Scaling Pinterest

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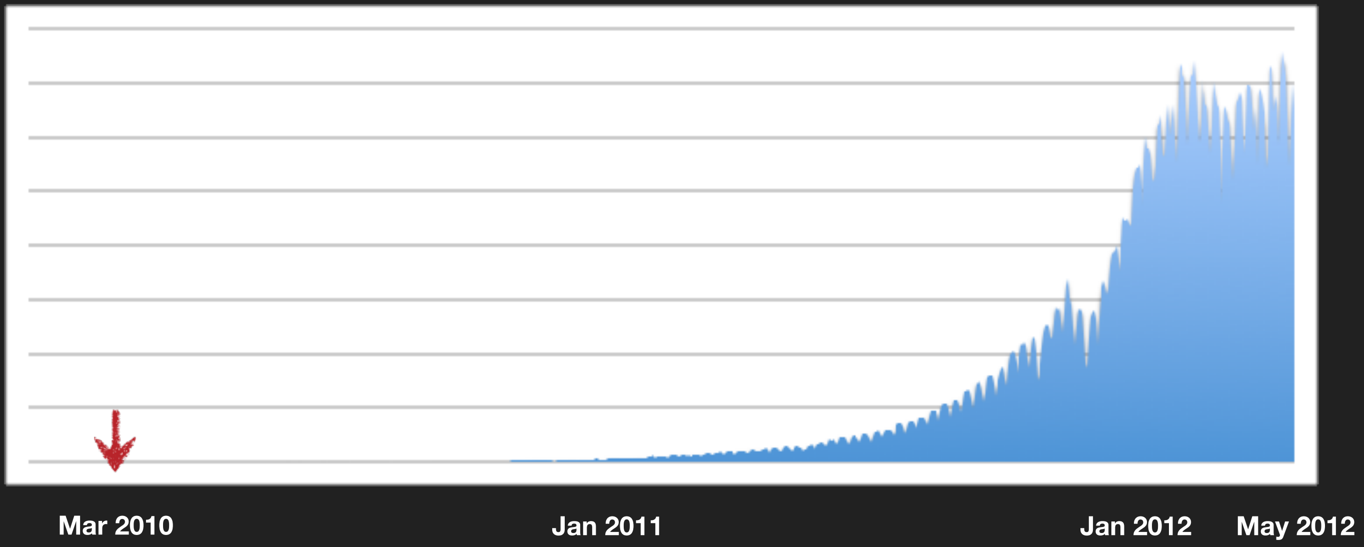
Evolution

Growth

March 2010

- RackSpace
- 1 small Web Engine
- 1 small MySQL DB
- 1 Engineer + 2 Founders

Page views per day



Growth

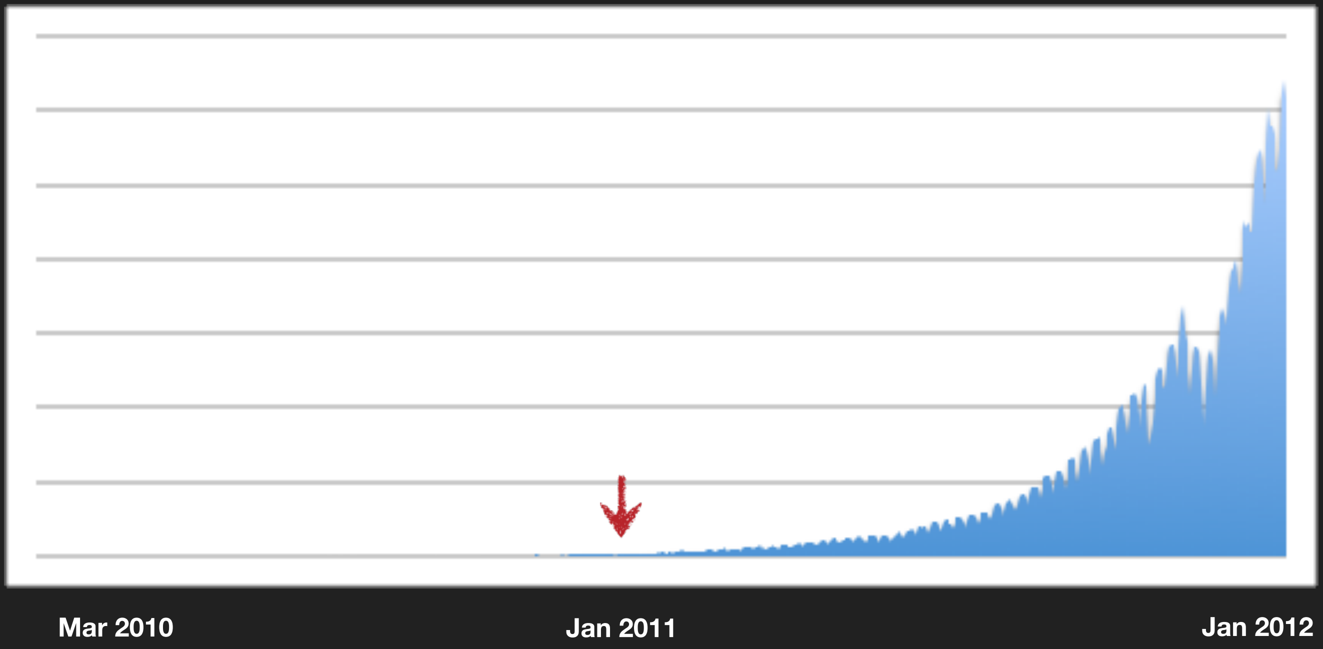
March 2010

Growth

January 2011

- Amazon EC2 + S3 + CloudFront
- 1 NGinX, 4 Web Engines
- 1 MySQL DB + 1 Read Slave
- 1 Task Queue + 2 Task Processors
- 1 MongoDB
- 2 Engineers + 2 Founders

Page views per day

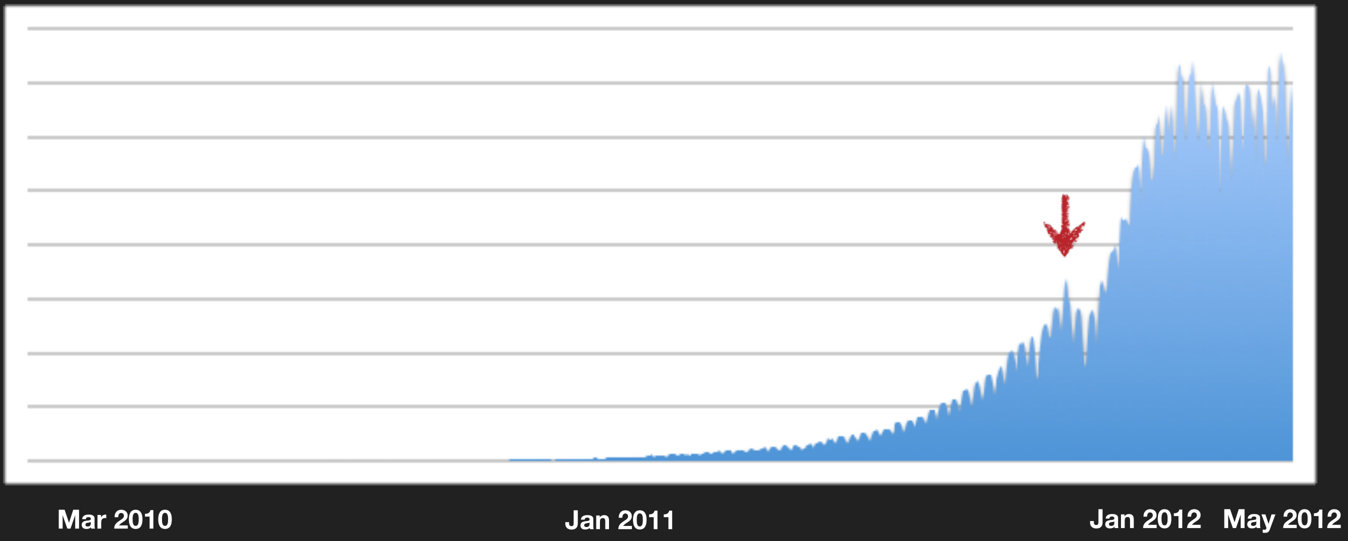


Growth

September 2011

- Amazon EC2 + S3 + CloudFront
- 2 NGinX, 16 Web Engines + 2 API Engines
- 5 Functionally Sharded MySQL DB + 9 read slaves
- 4 Cassandra Nodes
- 15 Membase Nodes (3 separate clusters)
- 8 Memcache Nodes
- 10 Redis Nodes
- 3 Task Routers + 4 Task Processors
- 4 Elastic Search Nodes
- 3 Mongo Clusters
- 3 Engineers (8 Total)

Page views per day



It will fail. Keep it simple.

If you’re the biggest user of a technology, the challenges will be greatly amplified

Growth

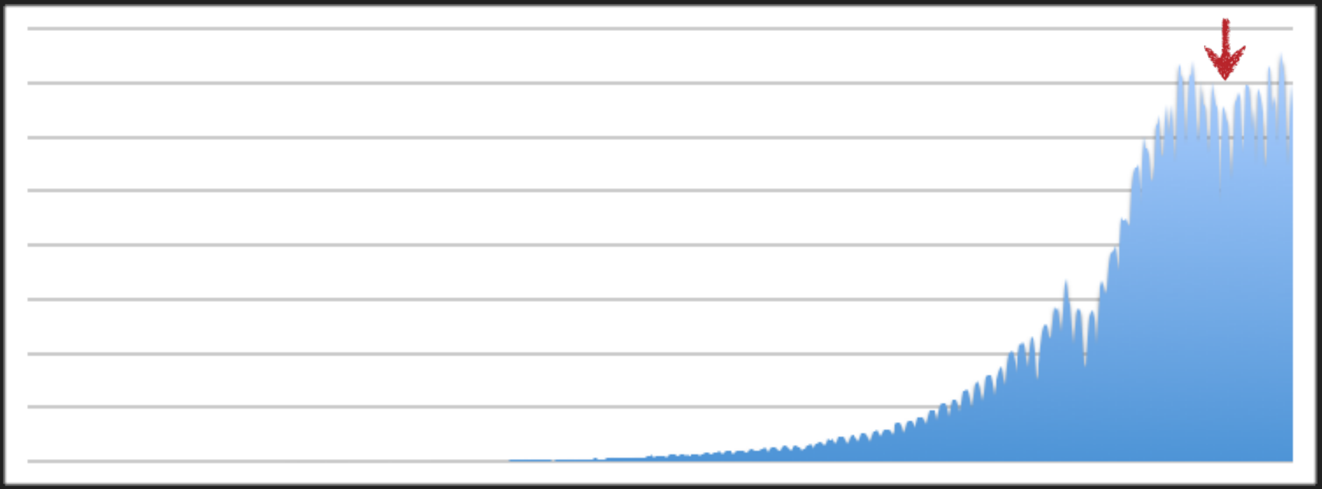
January 2012

Growth

April 2012

- Amazon EC2 + S3 + Edge Cast
- 12 Engineers
- 135 Web Engines + 75 API Engines
  - 1 Data Infrastructure
- 10 Service Instances
  - 1 Ops
- 80 MySQL DBs (m1.xlarge) + 1 slave
  - 2 Mobile
  each
  - 8 Generalists
- 110 Redis Instances
- 10 Non-Engineers
- 60 Memcache Instances
- 2 Redis Task Manager + 60 Task Processors
- 3rd party sharded Solr

Page views per day



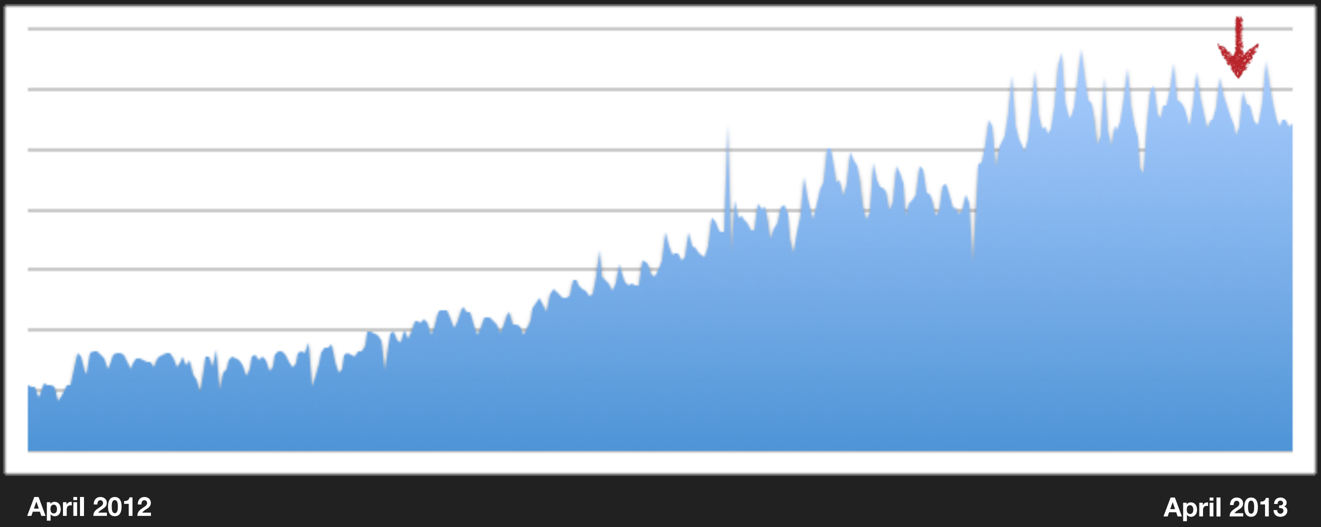
Growth

April 2013

- 65+ Engineers
  - 7 Data Infrastructure + Science
  - 7 Search and Discovery
  - 9 Business and Platform
  - 6 Spam, Abuse, Security
  - 9 Web
  - 9 Mobile
  - 2 growth
  - 10 Infrastructure
  - 6 Ops
- 65+ Non-Engineers

- Amazon EC2 + S3 + Edge Cast
- 400+ Web Engines + 400+ API Engines
- 70+ MySQL DBs (hi.4xlarge on SSDs) + 1 slave each
- 100+ Redis Instances
- 230+ Memcache Instances
- 10 Redis Task Manager + 500 Task Processors
- 65+ Engineers (130+ total)
- 8 services (80 instances)
- Sharded Solr
- 20 HBase
- 12 Kafka + Azkabhan
- 8 Zookeeper Instances
- 12 Varnish

Page views per day

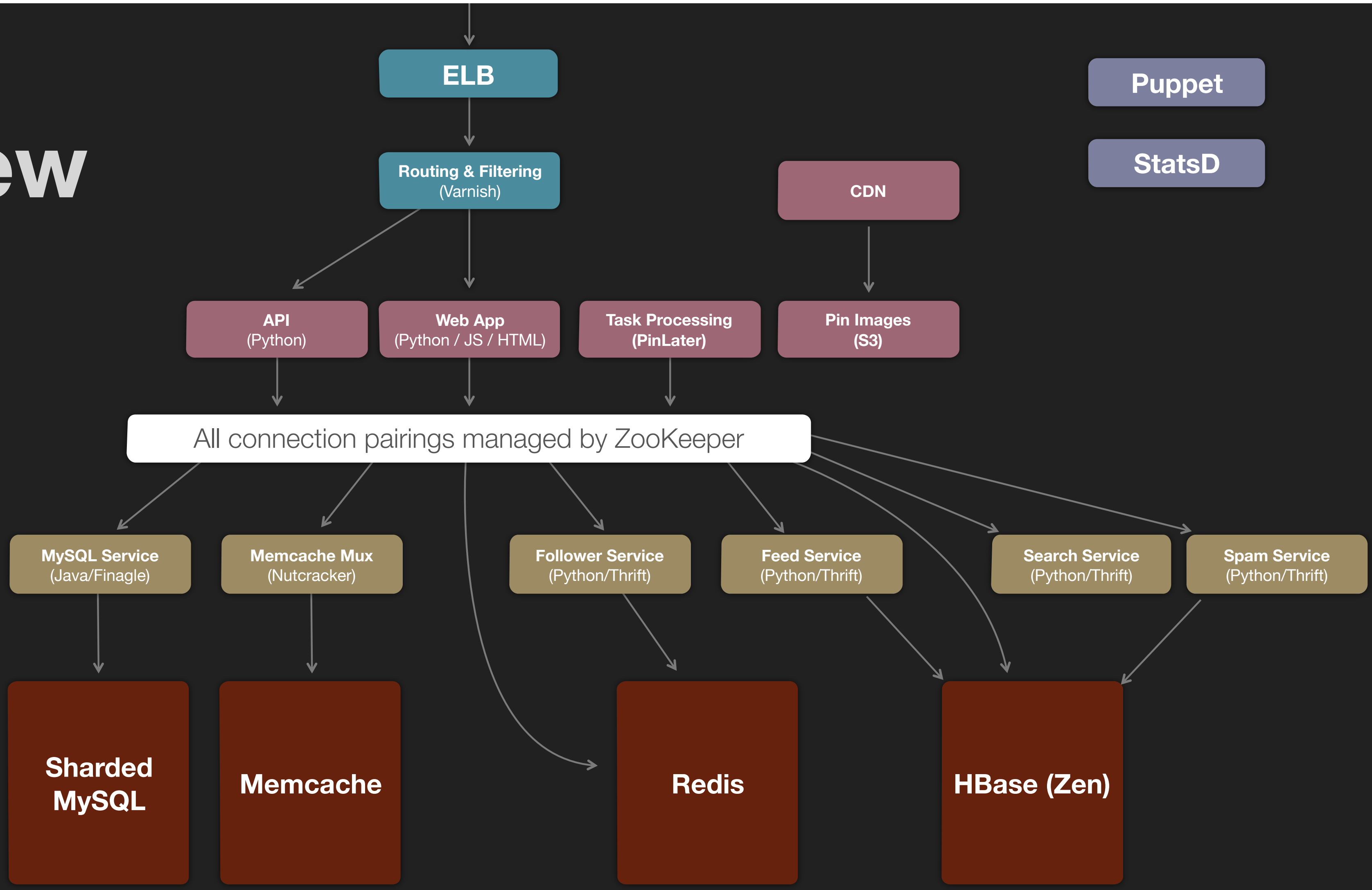


Pinterest

Pinterest
DEFCON
FOCUS
THE ART OF WAR

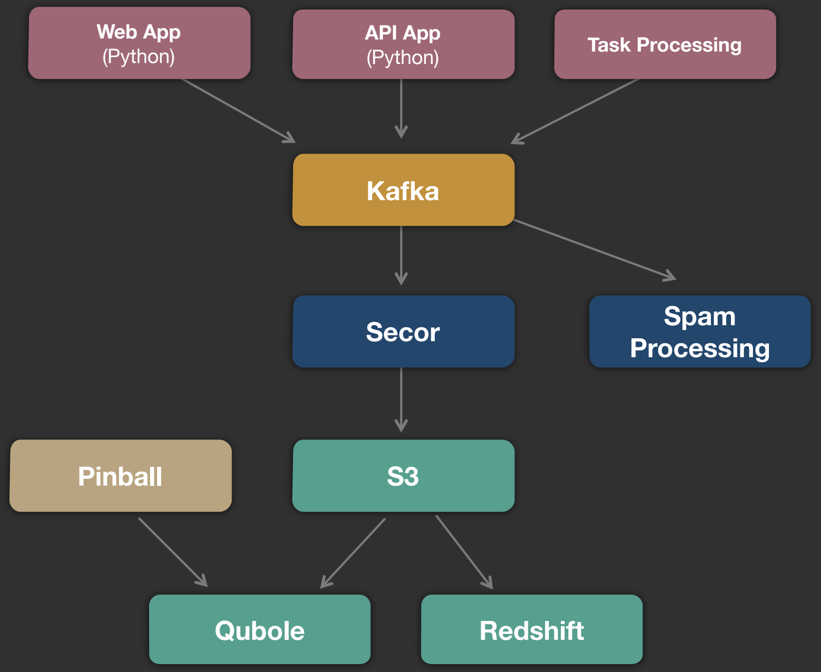
Technologies

Arch Overview



ELB
Puppet
StatsD
Routing & Filtering (Varnish)
CDN
API (Python)
Web App (Python / JS / HTML)
Task Processing (PinLater)
Pin Images (S3)
All connection pairings managed by ZooKeeper
MySQL Service (Java/Finagle)
Memcache Mux (Nutcracker)
Follower Service (Python/Thrift)
Feed Service (Python/Thrift)
Search Service (Python/Thrift)
Spam Service (Python/Thrift)
Sharded MySQL
Memcache
Redis
HBase (Zen)

Data Pipeline



Our MySQL Sharding?

http://www.infoq.com/presentations/Pinterest

Choosing Your Tech

Questions to ask

- Does it meet your needs?
- How mature is the product?
- Is it commonly used? Can you hire people who have used it?
- Is the community active?
- How robust is it to failure?
- How well does it scale? Will you be the biggest user?
- Does it have a good debugging tools? Profiler? Backup software?
- Is the cost justified?

$$\text{Maturity} = \frac{\text{Blood and Sweat}}{\text{Complexity}}$$

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Hosting

Why Amazon Web Services (AWS)?

- Variety of servers running Linux
- Very good peripherals: load balancing, DNS, map reduce, basic security, and more
- Good reliability
- Very active dev community
- Not cheap, but...
- *New instances ready in seconds*

Hosting

AWS Usage

- Route 53 for DNS
- ELB for 1st tier load balance
- EC2 Ubuntu Linux
  - Varnish layer
  - All web, API, background appliances
  - All services
  - All databases and caches
- S3 for images, logs

Code

Why Python?

- Extremely mature
- Well known and well liked
- Solid active community
- Very good libraries specifically targeted to web development
- Effective rapid prototyping
- Open Source

Some Java and Go...

- Faster, lower variance response time

Code

Python Usage

- All web backend, API, and related business logic
- Most services

Java and Go Usage

- Varnish plugins
- Search indexers
- High frequency services (e.g., MySQL service)

Production Data

Why MySQL and Memcache?

- **Extremely mature**
- **Well known and well liked**
- **(MySQL) Rarely catastrophic loss of data**
- **Response time to request rate increases linearly**
- **Very good software support: XtraBackup, Innotop, Maatkit**
- **Solid active community**
- **Open Source**

Production Data

MySQL and Memcache Usage

- Storage / Caching of core data
  - Users, boards, pins, comments, domains
  - Mappings (e.g., users to boards, user likes, repin info)
  - Legal compliance data

Production Data

Why Redis?

- Well known and well liked
- Active community
- Consistently good performance
- Variety of convenient and efficient data structures
- 3 Flavors of Persistence: Now, Snapshot, Never
- Open Source

Production Data

Redis Usage

- Follower data
- Configurations
- Public feed pin IDs
- Caching of various core mappings (e.g., board to pins)

Production Data

Why HBase?

- Small, but growing loyal community
- Difficult to hire for, but…

- Non-volatile, O(1), extremely fast and efficient storage
- Strong Hadoop integration
- Consistently good performance
- Used by Facebook (bigger than us)
- Seems to work well
- Open Source

Production Data

HBase Usage

- User feeds (pin IDs are pushed to feeds)
- Rich pin details
- Spam features
- User relationships to pins

Production Data

What happened to Cassandra, Mongo, ES, and Membase?

- Does it meet your needs?
- How mature is the product?
- Is it commonly used? Can you hire people who have used it?
- Is the community active? Can you get help?
- How robust is it to failure?
- How well does it scale? Will you be the biggest user?
- Does it have a good debugging tools? Profiler? Backup software?
- Is the cost justified?

A 2nd chance…

A 2nd Chance

Stuff we could have done better

- Logging on day 1 (StatsD, Kafka, Map Reduce)
    - Log every request, event, signup
    - Basic analytics
    - Recovery from data corruption or failure
- Alerting on day 1

A 2nd Chance

Stuff we could have done better

- Shard our MySQL storage much earlier
  - Once you start relying on read slaves, start the timebomb countdown
  - We also fell into the NoSQL trap (Membase, Cassandra, Mongo, etc)
- Pyres for background tasks day 1
- Hire technical operations eng earlier
- Chef / Puppet earlier
- Unit testing earlier (Jenkins for builds)

A 2nd Chance

Stuff we could have done better

- A/B testing earlier
  - Decider on top of Zookeeper WATCH
  - Progressive roll out
  - Kill switches

What's next?

Looking Forward

- Beyond 400 Pinployees
- Continually improve Pinner experience
  - Help Pinners discover more of the things they love
  - Build better and faster
- Continually improve collaboration and build bigger, better, faster products

Have fun

No Seriously, Have fun

Thanks!
Questions?

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