# 内存数据库服务运营之路

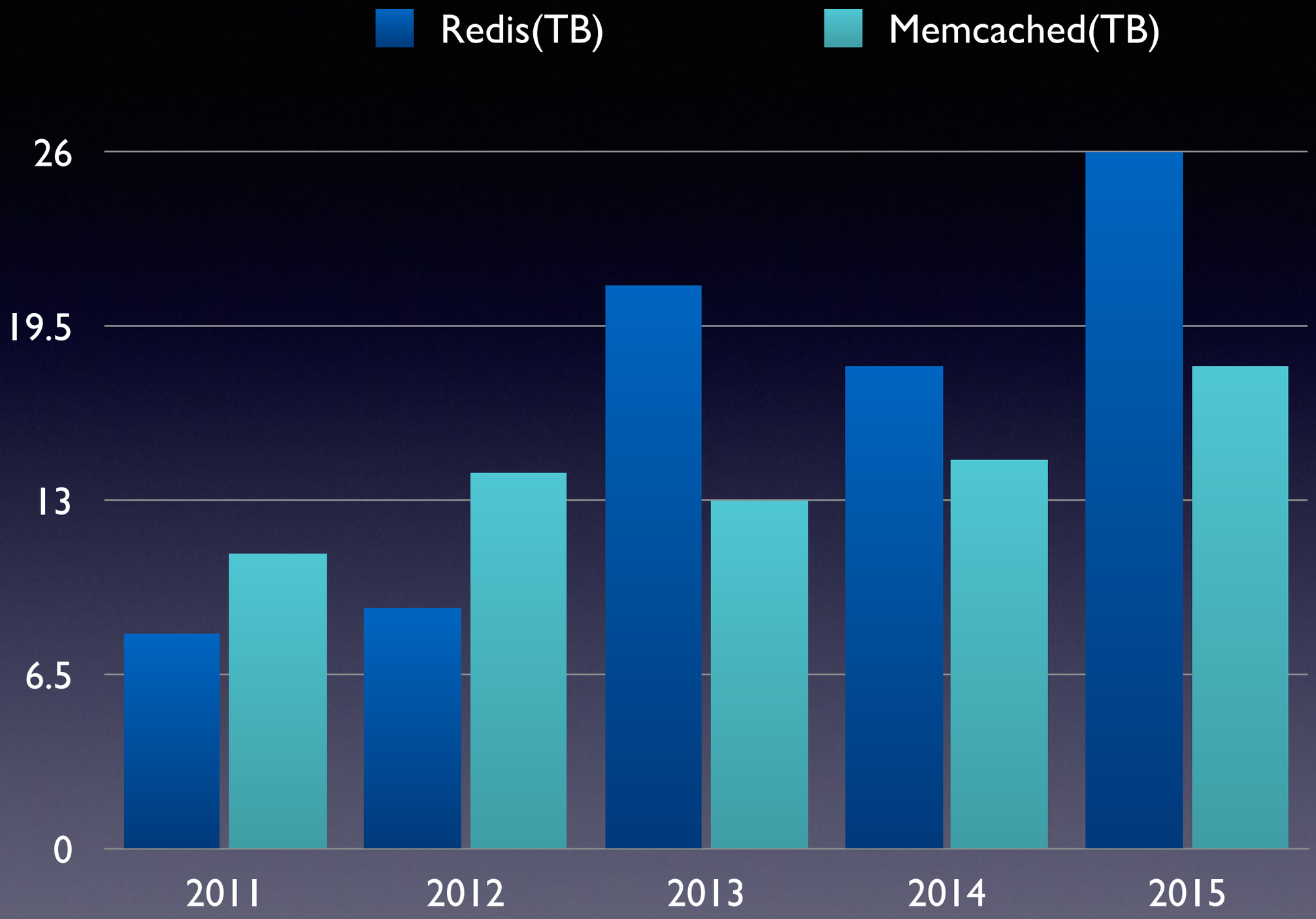
@启盼cobain

“RAM is the new disk...”

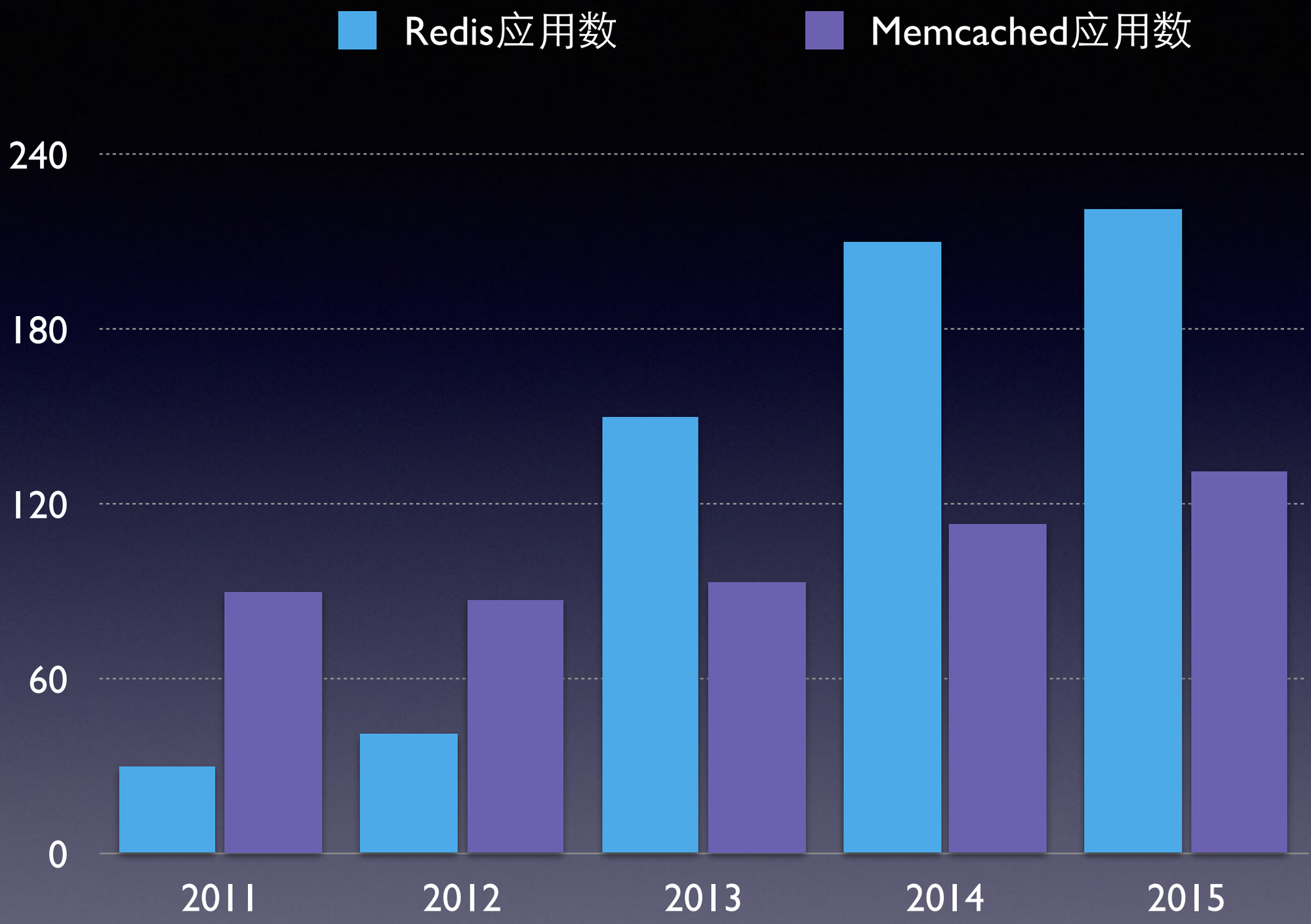
— Jim Gray

# 目录

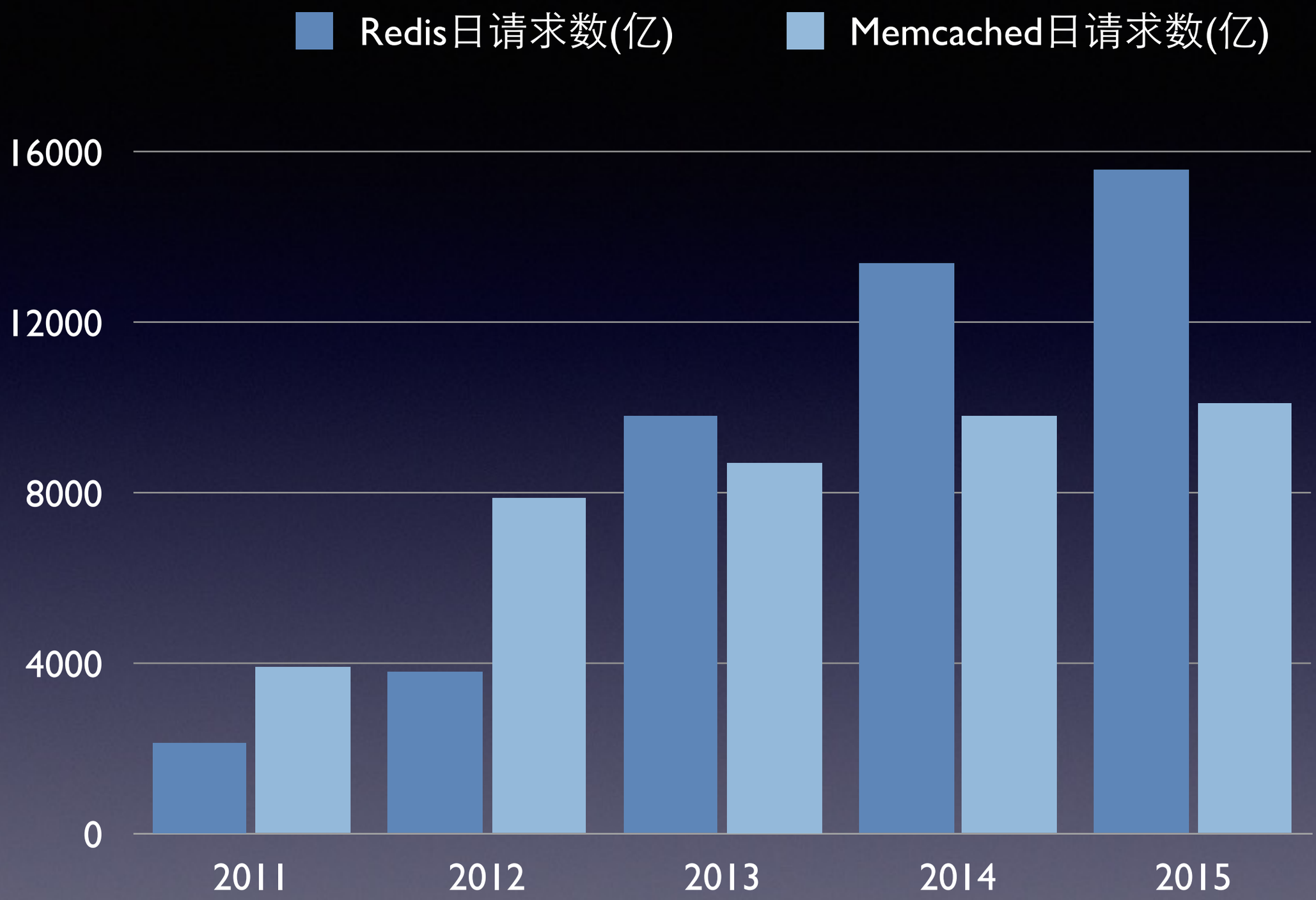
# 2011-2015




# In memory application roadmap in Sina




# In memory application roadmap in Sina




# In memory application roadmap in Sina

# 2011-2015

- 面临挑战
  - 2011微博索引Memcached请求量翻番 – > 缓存失效风险
  - 2012微博计数服务Redis改造上线 – > Redis高可用
  - 2013异地机房部署 – > 跨机房数据更新
  - 2013微博核心缓存请求量再次翻番 – > 缓存面临超级热点
  - 2013年内存容量增长三倍 – > Redis应用内存疯长
  - 2013 2014 App数量及请求量增长四倍 – > 运维效率
  - 2015 2016 ?

# Memcached Roadmap in Sina

Consist Hash
5 Apr, 2011

Distribute to more Servers

Master Slave
5 Apr, 2012

Avoid cache effectiveness

Level 1 Group
5 Aug, 2012

Handler Super Hot

Multi IDC Support
5 Apr, 2013

Support multi data center cache updates

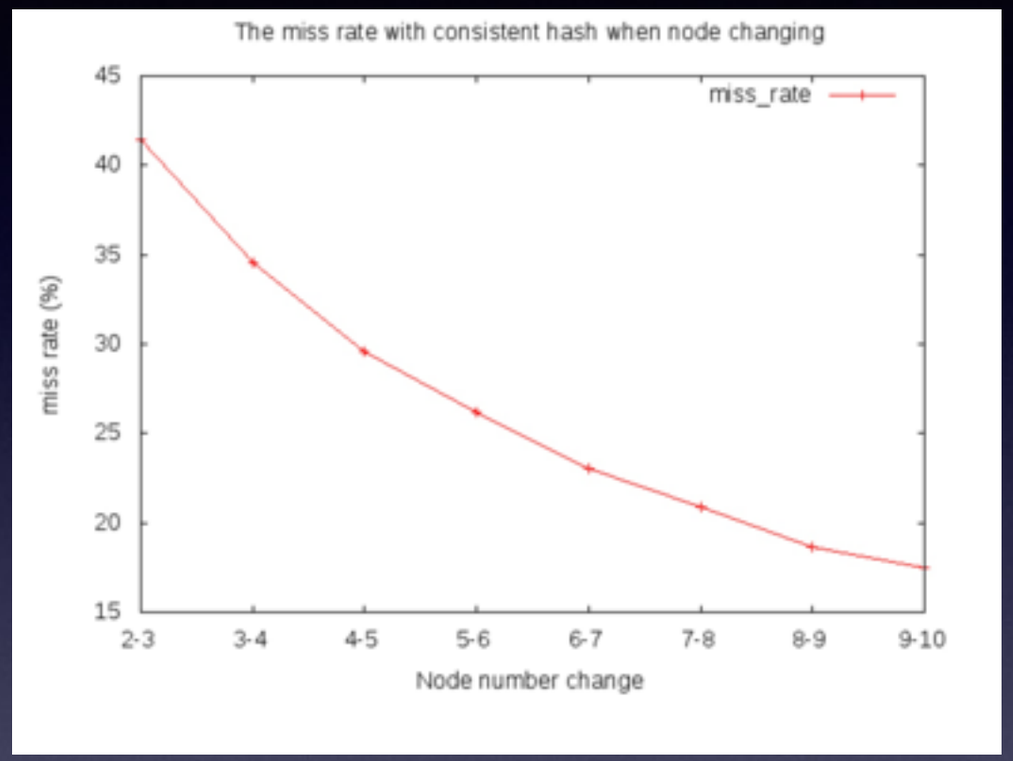
Cache Service(Twemproxy)
5 Apr, 2014

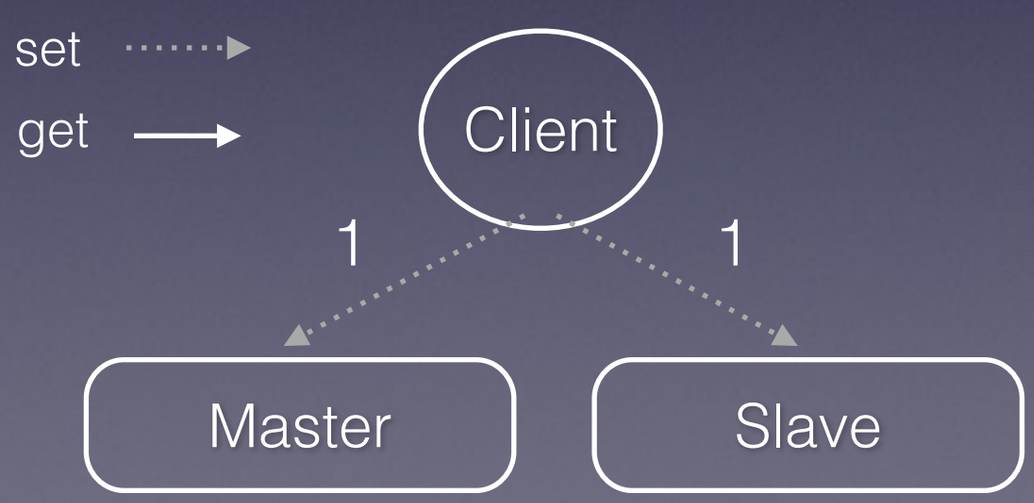
Simplify client with cache middleware

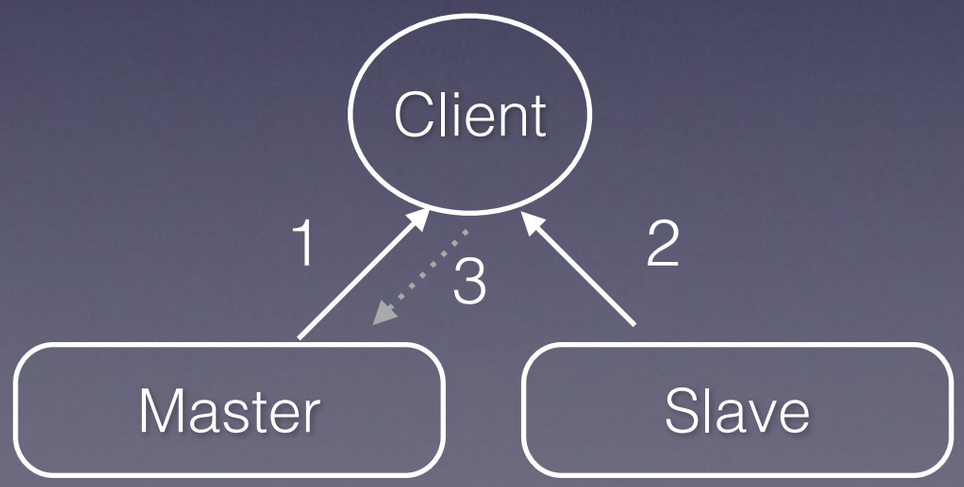
2011 2012 2013 2014 2015 2016

# 应对缓存实效风险

- 共享内存，更多分片 (without multiget)
- 主备缓存(with multiget)

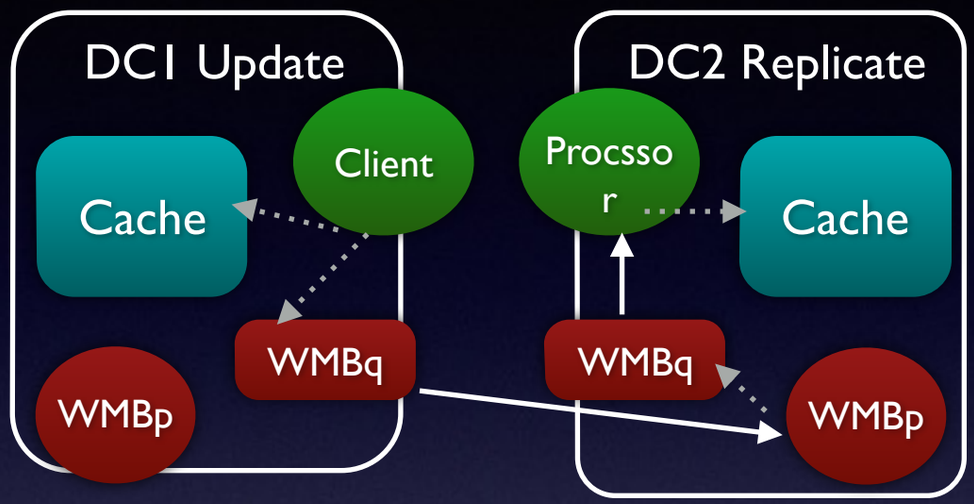


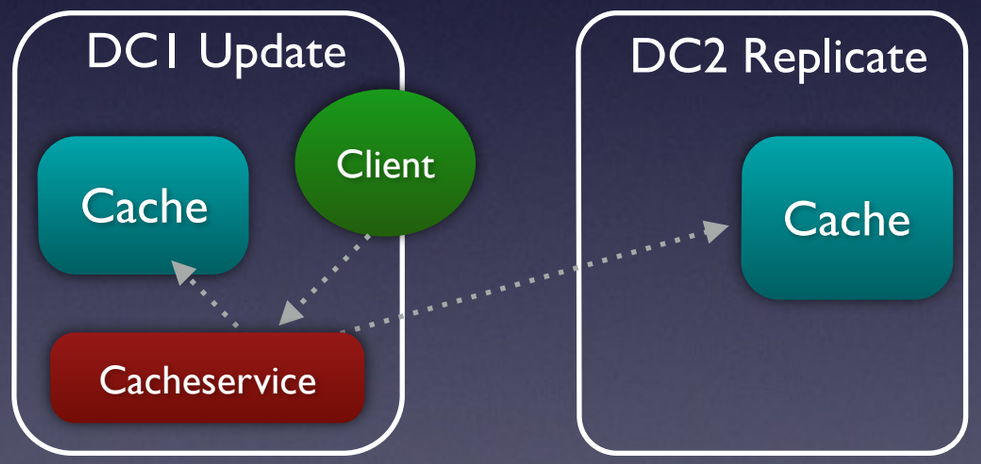



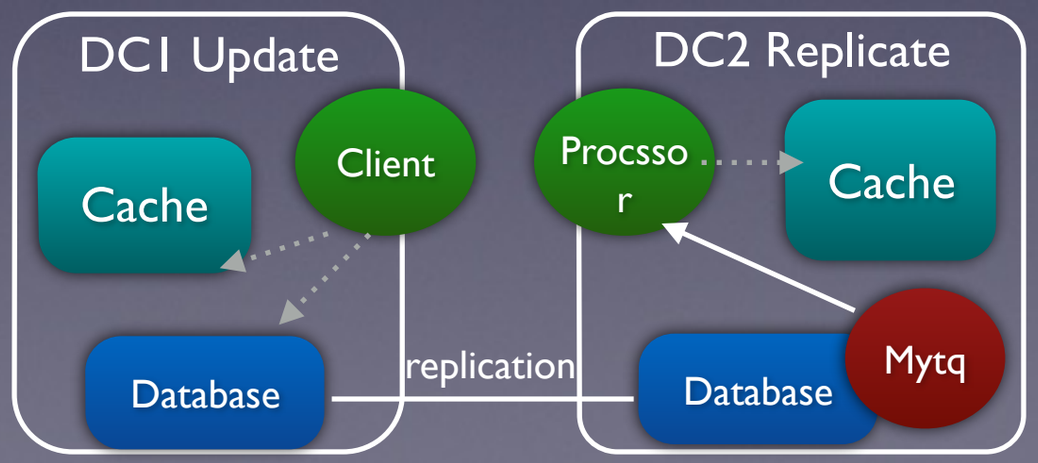



# 应对跨机房数据更新

- **消息总线 (e.g. WMB)**
  - 优势：不依赖队列外其他组件
  - 劣势：消息总线复杂性较高
- **中间件更新 (e.g. Cacheservice)**
  - 优势：应用透明，相对运维友好
  - 劣势：可靠性较低
- **数据库复制 (e.g. MySQL Replication + Mytriggerq + Processor)**
  - 优势：可靠
  - 劣势：维护额外数据库同步，消息格式转化相对受限。

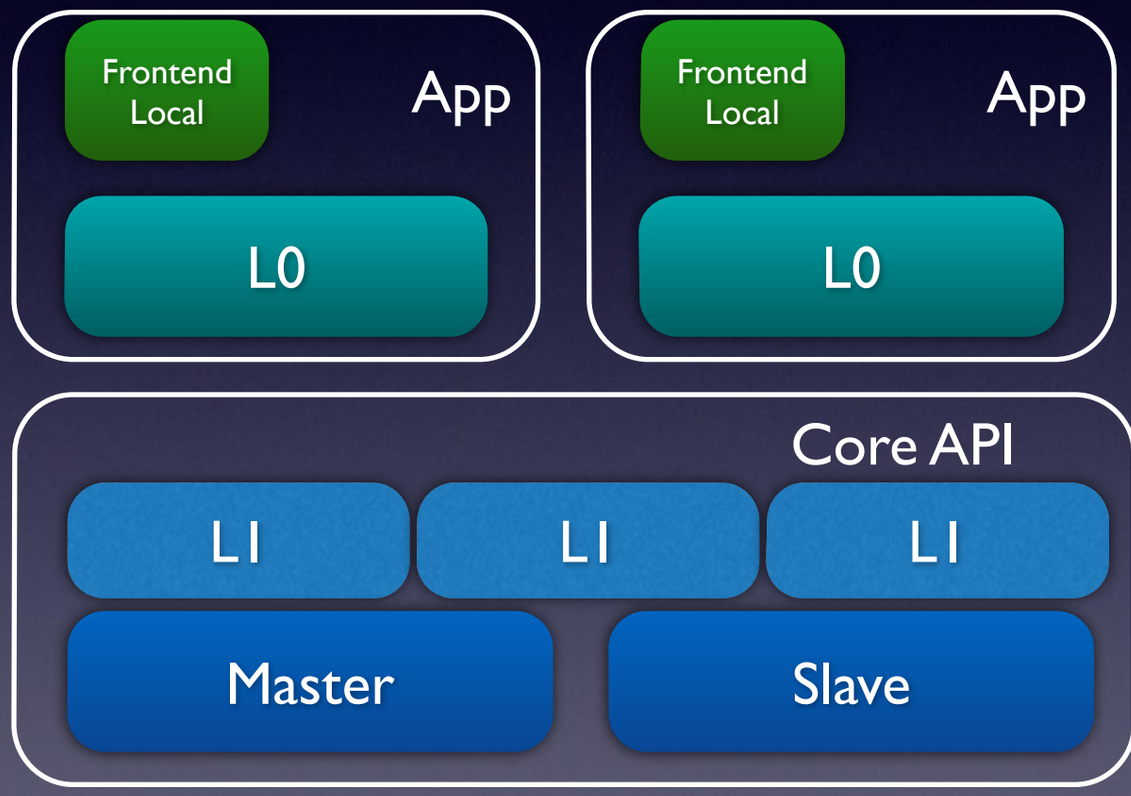


# 应对超级热点

- 多级缓存
- 核心缓存快速构建数据副本
  - Memcached L1 Group



# Redis Roadmap in Sina

**Fist redis application online**
5 Jan, 2011

Came in Redis of the official version 2.0

**Eredis**
5 Apr, 2012

An special redis version support incremental replication

**Rediscounter**
5 Sep, 2012

A special reds version just for counts.

**Upgrade to Redisscounter**
5 Apr, 2013

Redisscounter 1.0.18 release a redis stable version custom made to save counters.

**Upgrade all Redis support dynamic upgrade**
5 Sep, 2013

Redis 2.4.18 upgrade all eredis & reds to 2.4.18, support dynamic upgrade

**Upgrade all Redis support cluster sharing AOF position**
5 Mar, 2014

Redis 2.4.19 support increment replication & cluster sharing AOF position

**Support save count to range table**
5 Apr, 2014

CounterService 2.0 support save increment count to range table

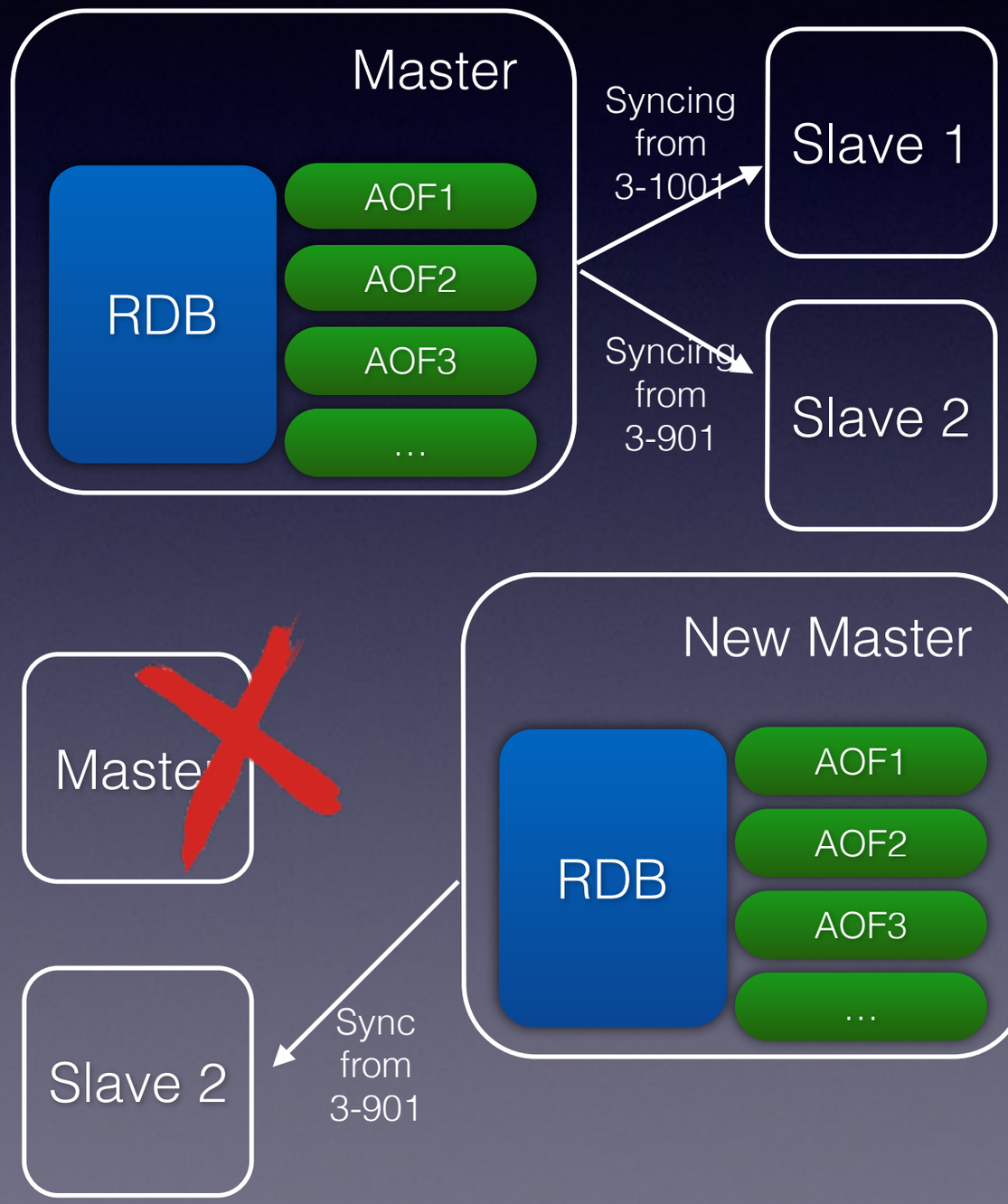
**Support save old range table to SSD**
5 Sep, 2014

Counterservice 3.0 support save old range table to SSD

2011 2012 2013 2014 2015 2016 2017

# Redis高可用

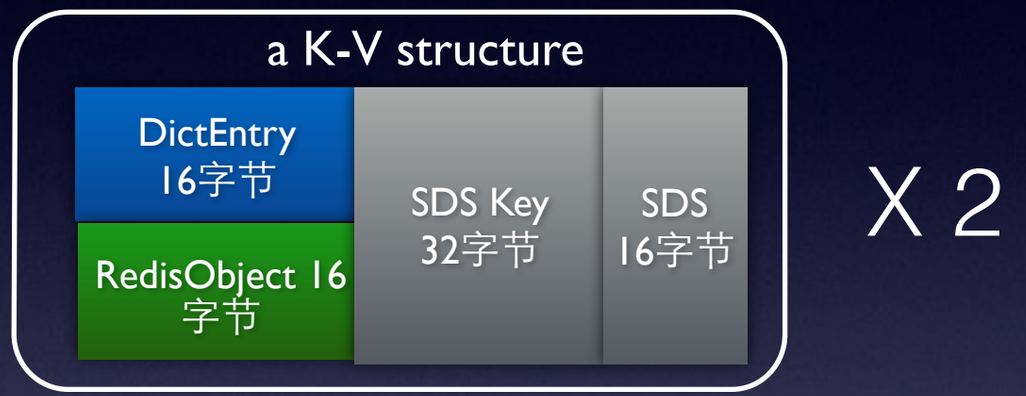
- 一主多从
  - Slave故障自动摘除
  - Master故障选主后闪恢复



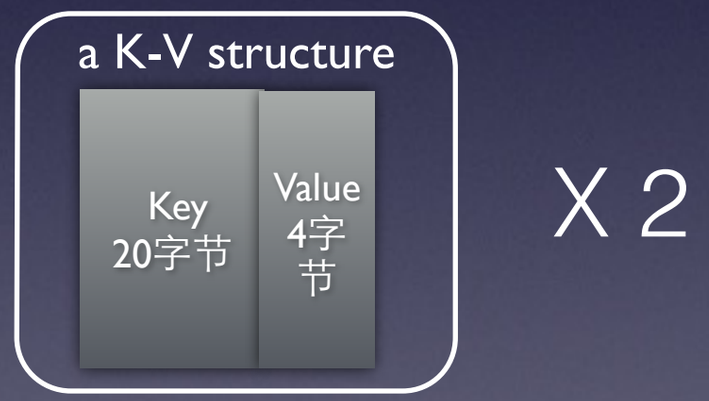
# Redis内存疯涨

- Cache化改造
  - store:cache 9:1 -> 6:4
- 数据结构优化
  - Redisscounter
  - Counterservice

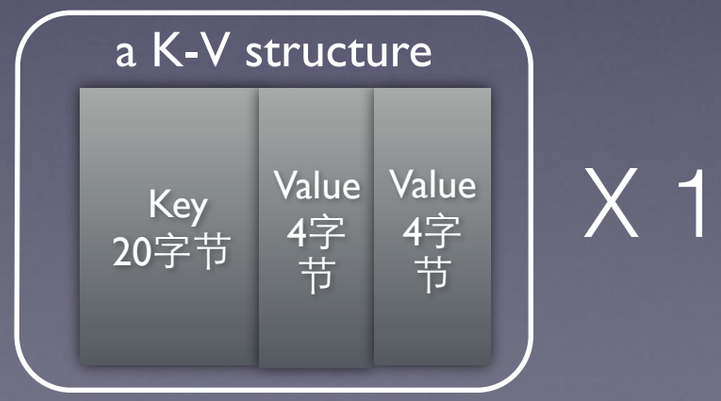
存储一个Key 20字节， 两个Value 4字节计数




3倍容量优化




2倍容量优化



# 应用存储架构演进

- 计数服务存储演化

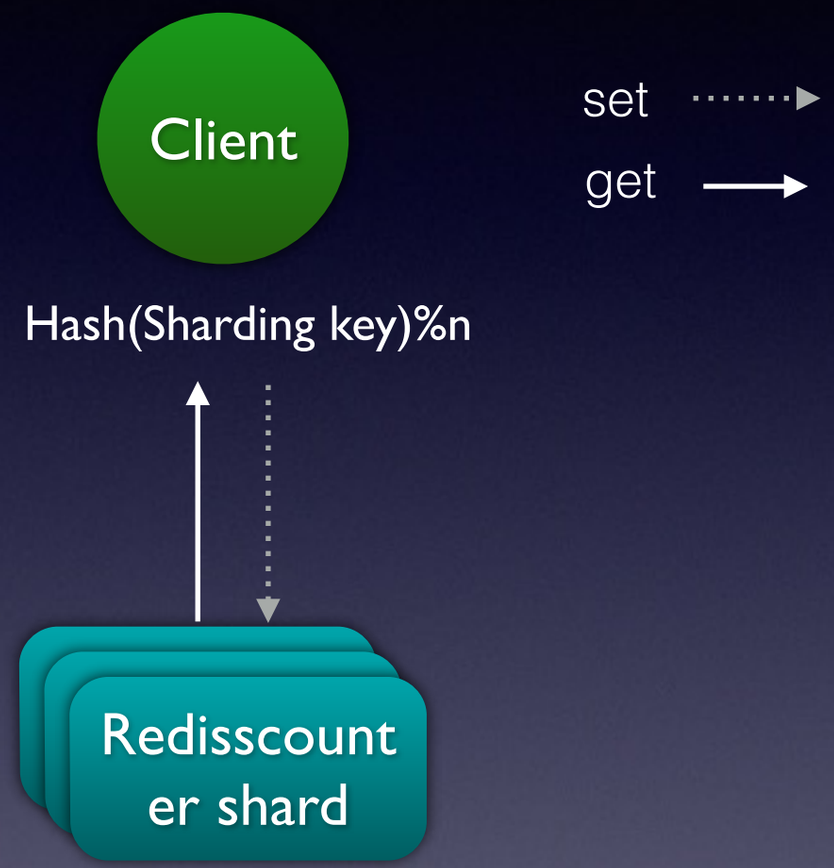



# 计数服务存储演化

- 十亿级计数

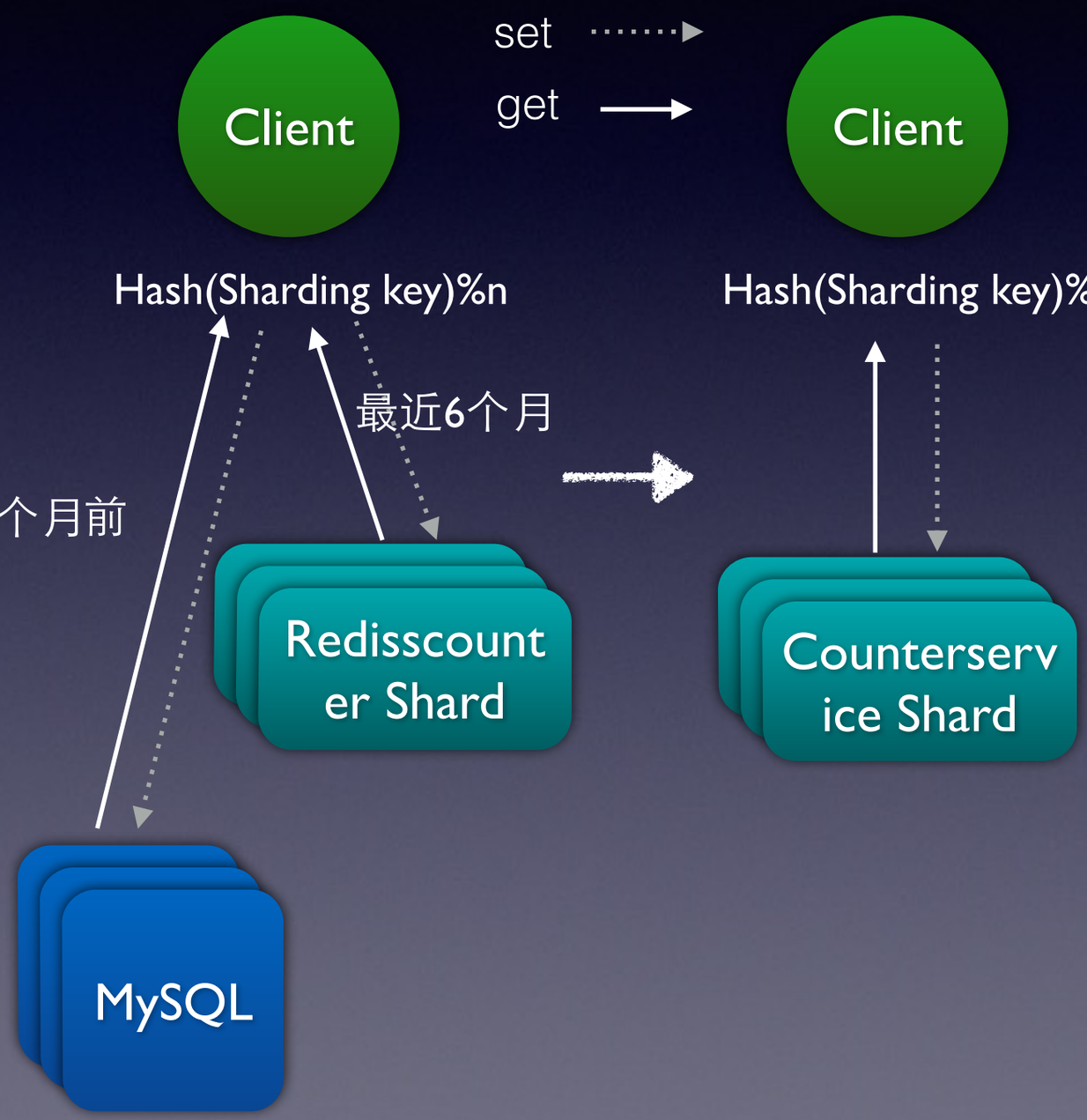
- 用Redis存储1亿计数需要多大空间?

- 用户纬度增长(e.g 用户关注数，粉丝数，微博数)



# 计数服务存储演化

- 百亿级计数 (Counterservice 2.0)
- 微博纬度增长(e.g 微博转发评论数)
- MySQL热点更新响应不够稳定



# 计数服务存储演化

- 千亿级计数 (Counterservice 3.0)

- 内存table写满后自动dump至SSD

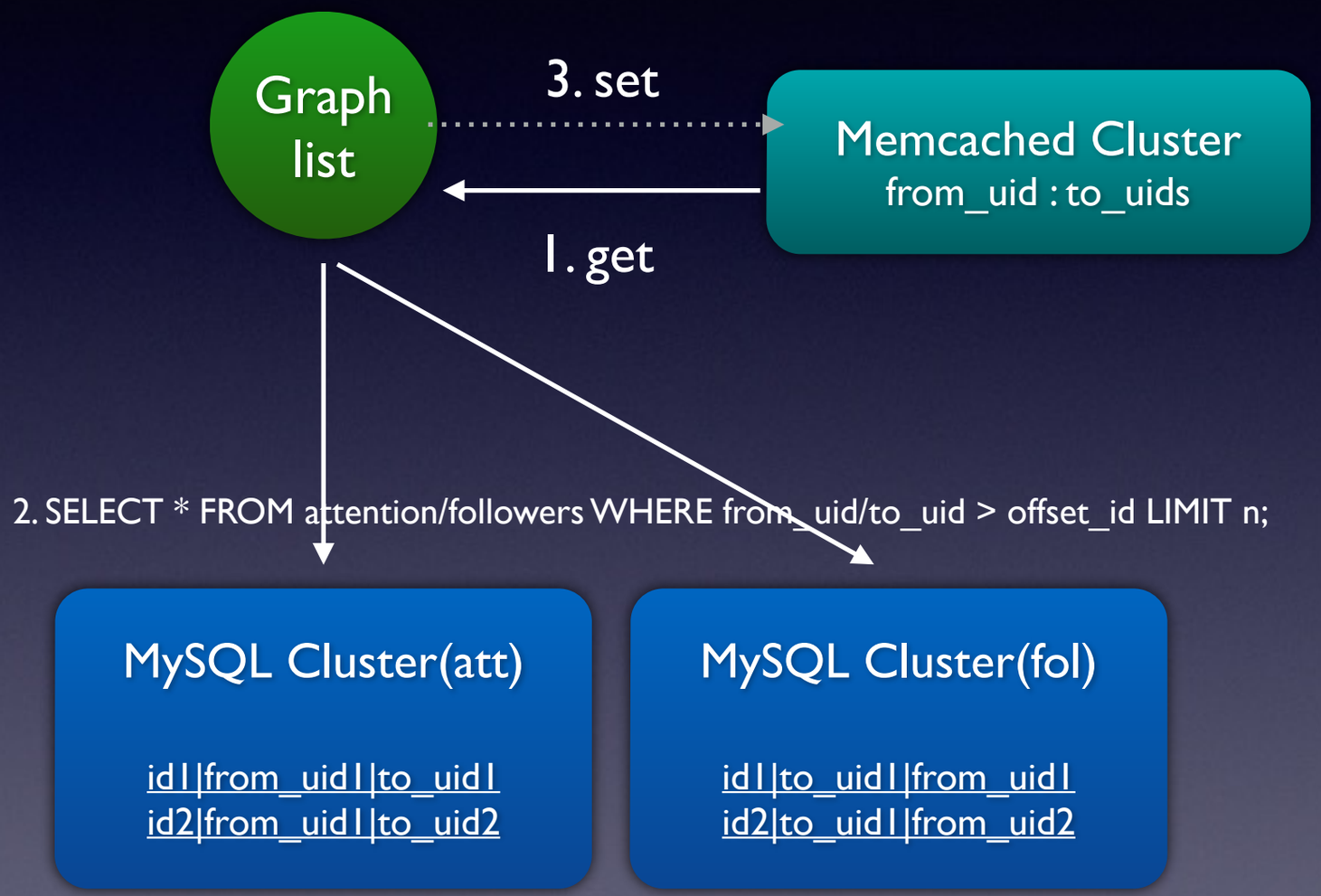
- LRU cache防止历史热点

# 应用存储架构演进

- 社交图谱存储演化

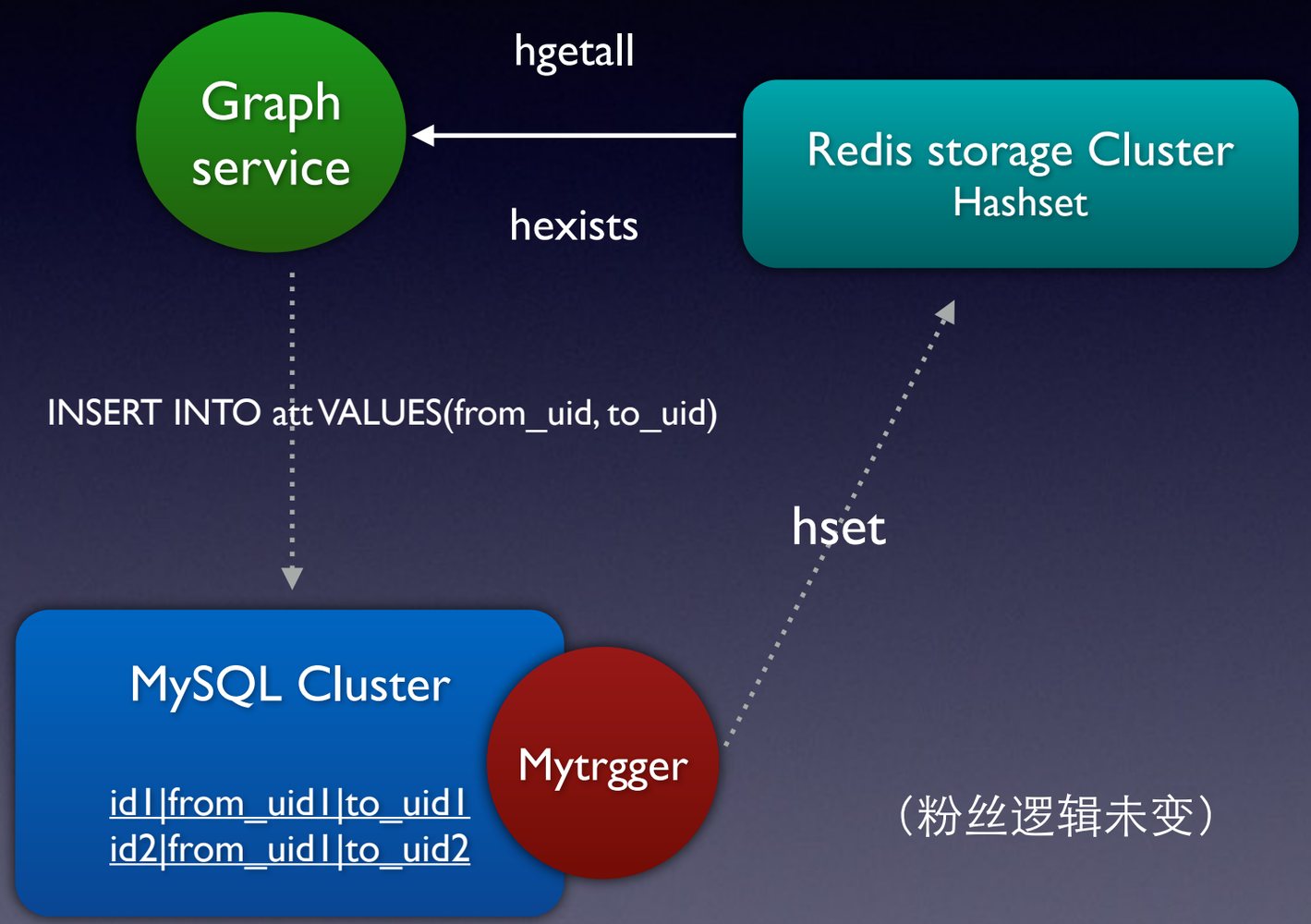
# 社交图谱存储演化

- 社交图谱 – 初级阶段
  - graph_list
  - attention/followers
  - Memcached + MySQL



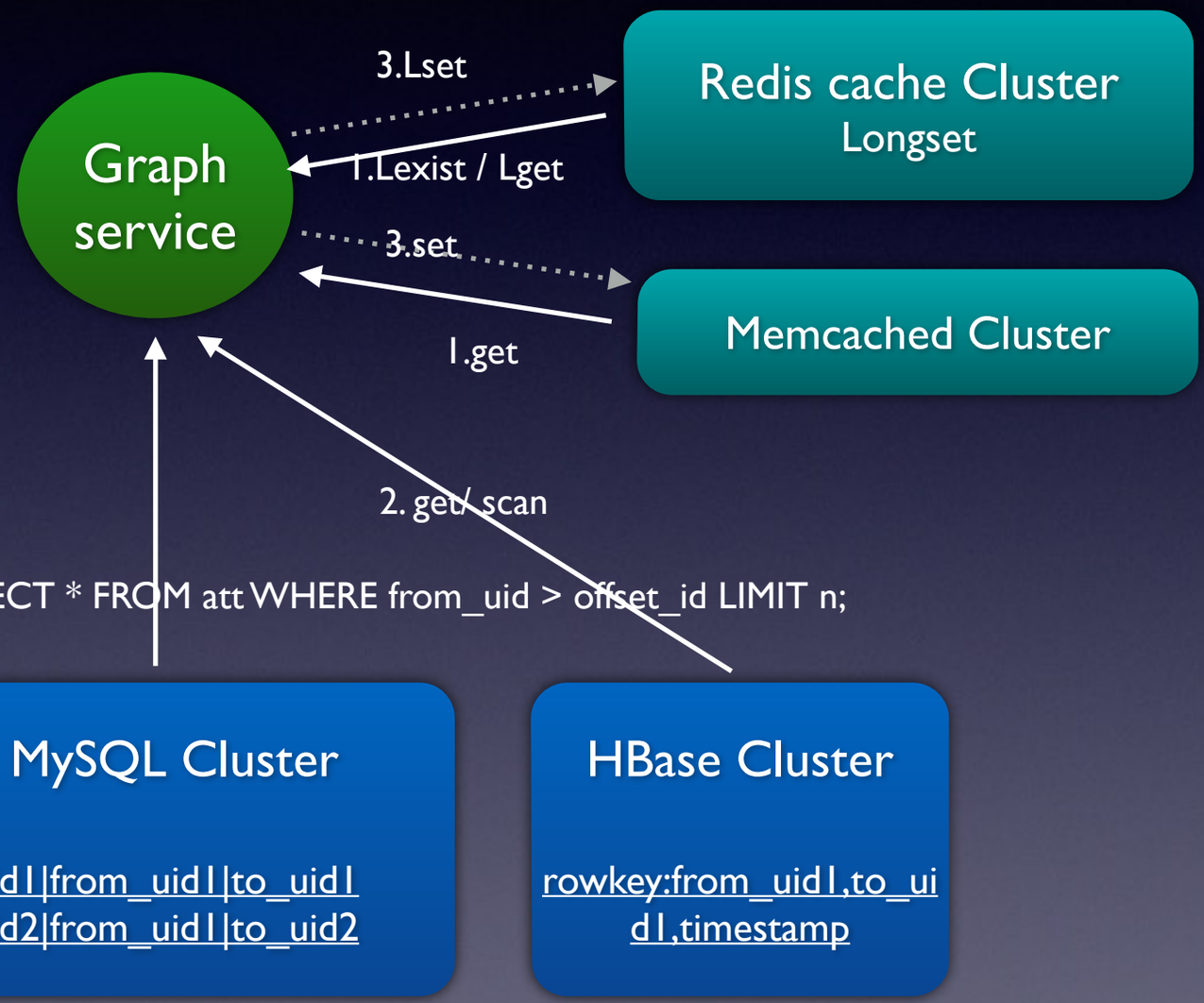
# 社交图谱存储演化

- 社交图谱 – 中期阶段
  - check attention/followers
    - Redis Hashset
  - MySQL+Mytrigger+Redis



# 社交图谱存储演化

- 社交图谱 – 进阶
  - 内存占用成本
    - Redis Storage到Redis Cache
- Hset性能瓶颈
  - Longset
- 优化长尾存储
  - HBase



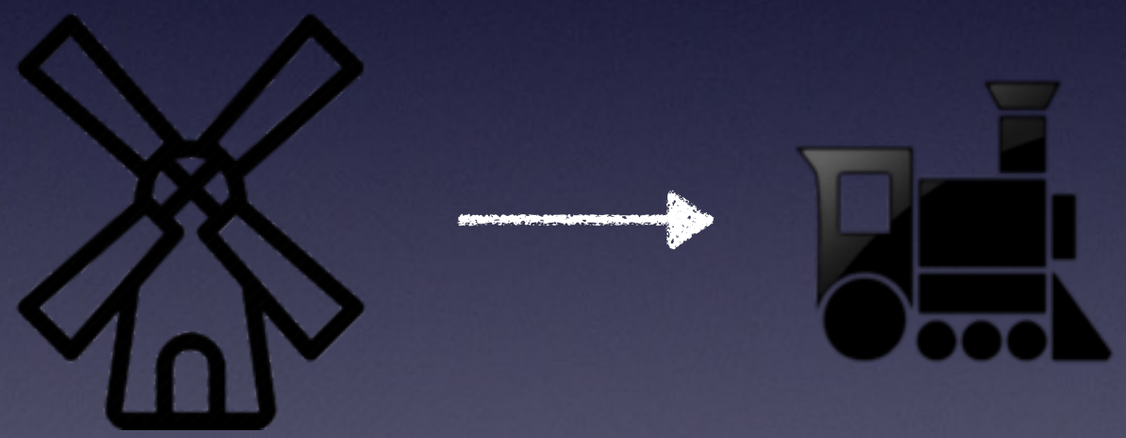
# 社交图谱存储演化

- 未来计划 – 持续分级存储
  - 存储层冷热分离至HBase
  - 缓存层冷热分离至SSD


OPS系统更要给力...

# OPS运维系统架构演进

- 小作坊运维
- 运维系统1.0
- 运维系统2.0



# OPS运维系统架构演进

- 小作坊运维
  - 独立监控报警系统
  - 多套运维系统共存
  - 工单进展难以跟踪
  - 运维系统多语言开发 php python

# OPS运维系统架构演进

- 运维系统1.0
- 统一中心管理
- 单模块架构
- 运维系统统一python

# OPS运维系统架构演进

- 工业时代2.0
  - 模块化，服务化，可持续迭代
  - 数据驱动

# 反思与总结

- 应用驱动，不幻想需求
- 没有银弹，避免滥用
- 架构尽量化繁为简
- 运维友好，保证服务生命力
- 分享，好的技术应该推广
- 服务意识，关注应用视角

# 反思与总结

- Think big, act small!

# Q&A

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