
sparkly Documentation

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Sparkly is a library that makes usage of pyspark more convenient and consistent.

A brief tour on Sparkly features:

```
# The main entry point is SparklySession,
# you can think of it as of a combination of SparkSession and SparkSession.builder.
from sparkly import SparklySession

# Define dependencies in the code instead of messing with `spark-submit`.
class MySession(SparklySession):
    # Spark packages and dependencies from Maven.
    packages = [
        'datastax:spark-cassandra-connector:2.0.0-M2-s_2.11',
        'mysql:mysql-connector-java:5.1.39',
    ]

    # Jars and Hive UDFs
    jars = ['/path/to/brickhouse-0.7.1.jar'],
    udfs = {
        'collect_max': 'brickhouse.udf.collect.CollectMaxUDAF',
    }

spark = MySession()

# Operate with interchangeable URL-like data source definitions:
df = spark.read_ext.by_url('mysql://<my-sql.host>/my_database/my_database')
df.write_ext('parquet:s3://<my-bucket>/<path>/data?partition_by=<field_name1>')

# Interact with Hive Metastore via convenient python api,
# instead of verbose SQL queries:
spark.catalog_ext.has_table('my_custom_table')
spark.catalog_ext.get_table_properties('my_custom_table')

# Easy integration testing with Fixtures and base test classes.
from sparkly.testing import SparklyTest

class TestMyShinySparkScript(SparklyTest):
    session = MySession

    fixtures = [
        MysqlFixture('<my-testing-host>', '<test-user>', '<test-pass>', '/path/to/
→data.sql', '/path/to/clear.sql')
    ]

    def test_job_works_with_mysql(self):
        df = self.spark.read_ext.by_url('mysql://<my-testing-host>/<test-db>/<test-
→table>?user=<test-usre>&password=<test-password>')
        res_df = my_shiny_script(df)
        self.assertDataFrameEqual(
            res_df,
            {'fieldA': 'DataA', 'fieldB': 'DataB', 'fieldC': 'DataC'},
        )
```

Sparkly Session

SparklySession is the main entry point to sparkly's functionality. It's derived from SparkSession to provide additional features on top of the default session. There are two main differences between SparkSession and SparklySession:

1. SparklySession doesn't have builder attribute, because we prefer declarative session definition over imperative.
2. Hive support is enabled by default.

The example below shows both imperative and declarative approaches:

```
# PySpark-style (imperative)
from pyspark import SparkSession

spark = SparkSession.builder\
    .appName('My App')\
    .master('spark://')\
    .config('spark.sql.shuffle.partitions', 10)\
    .getOrCreate()

# Sparkly-style (declarative)
from sparkly import SparklySession

class MySession(SparklySession):
    options = {
        'spark.app.name': 'My App',
        'spark.master': 'spark://',
        'spark.sql.shuffle.partitions': 10,
    }

spark = MySession()

# In case you want to change default options
spark = MySession({'spark.app.name': 'My Awesome App'})
```

Installing dependencies

Why: Spark forces you to specify dependencies (spark packages or maven artifacts) when a spark job is submitted (something like `spark-submit --packages=...`). We prefer a code-first approach where dependencies are actually declared as part of the job.

For example: You want to read data from Cassandra.

```
from sparkly import SparklySession

class MySession(SparklySession):
    # Define a list of spark packages or maven artifacts.
    packages = [
        'datastax:spark-cassandra-connector:2.0.0-M2-s_2.11',
    ]

    # Dependencies will be fetched during the session initialisation.
    spark = MySession()

    # Here is how you now can access a dataset in Cassandra.
    df = spark.read_ext.by_url('cassandra://<cassandra-host>/<db>/<table>?'
                               '↪consistency=QUORUM')
```

Custom Maven repositories

Why: If you have a private maven repository, this is how to point spark to it when it performs a package lookup. Order in which dependencies will be resolved is next:

- Local cache
- Custom maven repositories (if specified)
- Maven Central

For example: Let's assume your maven repository is available on: <http://my.repo.net/maven>, and there is some spark package published there, with identifier: *my.corp:spark-handy-util:0.0.1* You can install it to a spark session like this:

```
from sparkly import SparklySession

class MySession(SparklySession):
    repositories = ['http://my.repo.net/maven']
    packages = ['my.corp:spark-handy-util:0.0.1']

    spark = MySession()
```

Tuning options

Why: You want to customise your spark session.

For example:

- `spark.sql.shuffle.partitions` to tune shuffling;
- `hive.metastore.uris` to connect to your own HiveMetastore;
- `spark.hadoop.avro.mapred.ignore.inputs.without.extension` package specific options.

```
from sparkly import SparklySession

class MySession(SparklySession):
```



```

options = {
    # Increase the default amount of partitions for shuffling.
    'spark.sql.shuffle.partitions': 1000,
    # Setup remote Hive Metastore.
    'hive.metastore.uris': 'thrift://<host1>:9083,thrift://<host2>:9083',
    # Ignore files without `avro` extensions.
    'spark.hadoop.avro.mapred.ignore.inputs.without.extension': 'false',
}

# You can also overwrite or add some options at initialisation time.
spark = MySession({'spark.sql.shuffle.partitions': 10})

```

Using UDFs

Why: To start using Java UDF you have to import JAR file via SQL query like `add jar ../path/to/file` and then call `registerJavaFunction`. We think it's too many actions for such simple functionality.

For example: You want to import UDFs from `brickhouse` library.

```

from pyspark.sql.types import IntegerType
from sparkly import SparklySession

def my_own_udf(item):
    return len(item)

class MySession(SparklySession):
    # Import local jar files.
    jars = [
        '/path/to/brickhouse.jar'
    ]
    # Define UDFs.
    udfs = {
        'collect_max': 'brickhouse.udf.collect.CollectMaxUDAF', # Java UDF.
        'my_udf': (my_own_udf, IntegerType()), # Python UDF.
    }

spark = MySession()

spark.sql('SELECT collect_max(amount) FROM my_data GROUP BY ...')
spark.sql('SELECT my_udf(amount) FROM my_data')

```

API documentation

class `sparkly.session.SparklySession` (*additional_options=None*)

Wrapper around `HiveContext` to simplify definition of options, packages, JARs and UDFs.

Example:

```

from pyspark.sql.types import IntegerType
import sparkly

```

```
class MySession(sparkly.SparklySession):
    options = {'spark.sql.shuffle.partitions': '2000'}
    repositories = ['http://packages.confluent.io/maven/']
    packages = ['com.databricks:spark-csv_2.10:1.4.0']
    jars = ['../path/to/brickhouse-0.7.1.jar']
    udfs = {
        'collect_max': 'brickhouse.udf.collect.CollectMaxUDAF',
        'my_python_udf': (lambda x: len(x), IntegerType()),
    }

spark = MySession()
spark.read_ext.cassandra(...)
```

options

dict[str,str] – Configuration options that are passed to SparkConf. See [the list of possible options](#).

repositories

list[str] – List of additional maven repositories for package lookup.

packages

list[str] – Spark packages that should be installed. See <https://spark-packages.org/>

jars

list[str] – Full paths to jar files that we want to include to the session. E.g. a JDBC connector or a library with UDF functions.

udfs

dict[str,str|typing.Callable] – Register UDF functions within the session. Key - a name of the function, Value - either a class name imported from a JAR file

or a tuple with python function and its return type.

has_jar (*jar_name*)

Check if the jar is available in the session.

Parameters **jar_name** (*str*) – E.g. “mysql-connector-java”.

Returns bool

has_package (*package_prefix*)

Check if the package is available in the session.

Parameters **package_prefix** (*str*) – E.g. “org.elasticsearch:elasticsearch-spark”.

Returns bool

Read/write utilities for DataFrames

Sparkly isn't trying to replace any of existing storage connectors. The goal is to provide a simplified and consistent api across a wide array of storage connectors. We also added the way to work with *abstract data sources*, so you can keep your code agnostic to the storages you use.

Cassandra

Sparkly relies on the official spark cassandra connector and was successfully tested in production using version 2.0.0-M2.

Package	https://spark-packages.org/package/datastax/spark-cassandra-connector
Configuration	https://github.com/datastax/spark-cassandra-connector/blob/v2.0.0-M2/doc/reference.md

```
from sparkly import SparklySession

class MySession(SparklySession):
    # Feel free to play with other versions
    packages = ['datastax:spark-cassandra-connector:2.0.0-M2-s_2.11']

spark = MySession()

# To read data
df = spark.read_ext.cassandra('localhost', 'my_keyspace', 'my_table')
# To write data
df.write_ext.cassandra('localhost', 'my_keyspace', 'my_table')
```

Elastic

Sparkly relies on the official elastic spark connector and was successfully tested in production using version 5.1.1.

Package	https://spark-packages.org/package/elastic/elasticsearch-hadoop
Configuration	https://www.elastic.co/guide/en/elasticsearch/hadoop/5.1/configuration.html

```
from sparkly import SparklySession

class MySession(SparklySession):
    # Feel free to play with other versions
```

```
packages = ['org.elasticsearch:elasticsearch-spark-20_2.11:5.1.1']

spark = MySession()

# To read data
df = spark.read_ext.elastic('localhost', 'my_index', 'my_type', query='?q=awesomeness
↪')
# To write data
df.write_ext.elastic('localhost', 'my_index', 'my_type')
```

Kafka

Sparkly's reader and writer for Kafka are built on top of the official spark package for Kafka and python library `kafka-python`. The first one allows us to read data efficiently, the second covers a lack of writing functionality in the official distribution.

Package	https://mvnrepository.com/artifact/org.apache.spark/spark-streaming-kafka-0-8_2.11/2.1.0
Configuration	http://spark.apache.org/docs/2.1.0/streaming-kafka-0-8-integration.html

Note:

- To interact with Kafka, sparkly needs the `kafka-python` library. You can get it via: `pip install sparkly[kafka]`
- Sparkly was tested in production using Apache Kafka **0.10.x**.

```
import json

from sparkly import SparklySession

class MySession(SparklySession):
    packages = [
        'org.apache.spark:spark-streaming-kafka-0-8_2.11:2.1.0',
    ]

spark = MySession()

# To read JSON messaged from Kafka into a dataframe:

# 1. Define a schema of the messages you read.
df_schema = StructType([
    StructField('key', StructType([
        StructField('id', StringType(), True)
    ])),
    StructField('value', StructType([
        StructField('name', StringType(), True),
        StructField('surname', StringType(), True),
    ]))
])

# 2. Specify the schema as a reader parameter.
df = hc.read_ext.kafka(
    'kafka.host',
    topic='my.topic',
```

```

key_deserializer=lambda item: json.loads(item.decode('utf-8')),
value_deserializer=lambda item: json.loads(item.decode('utf-8')),
schema=df_schema,
)

# To write a dataframe to Kafka in JSON format:
df.write_ext.kafka(
    'kafka.host',
    topic='my.topic',
    key_serializer=lambda item: json.dumps(item).encode('utf-8'),
    value_serializer=lambda item: json.dumps(item).encode('utf-8'),
)

```

MySQL

Basically, it's just a high level api on top of the native jdbc reader and jdbc writer.

Jars	https://mvnrepository.com/artifact/mysql/mysql-connector-java
Configura- tion	https://dev.mysql.com/doc/connector-j/5.1/en/connector-j-reference-configuration-properties.html

```

from sparkly import SparklySession
from sparkly.utils import absolute_path

class MySession(SparklySession):
    # Feel free to play with other versions.
    packages = ['mysql:mysql-connector-java:5.1.39']

spark = MySession()

# To read data
df = spark.read_ext.mysql('localhost', 'my_database', 'my_table',
                          options={'user': 'root', 'password': 'root'})

# To write data
df.write_ext.mysql('localhost', 'my_database', 'my_table', options={
    'user': 'root',
    'password': 'root',
    'rewriteBatchedStatements': 'true', # improves write throughput dramatically
})

```

Universal reader/writer

The *DataFrame* abstraction is really powerful when it comes to transformations. You can shape your data from various storages using exactly the same api. For instance, you can join data from Cassandra with data from Elasticsearch and write the result to MySQL.

The only problem - you have to explicitly define sources (or destinations) in order to create (or export) a *DataFrame*. But the source/destination of data doesn't really change the logic of transformations (if the schema is preserved). To solve the problem, we decided to add the universal api to read/write *DataFrames*:

```
from sparkly import SparklyContext

class MyContext(SparklyContext):
    packages = [
        'datastax:spark-cassandra-connector:1.6.1-s_2.10',
        'com.databricks:spark-csv_2.10:1.4.0',
        'org.elasticsearch:elasticsearch-spark_2.10:2.3.0',
    ]

hc = MyContext()

# To read data
df = hc.read_ext.by_url('cassandra://localhost/my_keyspace/my_table?consistency=ONE')
df = hc.read_ext.by_url('csv:s3://my-bucket/my-data?header=true')
df = hc.read_ext.by_url('elastic://localhost/my_index/my_type?q=awesomeness')
df = hc.read_ext.by_url('parquet:hdfs://my.name.node/path/on/hdfs')

# To write data
df.write_ext.by_url('cassandra://localhost/my_keyspace/my_table?consistency=QUORUM&
↳parallelism=8')
df.write_ext.by_url('csv:hdfs://my.name.node/path/on/hdfs')
df.write_ext.by_url('elastic://localhost/my_index/my_type?parallelism=4')
df.write_ext.by_url('parquet:s3://my-bucket/my-data?header=false')
```

Controlling the load

From the official documentation:

Don't create too many partitions in parallel on a large cluster; otherwise Spark might crash your external database systems.

link: <<https://spark.apache.org/docs/2.0.1/api/java/org/apache/spark/sql/DataFrameReader.html>>

It's a very good advice, but in practice it's hard to track the number of partitions. For instance, if you write a result of a join operation to database the number of splits might be changed implicitly via *spark.sql.shuffle.partitions*.

To prevent us from shooting to the foot, we decided to add *parallelism* option for all our readers and writers. The option is designed to control a load on a source we write to / read from. It's especially useful when you are working with data storages like Cassandra, MySQL or Elastic. However, the implementation of the throttling has some drawbacks and you should be aware of them.

The way we implemented it is pretty simple: we use *coalesce* on a dataframe to reduce an amount of tasks that will be executed in parallel. Let's say you have a dataframe with 1000 splits and you want to write no more than 10 task in parallel. In such case *coalesce* will create a dataframe that has 10 splits with 100 original tasks in each. An outcome of this: if any of these 100 tasks fails, we have to retry the whole pack in 100 tasks.

[Read more about coalesce](#)

Reader API documentation

```
class sparkly.reader.SparklyReader(spark)
```

A set of tools to create DataFrames from the external storages.

Note: This is a private class to the library. You should not use it directly. The instance of the class is available under *SparklyContext* via *read_ext* attribute.

by_url (*url*)

Create a dataframe using *url*.

The main idea behind the method is to unify data access interface for different formats and locations. A generic schema looks like:

```
format:[protocol:]//host[:port][/location][?configuration]
```

Supported formats:

- CSV `csv://`
- Cassandra `cassandra://`
- Elastic `elastic://`
- MySQL `mysql://`
- Parquet `parquet://`
- Hive Metastore `table table://`

Query string arguments are passed as parameters to the relevant reader.

For instance, the next data source URL:

```
cassandra://localhost:9042/my_keyspace/my_table?consistency=ONE
&parallelism=3&spark.cassandra.connection.compression=LZ4
```

Is an equivalent for:

```
hc.read_ext.cassandra(
    host='localhost',
    port=9042,
    keyspace='my_keyspace',
    table='my_table',
    consistency='ONE',
    parallelism=3,
    options={'spark.cassandra.connection.compression': 'LZ4'},
)
```

More examples:

```
table://table_name
csv:s3://some-bucket/some_directory?header=true
csv://path/on/local/file/system?header=false
parquet:s3://some-bucket/some_directory
elastic://elasticsearch.host/es_index/es_type?parallelism=8
cassandra://cassandra.host/keyspace/table?consistency=QUORUM
mysql://mysql.host/database/table
```

Parameters `url` (*str*) – Data source URL.

Returns `pyspark.sql.DataFrame`

cassandra (*host, keyspace, table, consistency=None, port=None, parallelism=None, options=None*)
Create a dataframe from a Cassandra table.

Parameters

- **host** (*str*) – Cassandra server host.
- **keyspace** (*str*) –
- **table** (*str*) – Cassandra table to read from.
- **consistency** (*str*) – Read consistency level: ONE, QUORUM, ALL, etc.
- **port** (*int* / *None*) – Cassandra server port.
- **parallelism** (*int* / *None*) – The max number of parallel tasks that could be executed during the read stage (see [Controlling the load](#)).
- **options** (*dict* [*str*, *str*] / *None*) – Additional options for *org.apache.spark.sql.cassandra* format (see configuration for [Cassandra](#)).

Returns `pyspark.sql.DataFrame`

elastic (*host, es_index, es_type, query='', fields=None, port=None, parallelism=None, options=None*)
Create a dataframe from an ElasticSearch index.

Parameters

- **host** (*str*) – Elastic server host.
- **es_index** (*str*) – Elastic index.
- **es_type** (*str*) – Elastic type.
- **query** (*str*) – Pre-filter es documents, e.g. ‘?q=views:>10’.
- **fields** (*list* [*str*] / *None*) – Select only specified fields.
- **port** (*int* / *None*) –
- **parallelism** (*int* / *None*) – The max number of parallel tasks that could be executed during the read stage (see [Controlling the load](#)).
- **options** (*dict* [*str*, *str*] / *None*) – Additional options for *org.elasticsearch.spark.sql* format (see configuration for [Elastic](#)).

Returns `pyspark.sql.DataFrame`

kafka (*host, topic, offset_ranges=None, key_deserializer=None, value_deserializer=None, schema=None, port=9092, parallelism=None, options=None*)
Creates dataframe from specified set of messages from Kafka topic.

Defining ranges:

- If *offset_ranges* is specified it defines which specific range to read.
- If *offset_ranges* is omitted it will auto-discover it's partitions.

The *schema* parameter, if specified, should contain two top level fields: *key* and *value*.

Parameters *key_deserializer* and *value_deserializer* are callables which get bytes as input and should return python structures as output.

Parameters

- **host** (*str*) – Kafka host.
- **topic** (*str* / *None*) – Kafka topic to read from.

- **offset_ranges** (*list[(int, int, int)]*) – List of partition ranges [(partition, start_offset, end_offset)].
- **key_deserializer** (*function*) – Function used to deserialize the key.
- **value_deserializer** (*function*) – Function used to deserialize the value.
- **schema** (*pyspark.sql.types.StructType*) – Schema to apply to create a DataFrame.
- **port** (*int*) – Kafka port.
- **parallelism** (*int | None*) – The max number of parallel tasks that could be executed during the read stage (see [Controlling the load](#)).
- **options** (*dict | None*) – Additional kafka parameters, see [KafkaUtils.createRDD docs](#).

Returns pyspark.sql.DataFrame

Raises InvalidArgumentError

mysql (*host, database, table, port=None, parallelism=None, options=None*)

Create a dataframe from a MySQL table.

Options should include user and password.

Parameters

- **host** (*str*) – MySQL server address.
- **database** (*str*) – Database to connect to.
- **table** (*str*) – Table to read rows from.
- **port** (*int | None*) – MySQL server port.
- **parallelism** (*int | None*) – The max number of parallel tasks that could be executed during the read stage (see [Controlling the load](#)).
- **options** (*dict[str, str] | None*) – Additional options for JDBC reader (see configuration for [MySQL](#)).

Returns pyspark.sql.DataFrame

Writer API documentation

class sparkly.writer.**SparklyWriter** (*df*)

A set of tools to write DataFrames to external storages.

Note: We don't expect you to be using the class directly. The instance of the class is available under *DataFrame* via *write_ext* attribute.

by_url (*url*)

Write a dataframe to a destination specified by *url*.

The main idea behind the method is to unify data export interface for different formats and locations. A generic schema looks like:

```
format:[protocol:]//host[:port]/[location][?configuration]
```

Supported formats:

- CSV `csv://`
- Cassandra `cassandra://`
- Elastic `elastic://`
- MySQL `mysql://`
- Parquet `parquet://`

Query string arguments are passed as parameters to the relevant writer.

For instance, the next data export URL:

```
elastic://localhost:9200/my_index/my_type?&parallelism=3&mode=overwrite
&es.write.operation=upsert
```

Is an equivalent for:

```
hc.read_ext.elastic(
    host='localhost',
    port=9200,
    es_index='my_index',
    es_type='my_type',
    parallelism=3,
    mode='overwrite',
    options={'es.write.operation': 'upsert'},
)
```

More examples:

```
csv:s3://some-s3-bucket/some-s3-key?partitionBy=date,platform
cassandra://cassandra.host/keyspace/table?consistency=ONE&mode=append
parquet:///var/log/?partitionBy=date
elastic://elastic.host/es_index/es_type
mysql://mysql.host/database/table
```

Parameters `url` (*str*) – Destination URL.

cassandra (*host*, *keyspace*, *table*, *consistency=None*, *port=None*, *mode=None*, *parallelism=None*, *options=None*)

Write a dataframe to a Cassandra table.

Parameters

- **host** (*str*) – Cassandra server host.
- **keyspace** (*str*) – Cassandra keyspace to write to.
- **table** (*str*) – Cassandra table to write to.
- **consistency** (*str* | *None*) – Write consistency level: ONE, QUORUM, ALL, etc.
- **port** (*int* | *None*) – Cassandra server port.
- **mode** (*str* | *None*) – Spark save mode, <http://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes>
- **parallelism** (*int* | *None*) – The max number of parallel tasks that could be executed during the write stage (see *Controlling the load*).

- **options** (*dict[str, str]*) – Additional options to *org.apache.spark.sql.cassandra* format (see configuration for *Cassandra*).

elastic (*host, es_index, es_type, port=None, mode=None, parallelism=None, options=None*)

Write a dataframe into an ElasticSearch index.

Parameters

- **host** (*str*) – Elastic server host.
- **es_index** (*str*) – Elastic index.
- **es_type** (*str*) – Elastic type.
- **port** (*int* | *None*) –
- **mode** (*str* | *None*) – Spark save mode, <http://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes>
- **parallelism** (*int* | *None*) – The max number of parallel tasks that could be executed during the write stage (see *Controlling the load*).
- **options** (*dict[str, str]*) – Additional options to *org.elasticsearch.spark.sql* format (see configuration for *Elastic*).

kafka (*host, topic, key_serializer, value_serializer, port=9092, parallelism=None, options=None*)

Writes dataframe to kafka topic.

The schema of the dataframe should conform the pattern:

```
>>> StructType([
...     StructField('key', ...),
...     StructField('value', ...),
... ])
```

Parameters *key_serializer* and *value_serializer* are callables which get's python structure as input and should return bytes of encoded data as output.

Parameters

- **host** (*str*) – Kafka host.
- **topic** (*str*) – Topic to write to.
- **key_serializer** (*function*) – Function to serialize key.
- **value_serializer** (*function*) – Function to serialize value.
- **port** (*int*) – Kafka port.
- **parallelism** (*int* | *None*) – The max number of parallel tasks that could be executed during the write stage (see *Controlling the load*).
- **options** (*dict* | *None*) – Additional options.

mysql (*host, database, table, port=None, mode=None, parallelism=None, options=None*)

Write a dataframe to a MySQL table.

Options should include user and password.

Parameters

- **host** (*str*) – MySQL server address.
- **database** (*str*) – Database to connect to.
- **table** (*str*) – Table to read rows from.

- **mode** (*str/None*) – Spark save mode, <http://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes>
- **parallelism** (*int/None*) – The max number of parallel tasks that could be executed during the write stage (see *Controlling the load*).
- **options** (*dict*) – Additional options for JDBC writer (see configuration for *MySQL*).

`sparkly.writer.attach_writer_to_dataframe()`

A tiny amount of magic to attach write extensions.

Hive Metastore Utils

About Hive Metastore

The Hive Metastore is a database with metadata for Hive tables.

To configure `SparklySession` to work with external Hive Metastore, you need to set `hive.metastore.uris` option. You can do this via `hive-site.xml` file in spark config (`$SPARK_HOME/conf/hive-site.xml`):

```
<property>
  <name>hive.metastore.uris</name>
  <value>thrift://<n.n.n.n>:9083</value>
  <description>IP address (or fully-qualified domain name) and port of the metastore_
  ↪host</description>
</property>
```

or set it dynamically via `SparklySession` options:

```
class MySession(SparklySession):
    options = {
        'hive.metastore.uris': 'thrift://<n.n.n.n>:9083',
    }
```

Tables management

Why: sometimes you need more than just to create a table.

```
from sparkly import SparklySession

spark = SparklySession()

assert spark.catalog_ext.has_table('my_table') in {True, False}
spark.catalog_ext.rename_table('my_table', 'my_new_table')
spark.catalog_ext.drop_table('my_new_table')
```

Table properties management

Why: sometimes you want to assign custom attributes for your table, e.g. creation time, last update, purpose, data source. The only way to interact with table properties in spark - use raw SQL queries. We implemented a more convenient interface to make your code cleaner.

```
from sparkly import SparklySession

spark = SparklySession()
spark.catalog_ext.set_table_property('my_table', 'foo', 'bar')
assert spark.catalog_ext.get_table_property('my_table', 'foo') == 'bar'
assert spark.catalog_ext.get_table_properties('my_table') == {'foo': 'bar'}
```

Note properties are stored as strings. In case if you need other types, consider using a serialisation format, e.g. JSON.

Using non-default database

Why to split your warehouse into logical groups (for example by system components). In all `catalog_ext.*` methods you can specify full table names `<db-name>.<table-name>` and it should operate properly

```
from time import time
from sparkly import SparklySession

spark = SparklySession()

if spark.catalog_ext.has_database('my_database'):
    self.catalog_ext.rename_table(
        'my_database.my_badly_named_table',
        'new_shiny_name',
    )
    self.catalog_ext.set_table_property(
        'my_database.new_shiny_name',
        'last_update_at',
        time(),
    )
```

Note be careful using ‘USE’ statements like: `spark.sql('USE my_database')`, it’s stateful and may lead to weird errors, if code assumes correct current database.

API documentation

class `sparkly.catalog.SparklyCatalog` (*spark*)

A set of tools to interact with HiveMetastore.

drop_table (*table_name*, *checkfirst=True*)

Drop table from the metastore.

Note: Follow the official documentation to understand *DROP TABLE* semantic. [#LanguageManualDDL-DropTable](https://cwiki.apache.org/confluence/display/Hive/LanguageManual+DDL)

Parameters

- **table_name** (*str*) – A table name.
- **checkfirst** (*bool*) – Only issue DROPs for tables that are presented in the database.

get_table_properties (*table_name*)

Get table properties from the metastore.

Parameters **table_name** (*str*) – A table name.**Returns** Key/value for properties.**Return type** dict[str,str]**get_table_property** (*table_name, property_name, to_type=None*)

Get table property value from the metastore.

Parameters

- **table_name** (*str*) – A table name. Might contain a db name. E.g. “my_table” or “default.my_table”.
- **property_name** (*str*) – A property name to read value for.
- **to_type** (*function*) – Cast value to the given type. E.g. *int* or *float*.

Returns Any**has_database** (*db_name*)

Check if database exists in the metastore.

Parameters **db_name** (*str*) – Database name.**Returns** bool**has_table** (*table_name*)

Check if table is available in the metastore.

Parameters **table_name** (*str*) – A table name.**Returns** bool**rename_table** (*old_table_name, new_table_name*)

Rename table in the metastore.

Note: Follow the official documentation to understand *ALTER TABLE* semantic. [#LanguageManualDDL-RenameTable](https://cwiki.apache.org/confluence/display/Hive/LanguageManual+DDL)

Parameters

- **old_table_name** (*str*) – The current table name.
- **new_table_name** (*str*) – An expected table name.

set_table_property (*table_name, property_name, value*)

Set value for table property.

Parameters

- **table_name** (*str*) – A table name.
- **property_name** (*str*) – A property name to set value for.

- **value** (*Any*) – Will be automatically casted to string.

`sparkly.catalog.get_db_name(table_name)`

Get database name from full table name.

`sparkly.catalog.get_table_name(table_name)`

Get table name from full table name.

Testing Utils

Base TestCases

There are two main test cases available in Sparkly:

- `SparklyTest` creates a new session for each test case.
- `SparklyGlobalSessionTest` uses a single sparkly session for all test cases to boost performance.

```
from sparkly import SparklySession
from sparkly.test import SparklyTest

class MyTestCase(SparklyTest):
    session = SparklySession

    def test(self):
        df = self.spark.read_ext.by_url(...)

        # Compare all fields
        self.assertDataFrameEqual(
            actual_df=df,
            expected_data=[
                {'col1': 'row1', 'col2': 1},
                {'col1': 'row2', 'col2': 2},
            ],
        )

        # Compare a subset of fields
        self.assertDataFrameEqual(
            actual_df=df,
            expected_data=[
                {'col1': 'row1'},
                {'col1': 'row2'},
            ],
            fields=['col1'],
        )

    ...

class MyTestWithReusableSession(SparklyGlobalSessionTest):
    context = SparklySession
```

```
def test(self):
    df = self.spark.read_ext.by_url(...)

...
```

Instant Iterative Development

The slowest part in Spark integration testing is context initialisation. `SparklyGlobalSessionTest` allows you to keep the same instance of spark context between different test cases, but it still kills the context at the end. It's especially annoying if you work in [TDD fashion](#). On each run you have to wait 25-30 seconds till a new context is ready. We added a tool to preserve spark context between multiple test runs.

Note: In case if you change `SparklySession` definition (new options, jars or packages) you have to refresh the context via `sparkly-testing refresh`. However, you don't need to refresh context if udfs are changed.

Fixtures

“Fixture” is a term borrowed from Django framework. Fixtures load data to a database before the test execution.

There are several storages supported in Sparkly:

- Elastic
- Cassandra (requires `cassandra-driver`)
- Mysql (requires `PyMySQL`)
- _ Kafka (requires `kafka-python`)

```
from sparkly.test import MysqlFixture, SparklyTest

class MyTestCase(SparklyTest):
    ...
    fixtures = [
        MysqlFixture('mysql.host',
                     'user',
                     'password',
                     '/path/to/setup_data.sql',
                     '/path/to/remove_data.sql')
    ]
    ...
```

```
class sparkly.testing.CassandraFixture(host, setup_file, teardown_file)
    Fixture to load data into cassandra.
```

Notes

- Depends on `cassandra-driver`.

Examples

```
>>> class MyTestCase(SparklyTest):
...     fixtures = [
...         CassandraFixture(
...             'cassandra.host',
...             absolute_path(__file__, 'resources', 'setup.cql'),
...             absolute_path(__file__, 'resources', 'teardown.cql'),
...         )
...     ]
... 
```

```
>>> class MyTestCase(SparklyTest):
...     data = CassandraFixture(
...         'cassandra.host',
...         absolute_path(__file__, 'resources', 'setup.cql'),
...         absolute_path(__file__, 'resources', 'teardown.cql'),
...     )
...     def setUp(self):
...         data.setup_data()
...     def tearDown(self):
...         data.teardown_data()
... 
```

```
>>> def test():
...     fixture = CassandraFixture(...)
...     with fixture:
...         test_stuff()
... 
```

class sparkly.testing.**ElasticFixture**(*host, es_index, es_type, mapping=None, data=None, port=None*)

Fixture for elastic integration tests.

Examples

```
>>> class MyTestCase(SparklyTest):
...     fixtures = [
...         ElasticFixture(
...             'elastic.host',
...             'es_index',
...             'es_type',
...             '/path/to/mapping.json',
...             '/path/to/data.json',
...         )
...     ]
... 
```

class sparkly.testing.**Fixture**

Base class for fixtures.

Fixture is a term borrowed from Django tests, it's data loaded into database for integration testing.

setup_data()

Method called to load data into database.

teardown_data()

Method called to remove data from database which was loaded by *setup_data*.

class sparkly.testing.**KafkaFixture**(*host*, *port=9092*, *topic=None*, *key_serializer=None*,
value_serializer=None, *data=None*)

Fixture for kafka integration tests.

Notes

- depends on kafka-python lib.
- json file should contain array of dicts: [{‘key’: ..., ‘value’: ...}]

Examples

```
>>> class MyTestCase(SparklySession):
...     fixtures = [
...         KafkaFixture(
...             'kafka.host', 'topic',
...             key_serializer=..., value_serializer=...,
...             data='/path/to/data.json',
...         )
...     ]
```

class sparkly.testing.**KafkaWatcher**(*spark*, *df_schema*, *key_deserializer*, *value_deserializer*, *host*,
topic, *port=9092*)

Context manager that tracks Kafka data published to a topic

Provides access to the new items that were written to a kafka topic by code running within this context.

NOTE: This is mainly useful in integration test cases and may produce unexpected results in production environments, since there are no guarantees about who else may be publishing to a kafka topic.

Usage: my_deserializer = lambda item: json.loads(item.decode(‘utf-8’)) kafka_watcher = KafkaWatcher(
 my_sparkly_session, expected_output_dataframe_schema, my_deserializer, my_deserializer,
 ‘my.kafkaserver.net’, ‘my_kafka_topic’,

) with kafka_watcher:

 # do stuff that publishes messages to ‘my_kafka_topic’

 self.assertEqual(kafka_watcher.count, expected_number_of_new_messages)
 self.assertDataFrameEqual(kafka_watcher.df, expected_df)

class sparkly.testing.**MysqlFixture**(*host*, *user*, *password=None*, *data=None*, *teardown=None*)
 Fixture for mysql integration tests.

Notes

- depends on PyMySQL lib.

Examples

```
>>> class MyTestCase(SparklyTest):
...     fixtures = [
...         MysqlFixture('mysql.host', 'user', 'password', '/path/to/data.sql')
...     ]
...     def test(self):
...         pass
... 
```

class sparkly.testing.**SparklyGlobalSessionTest** (*methodName='runTest'*)

Base test case that keeps a single instance for the given session class across all tests.

Integration tests are slow, especially when you have to start/stop Spark context for each test case. This class allows you to reuse Spark session across multiple test cases.

class sparkly.testing.**SparklyTest** (*methodName='runTest'*)

Base test for spark scrip tests.

Initialize and shut down Session specified in *session* attribute.

Example

```
>>> class MyTestCase(SparklyTest):
...     def test(self):
...         self.assertDataFrameEqual(
...             self.spark.sql('SELECT 1 as one').collect(),
...             [{'one': 1}],
...         )
... 
```

assertDataFrameEqual (*actual_df, expected_data, fields=None, ordered=False*)

Ensure that DataFrame has the right data inside.

Parameters

- **actual_df** (*pyspark.sql.DataFrame* | *list* [*pyspark.sql.Row*]) – Dataframe to test data in.
- **expected_data** (*list* [*dict*]) – Expected dataframe rows defined as dicts.
- **fields** (*list* [*str*]) – Compare only certain fields.
- **ordered** (*bool*) – Does order of rows matter?

session

alias of SparklySession

Generic Utils

These are generic utils used in Sparkly.

`sparkly.utils.absolute_path(file_path, *rel_path)`
Return absolute path to file.

Usage:

```
>>> absolute_path('/my/current/dir/x.txt', '..', 'x.txt')
'/my/current/x.txt'
```

```
>>> absolute_path('/my/current/dir/x.txt', 'relative', 'path')
'/my/current/dir/relative/path'
```

```
>>> import os
>>> absolute_path('x.txt', 'relative/path') == os.getcwd() + '/relative/path'
True
```

Parameters

- **file_path** (*str*) – file
- **rel_path** (*list[str]*) – path parts

Returns *str*

`sparkly.utils.kafka_get_topics_offsets(host, topic, port=9092)`
Return available partitions and their offsets for the given topic.

Parameters

- **host** (*str*) – Kafka host.
- **topic** (*str*) – Kafka topic.
- **port** (*int*) – Kafka port.

Returns [– [(partition, start_offset, end_offset)].

Return type *int, int, int*

`sparkly.utils.parse_schema(schema)`
Generate schema by its string definition.

It's basically an opposite action to `DataType.simpleString` method. Supports all atomic types (like string, int, float...) and complex types (array, map, struct) except `DecimalType`.

Usages:

```
>>> parse_schema('string')
StringType
>>> parse_schema('int')
IntegerType
>>> parse_schema('array<int>')
ArrayType(IntegerType,true)
>>> parse_schema('map<string,int>')
MapType(StringType,IntegerType,true)
>>> parse_schema('struct<a:int,b:string>')
StructType(List(StructField(a,IntegerType,true),StructField(b,StringType,true)))
>>> parse_schema('unsupported')
Traceback (most recent call last):
...
sparkly.exceptions.UnsupportedDataType: Cannot parse type from string:
↳ "unsupported"
```

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