

Cassandra By Example: Data Modelling with CQL3

Berlin Buzzwords
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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());

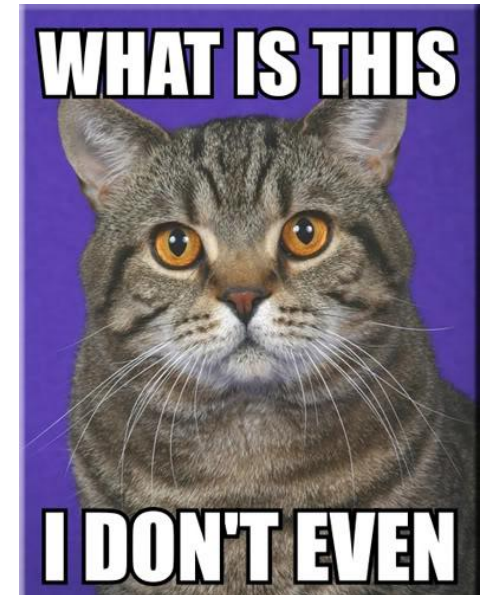
// Don't ask
ColumnOrSuperColumn cosc = new ColumnOrSuperColumn();
cosc.setColumn(col);

// 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);
```



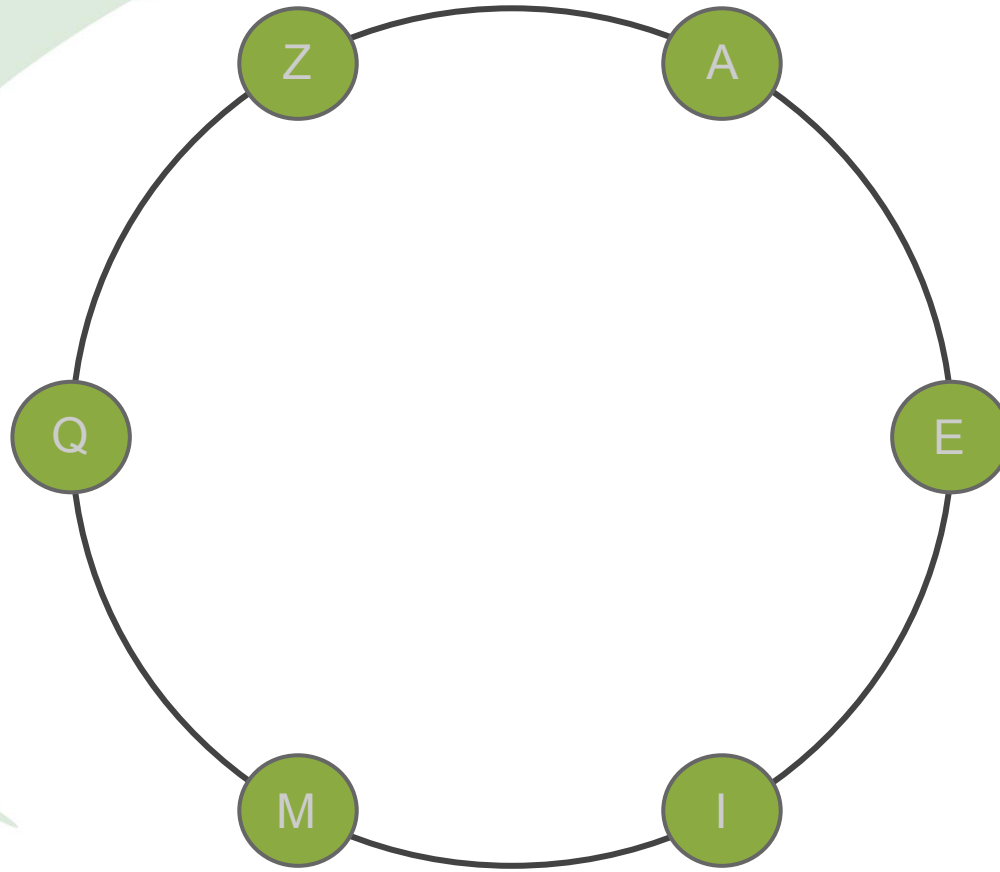
Better, no?

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

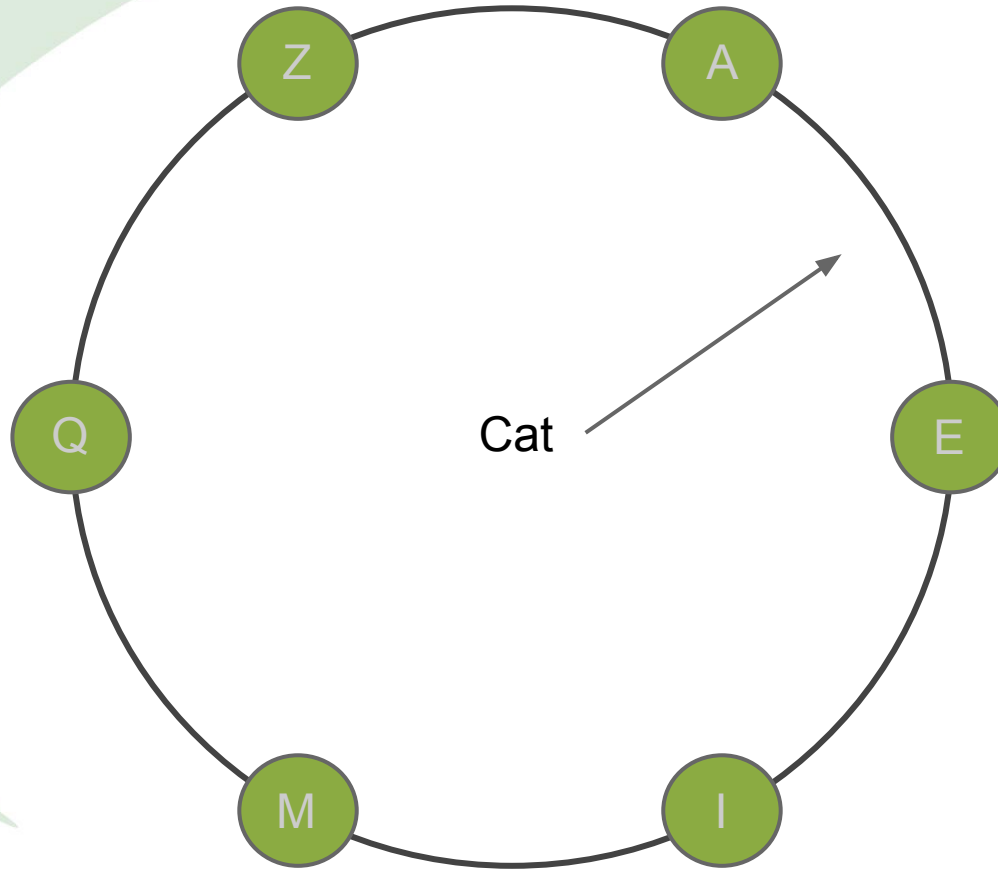
But before we begin...



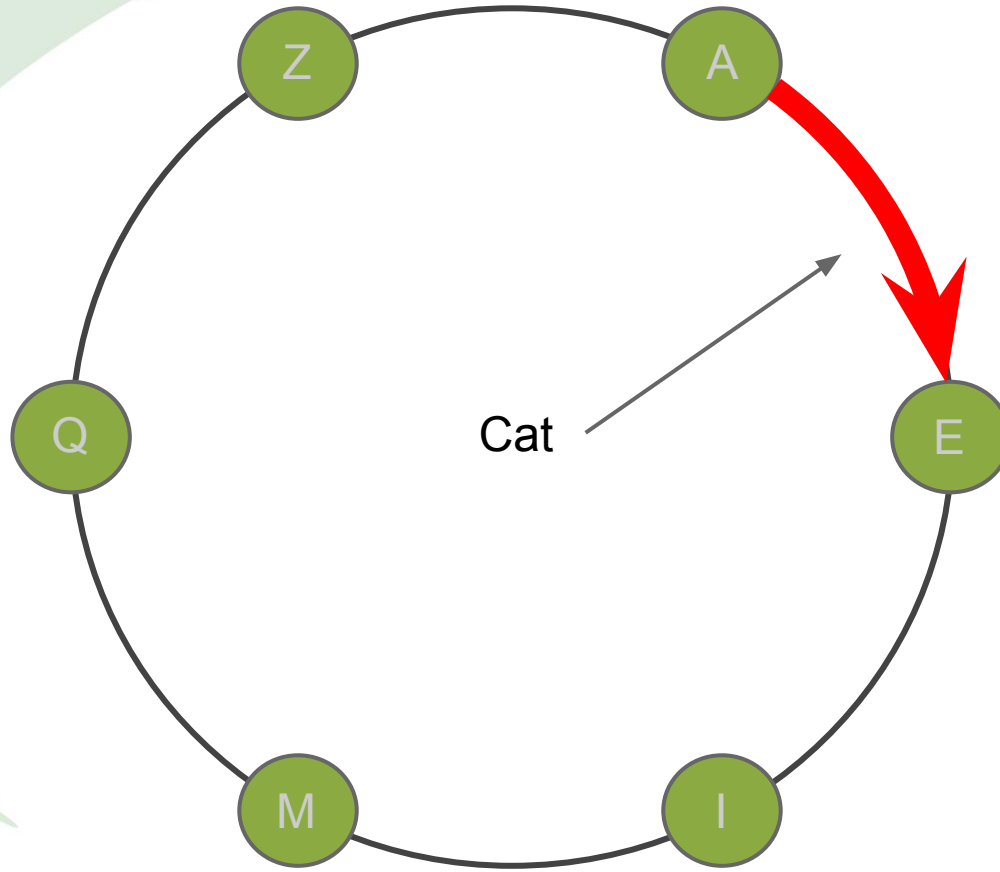
Partitioning



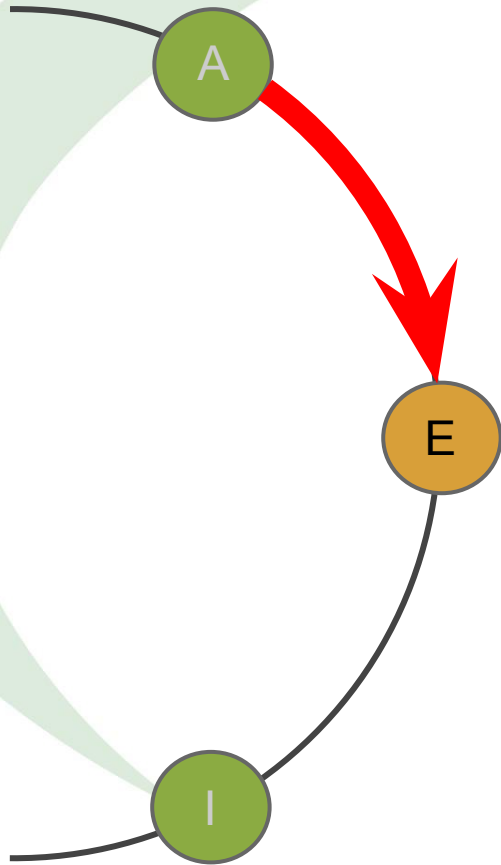
Partitioning



Partitioning



Partitioning



Pets

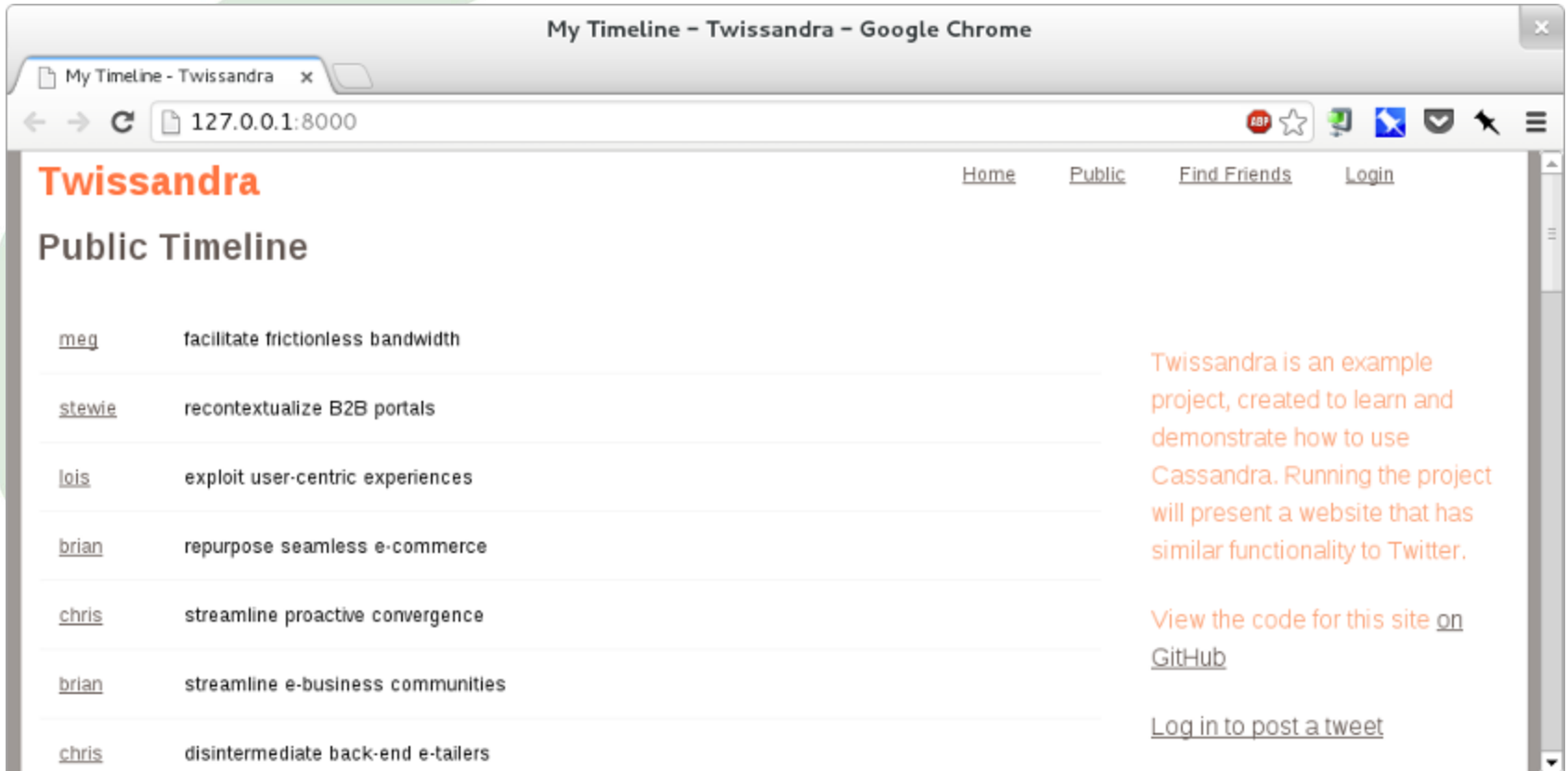
Animal	Type	Size	Youtub-able
Cat	mammal	small	true
...			



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



The screenshot shows a web browser window titled "My Timeline - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000". The page content includes a navigation menu with "Home", "Public", "Find Friends", and "Login". The main heading is "Twissandra" in orange, followed by "Public Timeline". A list of tweets is shown, each with a user name and a message. To the right, there is a paragraph of text explaining the project and a link to the code on GitHub. At the bottom right, there is a link to "Log in to post a tweet".

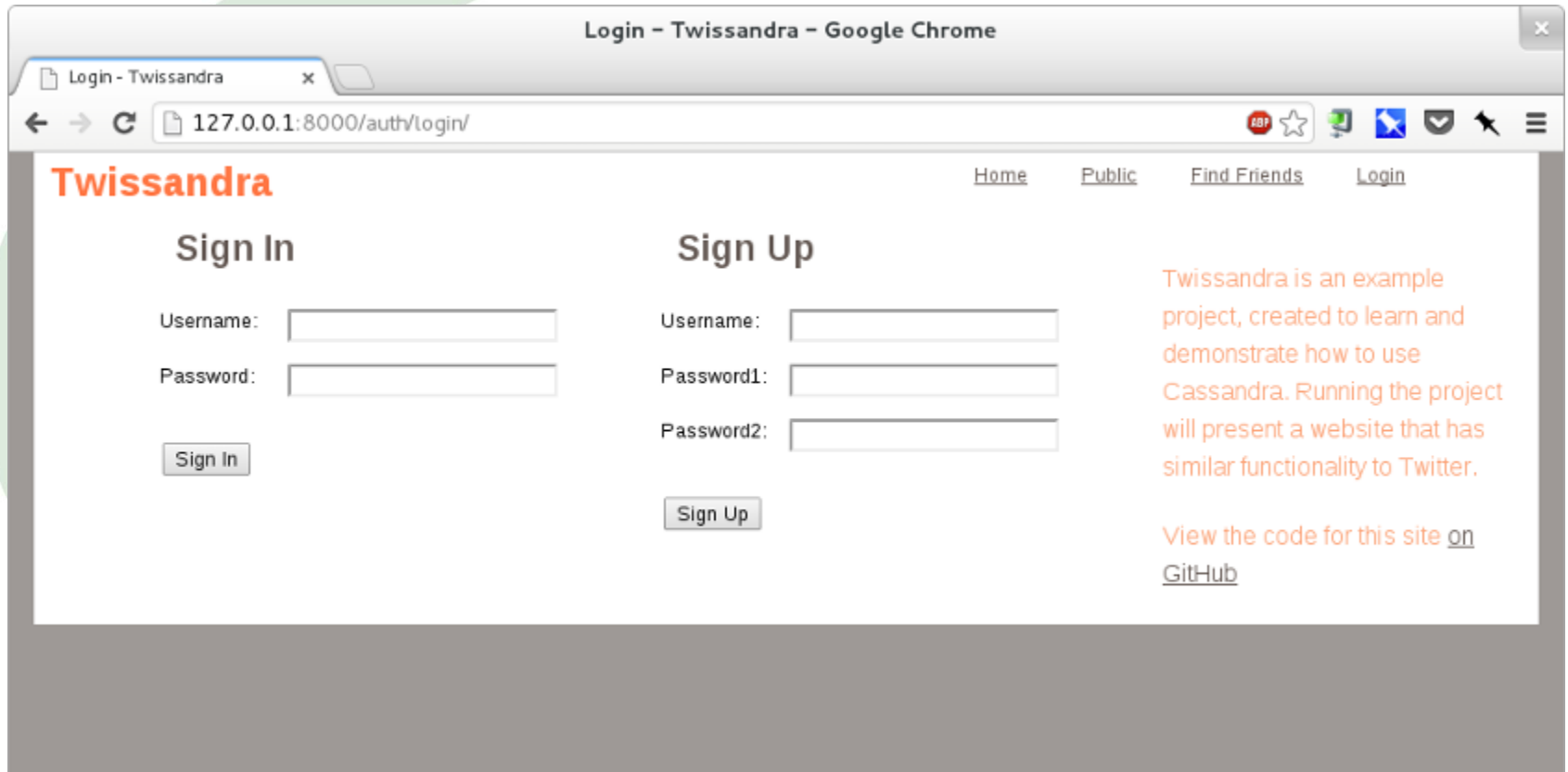
User	Message
meg	facilitate frictionless bandwidth
stewie	recontextualize B2B portals
lois	exploit user-centric experiences
brian	repurpose seamless e-commerce
chris	streamline proactive convergence
brian	streamline e-business communities
chris	disintermediate back-end e-tailers

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



The screenshot shows a web browser window titled "Login - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000/auth/login/". The page content includes the "Twissandra" logo in orange, navigation links for "Home", "Public", "Find Friends", and "Login", and two main sections: "Sign In" and "Sign Up".

Sign In

Username:

Password:

Sign Up

Username:

Password1:

Password2:

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](#)

Twissandra

The screenshot shows a web browser window titled "My Timeline - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000". The page content includes a header with the word "Twissandra" in orange, navigation links for "Home", "Public", "Find Friends", and "Sign out of stewie", and a text input field containing "victory is mine!". To the right of the input field is a "Post Tweet" button. Below the input field is a list of tweets, each with a user name and a message. To the right of the tweets is a paragraph of text describing Twissandra as an example project for learning Cassandra, and a link to view the code on GitHub.

My Timeline - Twissandra - Google Chrome

My Timeline - Twissandra x

127.0.0.1:8000

Twissandra

Home Public Find Friends Sign out of stewie

victory is mine!

Post Tweet

stewie cultivate web-enabled content

brian engineer viral e-services

stewie evolve transparent relationships

meg brand bricks-and-clicks deliverables

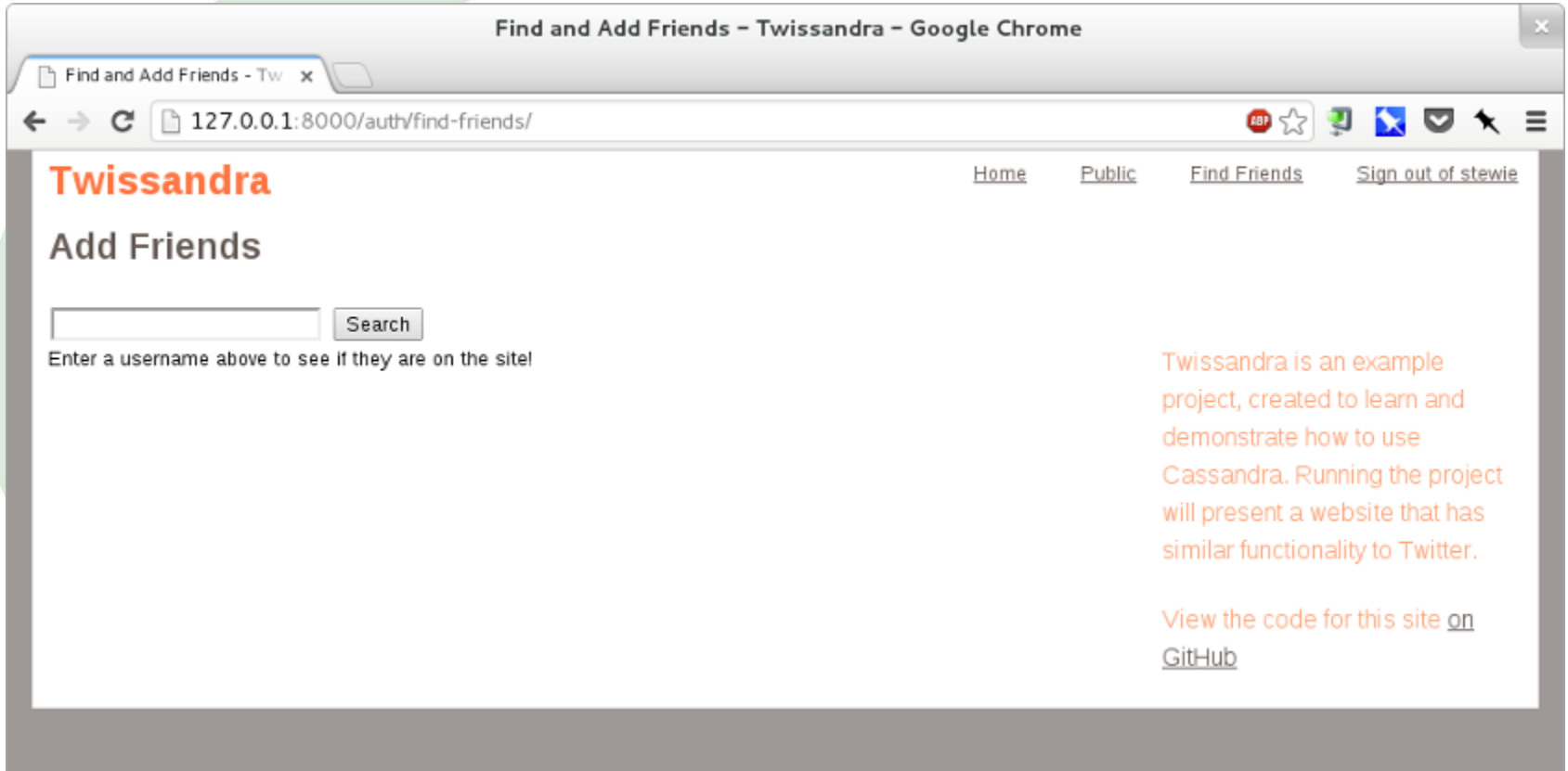
meg exploit leading-edge action-items

meg transition viral 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](#)

Twissandra



The screenshot shows a Google Chrome browser window titled "Find and Add Friends - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000/auth/find-friends/". The page content includes the Twissandra logo, navigation links for Home, Public, Find Friends, and Sign out of stewie, and an "Add Friends" section with a search input field and a "Search" button. A descriptive paragraph and a link to the GitHub repository are also visible.

Find and Add Friends - Twissandra - Google Chrome

Find and Add Friends - Tw x

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!

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](#)

Twissandra

stewie - Twissandra - Google Chrome

stewie - Twissandra x

127.0.0.1:8000/stewie/

Twissandra [Home](#) [Public](#) [Find Friends](#) [Sign out of stewie](#)

stewie's Timeline

- [stewie](#) cultivate web-enabled content
- [stewie](#) evolve transparent relationships
- [stewie](#) iterate magnetic platforms
- [stewie](#) synergize enterprise functionalities
- [stewie](#) seize value-added portals
- [stewie](#) reinvent end-to-end niches
- [stewie](#) visualize innovative platforms

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](#)

Twissandra Explained



users

The screenshot shows a web browser window titled "Login - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000/auth/login/". The page content includes the Twissandra logo, navigation links for Home, Public, Find Friends, and Login, and two main sections: "Sign In" and "Sign Up". The "Sign Up" section is highlighted with a red circle. To the right of the forms is a paragraph of text describing Twissandra as an example project for learning Cassandra, with a link to view the code on GitHub.

Twissandra Home Public Find Friends Login

Sign In

Username:

Password:

Sign Up

Username:

Password1:

Password2:

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](#)

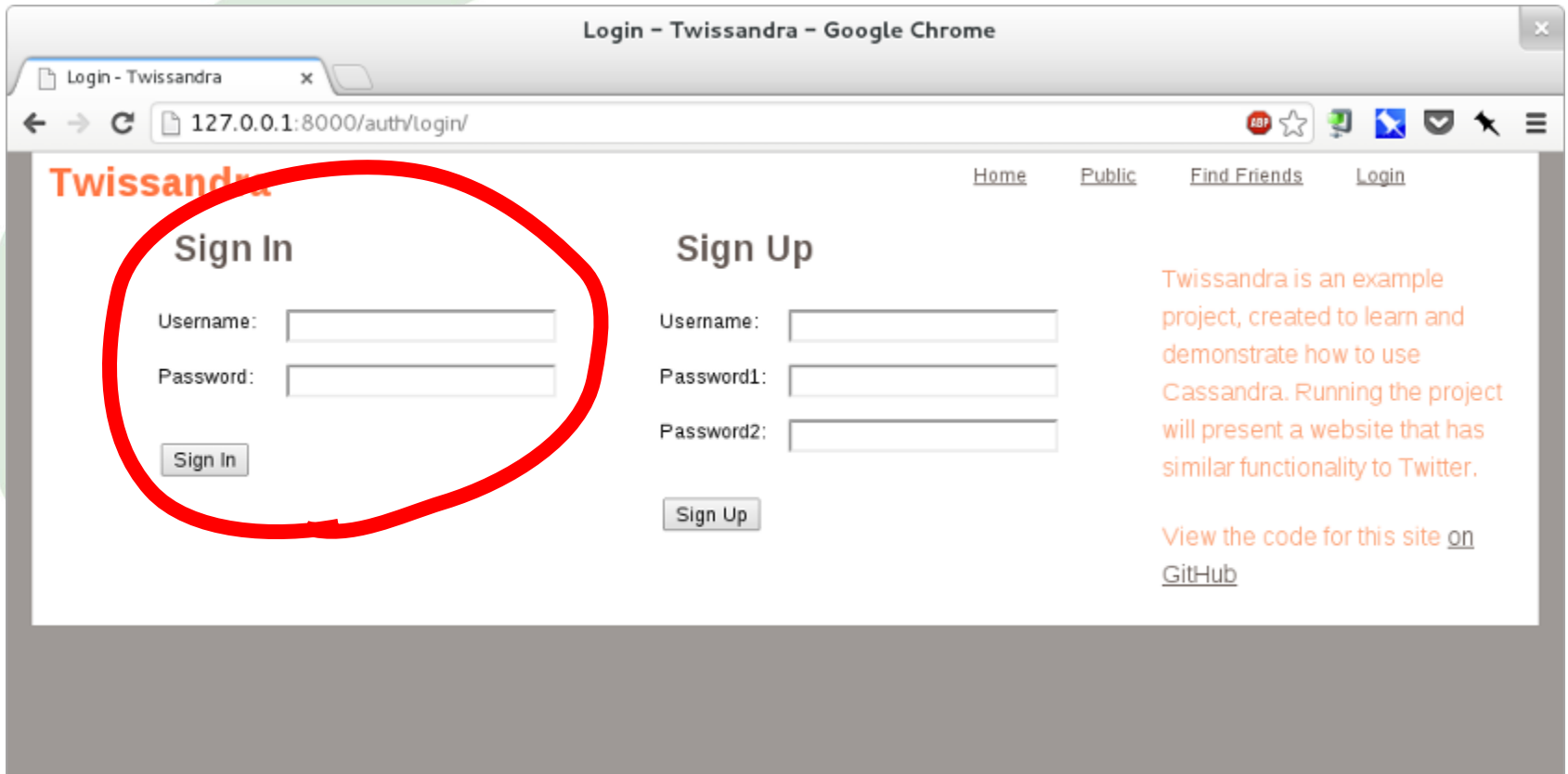
users

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

users

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

users



The screenshot shows a web browser window titled "Login - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000/auth/login/". The page content includes a navigation menu with "Home", "Public", "Find Friends", and "Login". There are two main forms: "Sign In" and "Sign Up". The "Sign In" form is circled in red and contains the following fields and buttons:

- Username:
- Password:
- Sign In button

The "Sign Up" form contains the following fields and buttons:

- Username:
- Password1:
- Password2:
- Sign Up button

Text on the right side of the page:

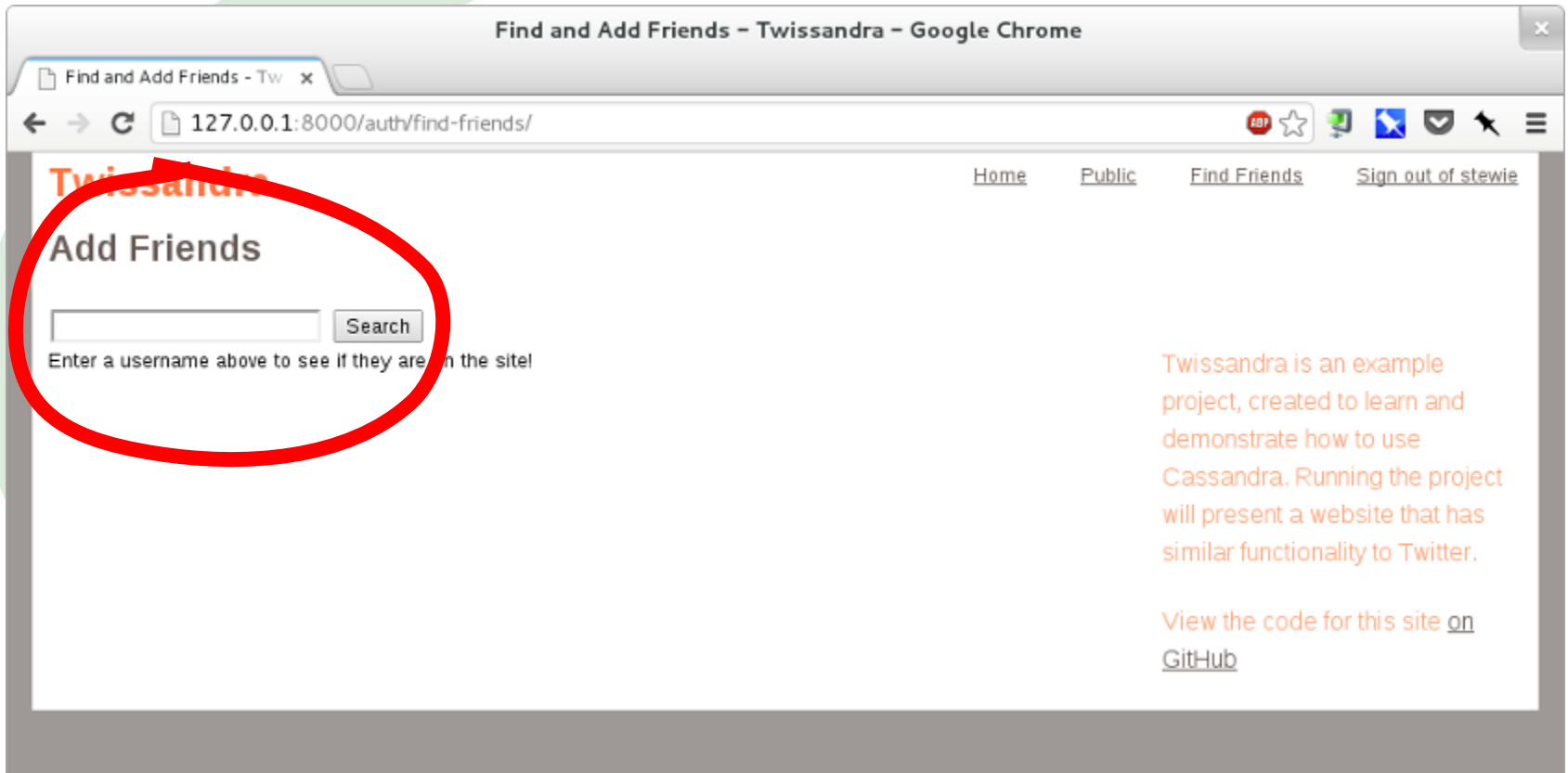
Twissandra is an example project, created to learn and demonstrate how to use Cassandra. Running the project will present a website that has similar functionality to Twitter.

[View the code for this site on GitHub](#)

users

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

following / followers



Find and Add Friends - Twissandra - Google Chrome

Find and Add Friends - Tw x

127.0.0.1:8000/auth/find-friends/

Home Public Find Friends Sign out of stewie

Twissandra

Add Friends

Enter a username above to see if they are on the site!

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](#)

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
...





followers

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

followers

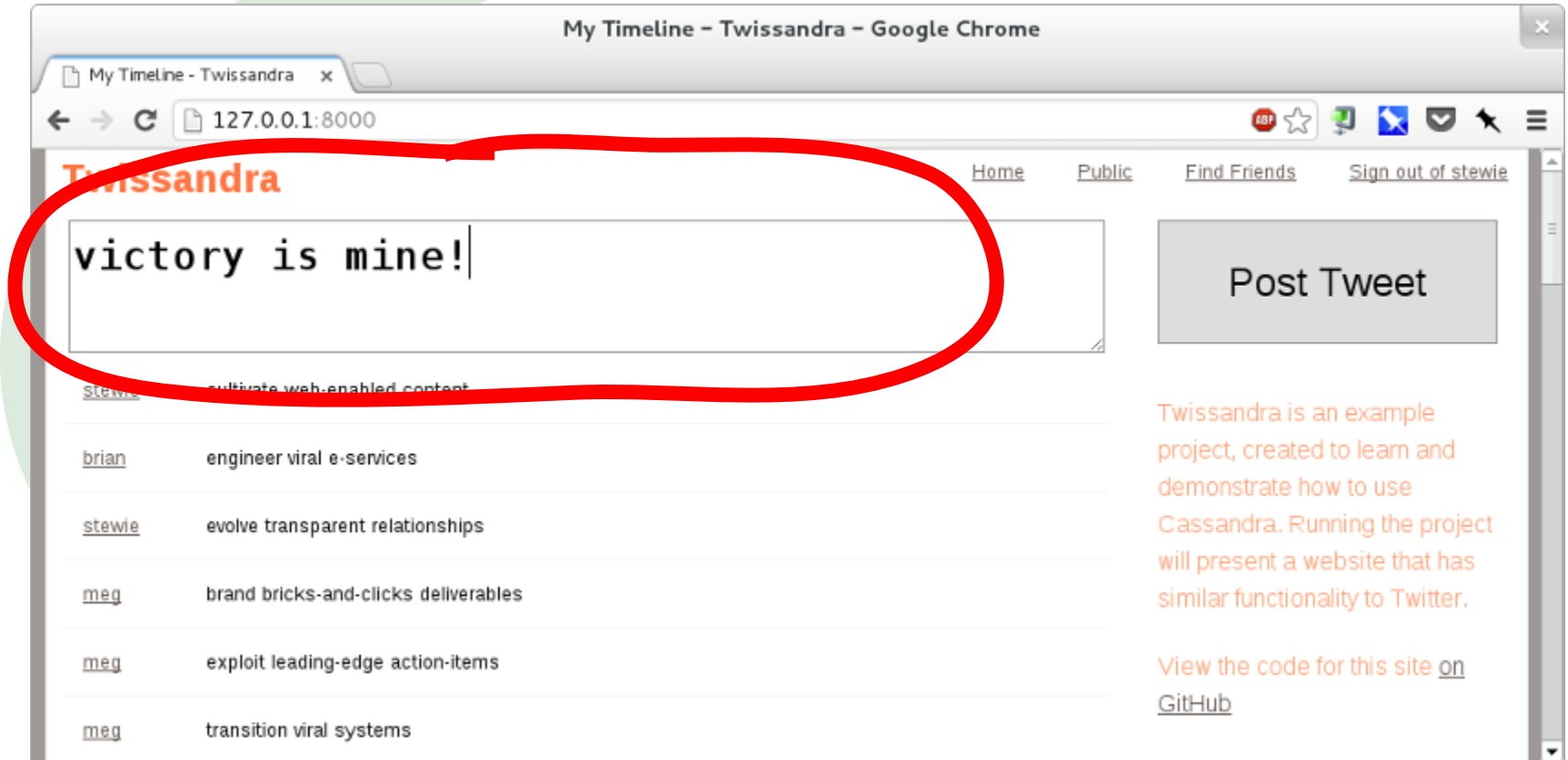
```
-- Meg follows Stewie
INSERT INTO followers (username, followed)
    VALUES ('stewie', 'meg')

-- 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



The screenshot shows a web browser window titled "My Timeline - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000". The page header includes the name "Twissandra" in orange, and navigation links for "Home", "Public", "Find Friends", and "Sign out of stewie". A large red oval highlights the text input field containing "victory is mine!". To the right of the input field is a "Post Tweet" button. Below the input field is a list of tweets from users: stewie (cultivate web-enabled content), brian (engineer viral e-services), stewie (evolve transparent relationships), meg (brand bricks-and-clicks deliverables), meg (exploit leading-edge action-items), and meg (transition viral systems). On the right side of the page, there is a paragraph of text: "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." Below this is a link: "View the code for this site on [GitHub](#)".

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!'  
)
```

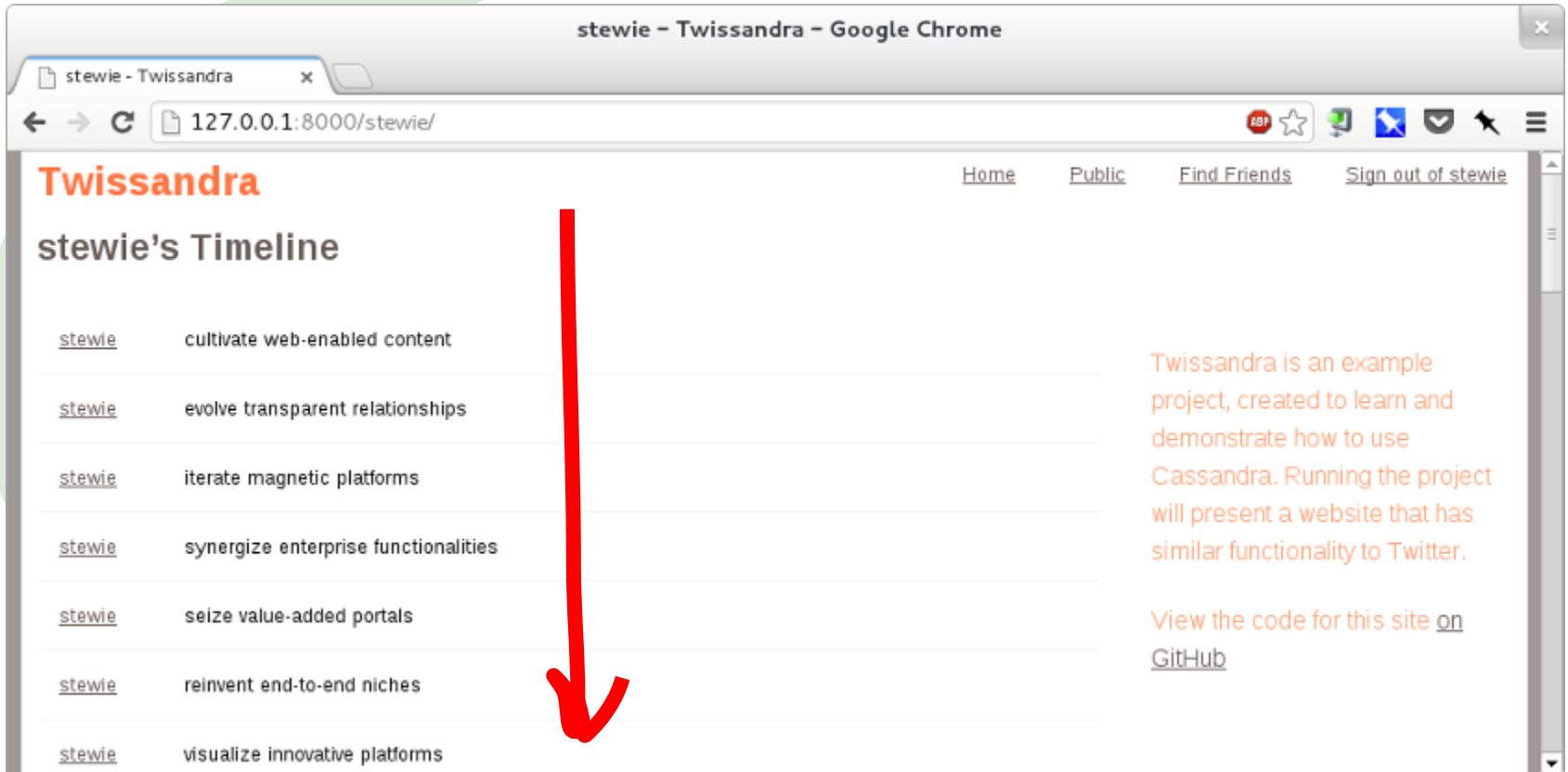
Query tweets by ... ?

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



userline

tweets, by user



The screenshot shows a web browser window titled "stewie - Twissandra - Google Chrome". The address bar displays "127.0.0.1:8000/stewie/". The page content includes the "Twissandra" logo, navigation links for "Home", "Public", "Find Friends", and "Sign out of stewie", and a section titled "stewie's Timeline".

The timeline lists seven tweets, each starting with the user "stewie" and followed by a message:

- stewie cultivate web-enabled content
- stewie evolve transparent relationships
- stewie iterate magnetic platforms
- stewie synergize enterprise functionalities
- stewie seize value-added portals
- stewie reinvent end-to-end niches
- stewie visualize innovative platforms

To the right of the timeline, there is a descriptive paragraph: "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." Below this is a link: "View the code for this site on [GitHub](#)".

A large red arrow points downwards from the top of the timeline to the bottom, highlighting the sequence of tweets.

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

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

timeline

tweets from those a user follows

My Timeline - Twissandra - Google Chrome

My Timeline - Twissandra x

127.0.0.1:8000

Twissandra

Home Public Find Friends Sign out of stewie

victory is mine!

Post Tweet

[stewie](#) cultivate web-enabled content

[brian](#) engineer viral e-services

[stewie](#) evolve transparent relationships

[meg](#) brand bricks-and-clicks deliverables

[meg](#) exploit leading-edge action-items

[meg](#) transition viral 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](#)

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://tinyurl.com/d0ntklik>

The



End