twitter
UC BERKELEY - CS10

@raffi
raffi
Giving a talk at Cal's CS10 - The Beauty and Joy of Computing.
inst.eecs.berkeley.edu/~cs10/fa10
20 Oct via Twitter for iPhone
Favorite
Reply
Delete
from UC Berkeley
155 Donner Lab
Berkeley, CA
View Tweets at this place

TO START... WHAT'S A TWEET?

FOLLOW ME!

twitter.com/raffi
or send a SMS to 40404
follow raffi

“Rudimentary communication among individuals in real time allows many to move together as one” - @biz

ONE WORD

April 10, 2008
4:33:23 PM

ONE WORD

April 10, 2008
4:33:23 PM

AND IT'S OVER

April 11, 2008
1:27:26 PM

HAITI

January 2010

CHILE

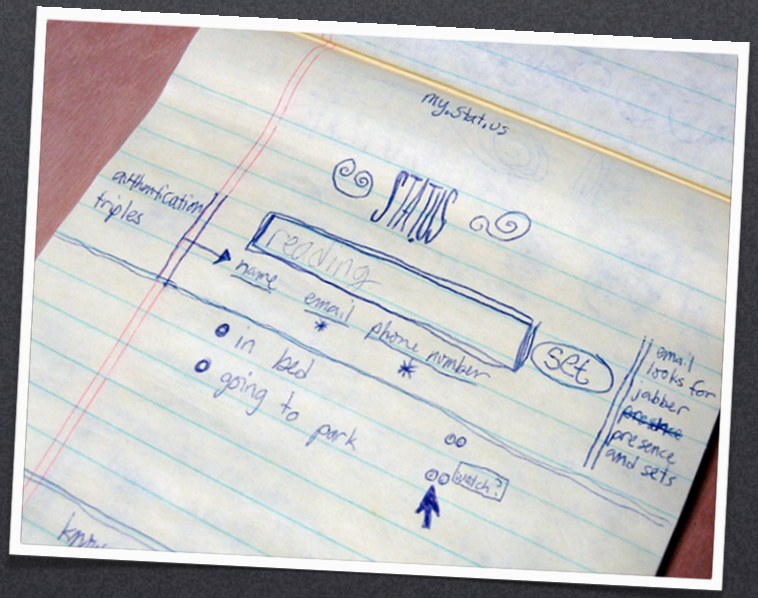
February 2010

MTV VMAs

September 2010

EMMYS

August 2010



The humble beginnings

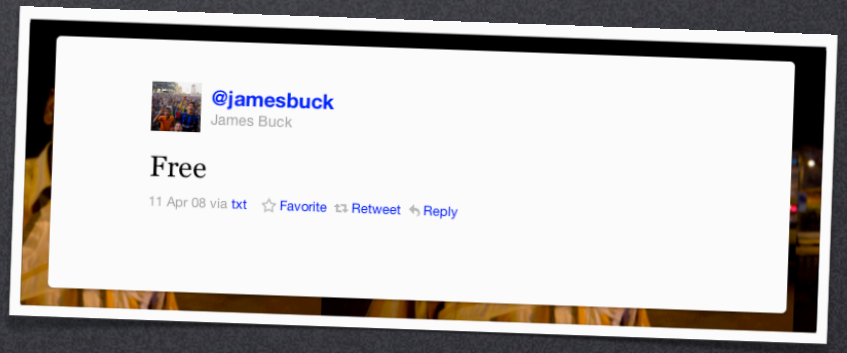
HOW DOES TWITTER WORK?

TWITTER IS JUST A “STRUCT”, A GRAPH, & A LIST

A TWEET IS A SIMPLE THING

140 characters

WHAT'S THE DATA STRUCTURE OF A TWEET?

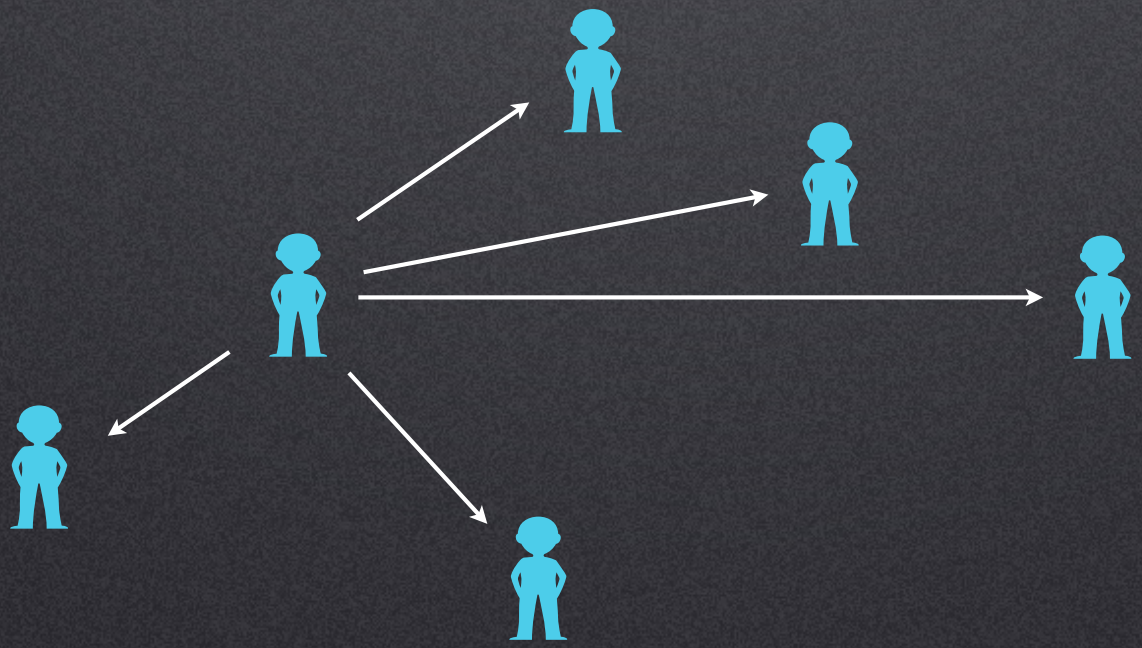



```
{
 "id" : 787167620,
 "text" : "Free",
 "date" : "2008-04-11 13:27:26"
 "user" : "jamesbuck"
}*
```

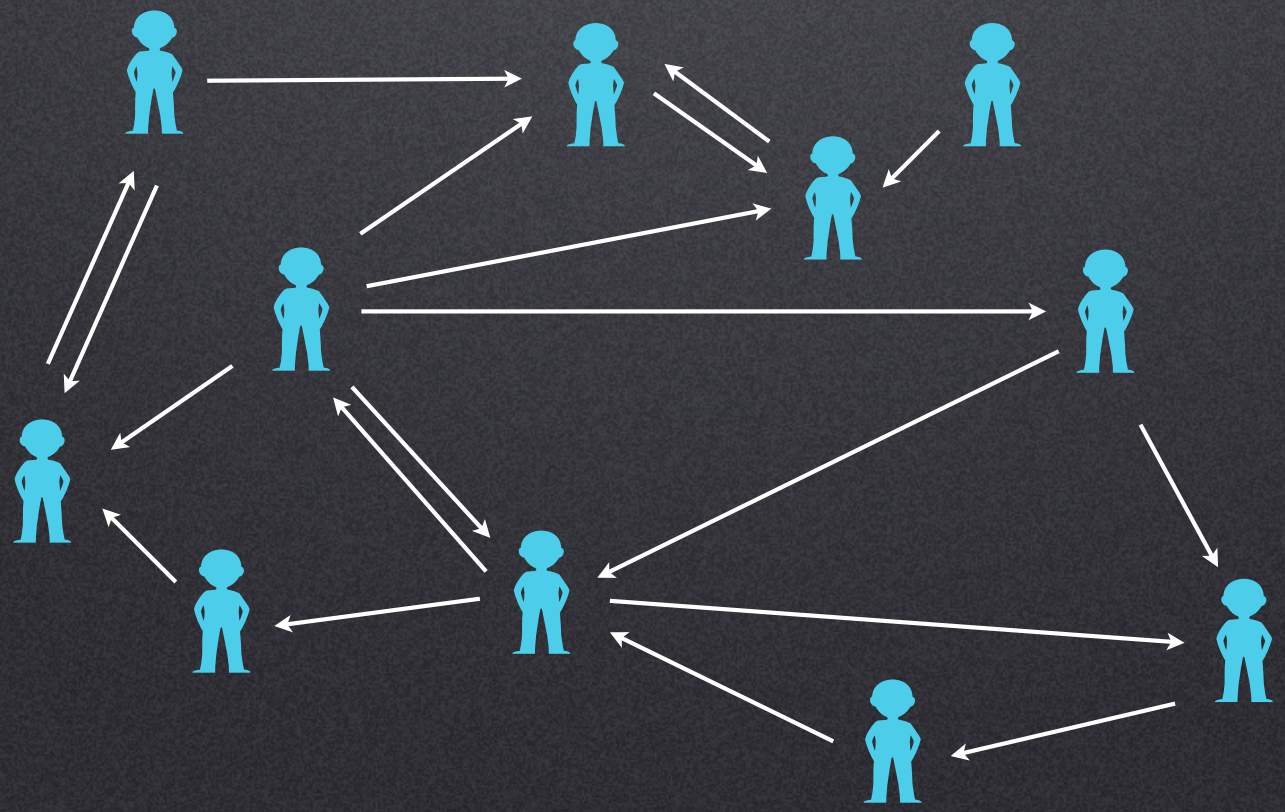
*not quite, but something like this

WHERE DO THEY GO?

TWEETS MULTIPLY!



IT'S A HUGE GRAPH



VIEWING TWEETS

HOME TIMELINE

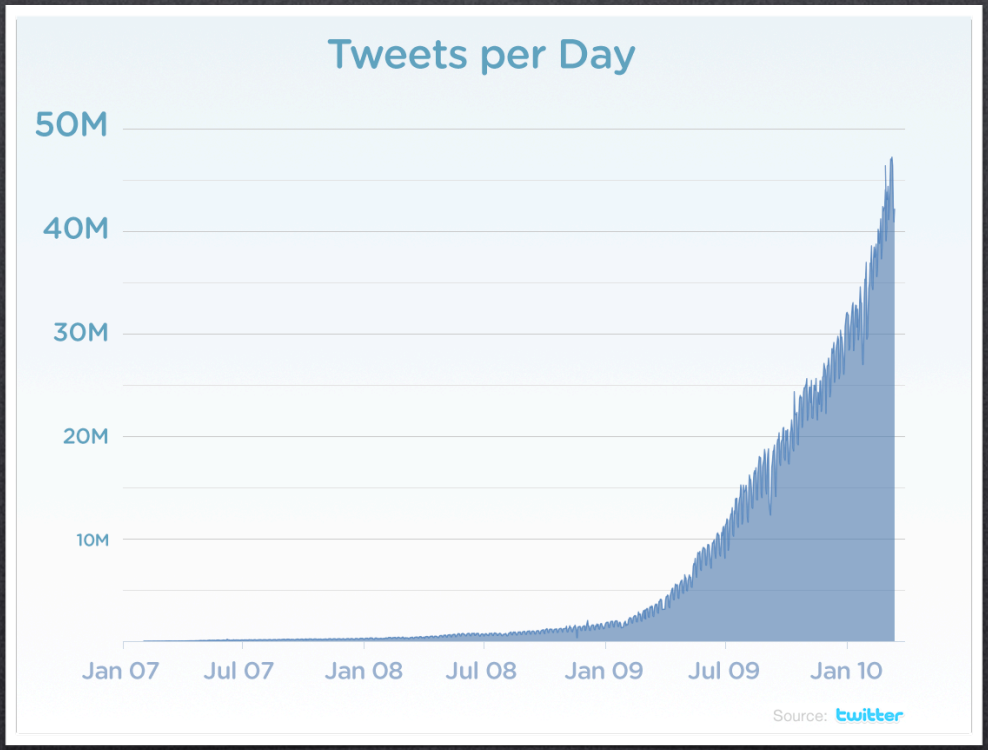
[27886578700,
27856404785,
27727644786,
27679412331,
27594550593,
27583976236,
27580246968,
27576503025,
27545926564,
27545450496,
27539864336...

IS THAT IT? ... YES! ... SORTA ...

THINGS GET MORE COMPLICATED AT SCALE

AND SCALING REAL-TIME IS HARD

HOW MANY TWEETS ARE THERE?



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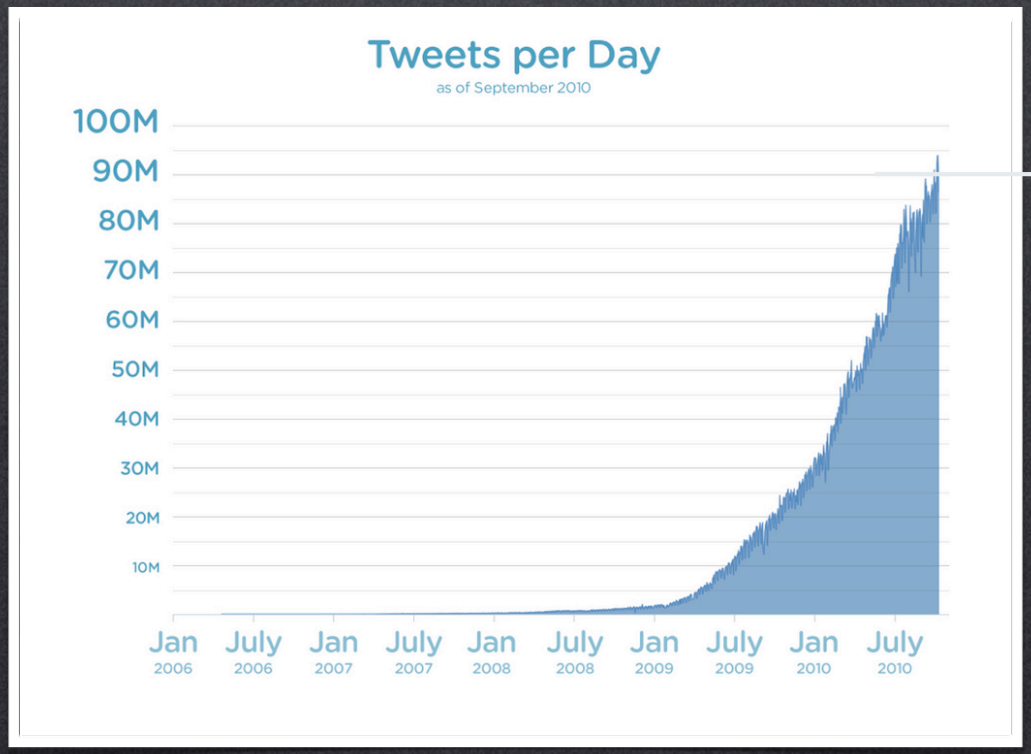
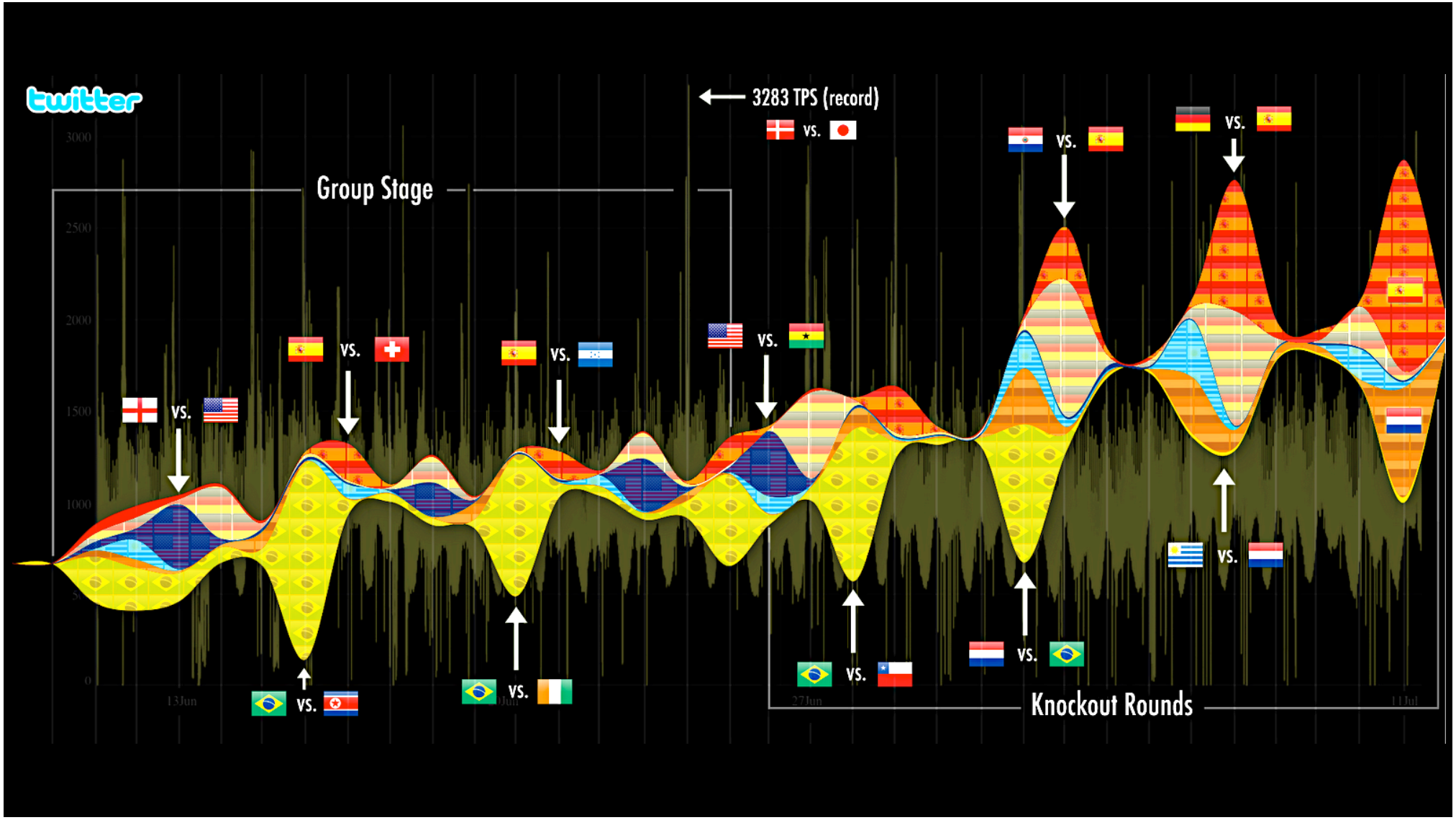
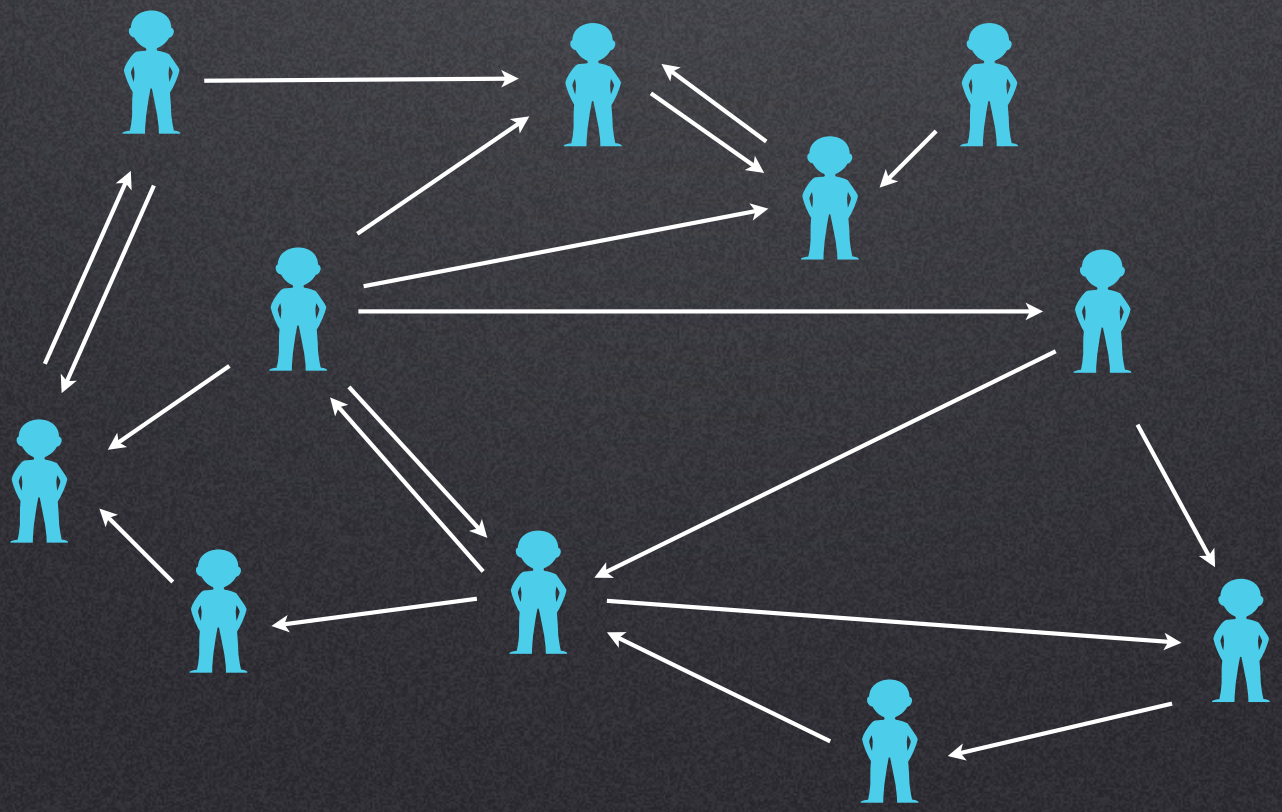


90M!

90M tweets per day ≈ 1000 tweets per second


twitter
3283 TPS (record)
vs.
Group Stage
Knockout Rounds
3000
2500
2000
1500
1000
13Jun
27Jun
11Jul

LOTS OF DELIVERIES



TWEETS MULTIPLY

5,162 people
need to see my
tweet

@ladygaga

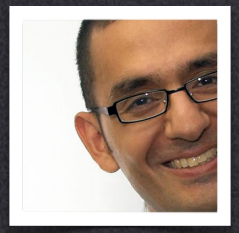
mother mons†er
6.8 million followers

@justinbieber

Justin Bieber
5.7 million followers

@BarakObama

44th President of the United States
5.6 million followers



@raffi

me!
5.1 thousand followers

@ladygaga

mother mons†er
6.8×10^6 followers

@raffi

me!
5.1×10^3 followers

differs by 10^3

@ladygaga

mother mons†er
6.8 x 10^6 followers

scaling 10^6

10^6 deliveries per minute = 6000 deliveries per millisecond

A SYSTEM IS ONLY AS STRONG AS ITS WEAKEST LINK

≈

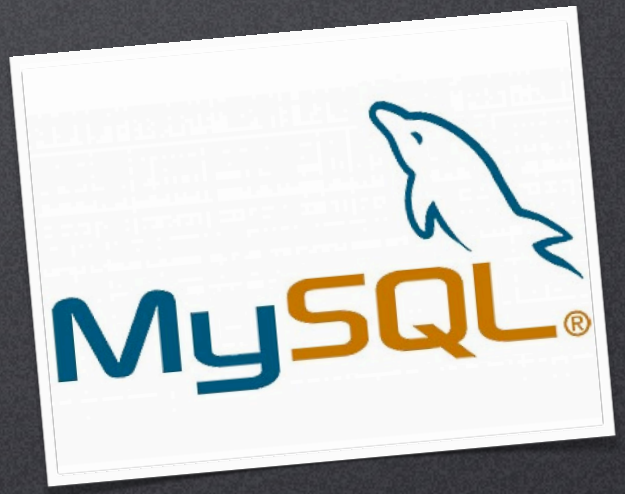
80 MB
per sec

10 ms
per seek

10 ms per seek = 100 seeks per second

MySQL

Can't generate IDs fast enough
Centralized and a single point of failure



snowflake

Highly available and uncoordinated (10kqps)
Compatible with the twitter ecosystem
`http://github.com/twitter/snowflake`

HOW BIG ARE THEY?

1 tweet text = 140 characters

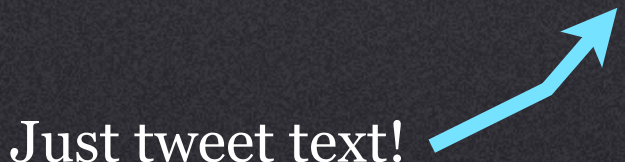
≈ 200 bytes

1000 tweets per second

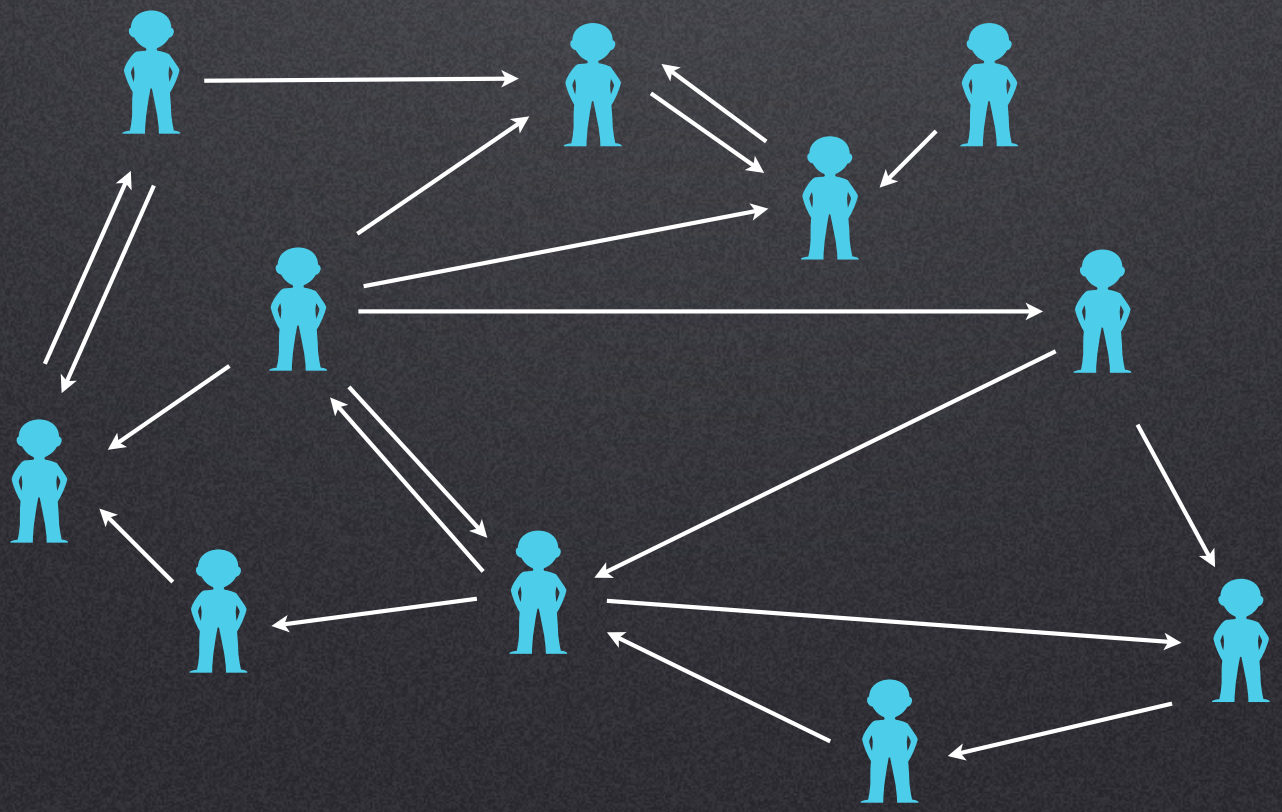
≈ 195 KB/sec

≈ 11 MB/min

≈ 16 GB/day

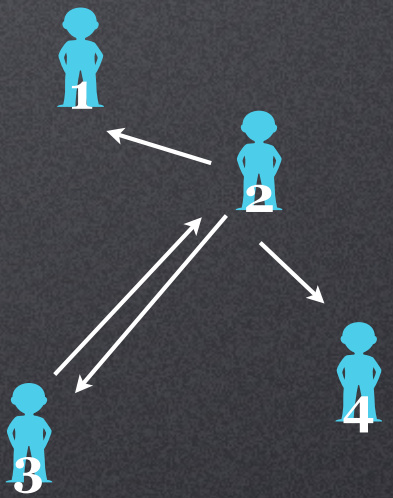


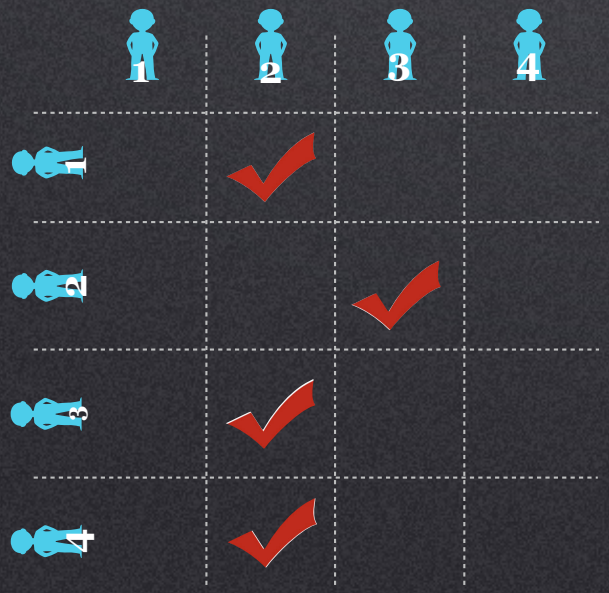
LOTS OF DELIVERIES



Digraph

Need to represent this





Matrix

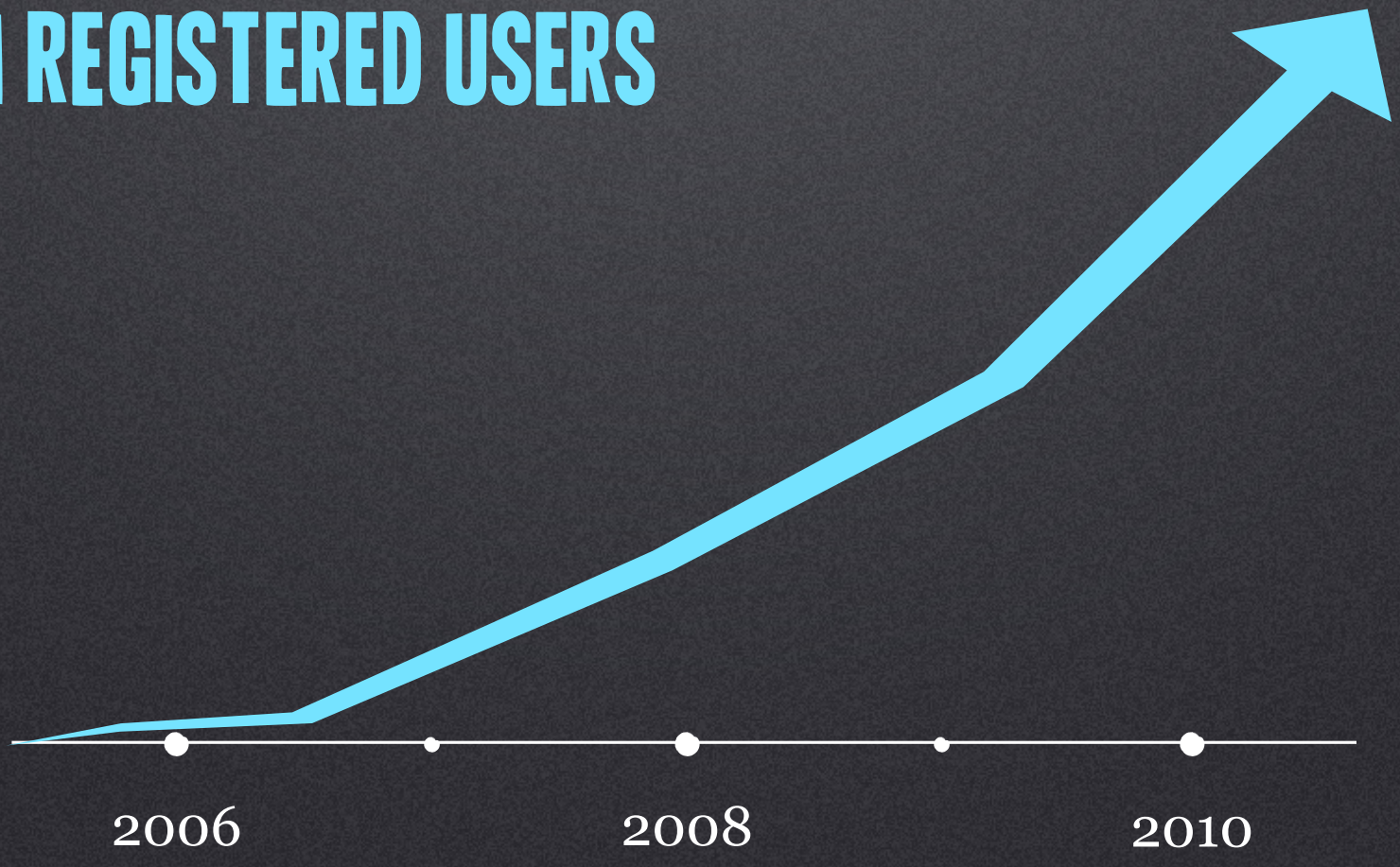
Naïve implementation is not scalable

Photo used under Creative Commons from jurvetson

flockdb

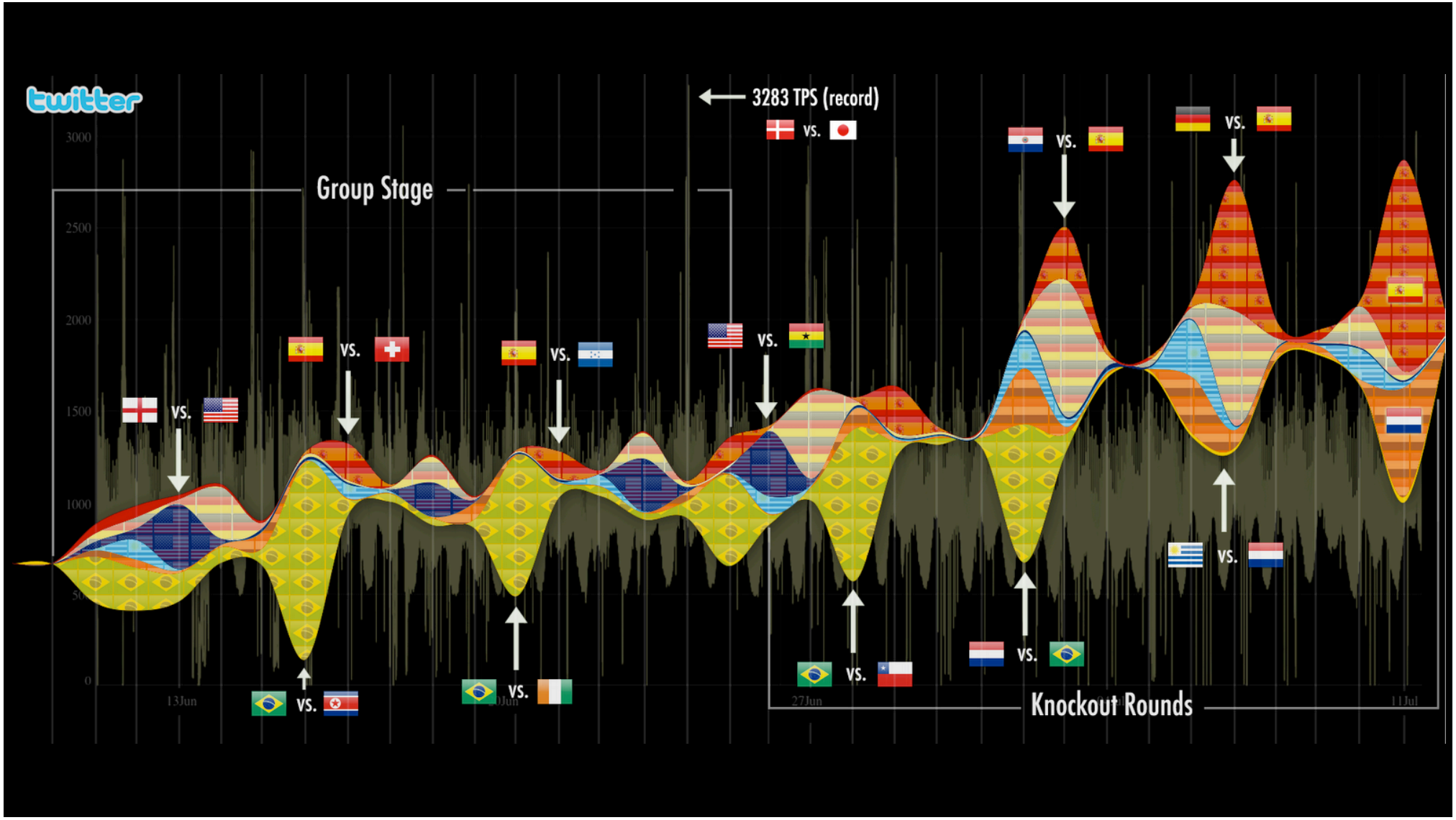
Distributed graph database
High rate of CRUD operations
Complex set arithmetic queries
http://github.com/twitter/flockdb

160M REGISTERED USERS



USING THE SYSTEM

6B API calls per day ≈ 70,000 calls per second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WHERE DO WE WANT TO BE?

Today - 160M people generate ~1000 TPS

Tomorrow - we want to support half the world and all its devices

(right now, there are 6B people and 5B phones)

QUESTIONS?

Follow me at
twitter.com/raffi