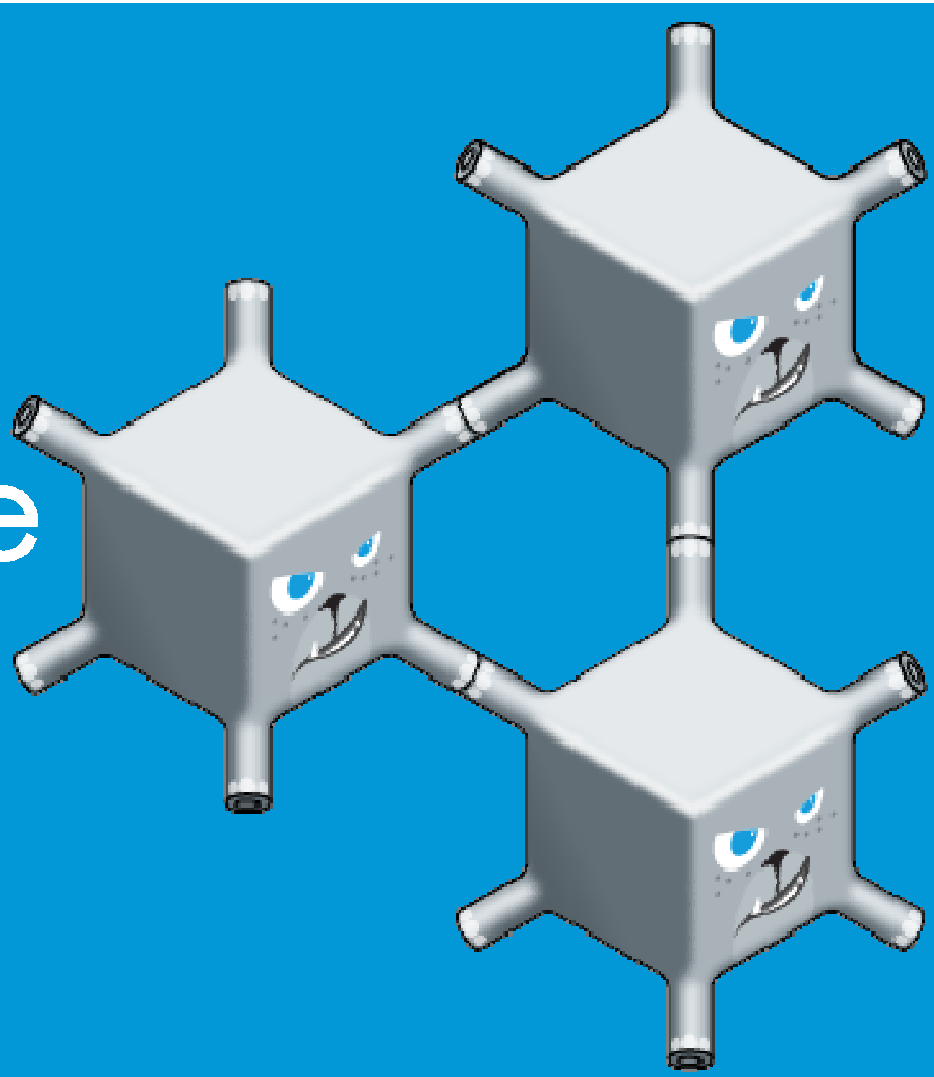
membase



CS227

- Silvia Zuffi
- Sunil Mallya

Slides credits: official membase meetings

Schedule

- Overview silvia
- History silvia
- Data Model silvia
- Architecture sunil
- Transaction support sunil
- Case studies silvia

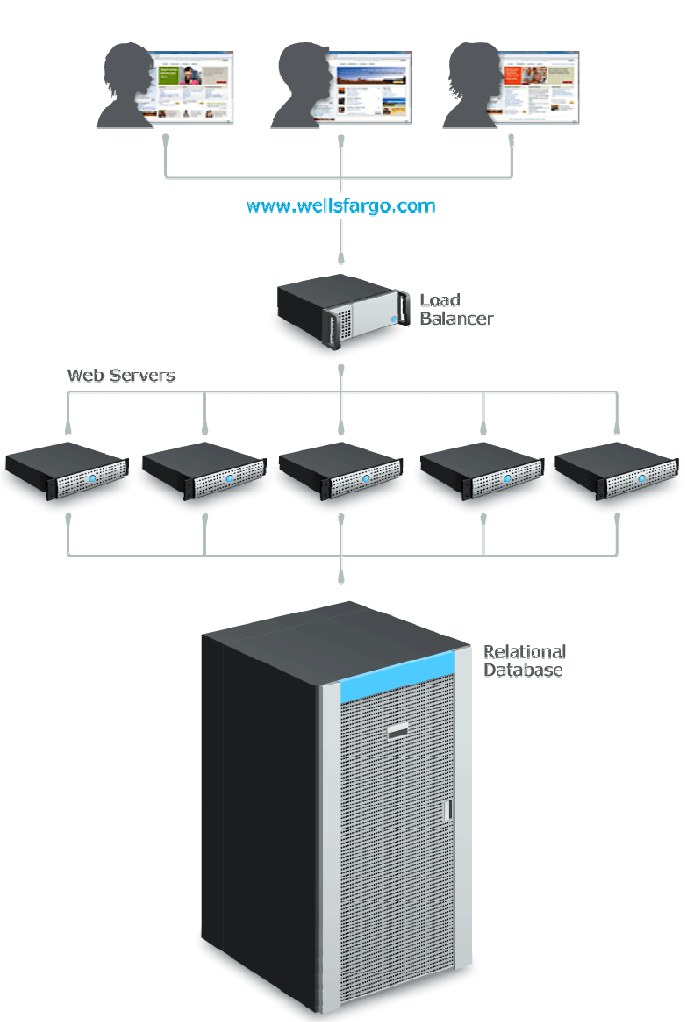
Overview, history and data model

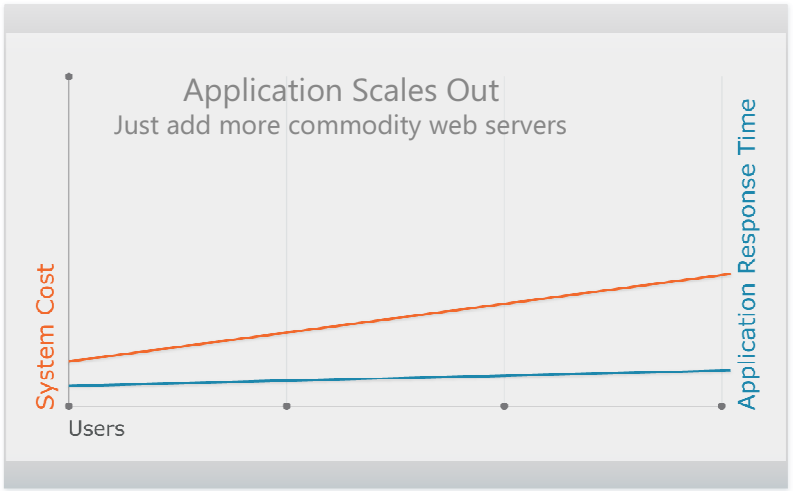
Overview: what is Membase?

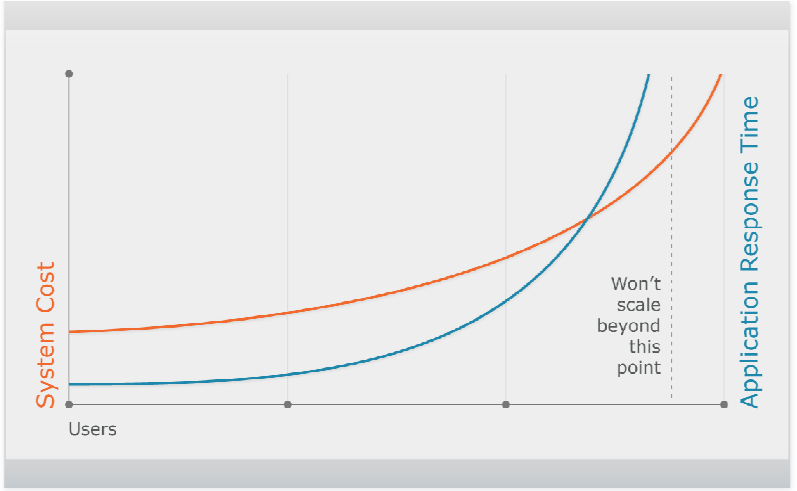
- A key-value distributed database optimized for storing data behind web applications

- Simple - Fast - Elastic (by design)

Overview: before



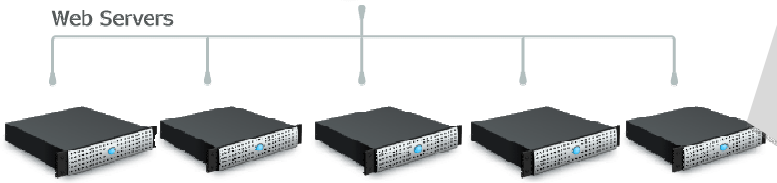




Overview: with Membase

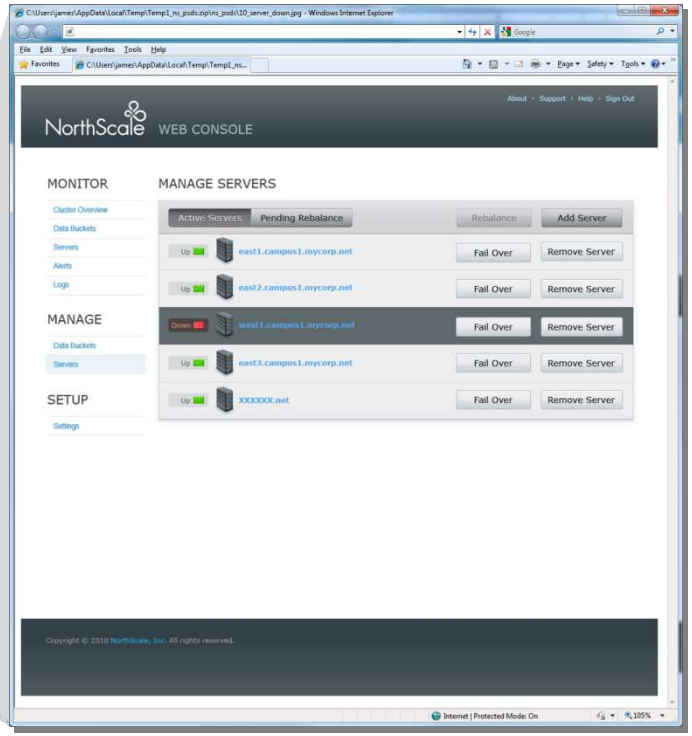
Application user

Web application server



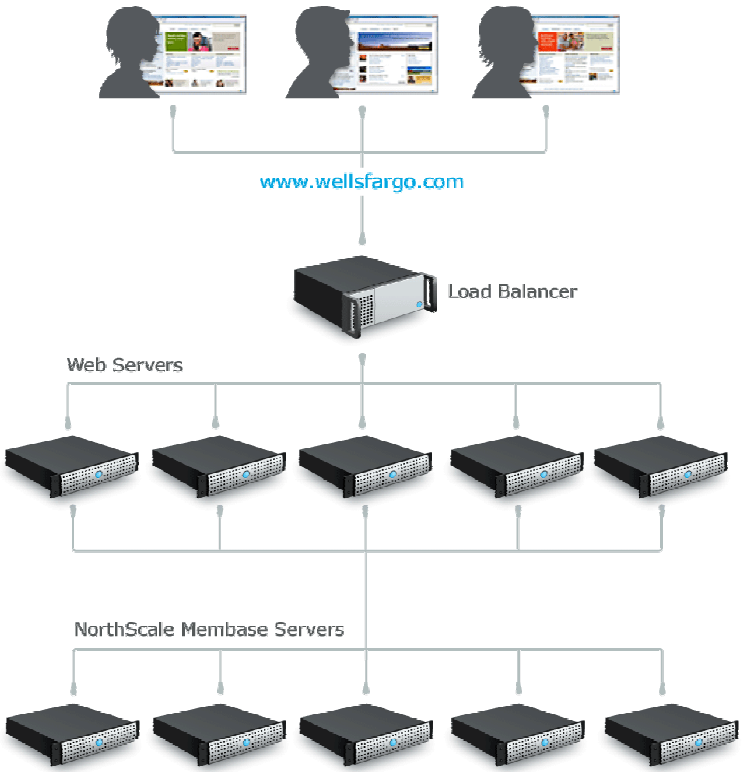
Membase Servers

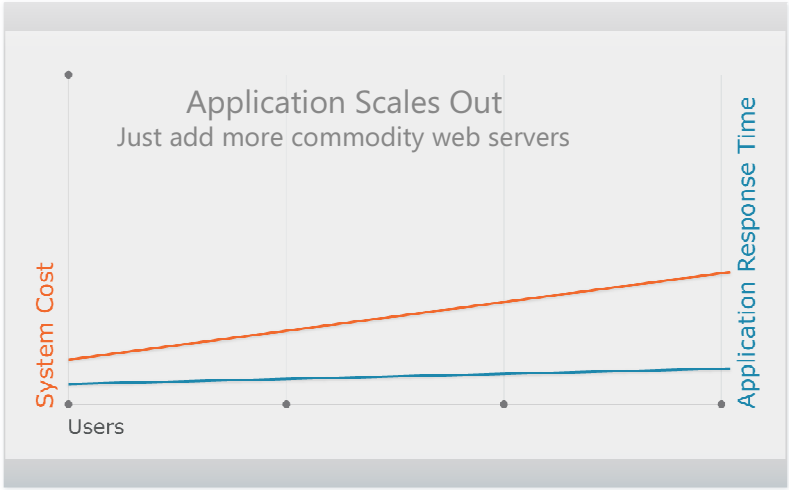
DATA CENTER

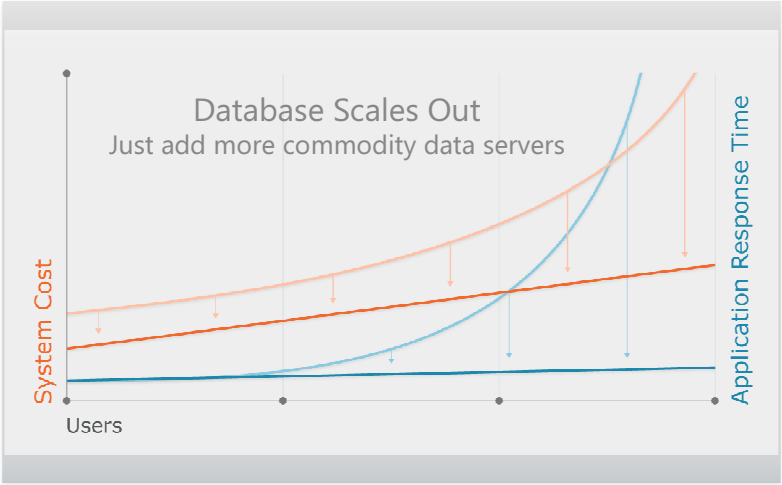


ADMINISTRATOR CONSOLE

Overview: after







History

- Membase was developed by NorthScale, founded by several leaders of the memcached project
- June 2010: NorthScale, and project co-sponsors Zynga and NHN create a new project (membase.org).
- February 8, 2011, Membase merged with CouchOne.The merged project will be known as **Couchbase**

History

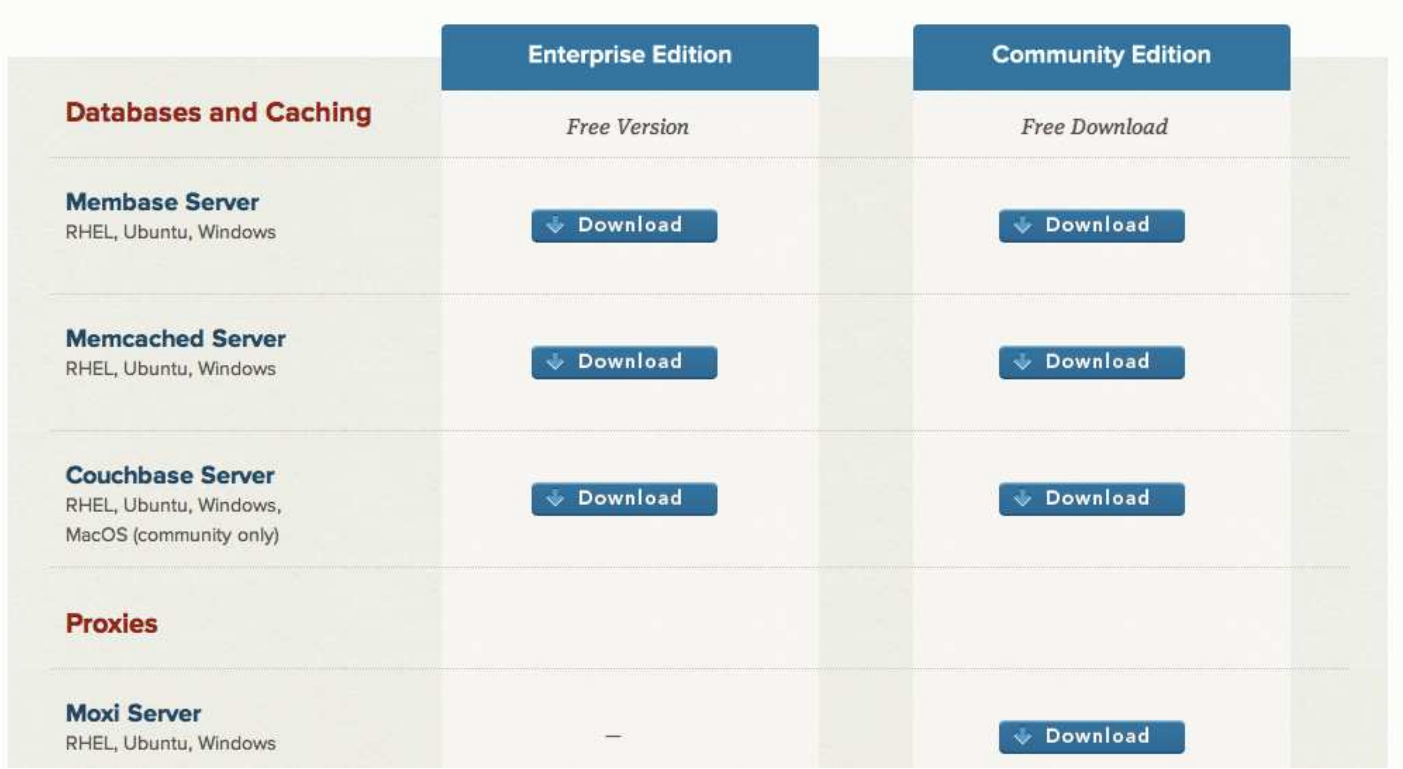
CouchOne + Membase = Couchbase

Today is, without question, one of the most exciting days of my career – in the top 3 for sure. It is difficult to imagine a marriage of technologies and cultures more right than the merger of Membase and CouchOne. Couchbase, the resulting company and product family, combines the industry's leading caching and clustering technologies (powering 18 of the world's top 20 websites and tens of thousands of others) with the most reliable and full-featured document database (with millions of installations worldwide). The result is, by a very wide margin, the fastest, safest and most comprehensive NoSQL database available.

James Phillips, senior Vice President

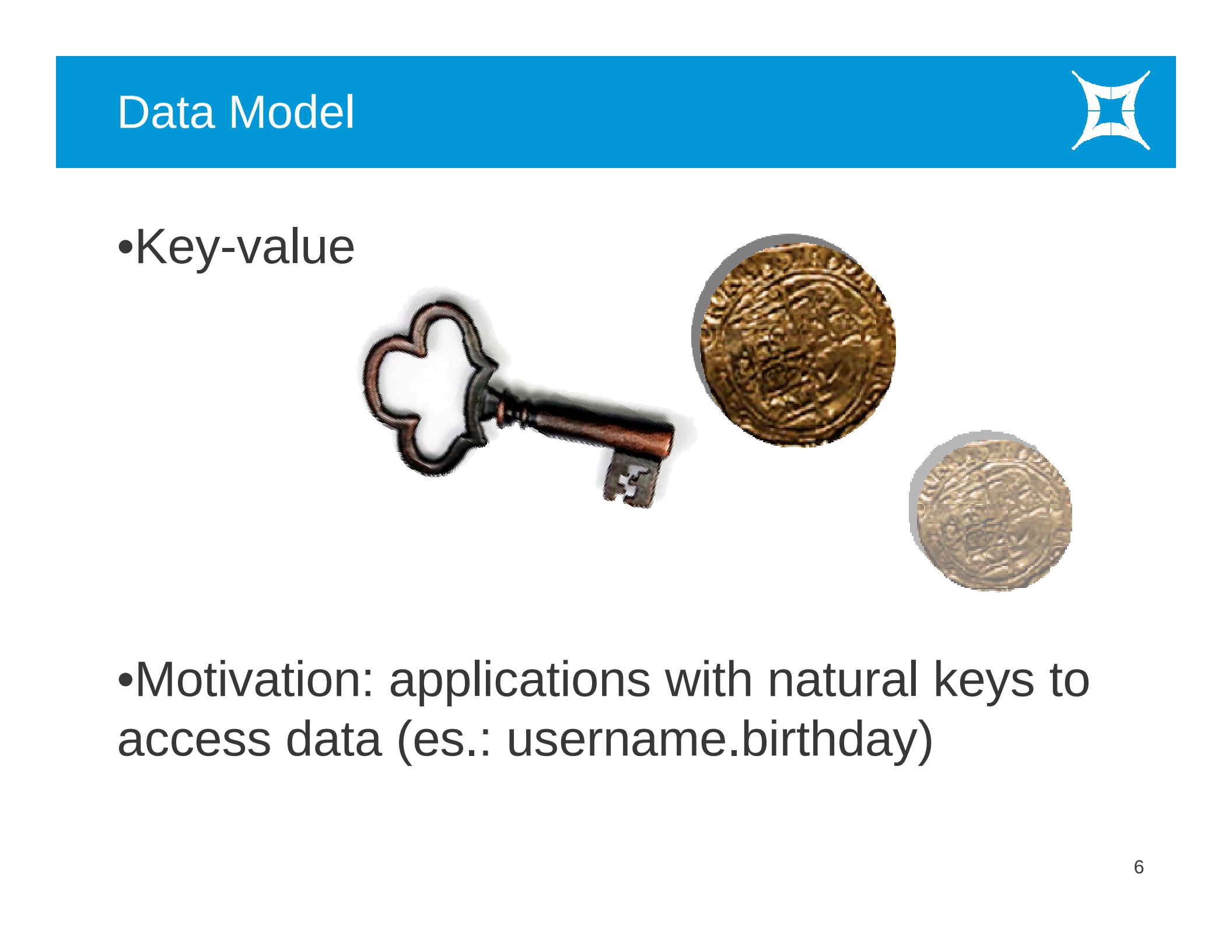
History

- Initial release March 2010
- Stable release 1.6.4.1 28 Dec 2010



	Enterprise Edition	Community Edition
Databases and Caching	*Free Version*	*Free Download*
Membase Server RHEL, Ubuntu, Windows	Download	Download
Memcached Server RHEL, Ubuntu, Windows	Download	Download
Couchbase Server RHEL, Ubuntu, Windows, MacOS (community only)	Download	Download
Proxies		
Moxi Server RHEL, Ubuntu, Windows	–	Download

Data Model



- Key-value

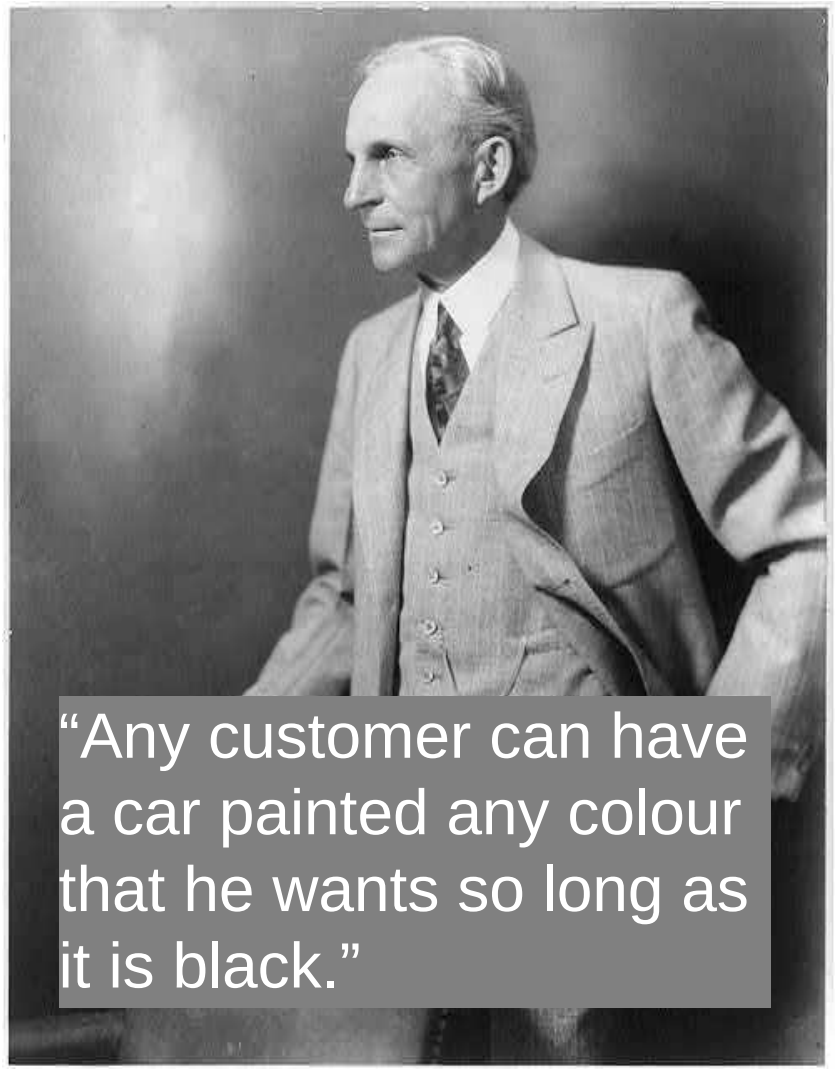
- Motivation: applications with natural keys to access data (es.: username.birthday)

Key-value

Key
Value

Data types:
Byte[]

Google protobuf
Thrift
Avro



Operators and Programming Languages

- GET/SET
  - getl: get with an expiration time
- Increment/Decrement
- Append/Prepend

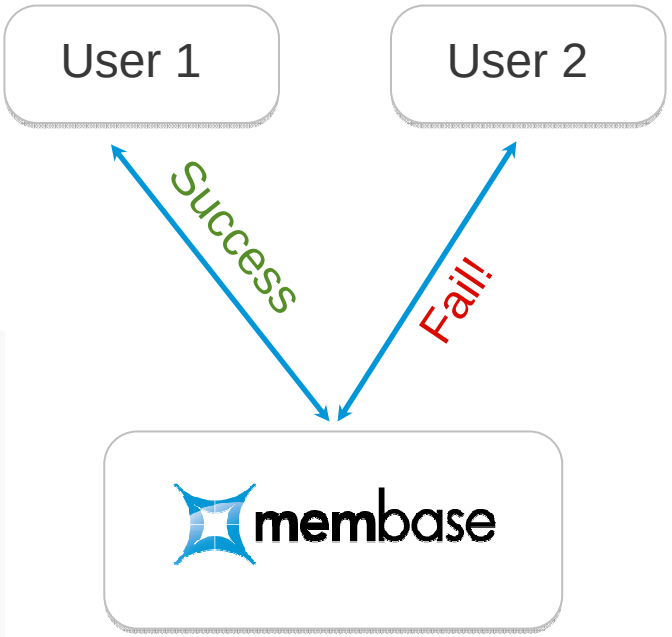
- Practically every language and application framework is supported (“memcapable”)

- Data manager: written in C, C++
- Cluster manager: Erlang/OTP

Transactions

- Based on CAS operations
- Compare and Swap
- special instruction that atomically compares the content of a memory location

```
bool compare_and_swap (int *accum, int *dest, int newval)
{
  if ( *accum == *dest ) {
       *dest = newval;
       return true;
  } else {
       *accum = *dest;
       return false;
  }
}
```

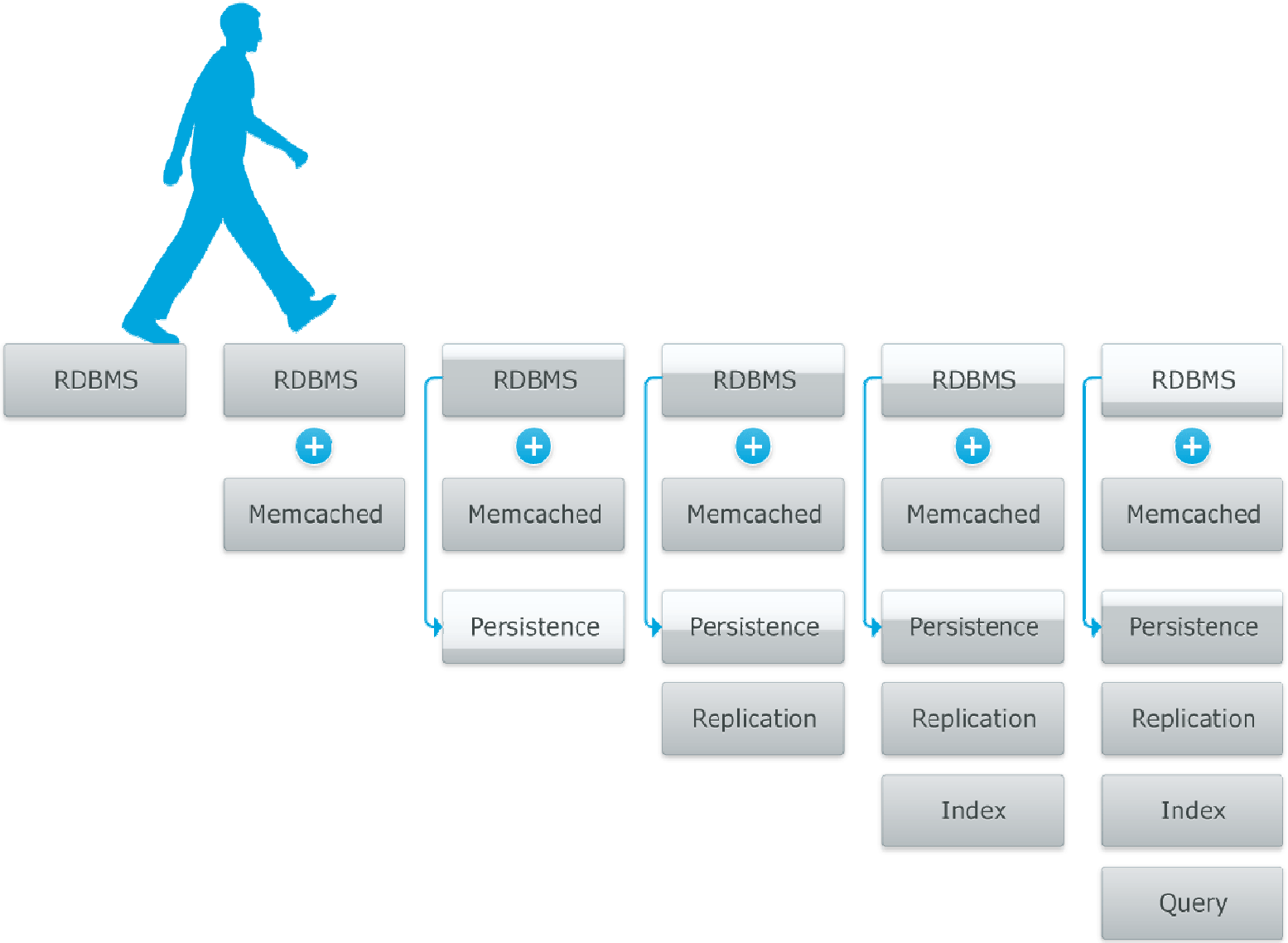


Architecture and transaction support

What is the problem being solved ?

- Highly interactive web apps
- Small amount of data
- Why doesn’t the traditional architecture work ?
- Is nosql “DB” really a DB ?
- Can a Database do what a nosql-db does?
  - If yes ? Why not use a database
  - What is it that is really different ?
    - De Normalized data

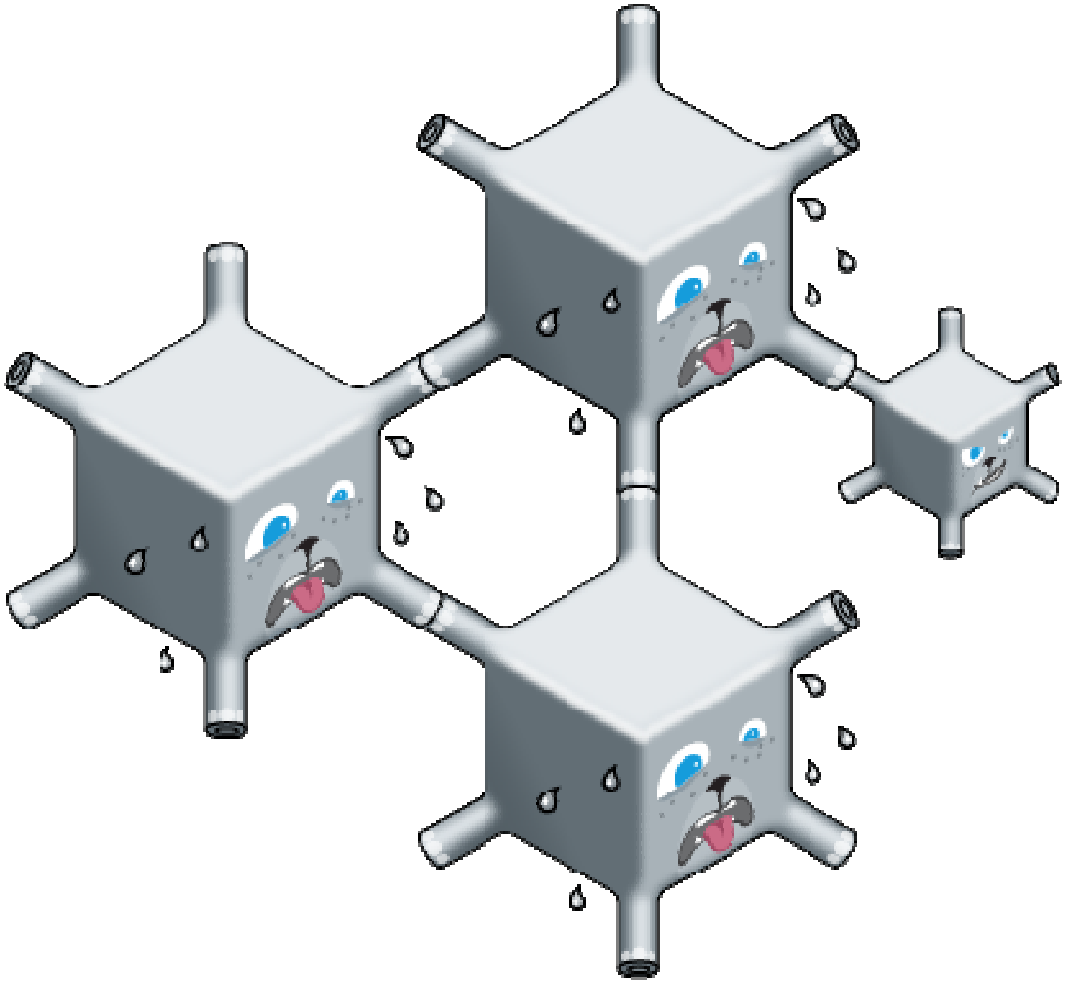
Membase - A practical path to “NoSQL” adoption



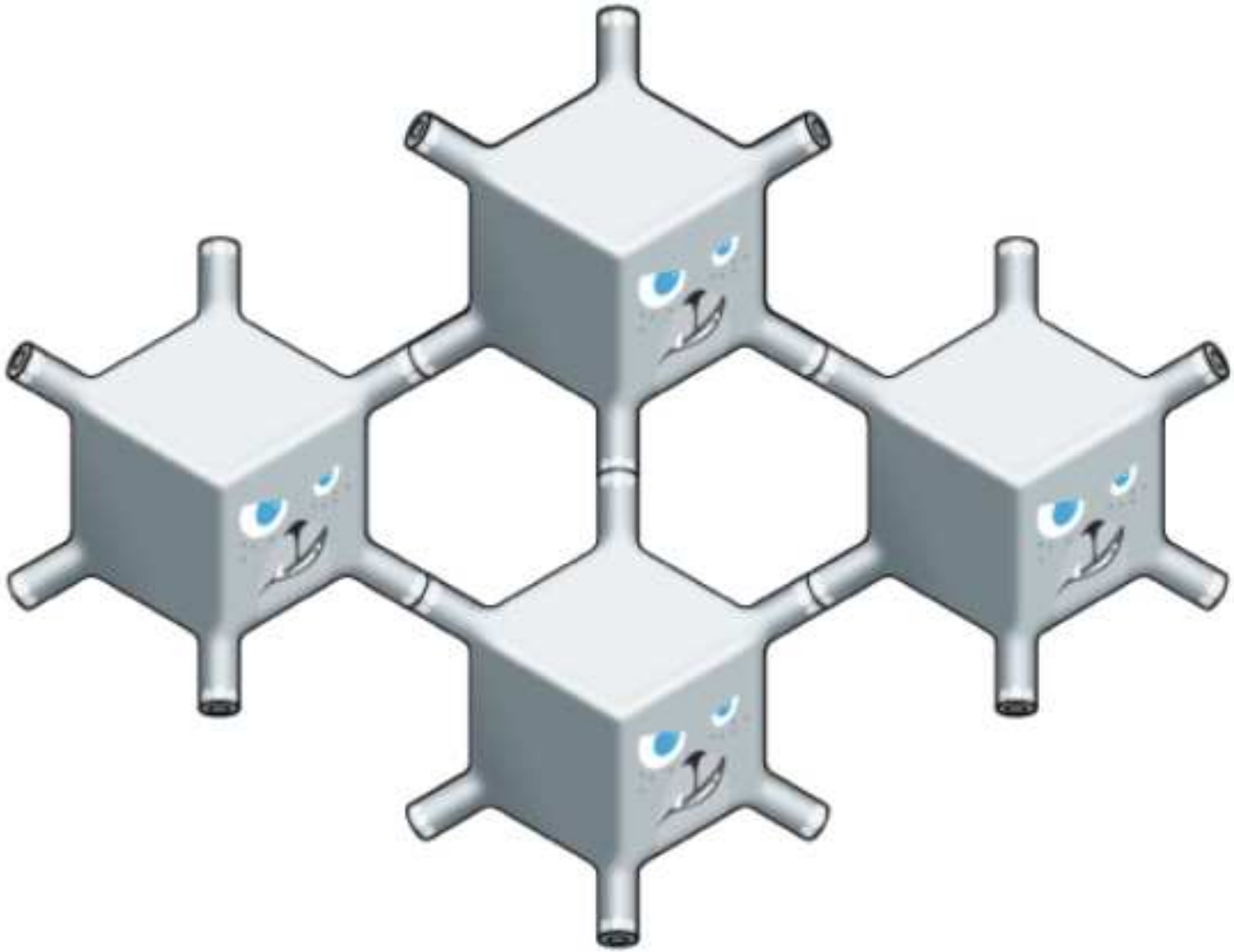
Physical Structures

- CA type system: scale linearly and always maintain consistency
- Clustering based on Erlang OTP
- Things are persistent, Data is written to Disk.

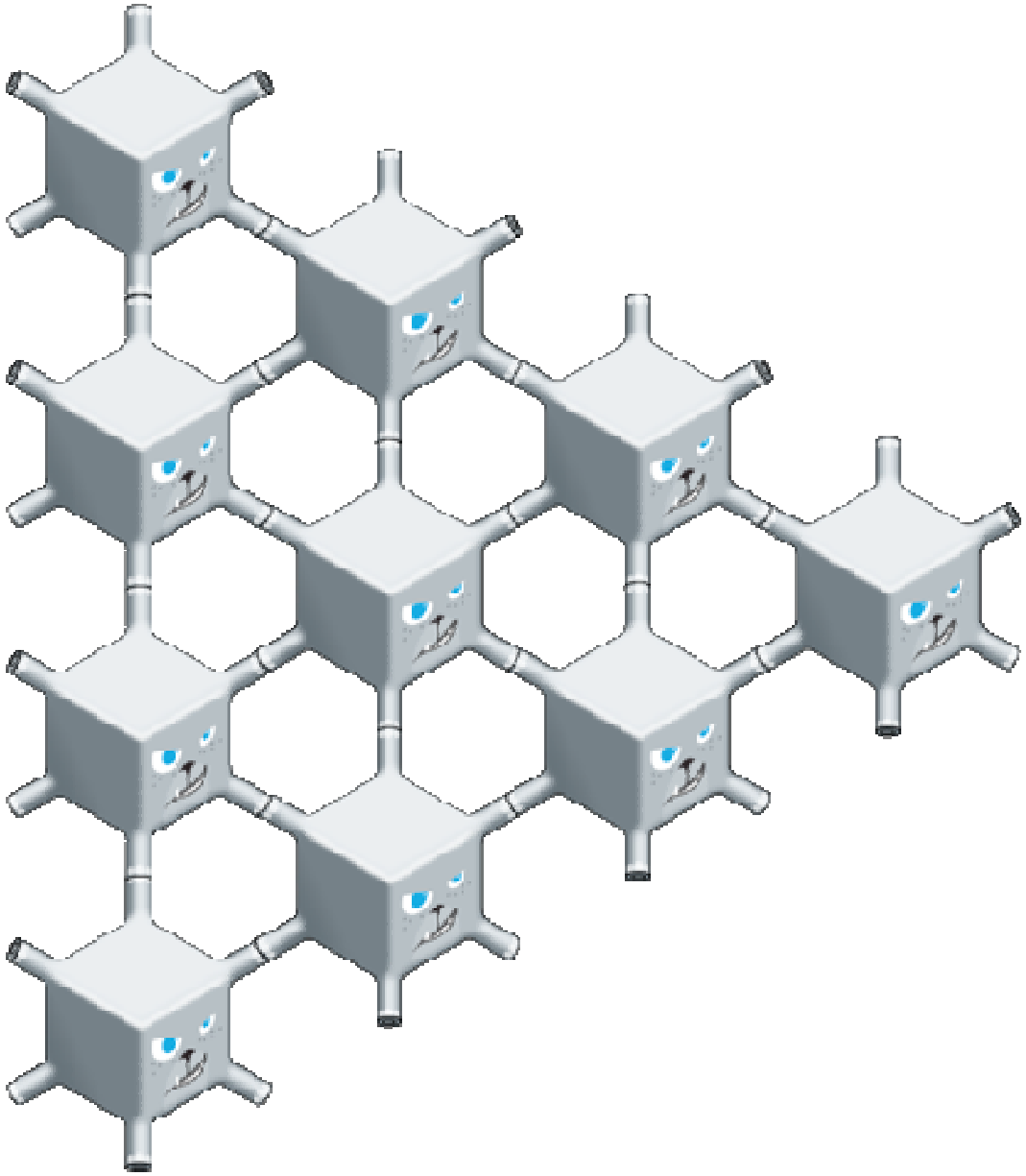
Elasticity



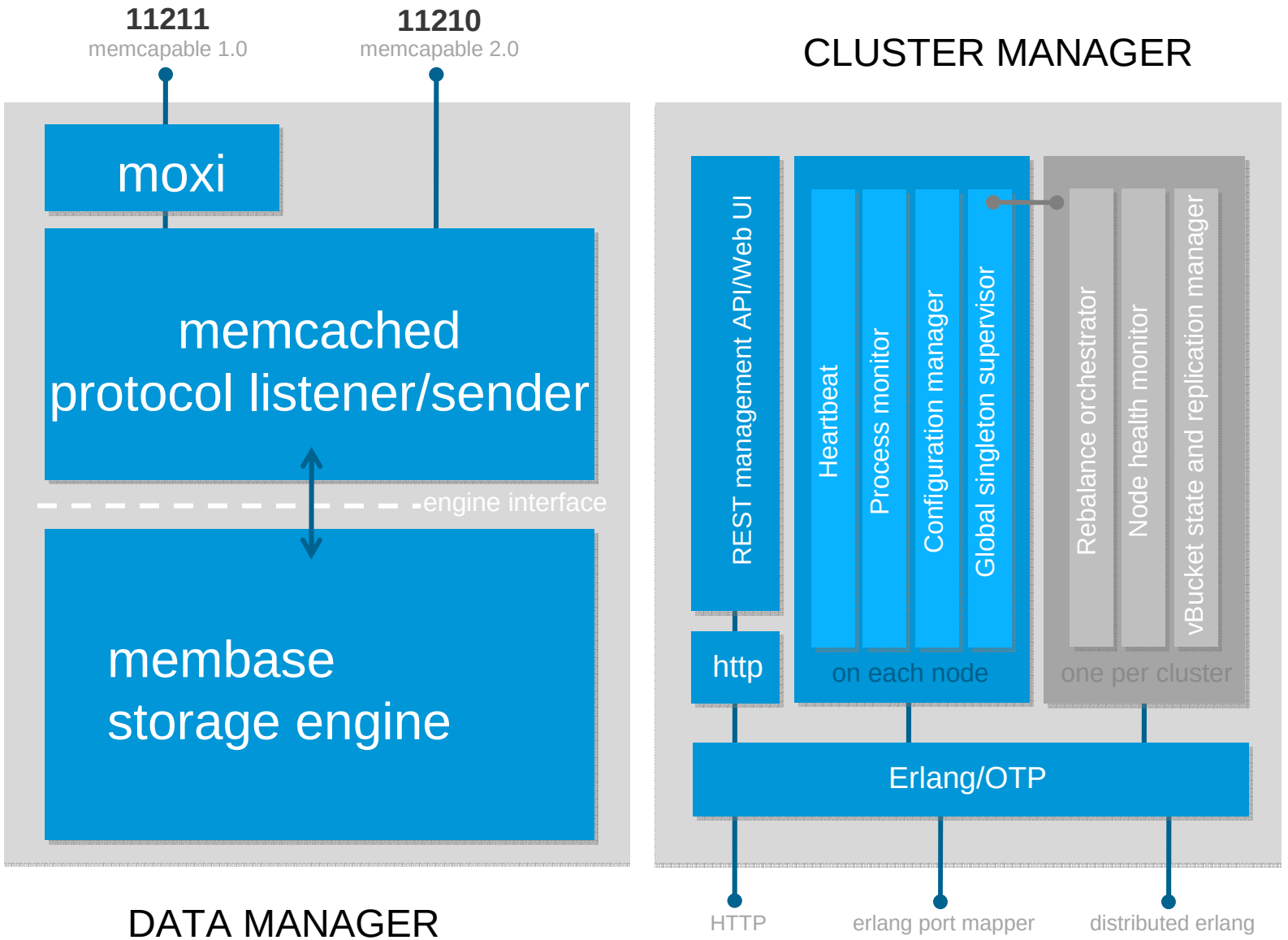
Elasticity



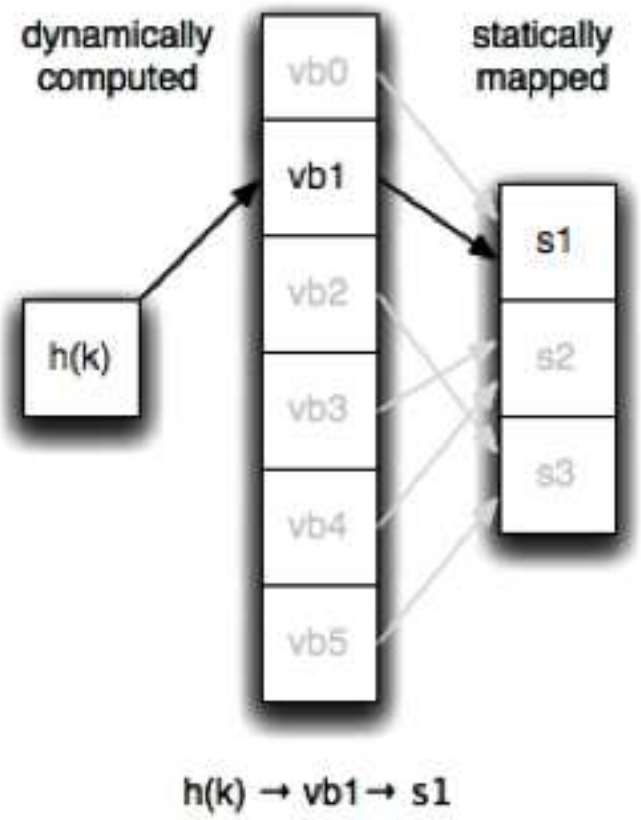
Elasticity



Architecture



vBuckets

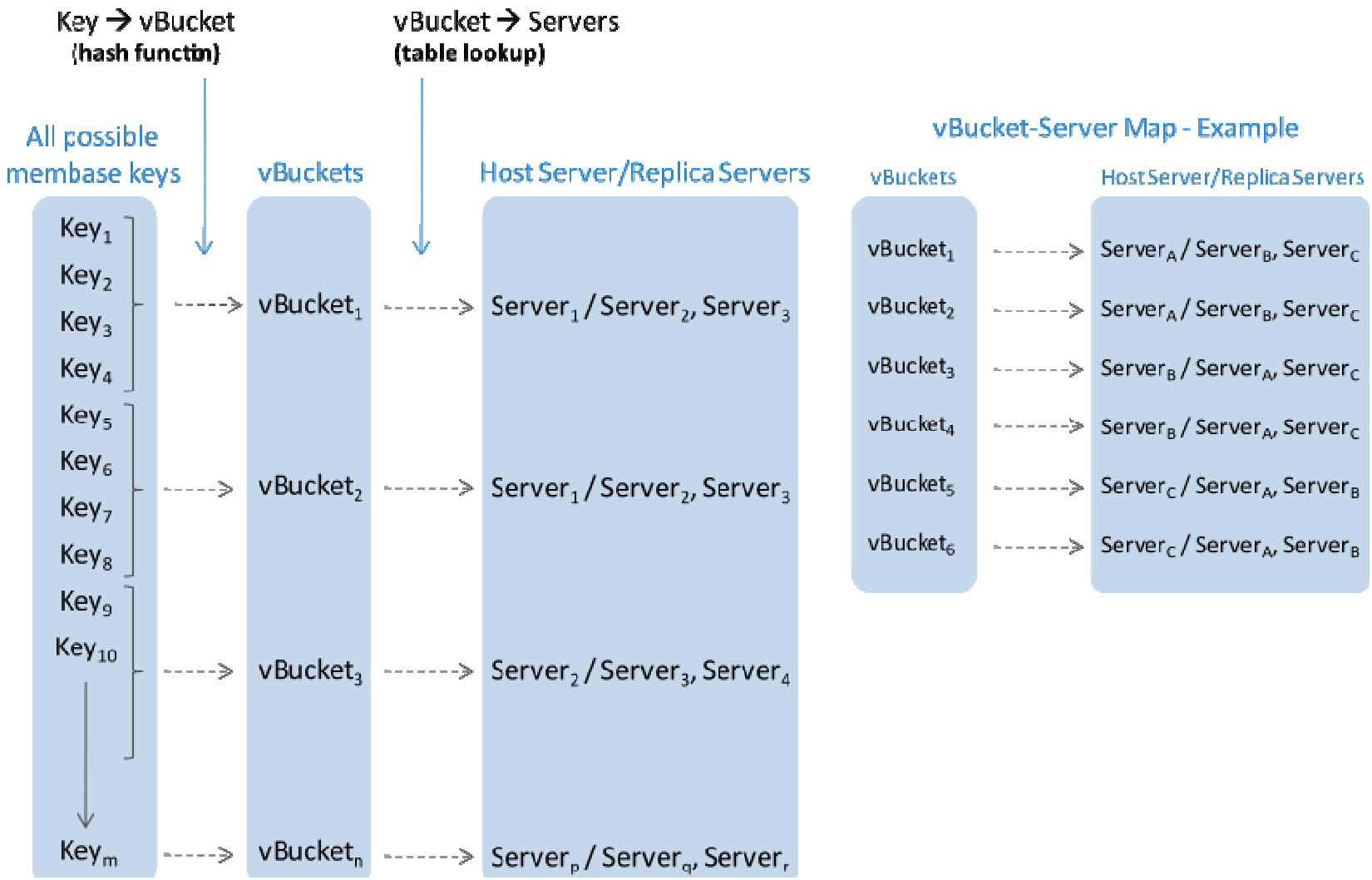


Any given vbucket will be in one of the following states on any given server:

- **A** - Active, fully operational
- **D** - Dead, fully non-operational
- **R** - Replica, dead to clients, receives replicas
- **P** - Pending, blocks clients, receives replicas

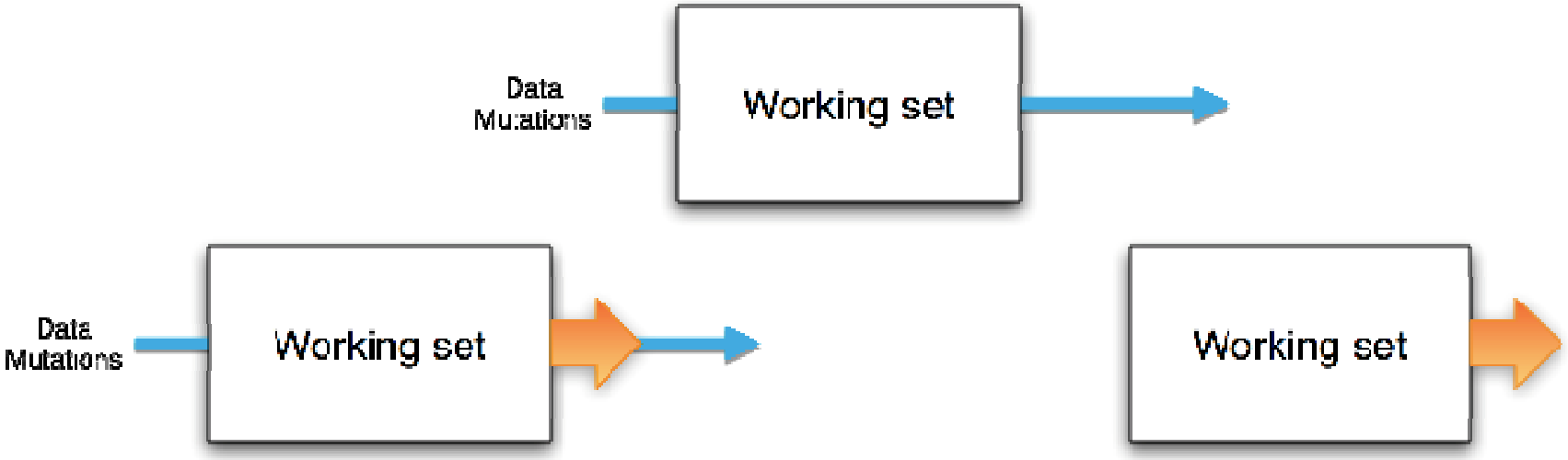
http://blog.membase.com/scaling-memcached-vbuckets

vBuckets mappings



TAP

- A generic, scalable method of streaming mutations from a given server
  - As data operations arrive, they can be sent to arbitrary TAP receivers
- Leverages the existing memcached engine interface, and the non-blocking IO interfaces to send data
- Three modes of operation



Replication & Failover

- Multi-model replication support
  - Peer-to-peer replication support with underlying architecture supporting master-slave replication

- Configurable replication count
  - Balance resource utilization with availability requirements

- High-speed failover

  Fast failover to replicated items based upon request

Case sudies

Where does Membase fit?

- Online applications with a lot of users
- Applications with growing datasets which need quick access

Users

- Who uses Membase?

Users: zynga

- Social game leader – FarmVille, Mafia Wars, Café World
- Over 230 million monthly users
- **Membase Server** is the 500,000 ops-per-second database behind FarmVille and Café World

Case Study: Ad targeting

Targeting

Target users based on what they have bought and the sites they have visited

Behavioral targeting

Target users based on their displayed behaviors online.

- **Audience Behaviors:** Target one of over 160 behavioral segments (e.g., Auto Intenders, Apparel Shoppers, Family Planners, Travelers, Investors, Health Seekers, Trendy Homemakers, Moviegoers and more).
- **Custom Audience Behaviors:** Target a custom segment of users who have displayed relevant, discrete behaviors such as site visitation and buying habits across various content categories.

Target users based on registration information

Demographic

Age, gender, income, kids – it's the meat and potatoes of targeting.

- **User/Household:** Target users based on attributes from user registration or third-party data (e.g. age, gender, income, kids).
- **Site:** Place your ads on the sites that are visited most frequently by your desired audience. We aggregate our inventory by demographic and psychographic attributes – based on comScore data. You can, for example, place your ad on sites that are visited by users who attended college, users who applied offline for a credit card in the last six months, user who traveled domestically over six times in the last six months, and many more.

Aol website

Case study: sharing network

ShareThis®

Case study: sharing network

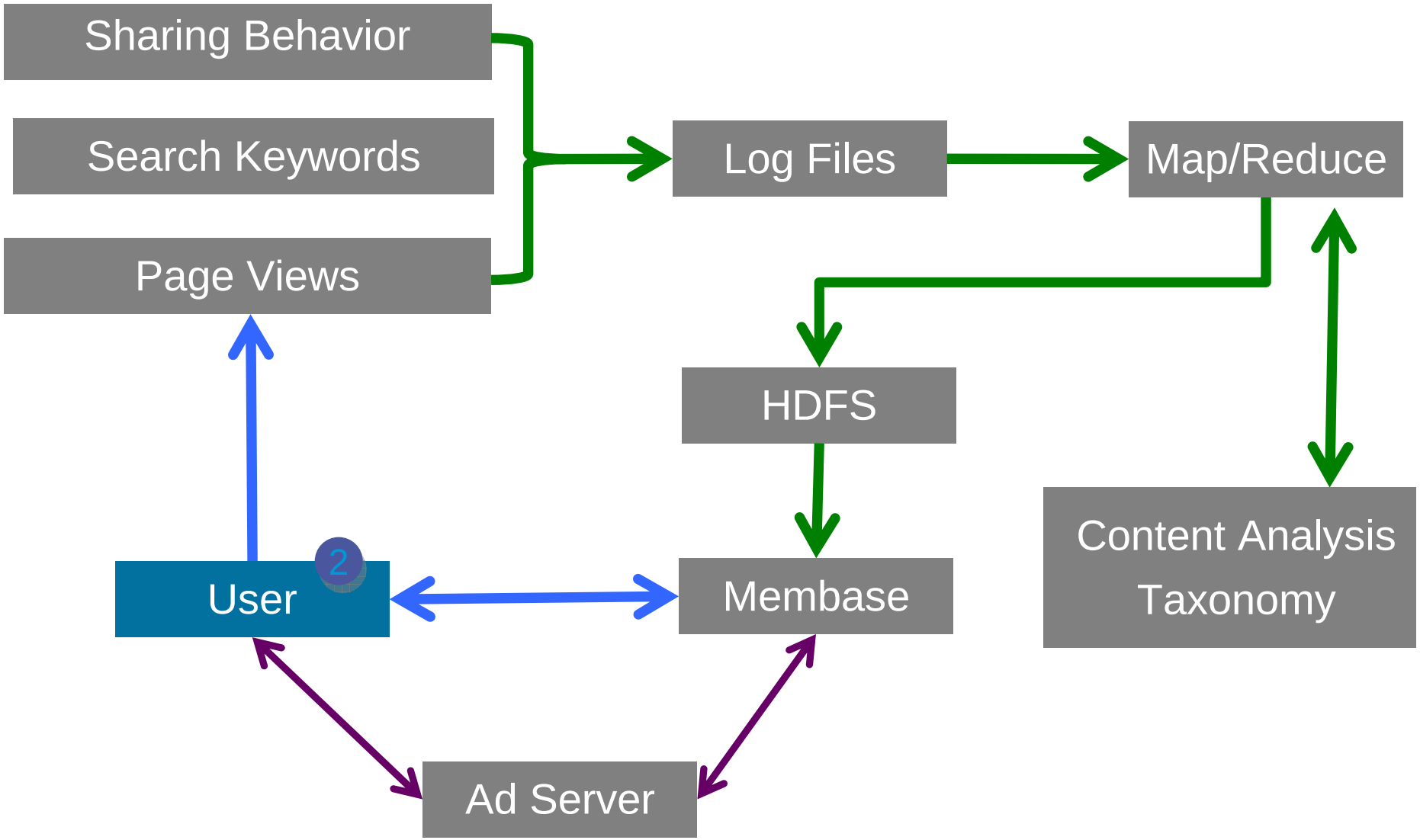
450/mo
million
consumers

50+
social channels

~850
thousand sites

1-800 flowers.com
STAPLES that was easy.
FOX NEWS .com
LA
Us MAGAZINE.COM
COSMOPOLITAN
CB
FOX NEWS .com
LA
delish
Mashable
FANDANGO

Case study: targeting

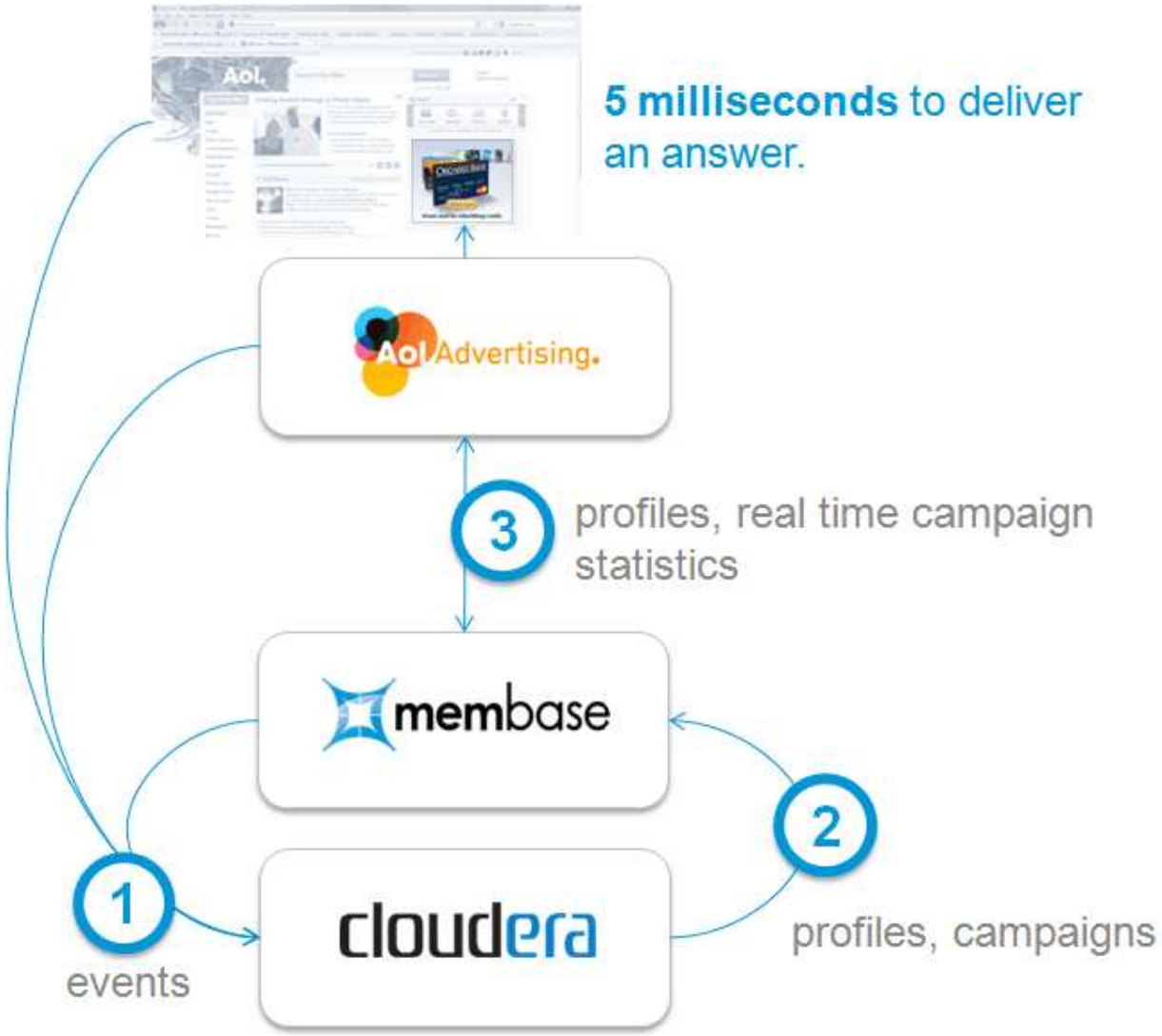


Case Study: Ad targeting

Aol Advertising.

- Data management challenges :
- to analyze billions of user-related events, presented as a mix of structured and unstructured data, to infer demographic, psychographic and behavioral characteristics (“cookie profiles”)
- make hundreds of millions of cookie profiles available to their AD targeting platform fast
- to keep the user profiles updated

Case Study: Ad targeting



Thanks