

A stylized illustration of a white whale with a curved tail, set against a teal background. From the whale's back, several thin white lines extend upwards, each ending in a small orange bird with a white beak and a white flame-like shape on its head. The birds are scattered across the upper half of the image. At the bottom, there is a decorative border consisting of a row of white scalloped shapes on a teal background, with a solid orange band below that.

# \* The Whale

Visualizing Twitter with local groups

Erik Turnquist, Rob Hanlon, Eric Kimbrel, Zack Allred

# Overview

All features we could possibly think of:

- Visualization of Twitter relationships
- Friend and follower similarity
- Determine trends among a group of users
- Follower recommendations
- Identify groups of similar users

Core functionality achieved:

- visualization
- similarity
- trends

# Architecture

## Ruby

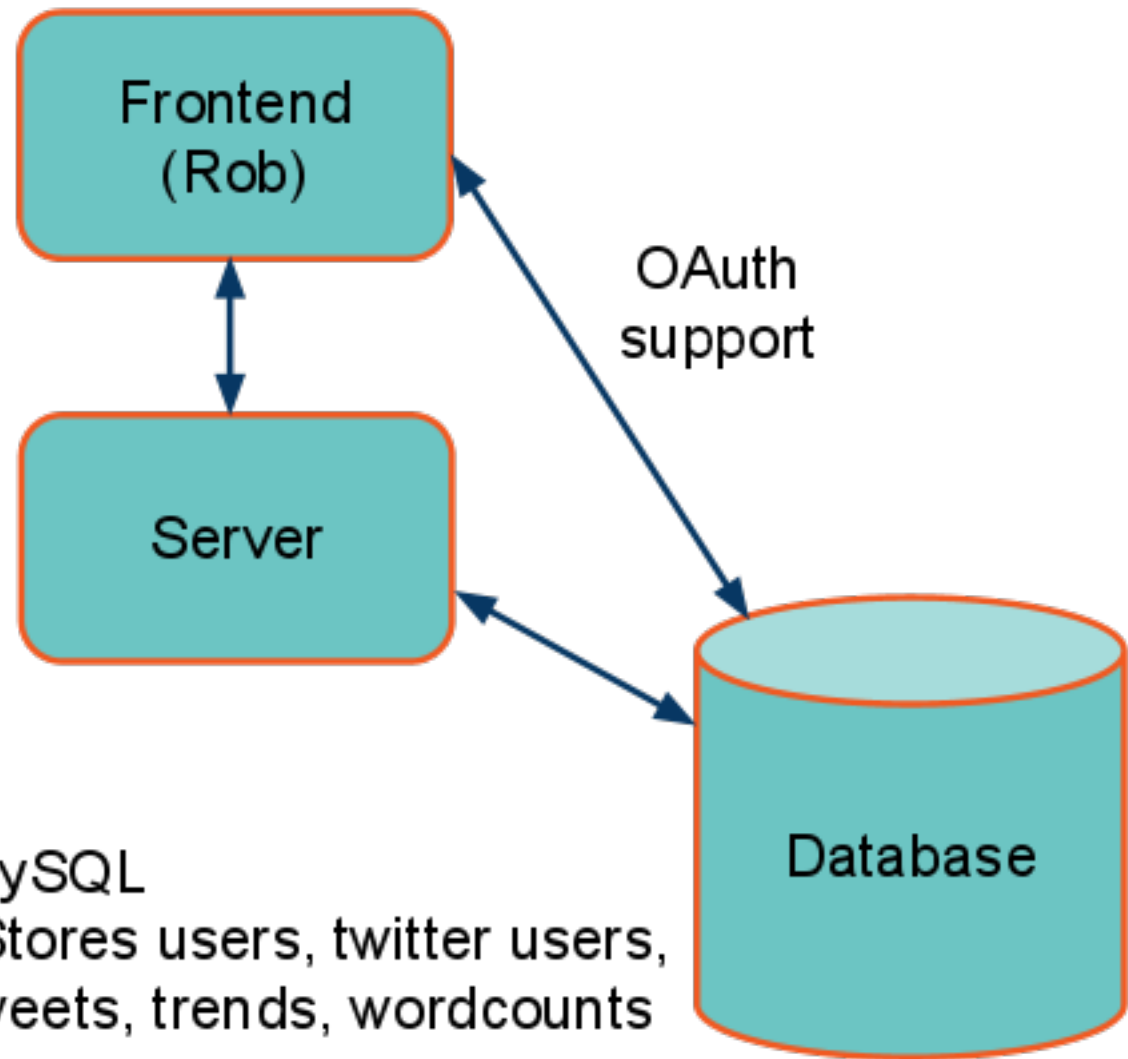
- jruby for requesting data
- OAuth for login and authorization
- <canvas> for UI

## Java

- Auto-update twitter data (Erik)
- twitter4j
- Similarity ranking (Zack)
- Group trends (Eric)

## MySQL

-Stores users, twitter users, tweets, trends, wordcounts



# Gathering Data

- Background service for automatically updating data
  - Lists of friends and followers
  - Newest tweets
- Optimized for performance
  - Threadpools for API calls
  - Only receives new information from API
- Uses minimal API calls
- Twitter API Issues

# Similarity

- Treat each user as a concatenation of their tweets.
  - We tried two different algorithms to rate the similarity scores of the result.
- First Attempt:
- Euclidean distance of the tf vectors (as proportions).
    - Ignored words whose frequency were too large or small
    - Ignored words used by only one of the two Twitterers
  - Similarity =  $1 - \text{the Euclidean distance}$
- Second Attempt:
- Cosine similarity of the tf-idf vectors

We chose to use the cosine similarity of the tf-idf vectors since the first method did not take into account the document frequency of the terms.

# Finding Trends on Selected Users.

1. Word Usage: Base trends off the most common words that occur between all selected users.

Group of 3 users:

hcr, house, healthcare, politics, base64, facebook, red, twitter, glenn, songoftheday

Group of 254:

db09, splatter, fb, hc09, sandvoxtip, unix@40, gomachine, dinner, unixtour, l4d

2. Term Extraction: Base trends on topics pulled from text using Yahoo's term extractor

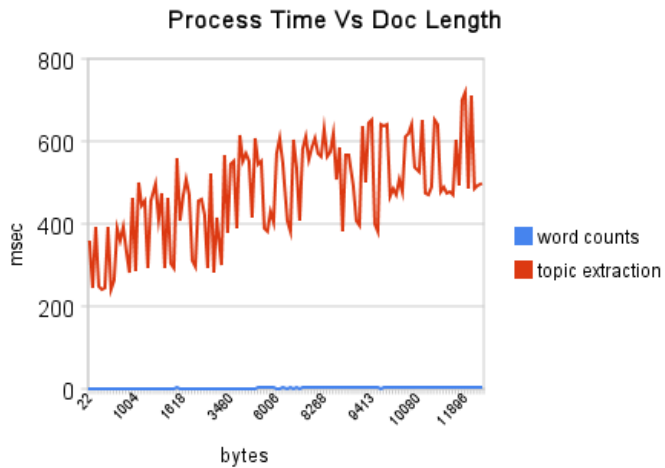
Group of 3:

iphone, google, bandstand, sounders, storytelling, curio, dingell, yesss, bystander, skerik

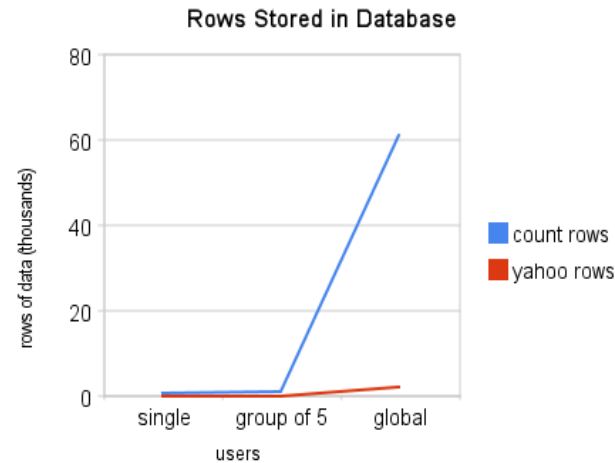
Group of 254:

iphone, google, twitter, rt, tweets, tweet, tinyurl, ly, facebook, followers

# Finding trends by word frequency vs. topic extraction.



Phase 1: Consider all of a users tweets as a single document and translate the document into word counts or a list of topics.



Phase 2: When trends are requested query our database and return the most frequent terms from the selected users.

# Frontend structure

## Non-GUI components:

- JRuby on Rails
  - Why? Direct construction and reference to Java objects from Ruby code, so Rails can do what it does best, and Java can do the number crunching
- twitter-auth RubyGem
  - 2 minute Twitter OAuth integration
- Resque
  - Used to asynchronously hit the backend and check for updated data
- Distributed Ruby
  - Conveniently shuttles around object references from Rails to Resque in order to make sure we're all working with the same objects

```
23     :sim => db.get_similarity_score(cur_id, id),
24     :follow => !follow[id].nil?,
25     :friend => !friends[id].nil?
26
27   render :json => hash
28   set.remove(id)
29 end
30
31 def get_center
32   render :json => { :login => @current_user.login,
33                   :id => @current_user.twitter_id.to_i,
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53   that.mouseDragged = function () {
54     };
55
56   that.mousePressed = function () {
57     for (var i = 0; i < proc.circles.length; i++) {
58       var position = proc.circles[i].scaledPosition(),
59           distanceX = position.x() - proc.mouseX,
60           distanceY = position.y() - proc.mouseY;
61
62       if (proc.sqrt(proc.sq(distanceX) + proc.sq(distanceY)) < (proc.NODE_SIZE))
63         proc.circles[i].toggleHighlight();
64     }
65   };
66
67   that.on('click', function () {
68     proc.clicked = true;
69     proc.clickedTimeout = setTimeout(function () {
70       proc.clicked = false;
71     }, 100);
72   });
73
74   that.on('mouseover', function () {
75     proc.hovered = true;
76     proc.hoveredTimeout = setTimeout(function () {
77       proc.hovered = false;
78     }, 100);
79   });
80
81   that.on('mouseout', function () {
82     proc.hovered = false;
83   });
84
85   that.on('mousemove', function () {
86     proc.mouseX = proc.mouseX + (proc.mouseX - proc.mouseX) * proc.DRAG_FACTOR;
87     proc.mouseY = proc.mouseY + (proc.mouseY - proc.mouseY) * proc.DRAG_FACTOR;
88   });
89
90   that.on('mousedown', function () {
91     proc.mouseDown = true;
92     proc.mouseDownTimeout = setTimeout(function () {
93       proc.mouseDown = false;
94     }, 100);
95   });
96
97   that.on('mouseup', function () {
98     proc.mouseDown = false;
99   });
100
101   that.on('keydown', function (e) {
102     if (e.keyCode == 32) {
103       proc.clicked = true;
104       proc.clickedTimeout = setTimeout(function () {
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106       }, 100);
107     }
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```



# Some eye candy

```
23358945      0 new tweets   71 db tweets
SQL (0.0ms)   SET SQL_AUTO_IS_NULL=0

Processing GraphController#get_center (for 32.158.102.13 at 2009-12-14 08:57:34) [GET]
  User Load (1.0ms)  SELECT * FROM `users` WHERE (`users`.`id` = 3) LIMIT 1
Completed in 96ms (View: 9, DB: 1) | 200 OK [http://attu1.cs.washington.edu/graph/get_center]
3647681 0 new tweets   9 db tweets
69591866   0 new tweets  100 db tweets
4794501 0 new tweets  100 db tweets
```

