Cassandra By Example:
Data Modelling with CQL3

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CQL is...

- Query language for Apache Cassandra
- Almost SQL (almost)
- ~~Alternative query interface~~ First class citizen
- More performant!
- Available since Cassandra 0.8.0 (almost 2 years!)

Bad Old Days: Thrift RPC

Bad Old Days: Thrift RPC

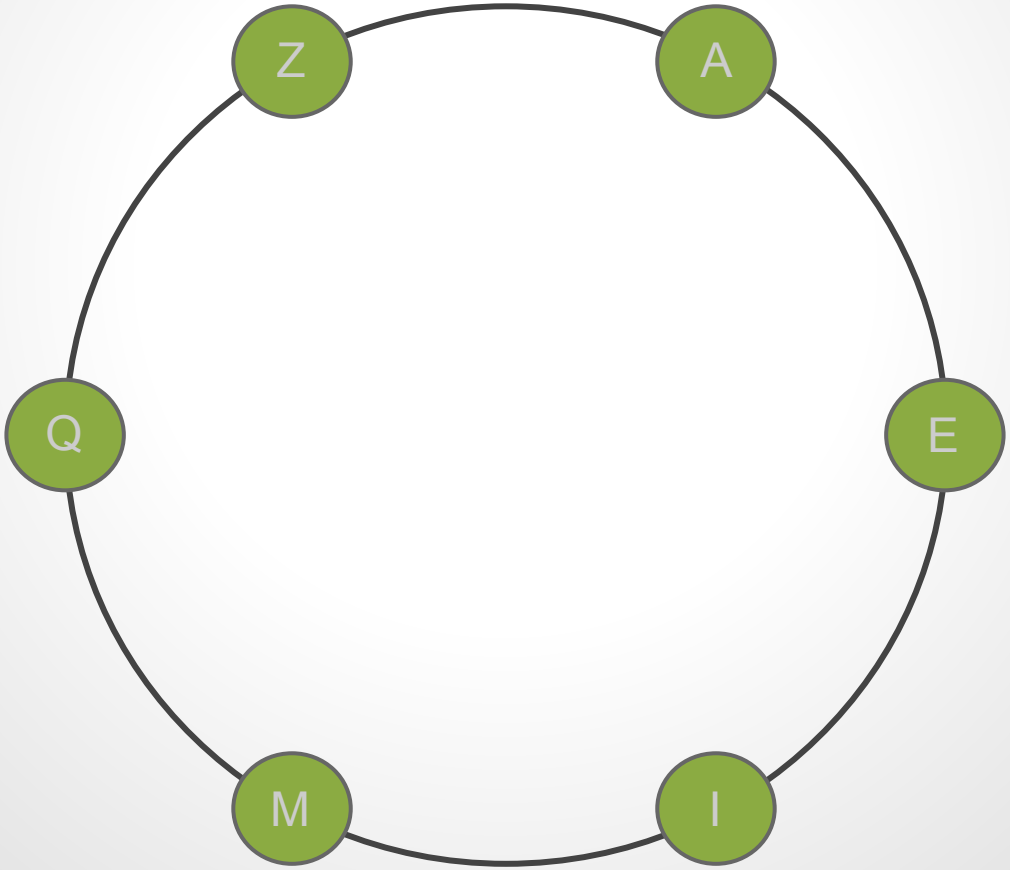
```
// Your Column
Column col = new Column(ByteBuffer.wrap("name".getBytes()));
col.setValue(ByteBuffer.wrap("value".getBytes()));
col.setTimestamp(System.currentTimeMillis());

// Don't ask
ColumnOrSuperColumn cosc = new ColumnOrSuperColumn();
cosc.setColumn(col);

// Prepare to be amazed
Mutation mutation = new Mutation();
mutation.setColumnOrSuperColumn(cosc);

List<Mutation> mutations = new ArrayList<Mutation>();
mutations.add(mutation);

Map mutations_map = new HashMap<ByteBuffer, Map<String, List<Mutation>>>();
Map cf_map = new HashMap<String, List<Mutation>>();
cf_map.set("Standard1", mutations);
mutations_map.put(ByteBuffer.wrap("key".getBytes()), cf_map);

cassandra.batch_mutate(mutations_map, consistency_level);
```

Better, no?

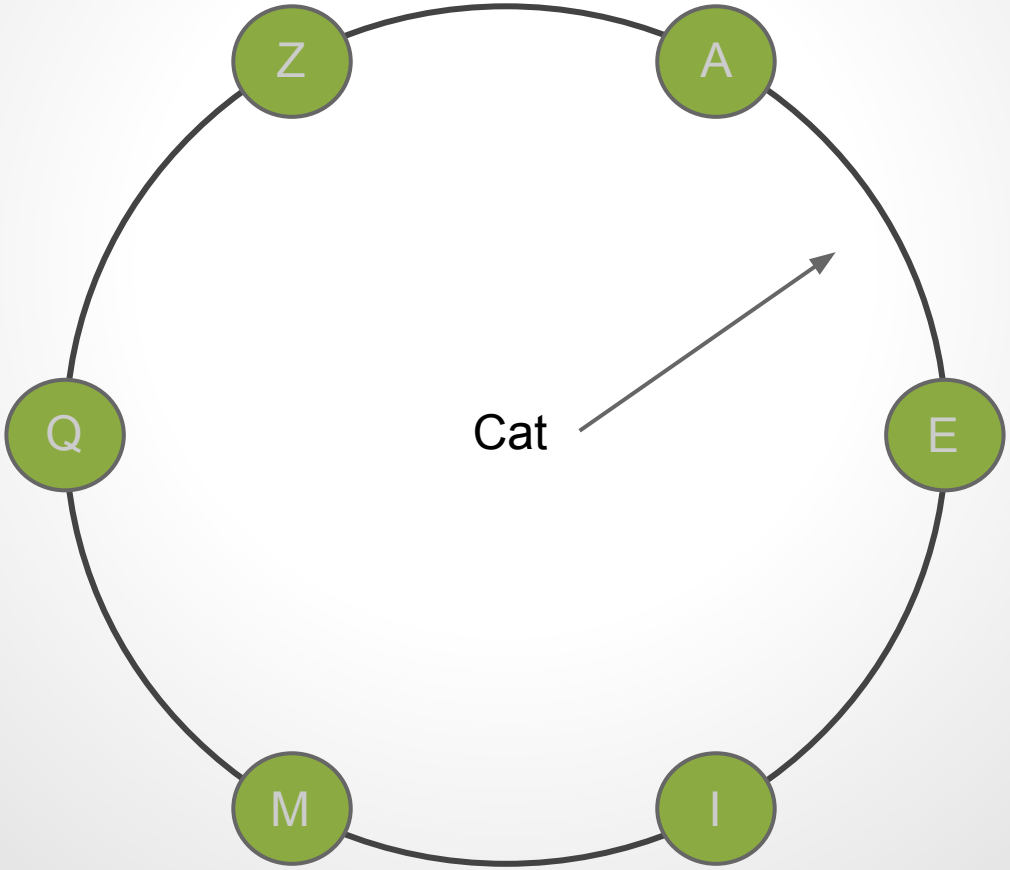
```
INSERT INTO (id, name) VALUES ('key', 'value');
```

But before we begin...

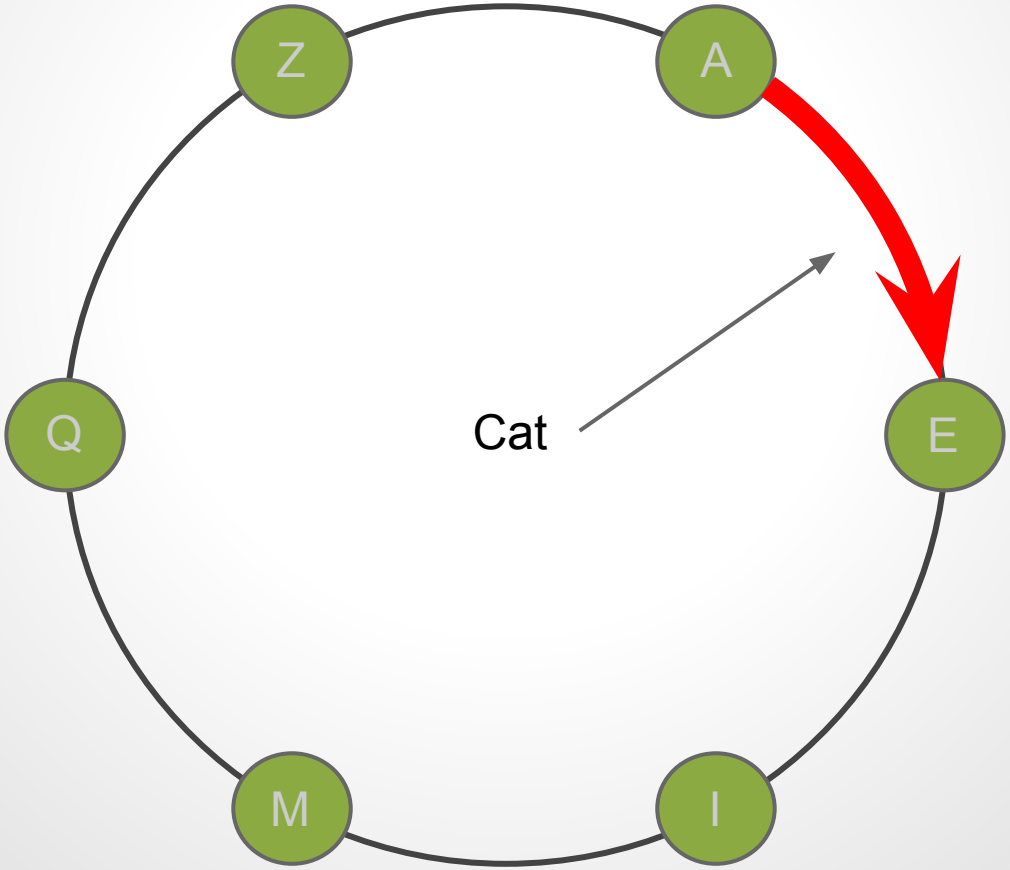
Partitioning



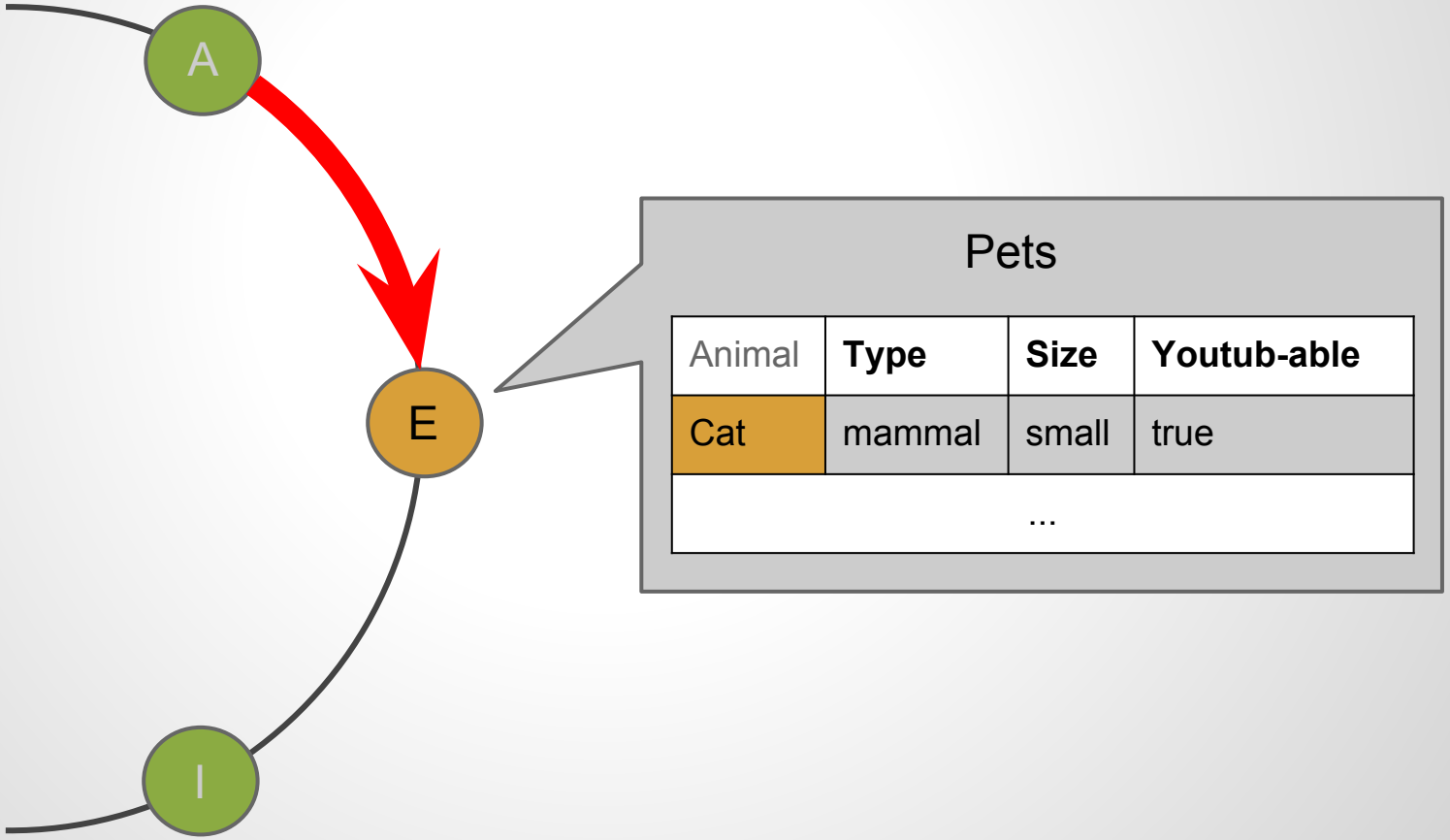
Partitioning



Partitioning



Partitioning

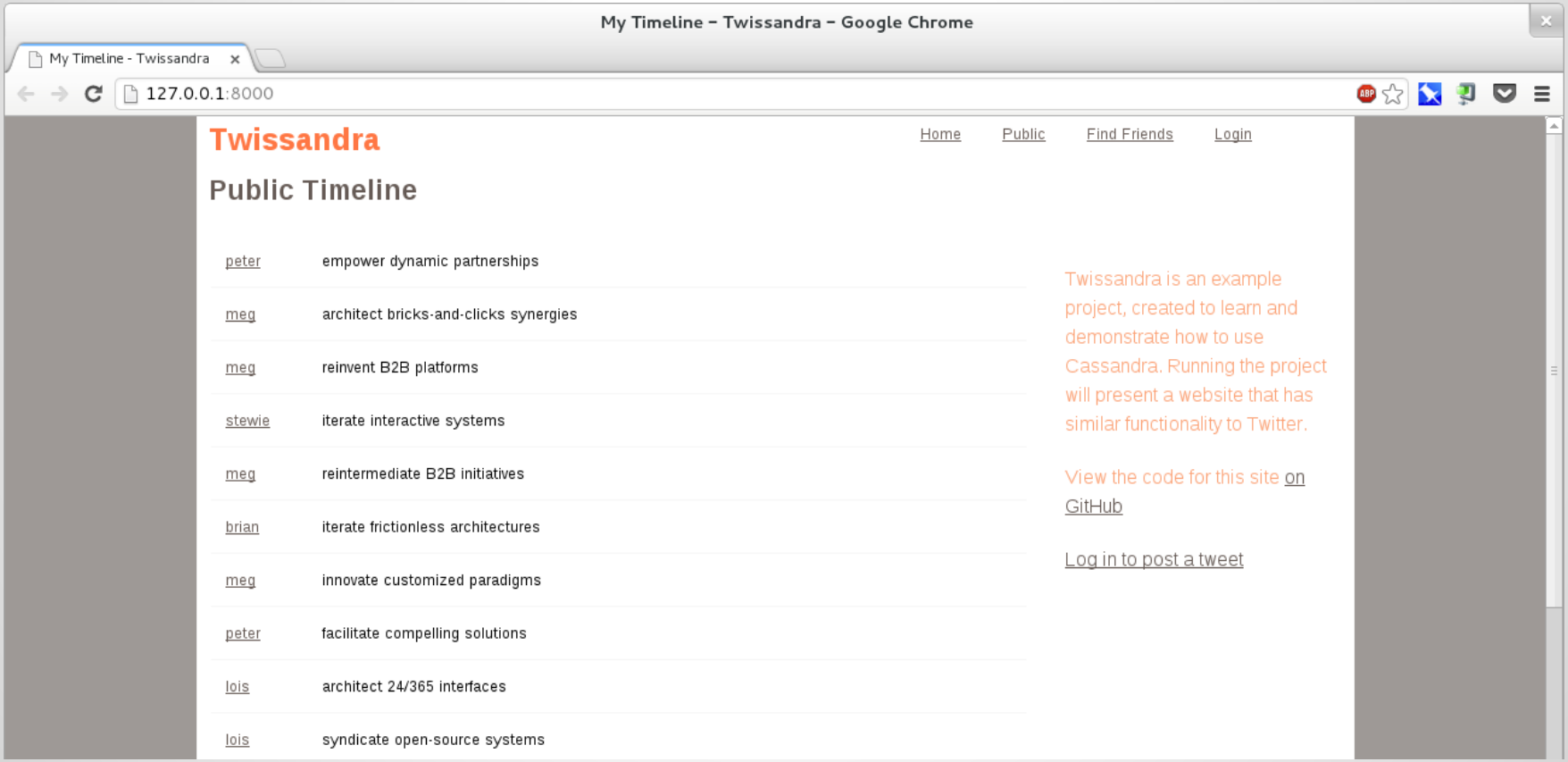



I DON'T ALWAYS USE CASSANDRA
BUT WHEN I DO, I
DENORMALIZE
memegenerator.net

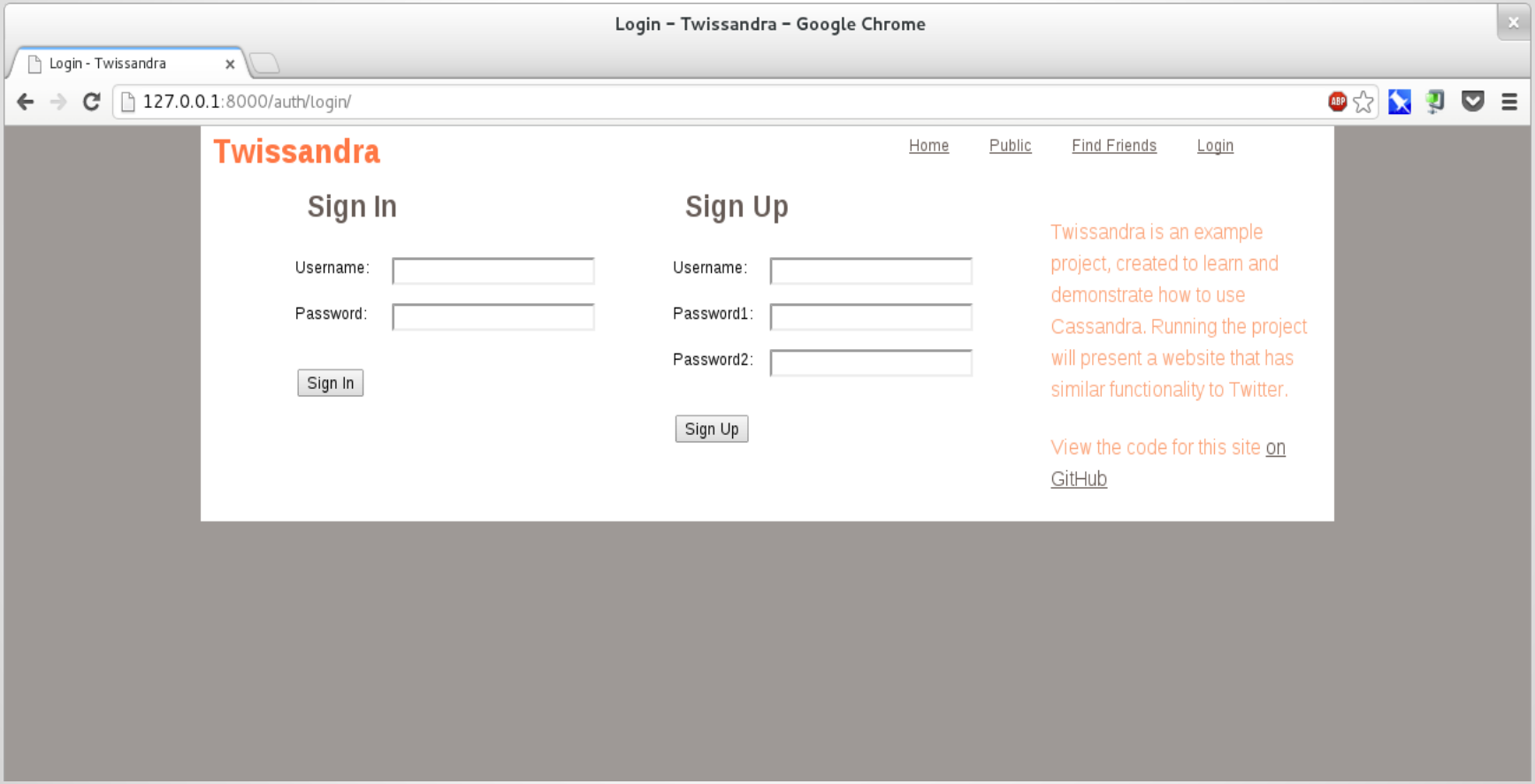
Twissandra

- Twitter-inspired sample application
- Originally by Eric Florenzano, June 2009
- Python (Django)
- DBAPI-2 driver for CQL
- Favors simplicity over correctness!
- https://github.com/eevans/twissandra
  - See: cass.py

Twissandra


My Timeline – Twissandra – Google Chrome
My Timeline - Twissandra
127.0.0.1:8000
Twissandra
Home
Public
Find Friends
Login
Public Timeline
peter empower dynamic partnerships
meg architect bricks-and-clicks synergies
meg reinvent B2B platforms
stewie iterate interactive systems
meg reintermediate B2B initiatives
brian iterate frictionless architectures
meg innovate customized paradigms
peter facilitate compelling solutions
lois architect 24/365 interfaces
lois syndicate open-source systems
Twissandra is an example project, created to learn and demonstrate how to use Cassandra. Running the project will present a website that has similar functionality to Twitter.
View the code for this site on GitHub
Log in to post a tweet

Twissandra


Login – Twissandra – Google Chrome
Login - Twissandra
127.0.0.1:8000/auth/login/
Twissandra
Home
Public
Find Friends
Login
Sign In
Username:
Password:
Sign In
Sign Up
Username:
Password1:
Password2:
Sign Up
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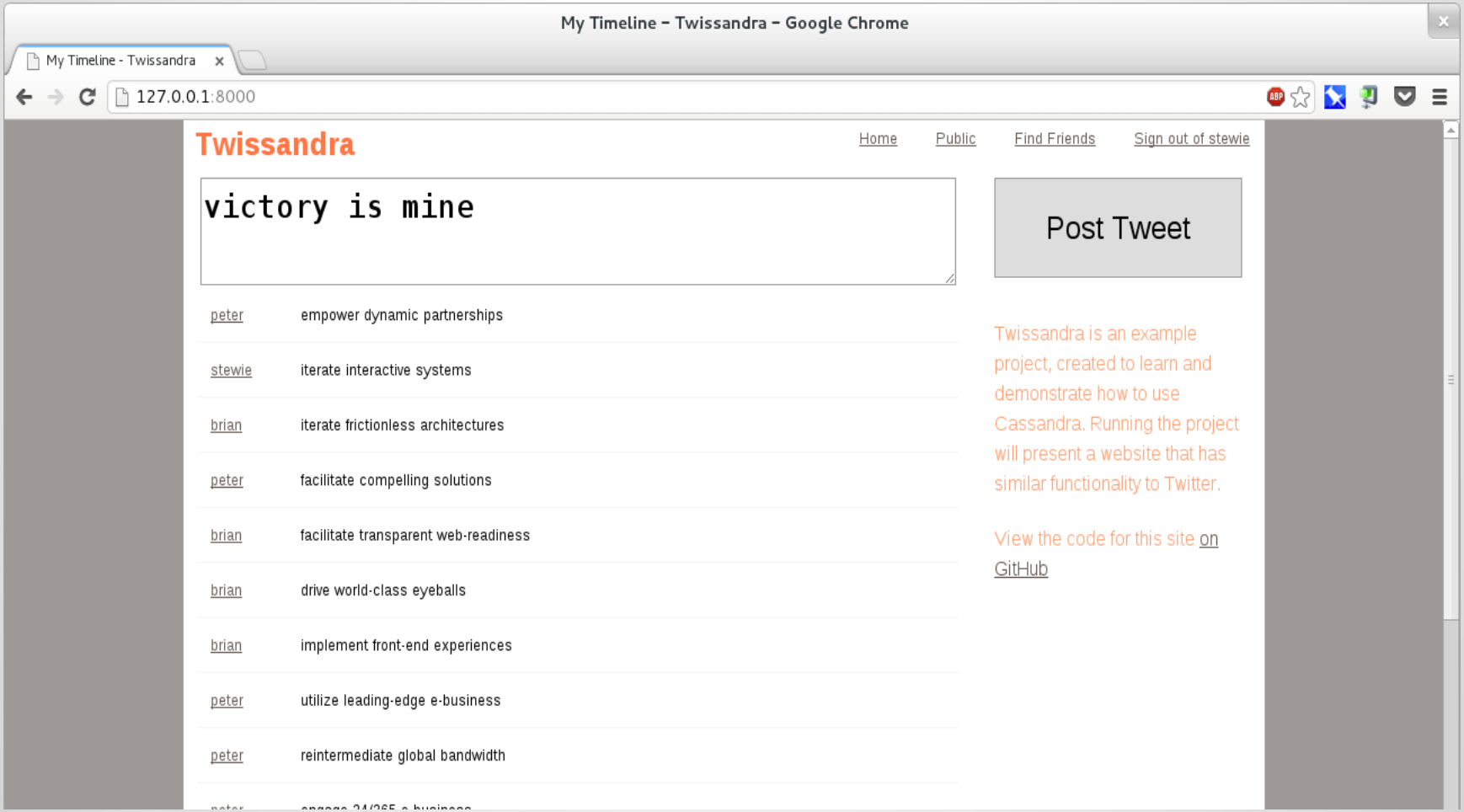
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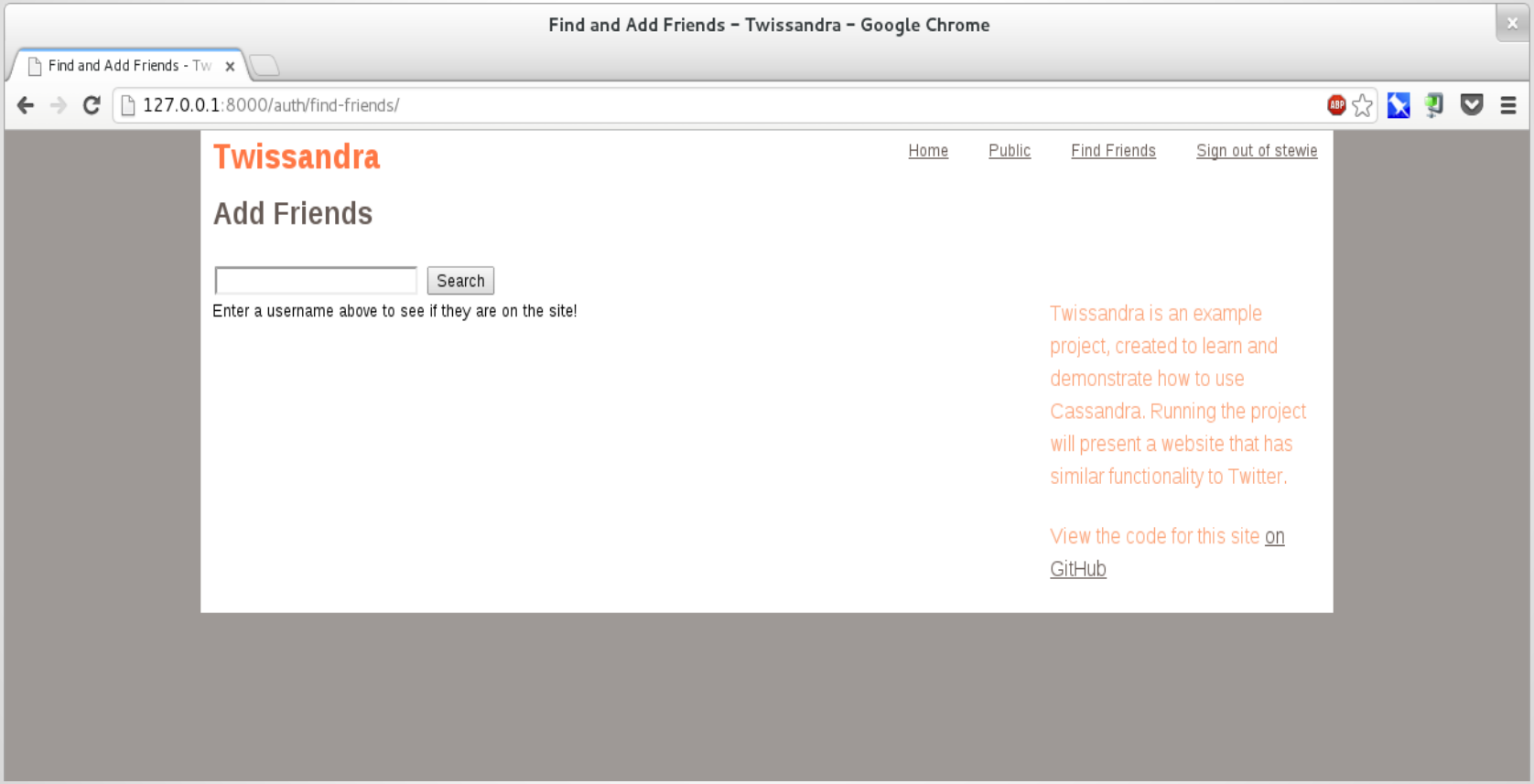
Find and Add Friends – Twissandra – Google Chrome
Find and Add Friends - Tw
127.0.0.1:8000/auth/find-friends/
Twissandra
Home
Public
Find Friends
Sign out of stewie
Add Friends
Search
Enter a username above to see if they are on the site!
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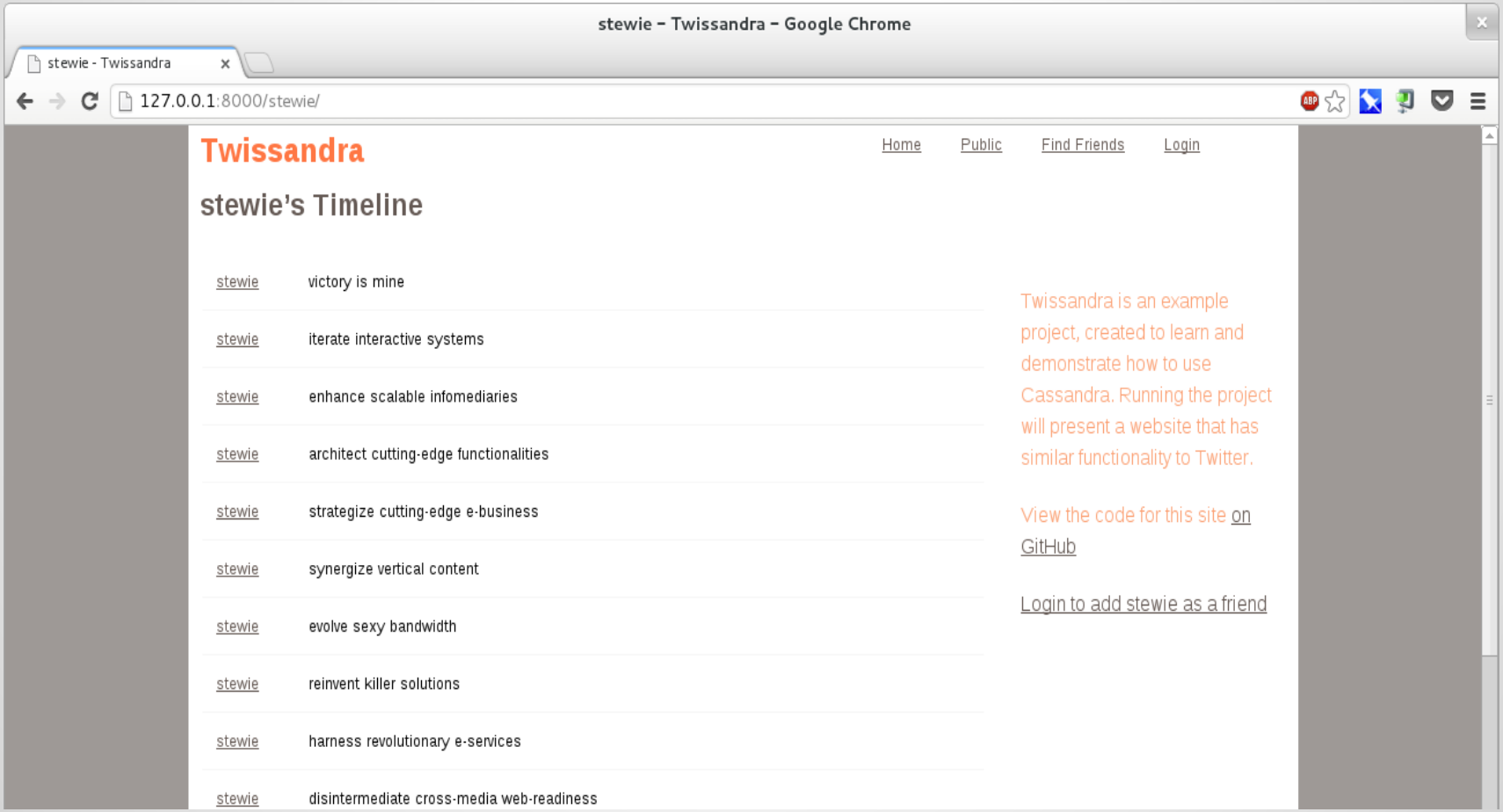
Twissandra


stewie – Twissandra – Google Chrome
stewie - Twissandra
127.0.0.1:8000/stewie/
Twissandra
Home
Public
Find Friends
Login
stewie's Timeline
stewie victory is mine
stewie iterate interactive systems
stewie enhance scalable infomediaries
stewie architect cutting-edge functionalities
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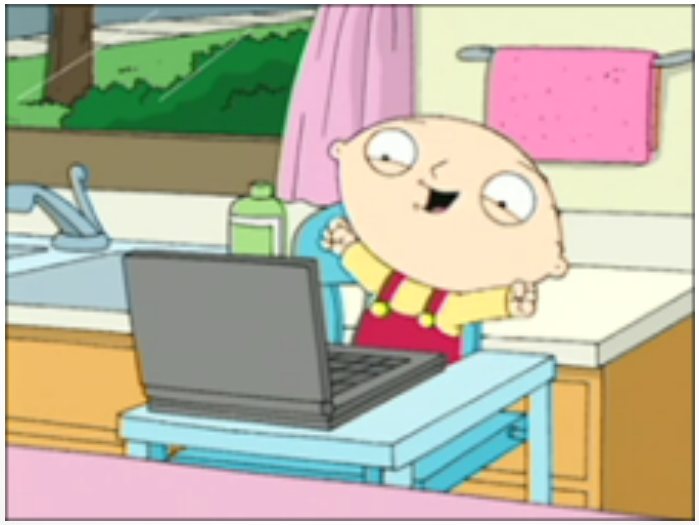
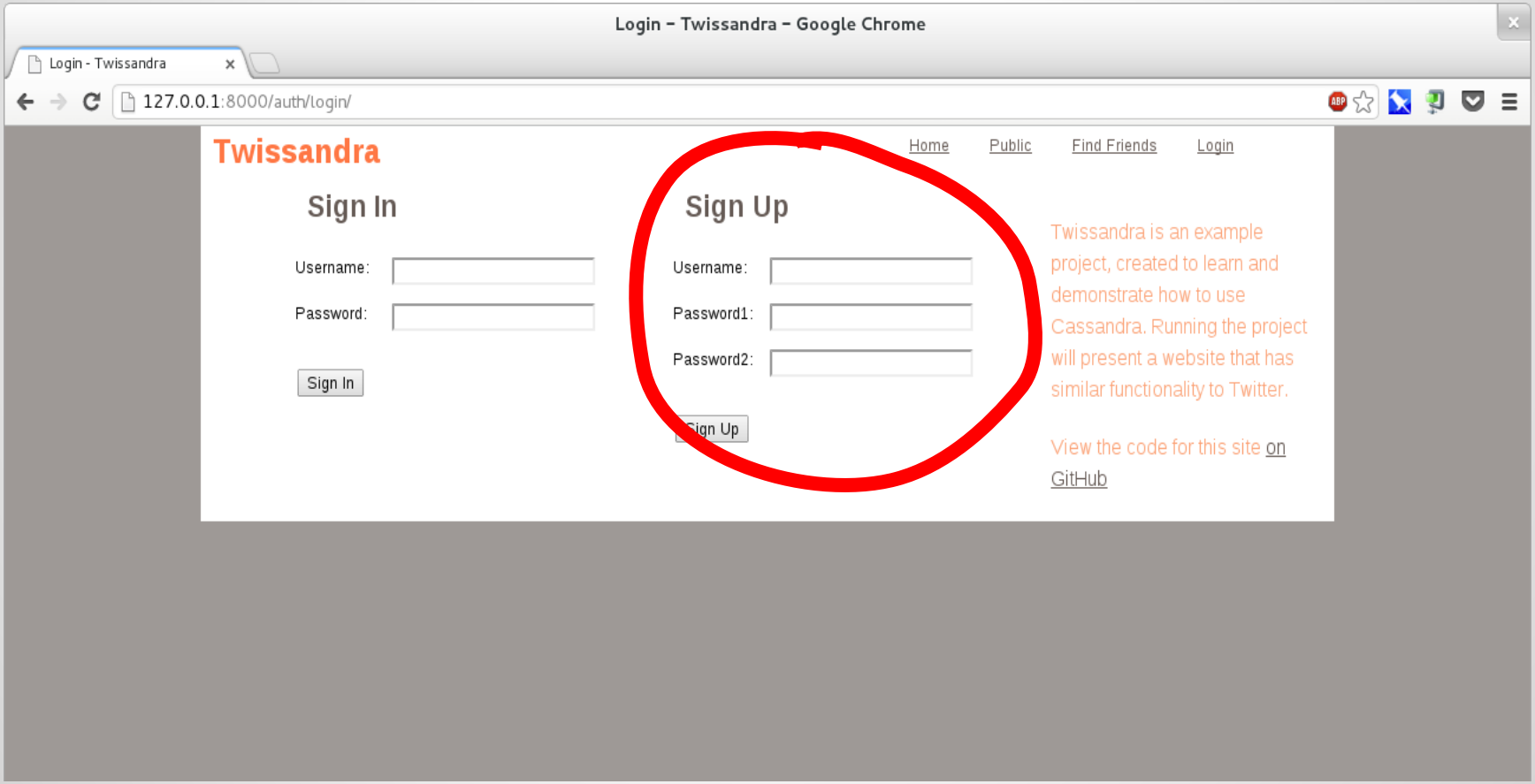
View the code for this site on GitHub
Login to add stewie as a friend

Twissandra Explained



users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Password2:
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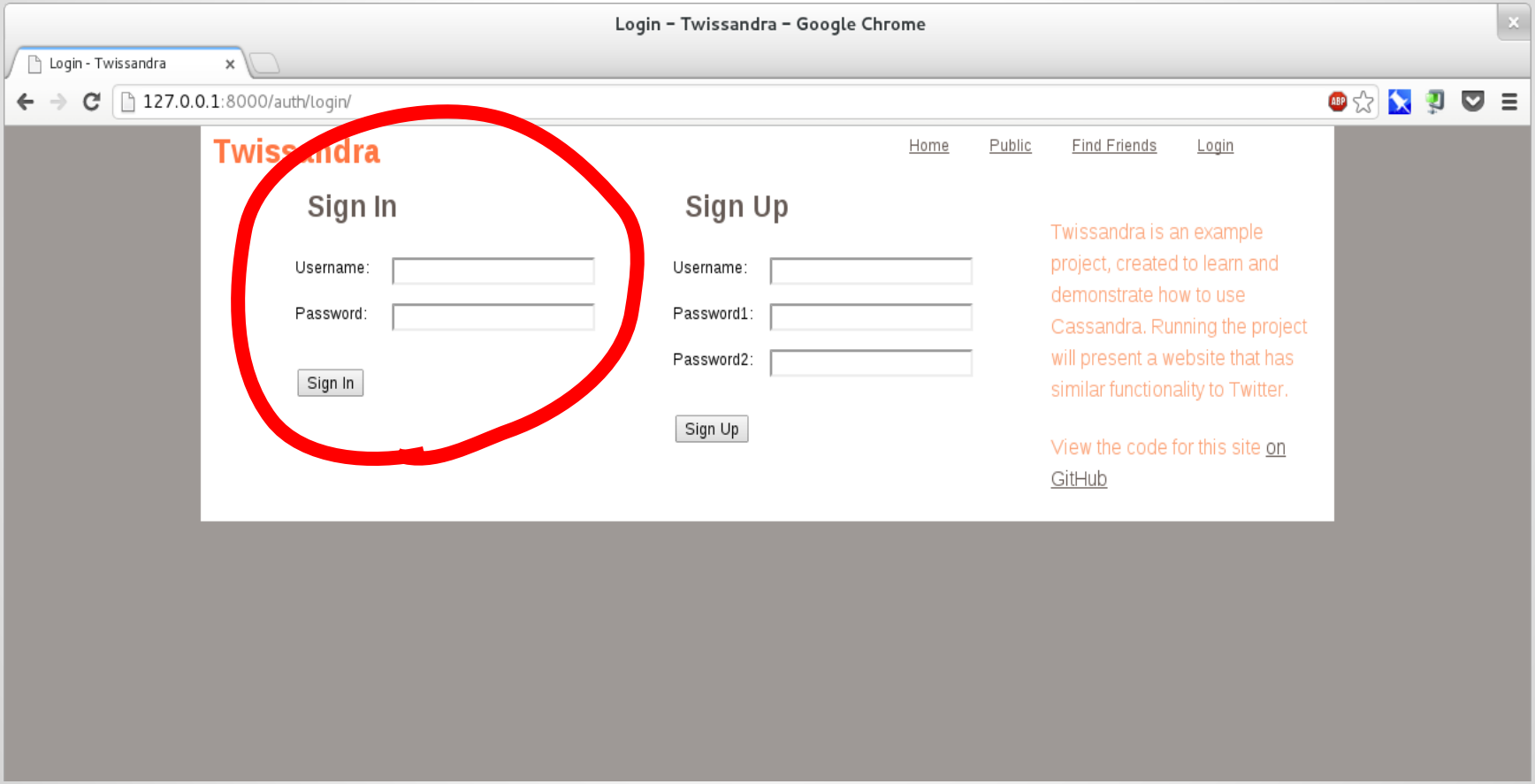
users

```
-- User storage
CREATE TABLE users (
    username text PRIMARY KEY,
    password text
);
```

users

```
-- Adding users (signup)
INSERT INTO users (username, password)
     VALUES ('meg', 's3kr3t')
```

users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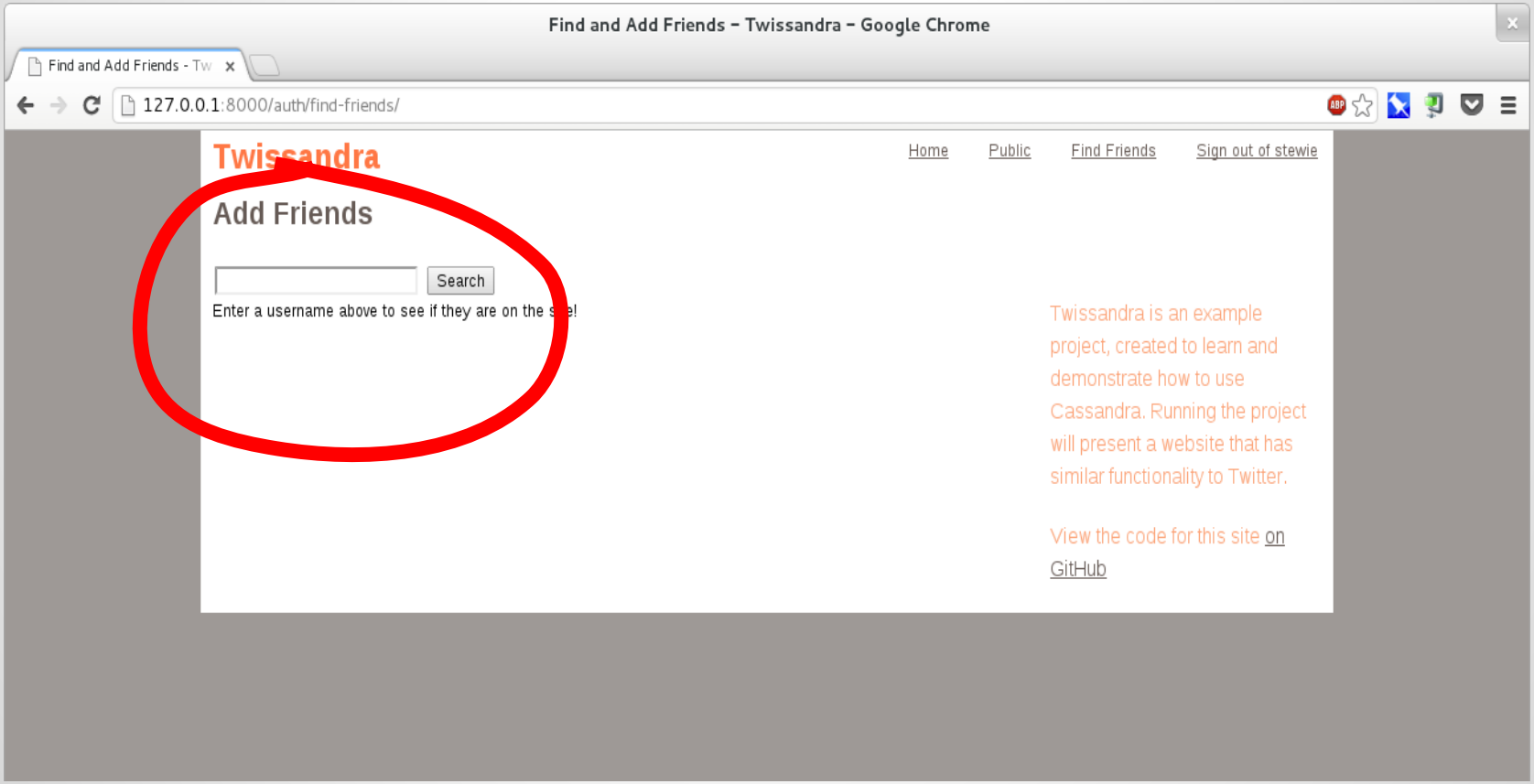
users

```
-- Lookup password (login)
SELECT password FROM users
     WHERE username = 'meg'
```

following / followers



following

```
-- Users a user is following
CREATE TABLE following (
    username text,
    followed text,
    PRIMARY KEY(username, followed)
);
```

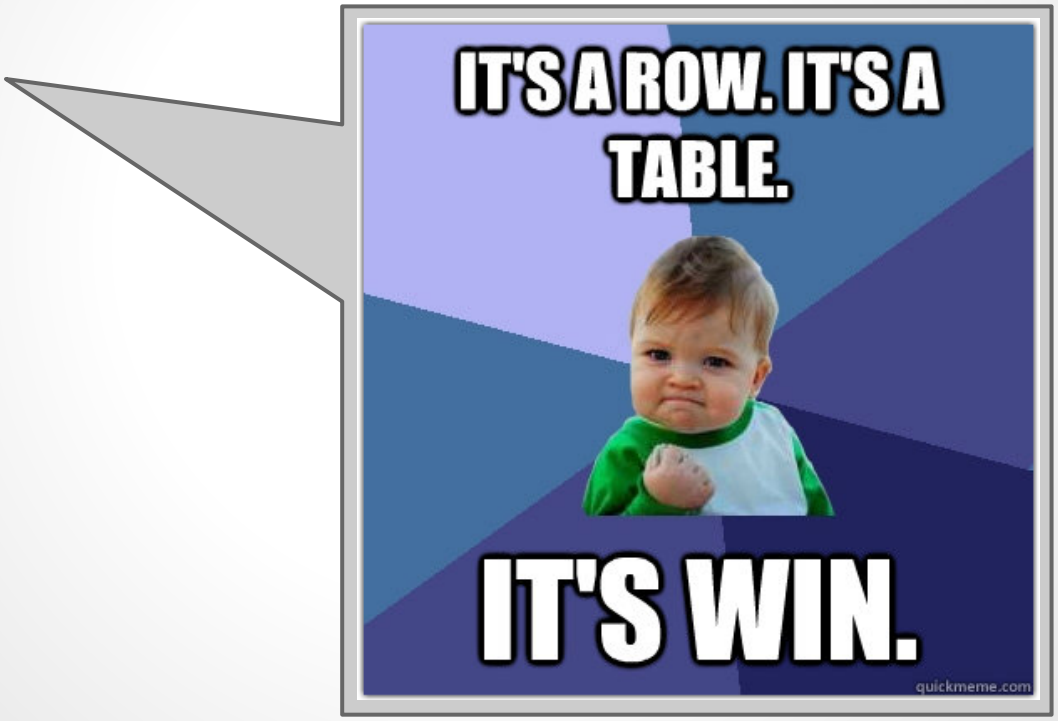
following

```
-- Meg follows Stewie
INSERT INTO following (username, followed)
    VALUES ('meg', 'stewie')

-- Get a list of who Meg follows
SELECT followed FROM following
    WHERE username = 'meg'
```

users @meg is following

```
  followed
----------
    brian
    chris
     lois
    peter
   stewie
 quagmire
      ...
```




ONE DOES NOT SIMPLY
CREATE HALF A SOCIAL GRAPH

followers

```
-- The users who follow username
CREATE TABLE followers (
    username text,
    following text,
    PRIMARY KEY(username, following)
);
```

followers

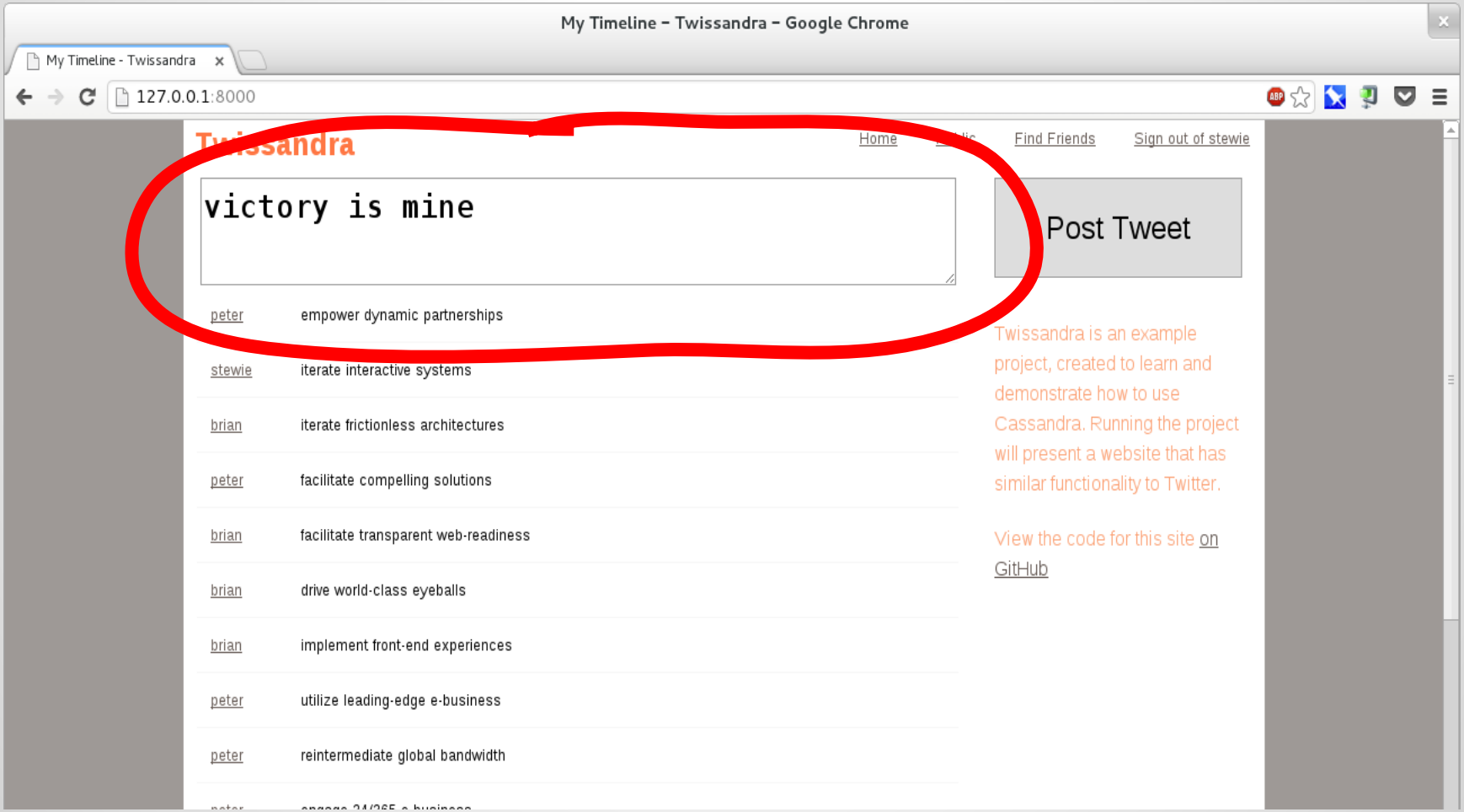
```
-- Meg follows Stewie
INSERT INTO followers (username, followed)
    VALUES ('stewie', 'meg')

-- Get a list of who follows Stewie
SELECT followers FROM following
    WHERE username = 'stewie'
```

redux: following / followers

```
-- @meg follows @stewie
BEGIN BATCH
   INSERT INTO following (username, followed)
       VALUES ('meg', 'stewie')
   INSERT INTO followers (username, followed)
       VALUES ('stewie', 'meg')
APPLY BATCH
```

tweets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Denormalization Ahead!

tweets

```
-- Tweet storage (think: permalink)
CREATE TABLE tweets (
    tweetid uuid PRIMARY KEY,
    username text,
    body text
);
```

tweets

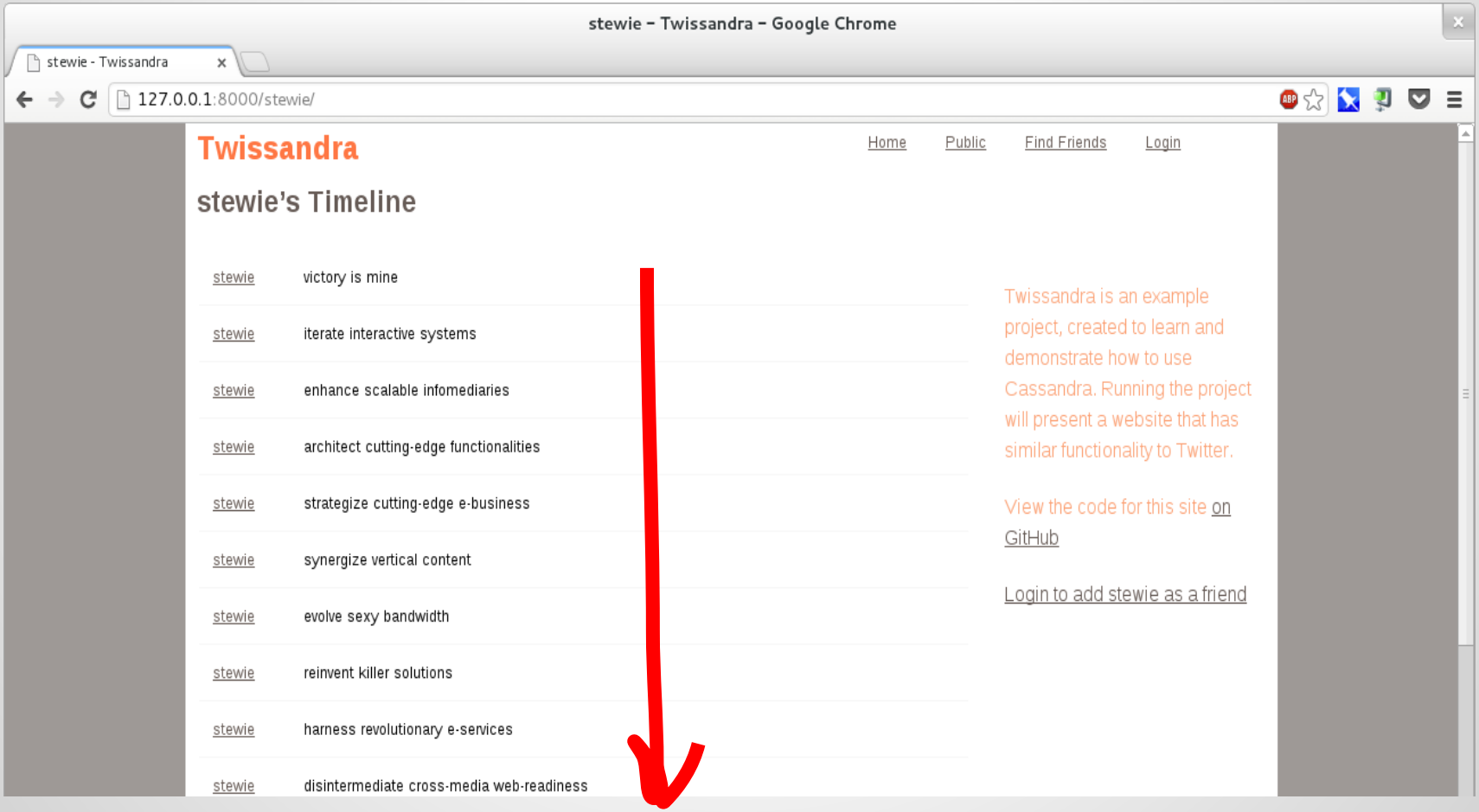
```
-- Store a tweet
INSERT INTO tweets (
    tweetid,
    username,
    body
) VALUES (
    60780342-90fe-11e2-8823-0026c650d722,
    'stewie',
    'victory is mine!'
)
```

Query tweets by ... ?

- author, time descending
- followed authors, time descending
- date starting / date ending

userline

tweets, by user



userline

```
-- Materialized view of the tweets
-- created by user.
CREATE TABLE userline (
    username text,
    tweetid timeuuid,
    body text,
    PRIMARY KEY(username, tweetid)
);
```

Wait, WTF is a *timeuuid*?

- Aka "Type 1 UUID" (http://goo.gl/SWuCb)
- 100 nano second units since Oct. 15, 1582
- Timestamp is first 60 bits (sorts temporally!)
- Used like timestamp, but:
  - more granular
  - globally unique

userline

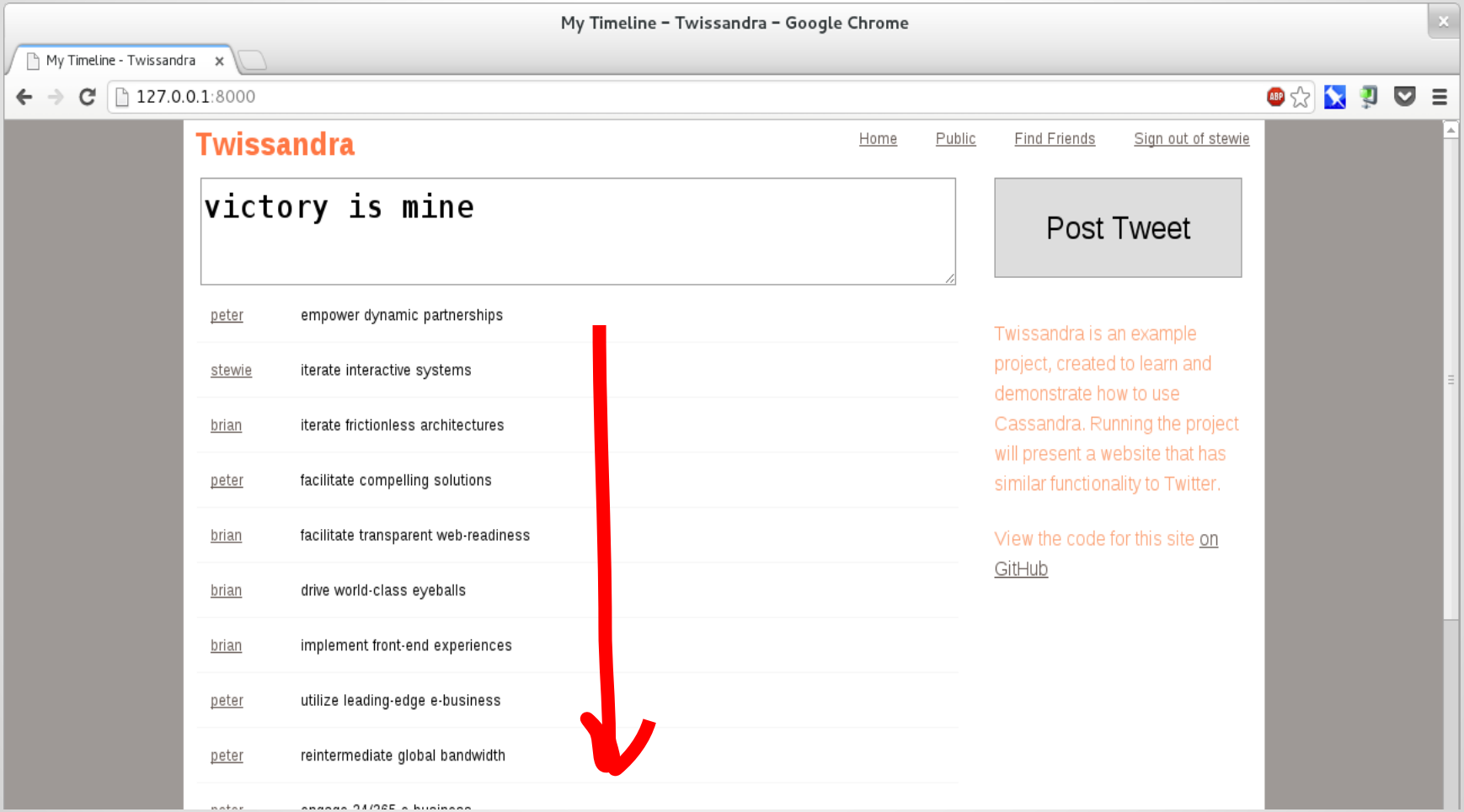
```
-- Range of tweets for a user
SELECT
  dateOf(tweetid), body
FROM
  userline
WHERE
  username = 'stewie' AND
  tweetid > minTimeuuid('2013-03-01 12:10:09')
ORDER BY
  tweetid DESC
LIMIT 40
```

@stewie's most recent tweets

```
 dateOf(posted_at)          | body
----------------------------+-------------------------------
 2013-03-19 14:43:15-0500 |                victory is mine!
 2013-03-19 13:23:24-0500 |      generate killer bandwidth
 2013-03-19 13:23:24-0500 |            grow B2B e-business
 2013-03-19 13:23:24-0500 |   innovate vertical e-services
 2013-03-19 13:23:24-0500 |  deploy e-business experiences
 2013-03-19 13:23:24-0500 | grow intuitive infrastructures
 ...
```

timeline

tweets from those a user follows



timeline

```
-- Materialized view of tweets from
-- the users username follows.
CREATE TABLE timeline (
    username text,
    tweetid timeuuid,
    posted_by text,
    body text,
    PRIMARY KEY(username, tweetid)
);
```

timeline

```
-- Range of tweets for a user
SELECT
   dateOf(tweetid), posted_by, body
FROM
   timeline
WHERE
   username = 'stewie' AND
   tweetid > '2013-03-01 12:10:09'
ORDER BY
   tweetid DESC
LIMIT 40
```

most recent tweets for @meg

```
 dateOf(posted_at)          | posted_by | body
----------------------------+-----------+--------------------
 2013-03-19 14:43:15-0500 |    stewie |   victory is mine!
 2013-03-19 13:23:25-0500 |       meg |   evolve intuit...
 2013-03-19 13:23:25-0500 |       meg | whiteboard bric...
 2013-03-19 13:23:25-0500 |    stewie |      brand clic...
 2013-03-19 13:23:25-0500 |     brian |  synergize gran...
 2013-03-19 13:23:24-0500 |     brian | expedite real-t...
 2013-03-19 13:23:24-0500 |    stewie |    generate kil...
 2013-03-19 13:23:24-0500 |    stewie |       grow B2B ...
 2013-03-19 13:23:24-0500 |       meg | generate intera...
 ...
```

redux: tweets

```
-- @stewie tweets
BEGIN BATCH
   INSERT INTO tweets ...
   INSERT INTO userline ...
   INSERT INTO timeline ...
   INSERT INTO timeline ...
   INSERT INTO timeline ...
   ...
APPLY BATCH
```

In Conclusion:

- Think in terms of your queries, store that
- Don't fear duplication; Space is cheap to scale
- Go wide; Rows can have 2 billion columns!
- The only thing better than NoSQL, is MoSQL
- Python hater? Java ❤'r?
  - https://github.com/eevans/twissandra-j
- http://goo.gl/zPOD

The

End