

# Project Architecture

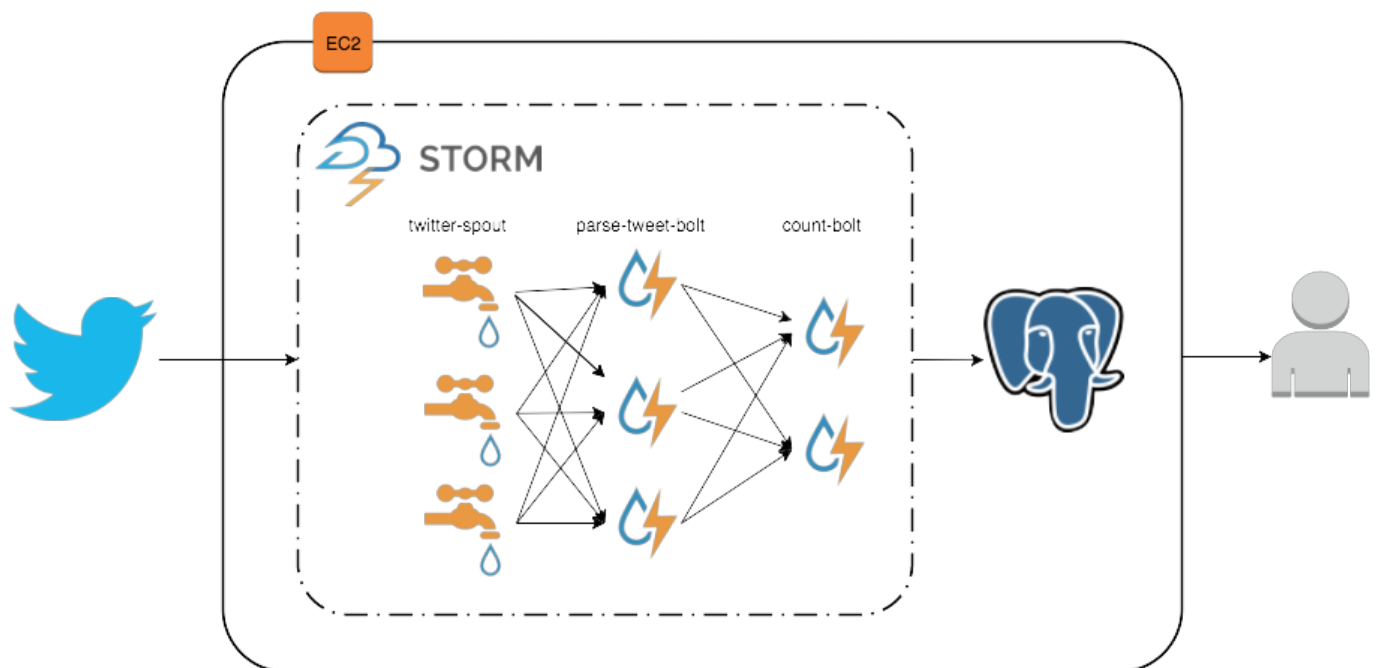
## Objective and Application Idea

We would like to create a streaming application that analyzes Twitter data. The application will allow the user to get counts of specific words for a Twitter stream as well as see a histogram of words with counts within a specific range. To collect the necessary data the application will read the stream of tweets from the Twitter streaming API, parse them, count the occurrences of each word in the stream of tweets, and persist the results into storage.

## Technologies Used

- [Apache Storm](#) and [Streamparse](#)
- [PostgreSQL](#) and [Psycopg](#)
- [Twitter Application](#) and [Tweepy](#)

## Architectural Description



The application uses a Storm topology to collect the necessary data. The topology consists of the following:

- 3 tasks of a `tweet-spout` component, which uses the Tweepy library to collect streaming data from our Twitter Application
- 3 tasks of a `parse-tweet-bolt` which extracts the individual words from each tweet and emits each word to the next component
- 2 tasks of a `count-bolt` which receives each word and updates the appropriate count within the Postgres database

# Overall Considerations

## Logging

For reliability purposes adequate logging is required in order to diagnose performance of the application. This logging should be adjustable via a configuration file.

## Exception Handling

For reliability purposes the application should be fault tolerant to various inputs and conditions. The application should gracefully exit when it enters an exceptional state.

## Security

Where applicable proper precautions should be taken to follow best security practices.

## Scalability

The choice of technology (Storm) presumes scalability but precautions should be taken to hinder scale out scenarios.

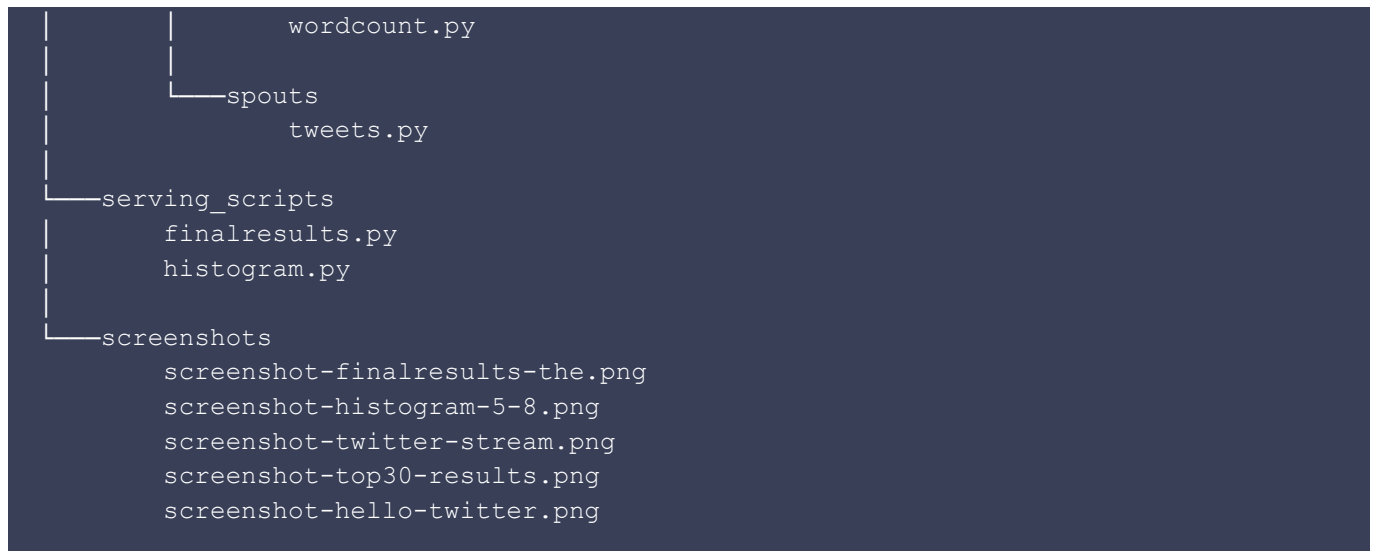
## Localization

The application functions on a stream of English tweets and the output language is English. We will not make considerations in the code for internationalization.

# Implementation

## File Structure

```
exercise_2
├── readme.txt
├── Plot.png
├── postgres_setup.py
├── exttweetwordcount.config
├── exttweetwordcount
│   ├── config.json
│   ├── fabfile.py
│   ├── project.clj
│   └── tasks.py
├── virtualenvs
│   └── wordcount.txt
├── topologies
│   └── tweetwordcount.clj
├── src
│   └── bolts
│       └── parse.py
```



## Dependencies

The application assumes that all of the technologies listed in the Technology section above are installed. The application also assumes that PostgreSQL is running and that the credentials present in `exttweetwordcount.config` and in `tweetwordcount.clj` are valid.

## Design Decisions

### Security

All calls to PostgreSQL have parameterized queries to prevent SQL injection attacks.

#### `config.json`

- The logger is set to level `INFO` and to write directly to the console.
- For security purposes the credentials use to access the Twitter API and the PostgreSQL database are present in this external configuration file.

#### `postgres_setup.py`

- The tweets will be stored in a database 'tcount' in table 'tweetwordcount'

#### `tweetwordcount.clj`

- The task parallelism is as defined in the Architectural Description above.
- Input to the `tweet-parse-bolt` uses a shuffle grouping while the input to the `count-bolt` uses a field grouping on the incoming word. This is a crucial configuration step for the correct operation of the `count-bolt` due to its implementation in `wordcount.py` (discussed below)

#### `tweets.py`

- To avoid internationalization problems the implementation restricts the language of the captured Tweets to English and further restricts the tweets to those containing the words a, the, i, you, u.

#### `parse.py`

- Only words that are a part of the body of the tweet are emitted. This excluded hashtags, retweets, user mentions and urls.
- For both storage and security purposes the word must consist of entirely ASCII characters to be emitted. This excludes unicode characters and thus would have to be altered for internationalization.
- All of the words are converted to lowercase since there are few english words in which the meaning is altered by use of casing.
- The split characters and the characters to strip are both defined in the code.

#### **wordcount.py**

- The internal word counter is initialized from the database in the event of preexisting word counts.
- The internal word counter is not declared as static and therefore, in order to keep a correct internal word count across multiple `count-bolt` tasks, the topology must specify that the input to this bolt uses a field grouping on the input word.

## Results

In order to run the application follow the instructions present in the `readme.txt` file in the root directory.

## Potential Improvements

### Configuration

The credentials for the PostgreSQL instance are stored in two places `exttweetwordcount.config` and `tweetwordcount.clj`. This could cause maintainance issues.

### Scalability

The scripts `finalresults.py` and `histogram.py` are not implicitly scale-out ready. Since they only query the local instance of Postgres each will only have local results. In order to create a truly scale-out solution an application would have to be built across the nodes to run those queries on each instance and then aggregate the results.

### Testing

In an enterprise level system there should be adequate unit and integration test coverage to ensure quality and to provide granular tools to diagnose faults in running systems. We do not present unit tests here.