The value of this expression assumes the value of 4 bytes of the digest modulo this argument.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have `digest(key) % 3 == 1`:

```
from aerospike import predexp as predexp
predexps = [
    predexp.rec_digest_modulo(3),
    predexp.integer_value(1),
    predexp.integer_equal()
]
```

`aerospike.predexp.rec_last_update()`

Create a last update record metadata value predicate expression. The record last update expression assumes the value of the number of nanoseconds since the unix epoch that the record was last updated.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have been updated after a timestamp:

```
from aerospike import predexp as predexp
predexps = [
    predexp.rec_last_update(),
    predexp.integer_value(timestamp_ns),
    predexp.integer_greater()
]
```

`aerospike.predexp.rec_void_time()`

Create a void time record metadata value predicate expression. The record void time expression assumes the value of the number of nanoseconds since the unix epoch when the record will expire. The special value of 0 means the record will not expire.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have void time set to 0 (no expiration):

```

from aerospike import predexp as predexp
predexps = [
    predexp.rec_void_time(),
    predexp.integer_value(0),
    predexp.integer_equal()
]

```

`aerospike.predexp.rec_device_size()`

Create a record device size metadata value predicate expression. The record device size expression assumes the value of the size in bytes that the record occupies on device storage. For non-persisted records, this value is 0.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records whose device storage size is larger than 65K:

```

from aerospike import predexp as predexp
predexps = [
    predexp.rec_device_size(),
    predexp.integer_value(65 * 1024),
    predexp.integer_greater()
]

```

`aerospike.predexp.integer_equal()`

Create an integer comparison logical predicate expression. If the value of either of the child expressions is unknown because a specified bin does not exist or contains a value of the wrong type the result of the comparison is false. If a true outcome is desirable in this situation use the complimentary comparison and enclose in a logical NOT.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” equal to 42:

```

from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("foo"),
    predexp.integer_value(42),
    predexp.integer_equal()
]

```

`aerospike.predexp.integer_greater()`

Create an integer comparison logical predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” greater than 42:

```

from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("foo"),
    predexp.integer_value(42),
    predexp.integer_greater()
]

```

`aerospike.predexp.integer_greatereq()`

Create an integer comparison logical predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” greater than or equal to 42:

```
from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("foo"),
    predexp.integer_value(42),
    predexp.integer_greatereq()
]
```

`aerospike.predexp.integer_less()`

Create an integer comparison logical predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” less than 42:

```
from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("foo"),
    predexp.integer_value(42),
    predexp.integer_less()
]
```

`aerospike.predexp.integer_lesseq()`

Create an integer comparison logical predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” less than or equal to 42:

```
from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("foo"),
    predexp.integer_value(42),
    predexp.integer_lesseq()
]
```

`aerospike.predexp.integer_unequal()`

Create an integer comparison logical predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

This expression will evaluate to true if, and only if, both children of the expression exist, and are of type integer, and are not equal to each other. If this is not desired, utilize `aerospike.predexp.integer_equal()` in conjunction with `aerospike.predexp.predexp_not()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” not equal to 42:

```
from aerospike import predexp as predexp
predexps = [
    predexp.integer_bin("foo"),
    predexp.integer_value(42),
    predexp.integer_unequal()
]
```

`aerospike.predexp.string_equal()`

Create an integer comparison logical predicate expression. If the value of either of the child expressions is

unknown because a specified bin does not exist or contains a value of the wrong type the result of the comparison is false. If a true outcome is desirable in this situation use the complimentary comparison and enclose in a logical NOT.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” equal to “bar”:

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_bin("foo"),
    predexp.string_value("bar"),
    predexp.string_equal()
]
```

`aerospike.predexp.string_unequal()`

Create an integer comparison logical predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

This expression will evaluate to true if, and only if, both children of the expression exist, and are of type string, and are not equal to each other. If this is not desired, utilize `aerospike.predexp.string_equal()` in conjunction with `aerospike.predexp.predexp_not()`.

For example, the following sequence of predicate expressions selects records that have bin “foo” not equal to “bar”:

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_bin("foo"),
    predexp.string_value("bar"),
    predexp.string_unequal()
]
```

`aerospike.predexp.geojson_within()`

Create a Geojson within predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

```
from aerospike import predexp as predexp
predexps = [
    predexp.geojson_bin("location"),
    predexp.geojson_value(my_geo_region),
    predexp.geojson_within()
]
```

`aerospike.predexp.geojson_contains()`

Create a Geojson contains predicate expression.

Returns `tuple()` to be used in `aerospike.Query.predexp()`.

```
from aerospike import predexp as predexp
predexps = [
    predexp.geojson_bin("region"),
    predexp.geojson_value(my_geo_point),
    predexp.geojson_contains()
]
```

`aerospike.predexp.string_regex(*flags)`

Create a string regex predicate. May be called without any arguments to specify default behavior.

Parameters `flags` – int *Regex Flag Values* Any, or none of the aerospike REGEX constants

Returns tuple() to be used in `aerospike.Query.predexp()`.

For example, the following sequence of predicate expressions selects records that have bin “hex” value ending in ‘1’ or ‘2’:

```
from aerospike import predexp as predexp
predexps = [
    predexp.string_bin('hex'),
    predexp.string_value('0x00.[12]'),
    predexp.string_regex(aerospike.REGEX_ICASE)
]
```

1.8 GeoJSON Class — GeoJSON

1.8.1 GeoJSON

class `aerospike.GeoJSON`

Starting with version 3.7.0, the Aerospike server supports storing GeoJSON data. A Geo2DSphere index can be built on a bin which contains GeoJSON data, enabling queries for the points contained within given shapes using `geo_within_geojson_region()` and `geo_within_radius()`, and for the regions which contain a point using `geo_contains_geojson_point()` and `geo_contains_point()`.

On the client side, wrapping geospatial data in an instance of the `aerospike.GeoJSON` class enables serialization of the data into the correct type during write operation, such as `put()`. On reading a record from the server, bins with geospatial data it will be deserialized into a `GeoJSON` instance.

See also:

[Geospatial Index and Query.](#)

```
from __future__ import print_function
import aerospike
from aerospike import GeoJSON

config = { 'hosts': [ ('127.0.0.1', 3000)] }
client = aerospike.client(config).connect()
client.index_geo2dsphere_create('test', 'pads', 'loc', 'pads_loc_geo')
# Create GeoJSON point using WGS84 coordinates.
latitude = 28.608389
longitude = -80.604333
loc = GeoJSON({'type': "Point",
              'coordinates': [longitude, latitude]})
print(loc)
# Alternatively create the GeoJSON point from a string
loc = aerospike.geojson('{"type": "Point", "coordinates": [-80.604333, 28.608389]}
↪')

# Create a user record.
bins = {'pad_id': 1,
        'loc': loc}

# Store the record.
client.put(('test', 'pads', 'launchpad1'), bins)
```

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```
# Read the record.
(k, m, b) = client.get(('test', 'pads', 'launchpad1'))
print(b)
client.close()
```

class `GeoJSON`(`[geo_data]`)

Optionally initializes an object with a `GeoJSON` `str` or a `dict` of geospatial data.

wrap(`geo_data`)

Sets the geospatial data of the `GeoJSON` wrapper class.

Parameters `geo_data` (`dict`) – a `dict` representing the geospatial data.

unwrap() → `dict` of geospatial data

Gets the geospatial data contained in the `GeoJSON` class.

Returns a `dict` representing the geospatial data.

loads(`raw_geo`)

Sets the geospatial data of the `GeoJSON` wrapper class from a `GeoJSON` string.

Parameters `raw_geo` (`str`) – a `GeoJSON` string representation.

dumps() → a `GeoJSON` string

Gets the geospatial data contained in the `GeoJSON` class as a `GeoJSON` string.

Returns a `GeoJSON` `str` representing the geospatial data.

New in version 1.0.53.

1.9 aerospike.exception — Aerospike Exceptions

```
from __future__ import print_function

import aerospike
from aerospike.exception import *

try:
    config = { 'hosts': [ ('127.0.0.1', 3000)], 'policies': { 'total_timeout': 1200}}
    client = aerospike.client(config).connect()
    client.close()
except ClientError as e:
    print("Error: {0} [{1}]" .format(e.msg, e.code))
```

New in version 1.0.44.

1.9.1 In Doubt Status

The in doubt status of a caught exception can be checked by looking at the 5th element of its `args` tuple

```
key = 'test', 'demo', 1
record = {'some': 'thing'}
try:
    client.put(key, record)
except AerospikeError as exc:
    print("The in doubt nature of the operation is: {}".format(exc.args[4]))
```

New in version 3.0.1.

1.9.2 Exception Types

exception `aerospike.exception.AerospikeError`

The parent class of all exceptions raised by the Aerospike client, inherits from `exceptions.Exception`

code

The associated status code.

msg

The human-readable error message.

file

line

exception `aerospike.exception.ClientError`

Exception class for client-side errors, often due to mis-configuration or misuse of the API methods. Subclass of *AerospikeError*.

exception `aerospike.exception.InvalidHostError`

Subclass of *ClientError*.

exception `aerospike.exception.ParamError`

Subclass of *ClientError*.

exception `aerospike.exception.ServerError`

The parent class for all errors returned from the cluster.

exception `aerospike.exception.InvalidRequest`

Protocol-level error. Subclass of *ServerError*.

exception `aerospike.exception.ServerFull`

The server node is running out of memory and/or storage device space reserved for the specified namespace. Subclass of *ServerError*.

exception `aerospike.exception.AlwaysForbidden`

Operation not allowed in current configuration. Subclass of *ServerError*.

exception `aerospike.exception.UnsupportedFeature`

Encountered an unimplemented server feature. Subclass of *ServerError*.

exception `aerospike.exception.DeviceOverload`

The server node's storage device(s) can't keep up with the write load. Subclass of *ServerError*.

exception `aerospike.exception.NamespaceNotFound`

Namespace in request not found on server. Subclass of *ServerError*.

exception `aerospike.exception.ForbiddenError`

Operation not allowed at this time. Subclass of *ServerError*.

exception `aerospike.exception.RecordError`

The parent class for record and bin exceptions exceptions associated with read and write operations. Subclass of *ServerError*.

key

The key identifying the record.

bin

Optionally the bin associated with the error.

- exception** `aerospike.exception.RecordKeyMismatch`
Record key sent with transaction did not match key stored on server. Subclass of *RecordError*.
- exception** `aerospike.exception.RecordNotFound`
Record does not exist in database. May be returned by read, or write with policy *aerospike.POLICY_EXISTS_UPDATE*. Subclass of *RecordError*.
- exception** `aerospike.exception.RecordGenerationError`
Generation of record in database does not satisfy write policy. Subclass of *RecordError*.
- exception** `aerospike.exception.RecordGenerationError`
Record already exists. May be returned by write with policy *aerospike.POLICY_EXISTS_CREATE*. Subclass of *RecordError*.
- exception** `aerospike.exception.RecordBusy`
Record being (re-)written can't fit in a storage write block. Subclass of *RecordError*.
- exception** `aerospike.exception.RecordTooBig`
Too many concurrent requests for one record - a "hot-key" situation. Subclass of *RecordError*.
- exception** `aerospike.exception.BinNameError`
Length of bin name exceeds the limit of 14 characters. Subclass of *RecordError*.
- exception** `aerospike.exception.BinExistsError`
Bin already exists. Occurs only if the client has that check enabled. Subclass of *RecordError*.
- exception** `aerospike.exception.BinNotFound`
Bin-level replace-only supported on server but not on client. Subclass of *RecordError*.
- exception** `aerospike.exception.BinIncompatibleType`
Bin modification operation can't be done on an existing bin due to its value type (for example appending to an integer). Subclass of *RecordError*.
- exception** `aerospike.exception.IndexError`
The parent class for indexing exceptions. Subclass of *ServerError*.
- index_name**
The name of the index associated with the error.
- exception** `aerospike.exception.IndexNotFound`
Subclass of *IndexError*.
- exception** `aerospike.exception.IndexFoundError`
Subclass of *IndexError*.
- exception** `aerospike.exception.IndexOOM`
The index is out of memory. Subclass of *IndexError*.
- exception** `aerospike.exception.IndexNotReadable`
Subclass of *IndexError*.
- exception** `aerospike.exception.IndexNameMaxLen`
Subclass of *IndexError*.
- exception** `aerospike.exception.IndexNameMaxCount`
Reached the maximum allowed number of indexes. Subclass of *IndexError*.
- exception** `aerospike.exception.QueryError`
Exception class for query errors. Subclass of *AerospikeError*.
- exception** `aerospike.exception.QueryQueueFull`
Subclass of *QueryError*.

- exception** `aerospike.exception.QueryTimeout`
Subclass of `QueryError`.
- exception** `aerospike.exception.ClusterError`
Cluster discovery and connection errors. Subclass of `AerospikeError`.
- exception** `aerospike.exception.ClusterChangeError`
A cluster state change occurred during the request. This may also be returned by scan operations with the fail-on-cluster-change flag set. Subclass of `ClusterError`.
- exception** `aerospike.exception.AdminError`
The parent class for exceptions of the security API.
- exception** `aerospike.exception.ExpiredPassword`
Subclass of `AdminError`.
- exception** `aerospike.exception.ForbiddenPassword`
Subclass of `AdminError`.
- exception** `aerospike.exception.IllegalState`
Subclass of `AdminError`.
- exception** `aerospike.exception.InvalidCommand`
Subclass of `AdminError`.
- exception** `aerospike.exception.InvalidCredential`
Subclass of `AdminError`.
- exception** `aerospike.exception.InvalidField`
Subclass of `AdminError`.
- exception** `aerospike.exception.InvalidPassword`
Subclass of `AdminError`.
- exception** `aerospike.exception.InvalidPrivilege`
Subclass of `AdminError`.
- exception** `aerospike.exception.InvalidRole`
Subclass of `AdminError`.
- exception** `aerospike.exception.InvalidUser`
Subclass of `AdminError`.
- exception** `aerospike.exception.NotAuthenticated`
Subclass of `AdminError`.
- exception** `aerospike.exception.RoleExistsError`
Subclass of `AdminError`.
- exception** `aerospike.exception.RoleViolation`
Subclass of `AdminError`.
- exception** `aerospike.exception.SecurityNotEnabled`
Subclass of `AdminError`.
- exception** `aerospike.exception.SecurityNotSupported`
Subclass of `AdminError`.
- exception** `aerospike.exception.SecuritySchemeNotSupported`
Subclass of `AdminError`.
- exception** `aerospike.exception.UserExistsError`
Subclass of `AdminError`.

exception `aerospike.exception.UDFError`

The parent class for UDF exceptions exceptions. Subclass of `ServerError`.

module

The UDF module associated with the error.

func

Optionally the name of the UDF function.

exception `aerospike.exception.UDFNotFound`

Subclass of `UDFError`.

exception `aerospike.exception.LuaFileNotFound`

Subclass of `UDFError`.

1.9.3 Exception Hierarchy

```
AerospikeError (*)
+-- TimeoutError (9)
+-- ClientError (-1)
|   +-- InvalidHost (-4)
|   +-- ParamError (-2)
+-- ServerError (1)
    +-- InvalidRequest (4)
    +-- ServerFull (8)
    +-- AlwaysForbidden (10)
    +-- UnsupportedFeature (16)
    +-- DeviceOverload (18)
    +-- NamespaceNotFound (20)
    +-- ForbiddenError (22)
    +-- RecordError (*)
        |   +-- RecordKeyMismatch (19)
        |   +-- RecordNotFound (2)
        |   +-- RecordGenerationError (3)
        |   +-- RecordExistsError (5)
        |   +-- RecordTooBig (13)
        |   +-- RecordBusy (14)
        |   +-- BinNameError (21)
        |   +-- BinExistsError (6)
        |   +-- BinNotFound (17)
        |   +-- BinIncompatibleType (12)
    +-- IndexError (204)
        |   +-- IndexNotFound (201)
        |   +-- IndexFoundError (200)
        |   +-- IndexOOM (202)
        |   +-- IndexNotReadable (203)
        |   +-- IndexNameMaxLen (205)
        |   +-- IndexNameMaxCount (206)
    +-- QueryError (213)
        |   +-- QueryQueueFull (211)
        |   +-- QueryTimeout (212)
    +-- ClusterError (11)
        |   +-- ClusterChangeError (7)
    +-- AdminError (*)
        |   +-- SecurityNotSupported (51)
        |   +-- SecurityNotEnabled (52)
        |   +-- SecuritySchemeNotSupported (53)
```

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```
|   +-- InvalidCommand (54)
|   +-- InvalidField (55)
|   +-- IllegalState (56)
|   +-- InvalidUser (60)
|   +-- UserExistsError (61)
|   +-- InvalidPassword (62)
|   +-- ExpiredPassword (63)
|   +-- ForbiddenPassword (64)
|   +-- InvalidCredential (65)
|   +-- InvalidRole (70)
|   +-- RoleExistsError (71)
|   +-- RoleViolation (81)
|   +-- InvalidPrivilege (72)
|   +-- NotAuthenticated (80)
+-- UDFError (*)
    +-- UDFNotFound (1301)
    +-- LuaFileNotFound (1302)
```

1.10 aerospike_helpers

1.10.1 aerospike_helpers package

Subpackages

aerospike_helpers.operations package

Submodules

aerospike_helpers.operations.list_operations module

aerospike_helpers.operations.map_operations module

aerospike_helpers.operations.operations module

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