Polyglot Persistence

RED | VENTURES

Majid Fatemian

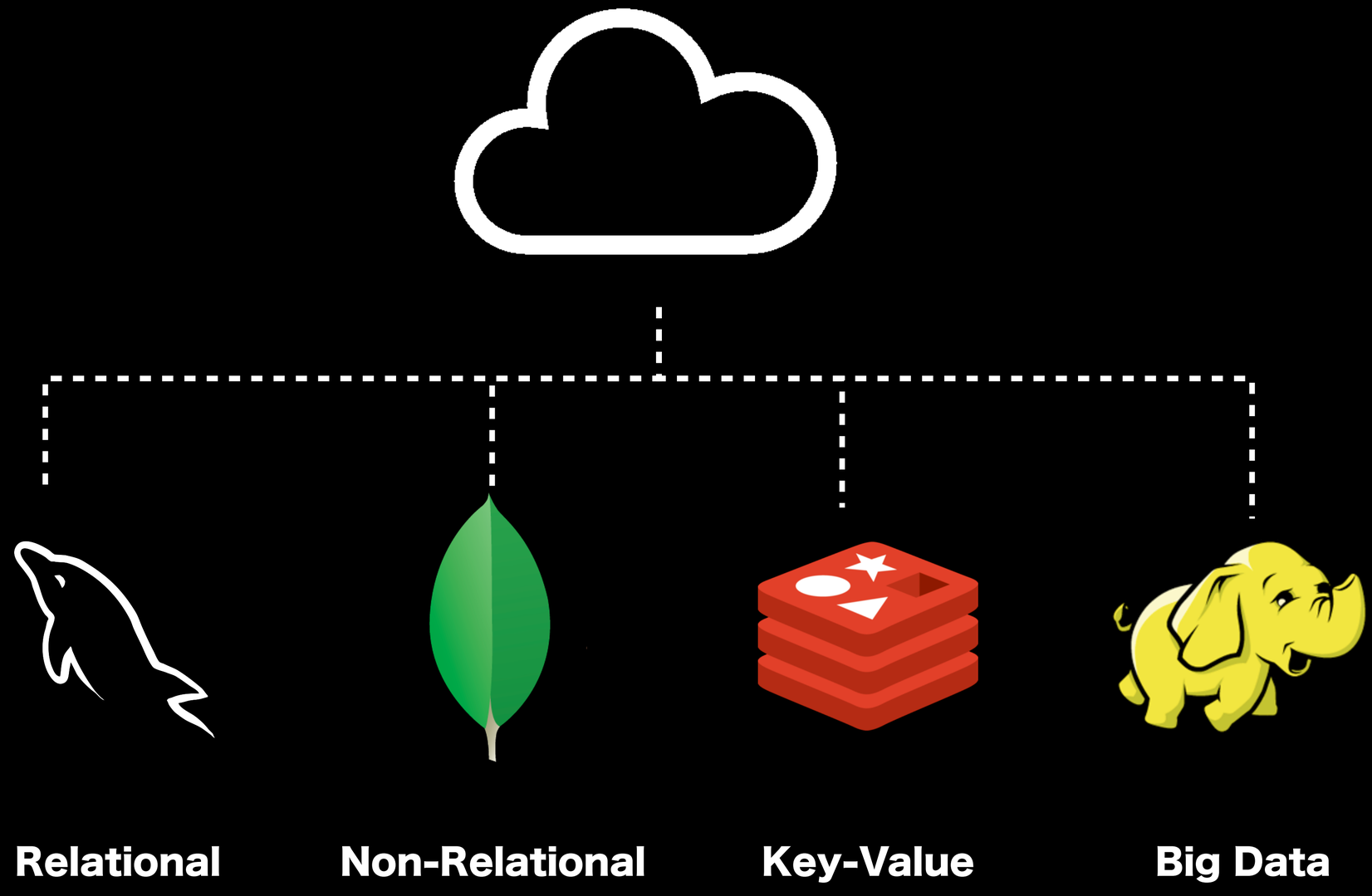
@majidfn

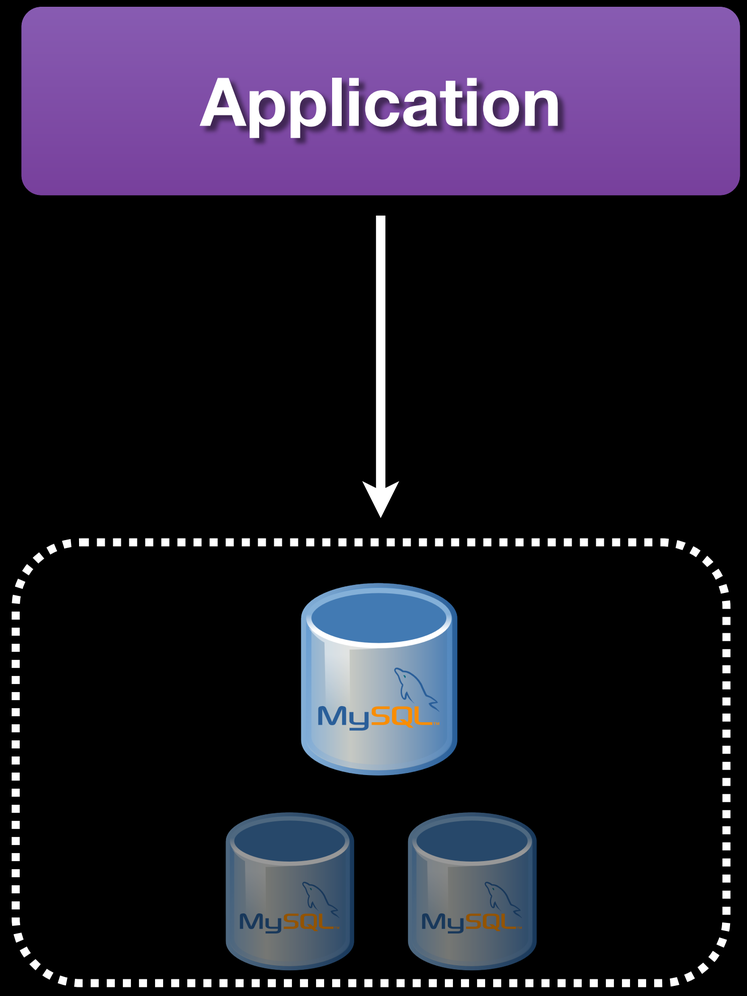
ASSASSIN'S CREED™

FARCRY

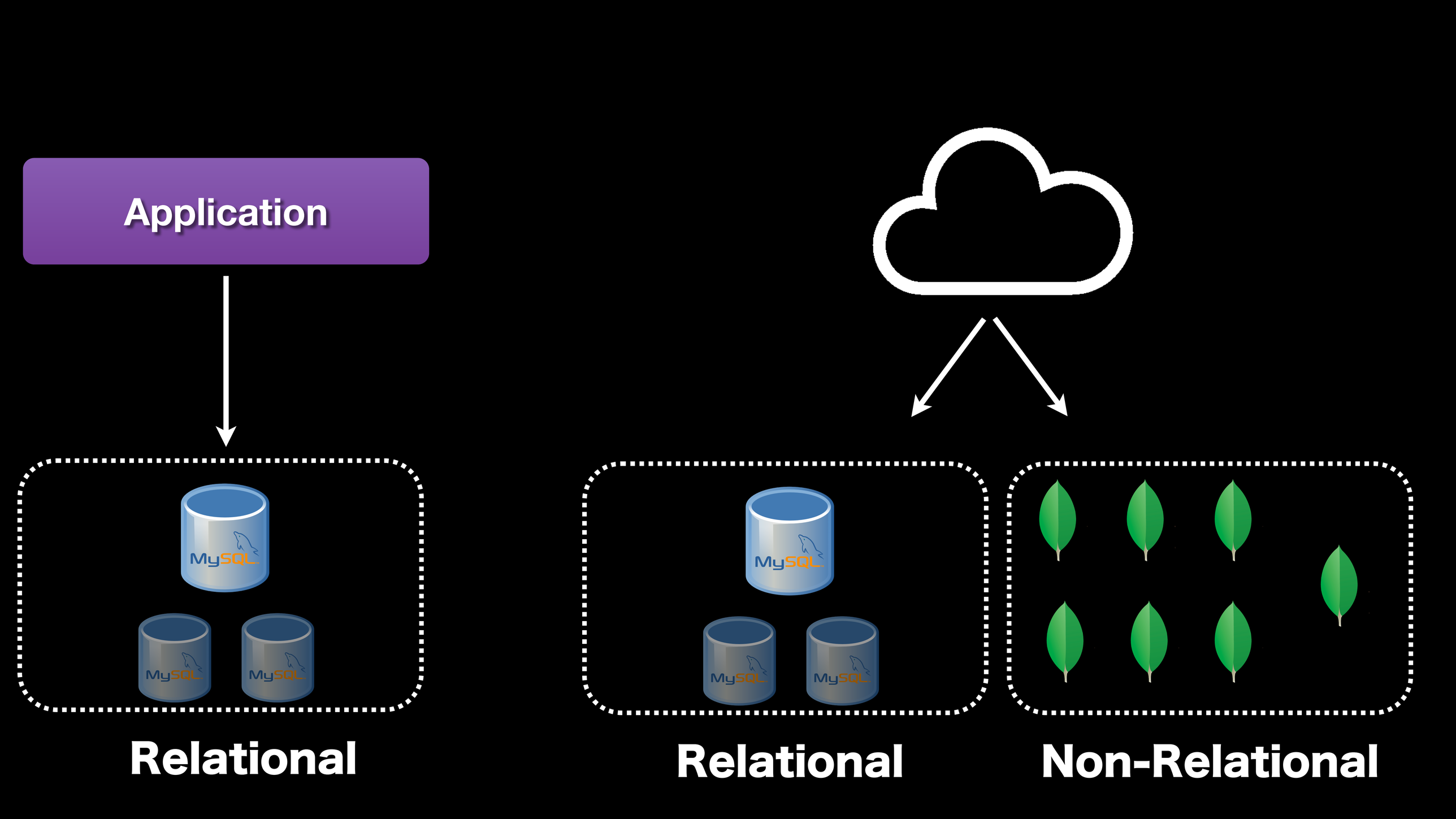
TOM CLANCY'S RAINBOW SIX SIEGE

YOURSHAPE

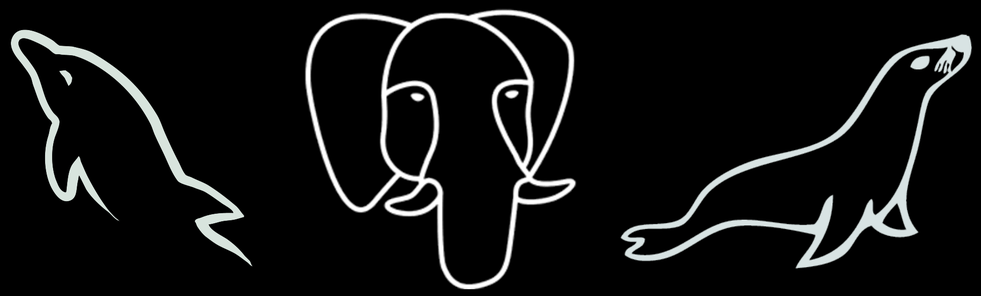

Relational
Non-Relational
Key-Value
Big Data



Relational


Application
MySQL
MySQL
MySQL
MySQL
MySQL
MySQL
Relational
Relational
Non-Relational

Relational



DATA

BIG DATA

Capture

Search

Storage

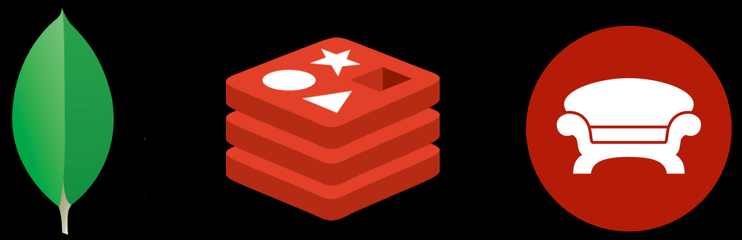
Analysis

Query

Privacy

Visualize

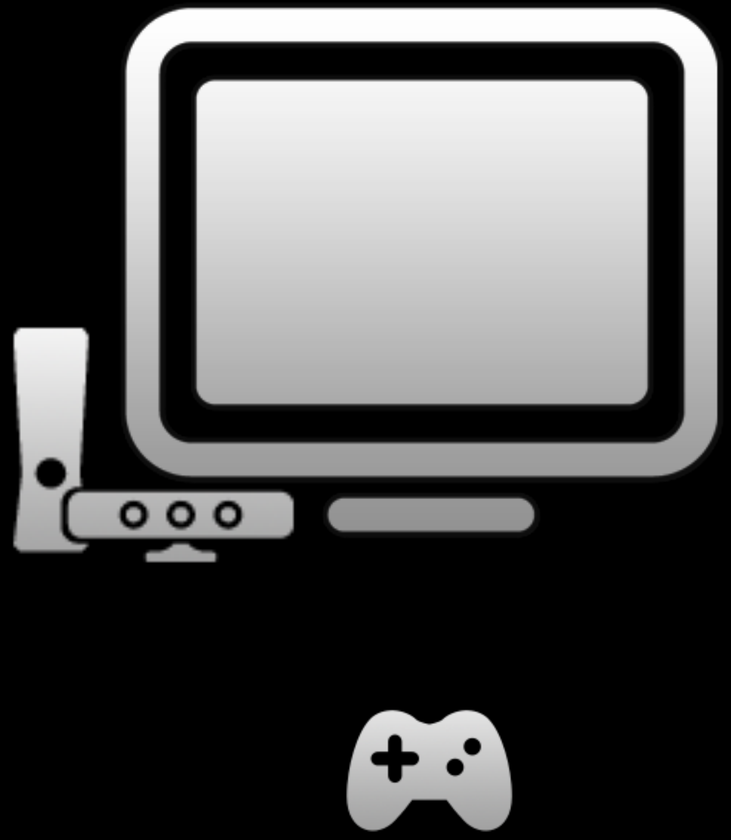
Non-Relational

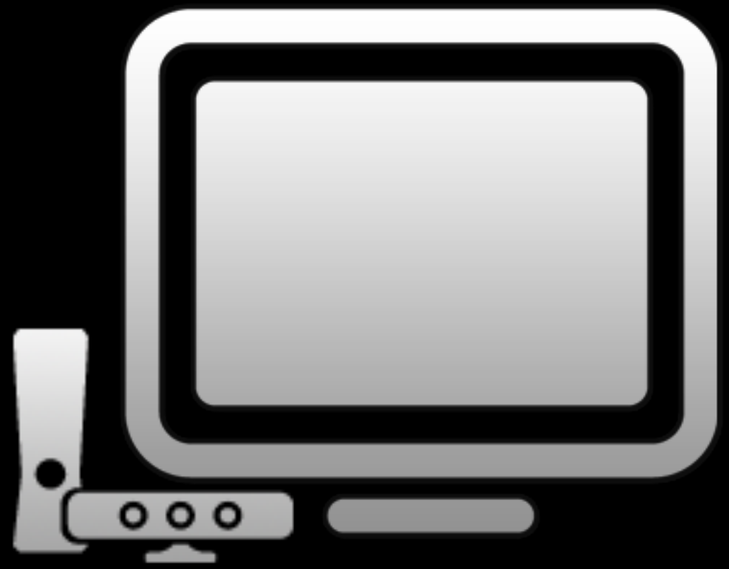


Non-Relational

Cluster

Schemaless

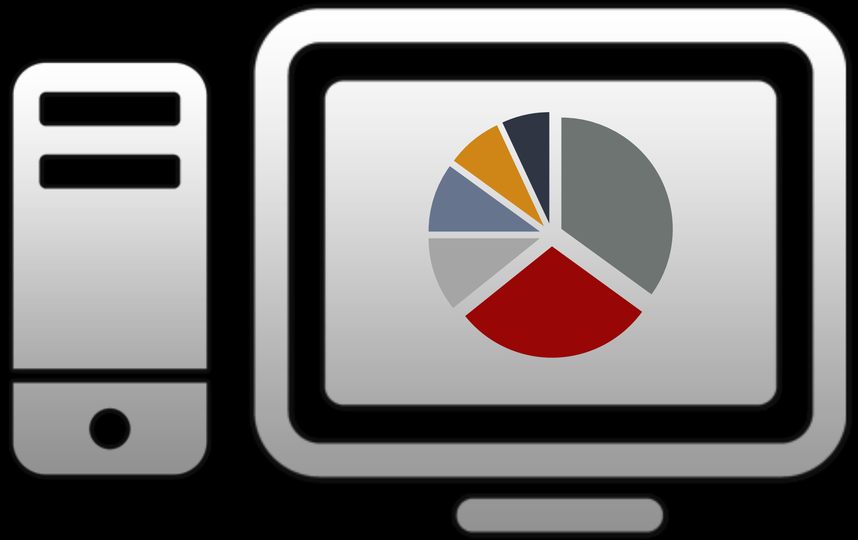


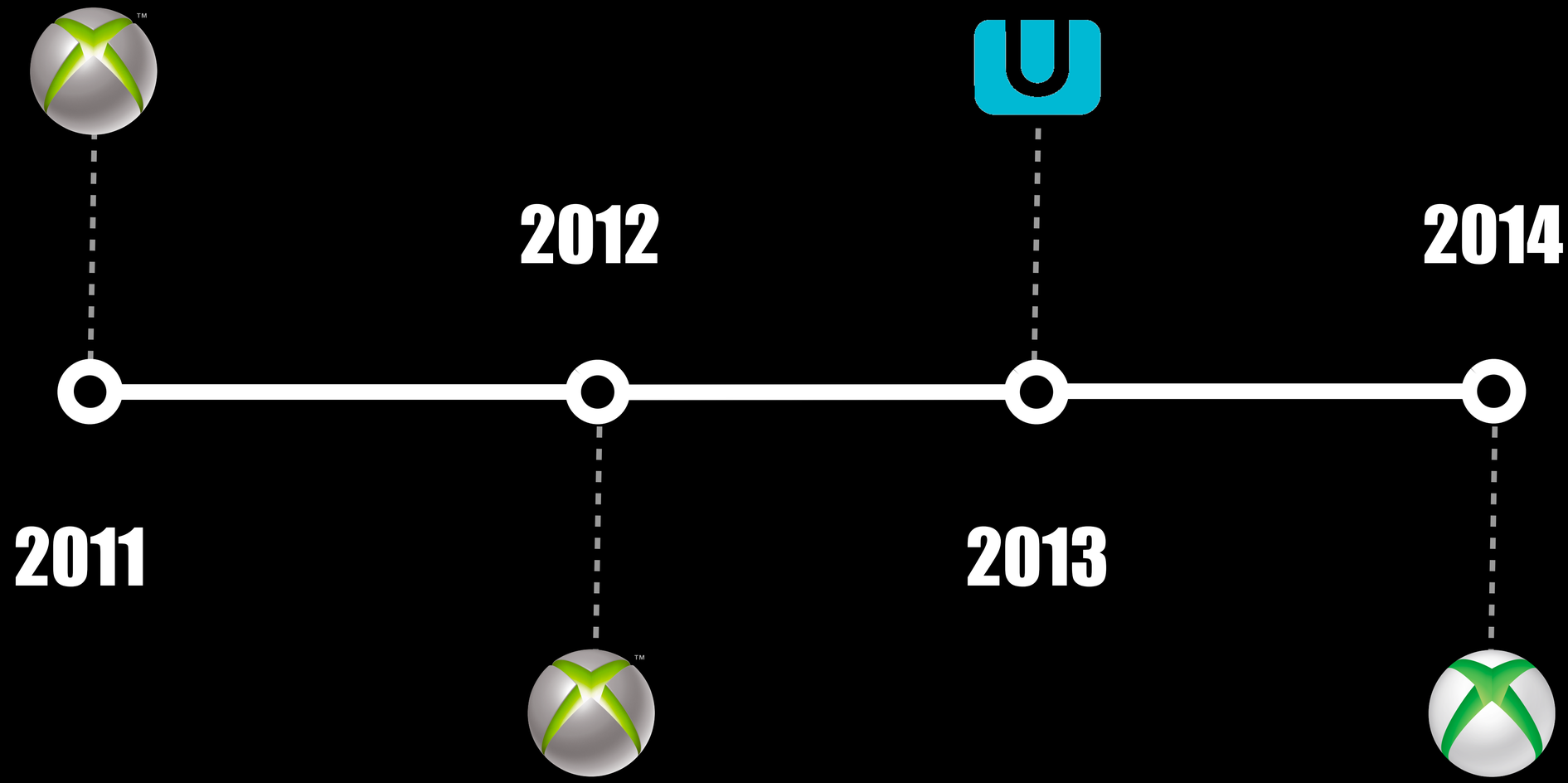


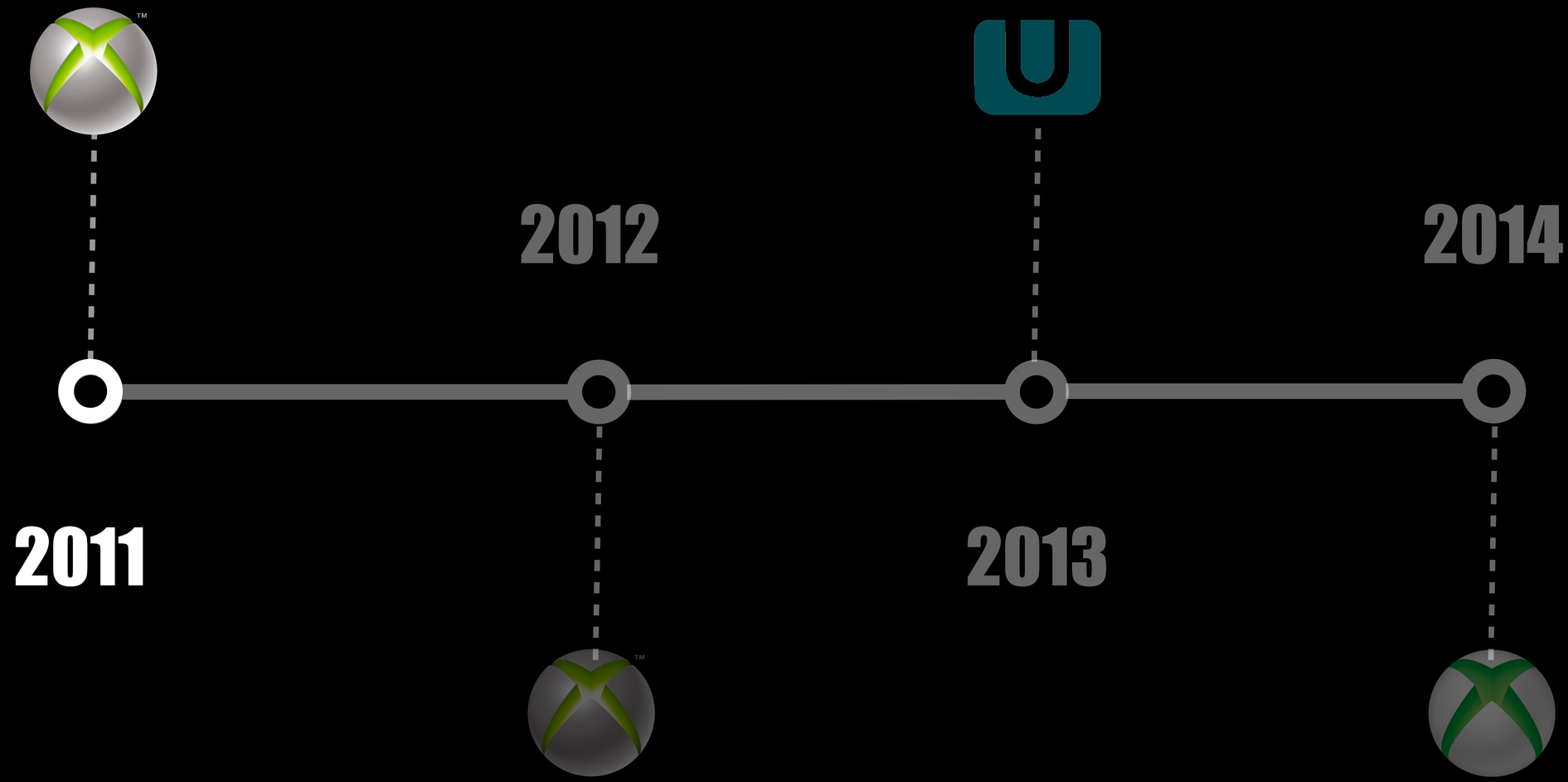
2 x XBOX 360

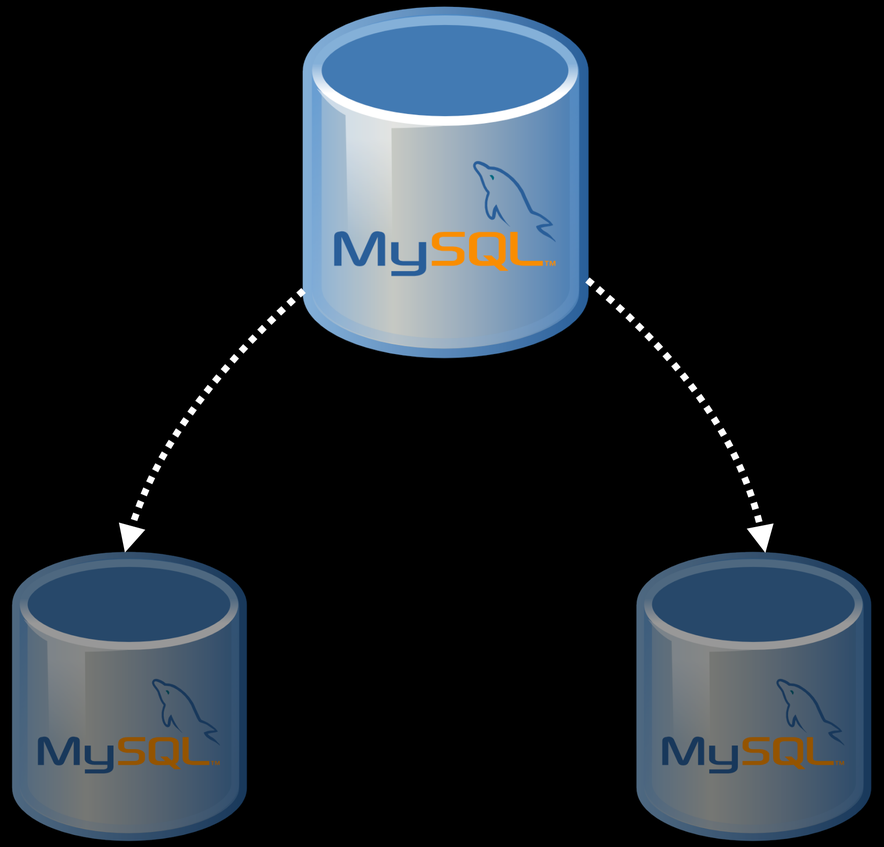
1 x Wii U

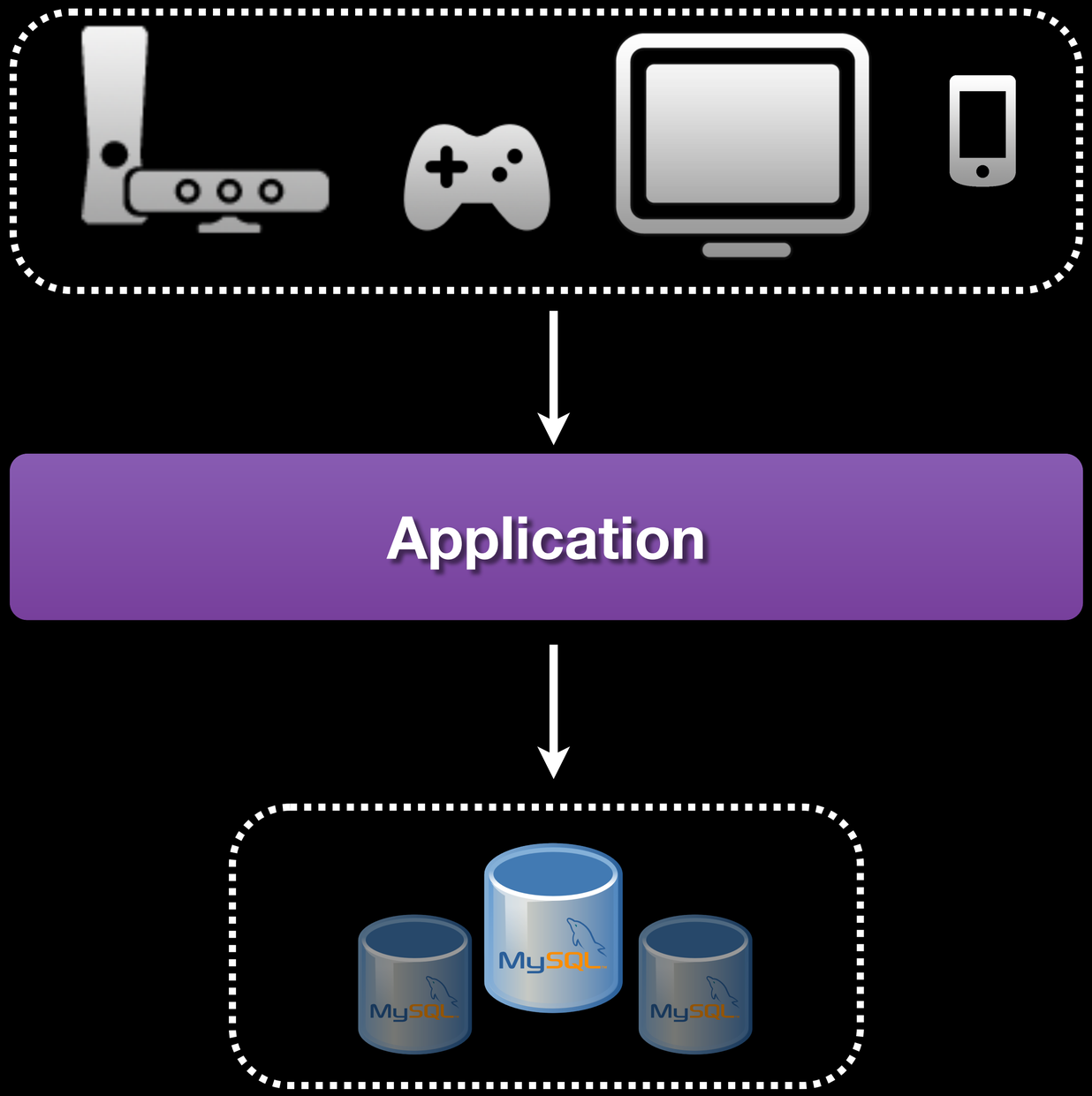
1 x XBOX ONE




2011
2012
2013
2014


2011
2012
2013
2014


MySQL
MySQL
MySQL


Application
MySQL
MySQL
MySQL

Relational

Consistency

{

ACID

Normalized

Profile

Player ID	Name	Location
1000	John	US
2000	Catherine	CA
3000	Paul	CA
4000	Kylee	US

Activity

Player ID	Map ID	Difficulty	Score
1000	223	E	5
2000	673	H	4.5
1000	451	M	4
2000	980	H	3

Profile

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1000	223	E	5
2000	673	H	4.5
1000	451	M	4
2000	980	H	3

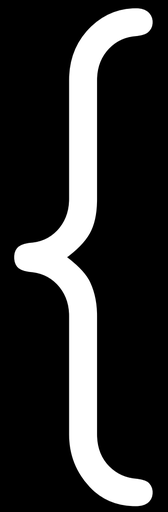
Relational

Availability

- Replication
- Fault Tolerance

Relational

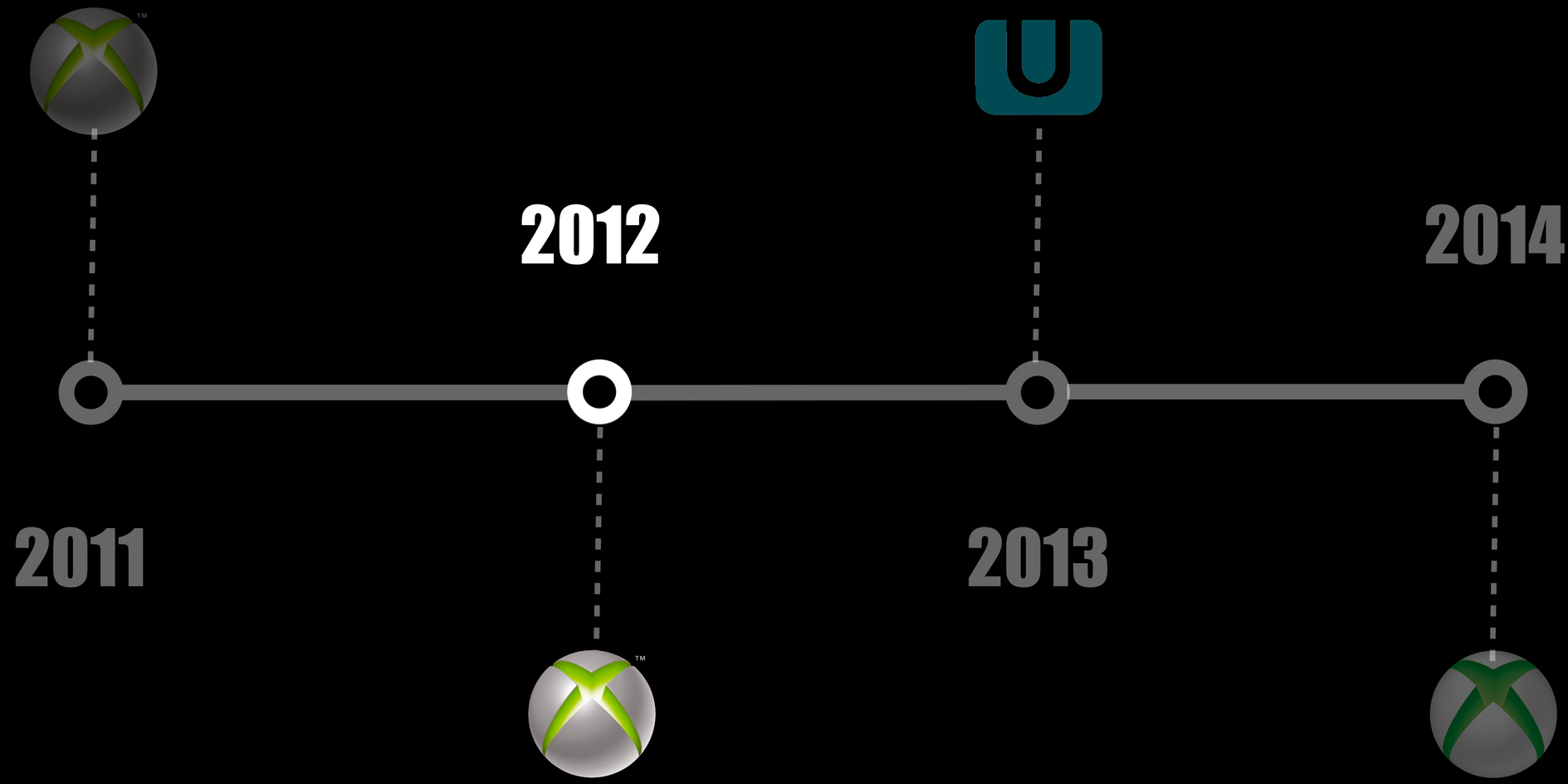
DevOps

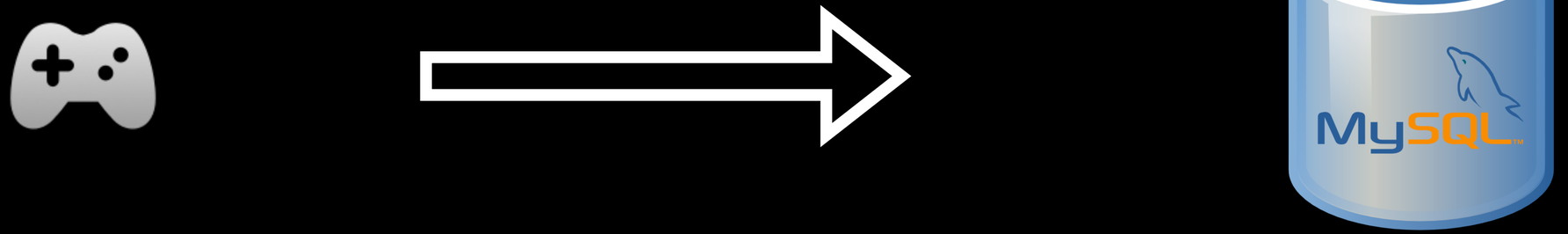


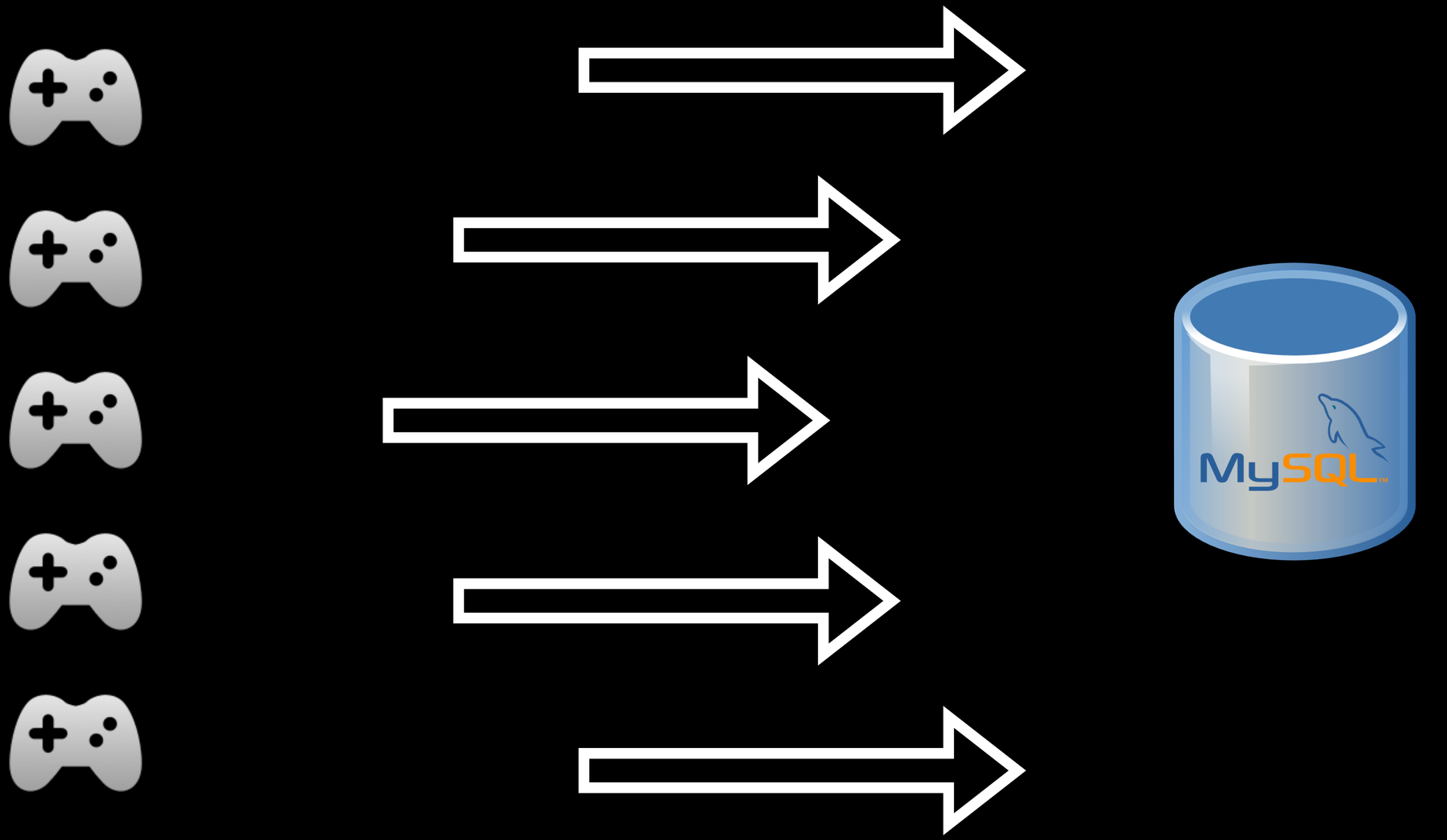
OPs / DBAs

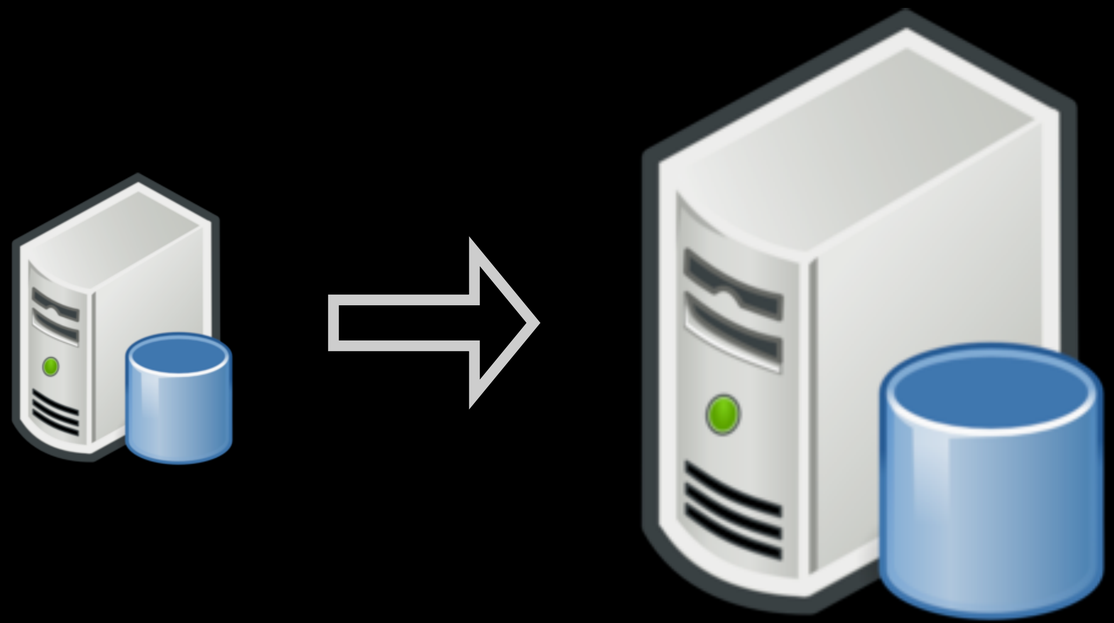
Tools

Devs


2012
2014
2011
2013

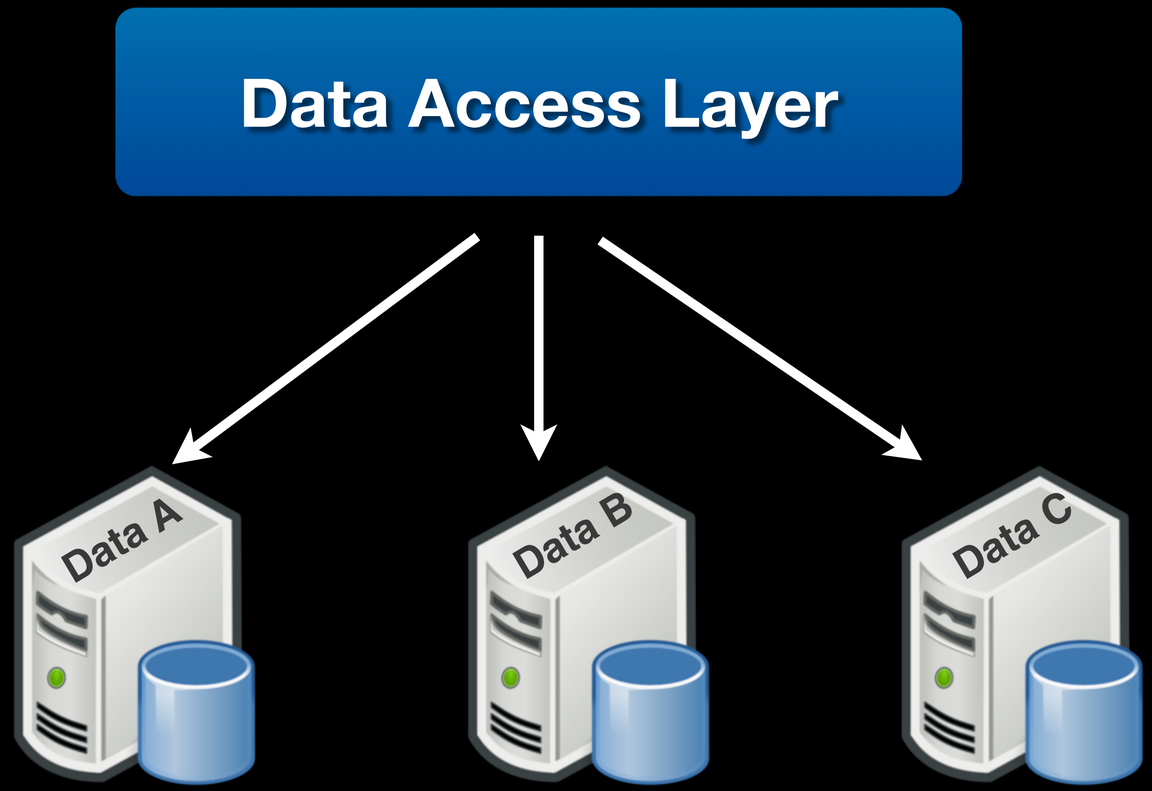

MySQL


MySQL



Relational

Scalability



Relational

Distribution

```
{
    player_id: 1234,
    level: 12,
    duration: 120,
    activity: activity
}
```

```
{
    player_id: 1234,
  * level: 40,
  * duration: 75,
  * activity: activity,
    game_id: 4001,
    platform: WiiU,
    difficulty_level: medium,
    repetition: 178,
    score: 450,
    endurance:3
}
```

Relational Schema

Total
stats

Players' Profiles

Categorized

Aggregated
stats

Individual Activities

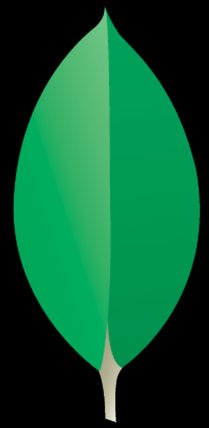
Detailed
stats

ACID
Transaction
Partitioning
Replication
Tools
OPs

Data Volume
Fixed Schema
Scale Up
Manual Sharding

NoSQL

mongoDB



1. OPs
2. Devs
3. Community

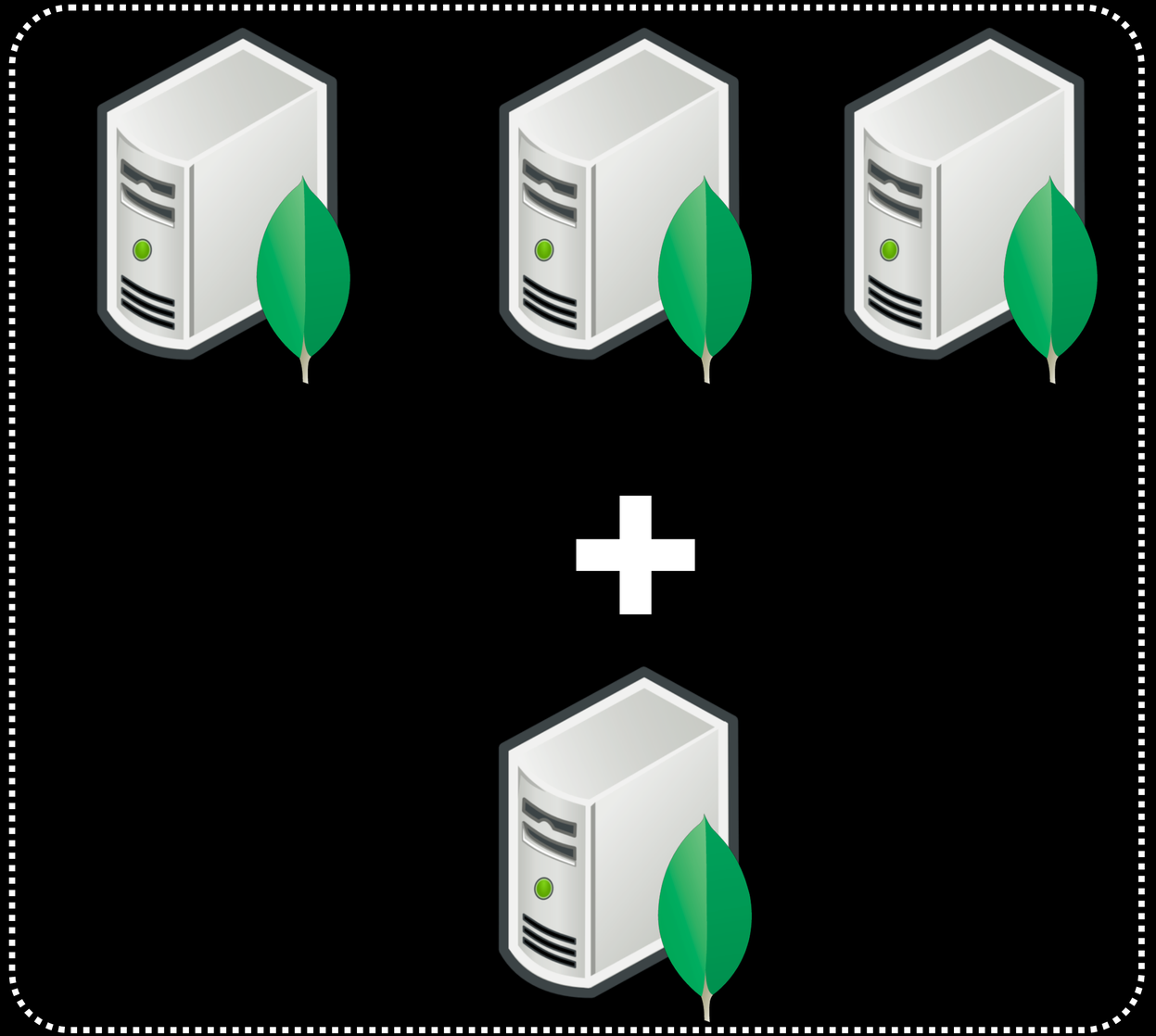
Non-Relational
Schema-less

player_id: 1234,
level: 75,
duration: 120,
activity: activity

player_id: 1234,
* level: 40,
* duration: 75,
* activity: activity,
game_id: 4001,
platform: WiiU,
difficulty_level: 2,
repetition: 178,
score: 450,
endurance:3

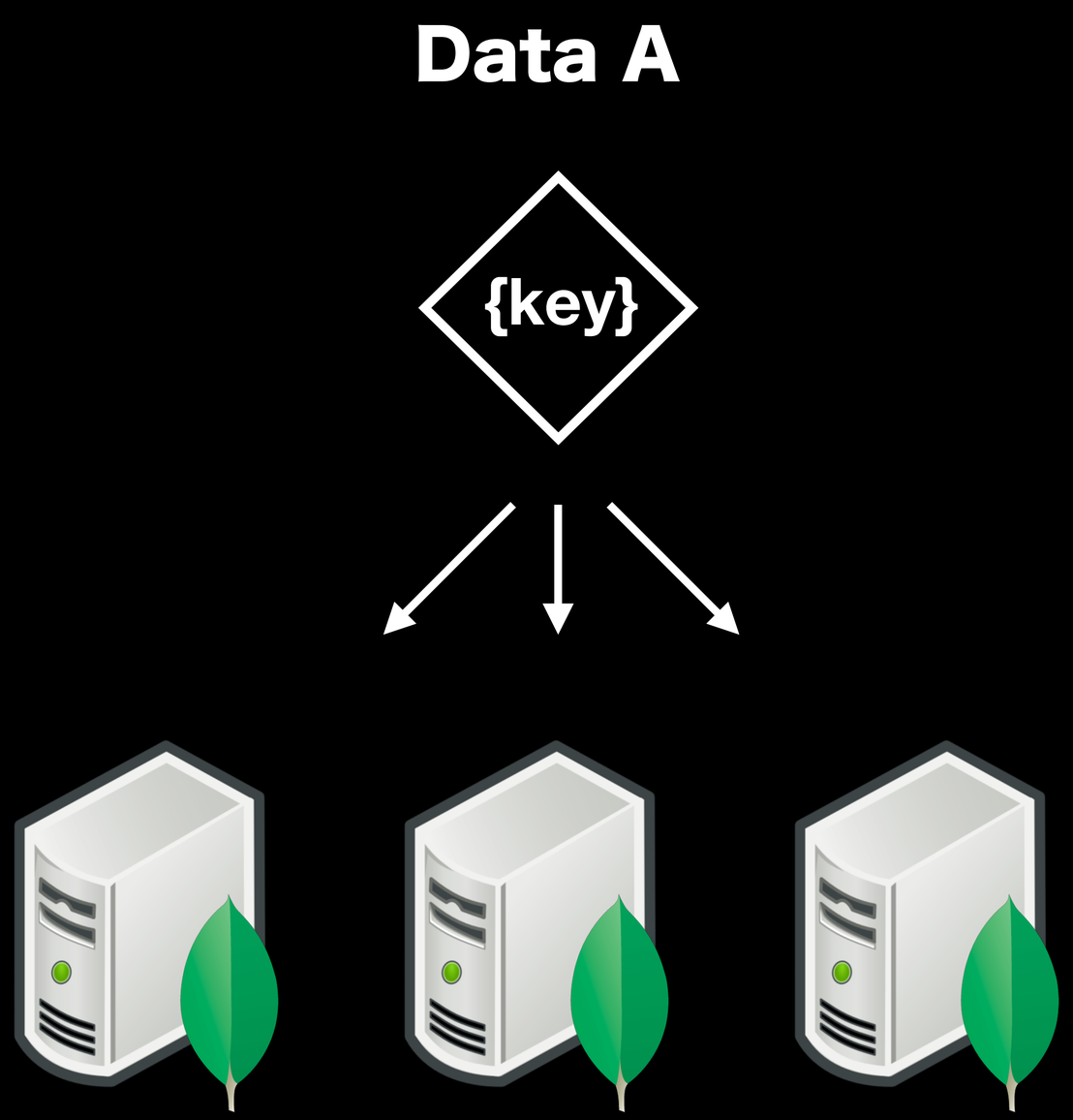
Non-Relational Scalability

Non-Relational
Scalability

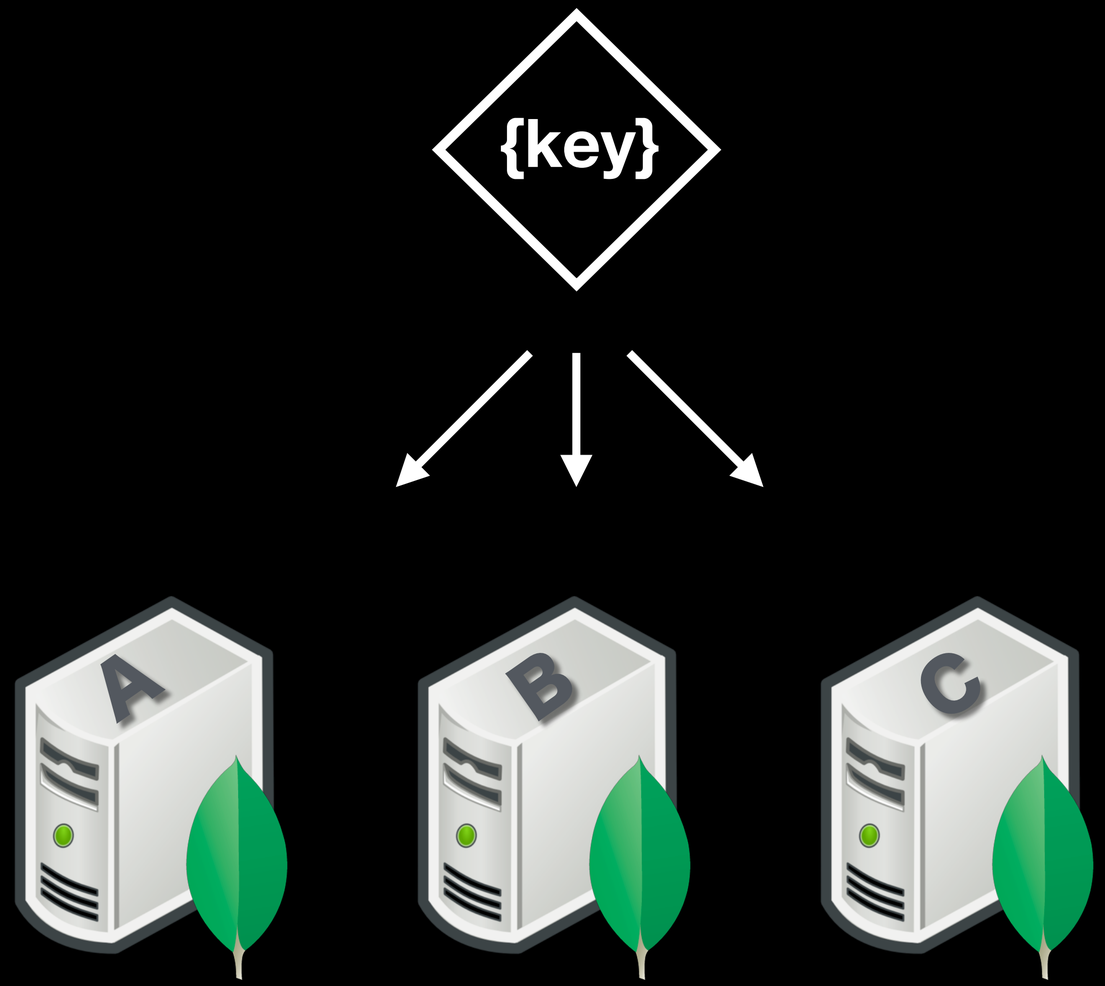


Non-Relational Sharding

Non-Relational
Sharding



Non-Relational
Sharding

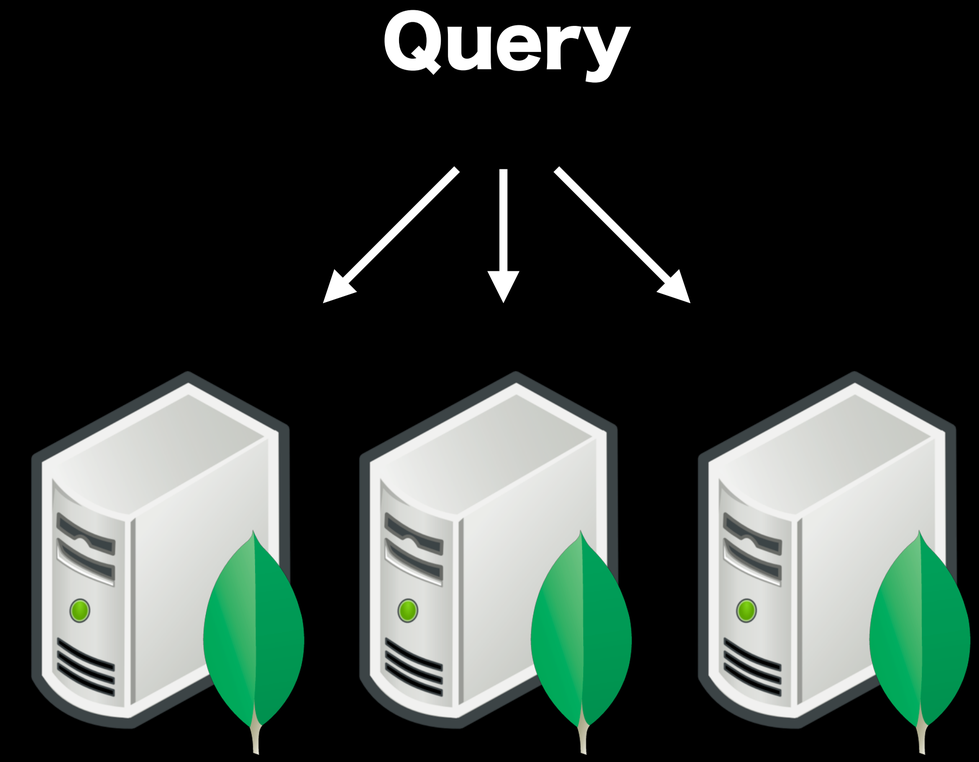


Non-Relational

Map/Reduce

Non-Relational

Map/Reduce



Non-Relational

Map/Reduce

Map

K,V1 K,V2 K,V3

Non-Relational

Map/Reduce

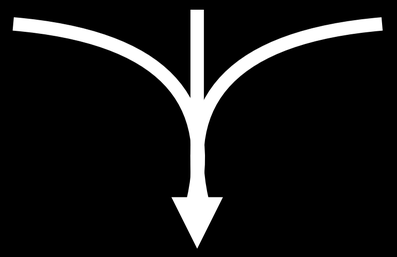
Map

K,V1 K,V2 K,V3

Non-Relational
Map/Reduce

Map

Reduce



Result

read / write

Disk Space

Non-Relational

Denormalized

Profile

Player ID	Name	Location
1000	John	US
2000	Catherine	CA
3000	Paul	CA
4000	Kylee	US

Activity

Player ID	Map ID	Difficulty	Score
1000	223	E	5
2000	673	H	4.5
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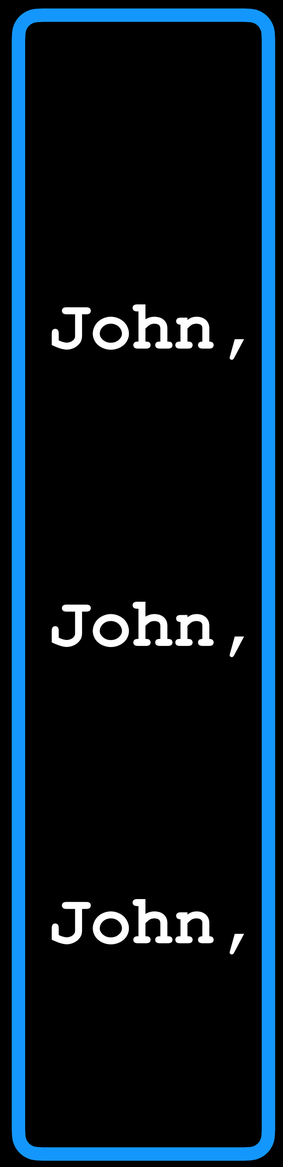


{Name: John, game:1, activity: Mission01, Score: 1245}

{Name: John, game:1, activity: Mission01, Score: 1245}

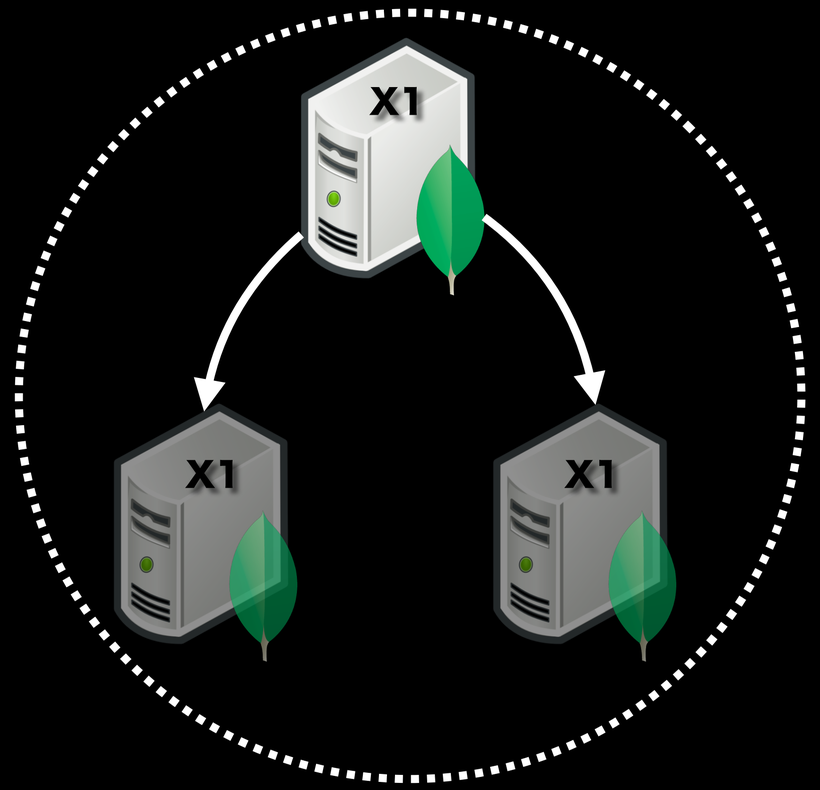
{Name: John, game:3, activity: Mission04, score: 5431}

Query

Aggregation

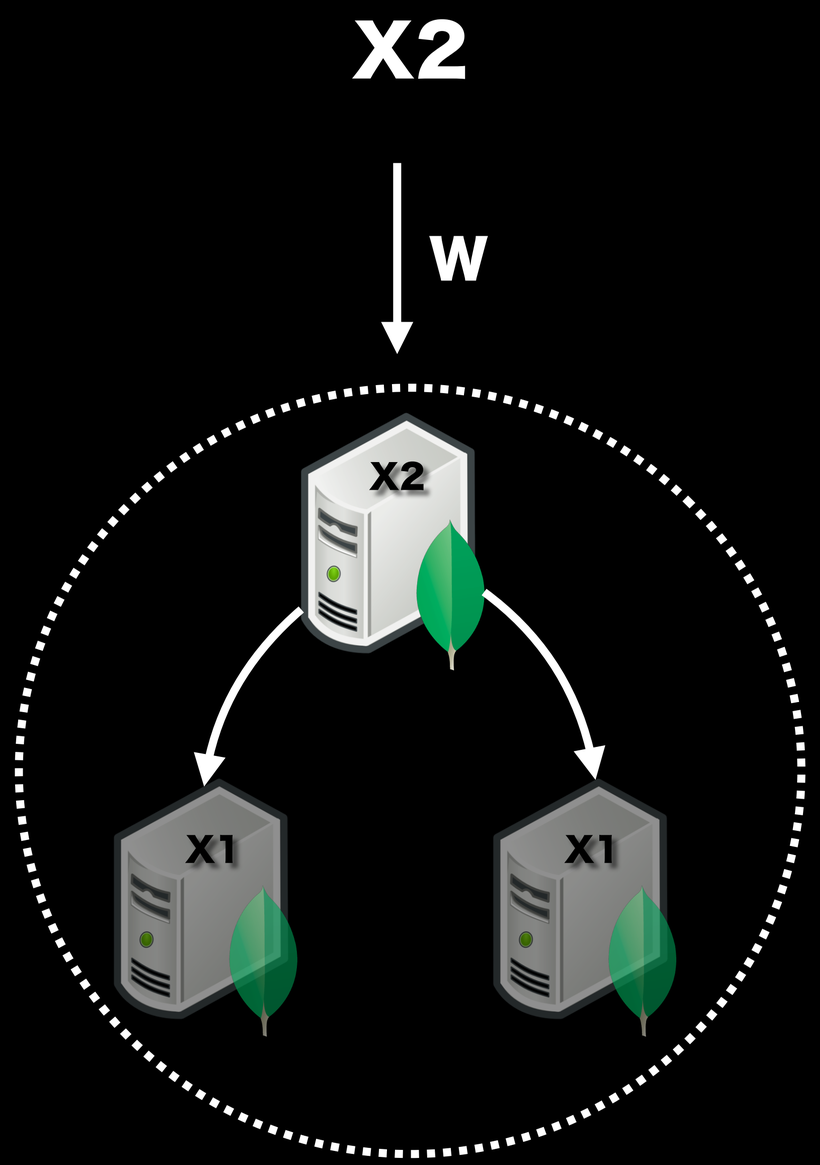
Non-Relational

Data Model



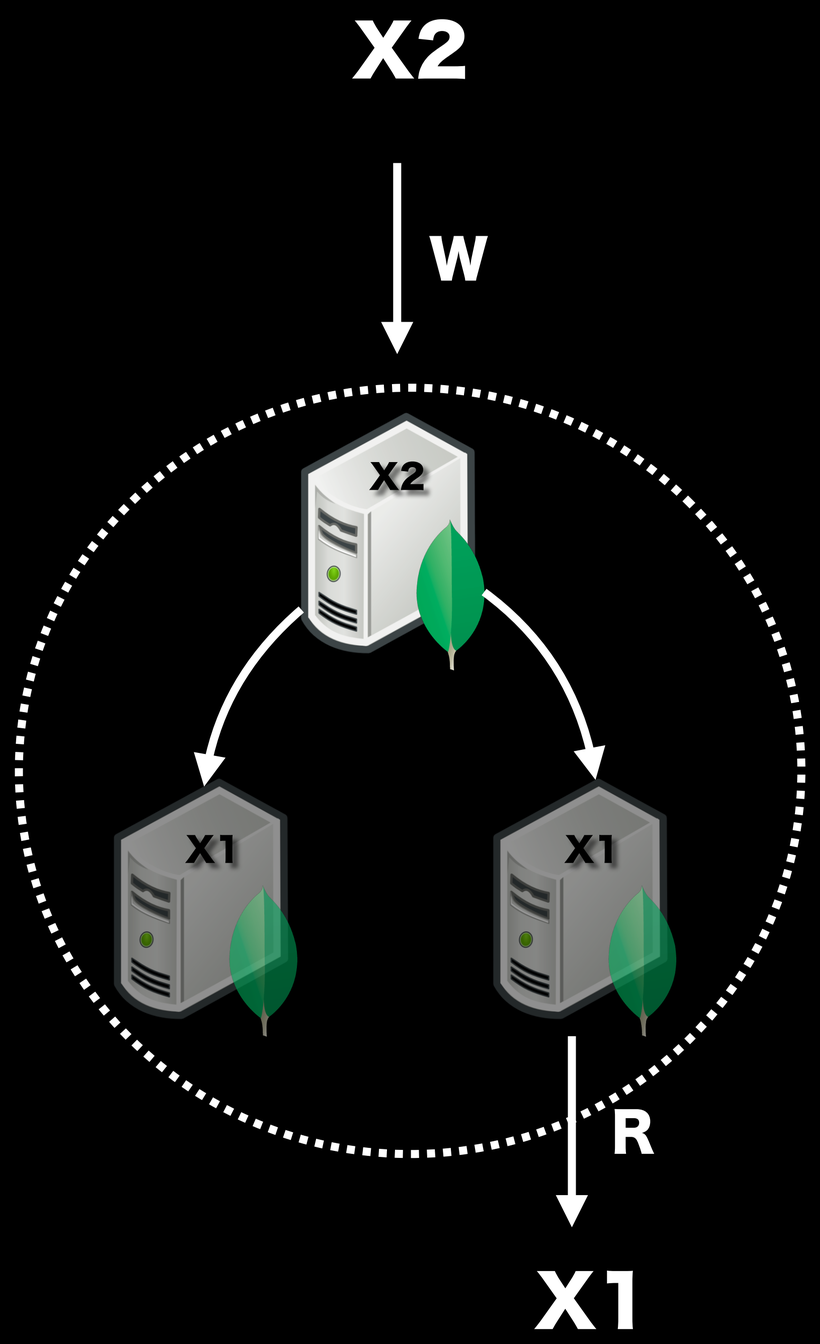
Non-Relational

Eventual-Consistency



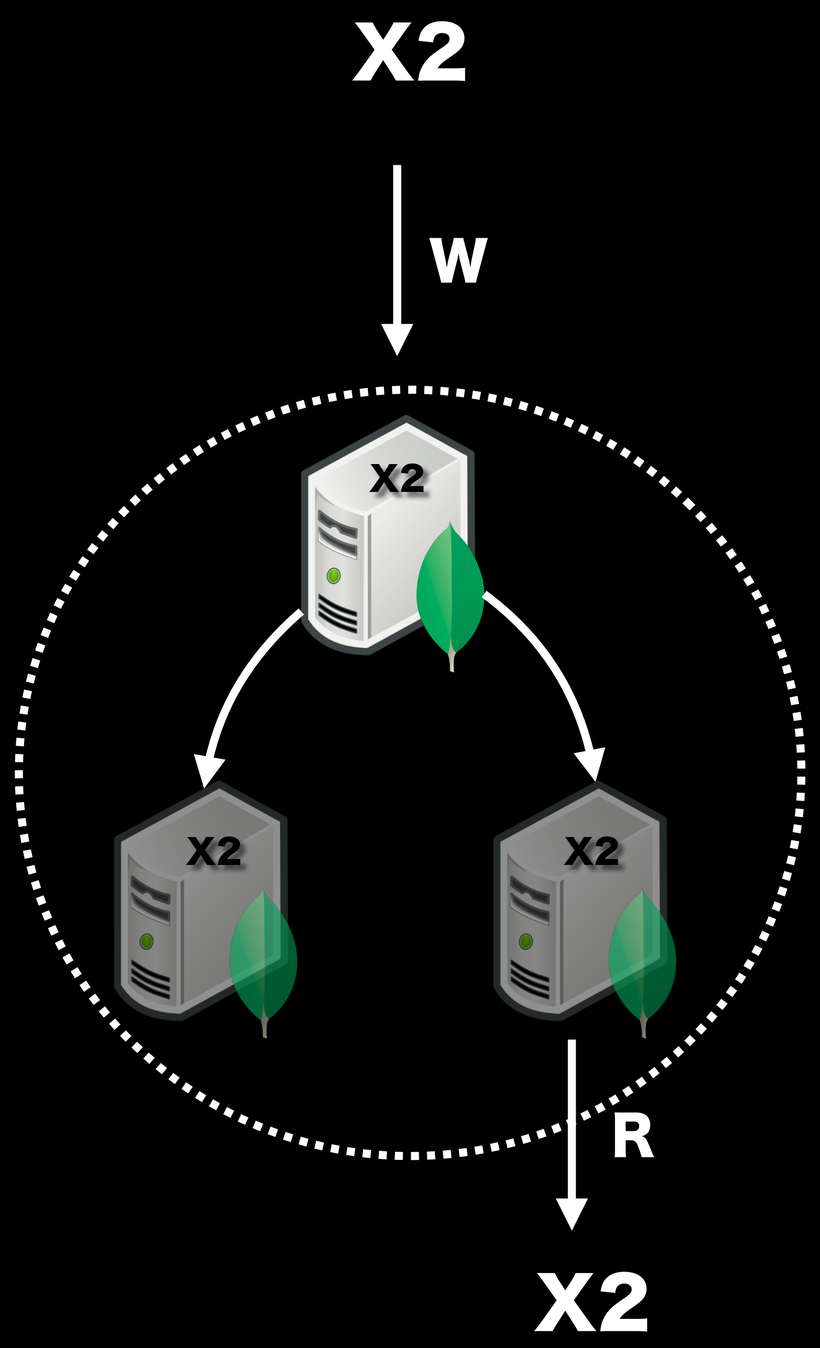
Non-Relational

Eventual-Consistency



Non-Relational

Eventual-Consistency

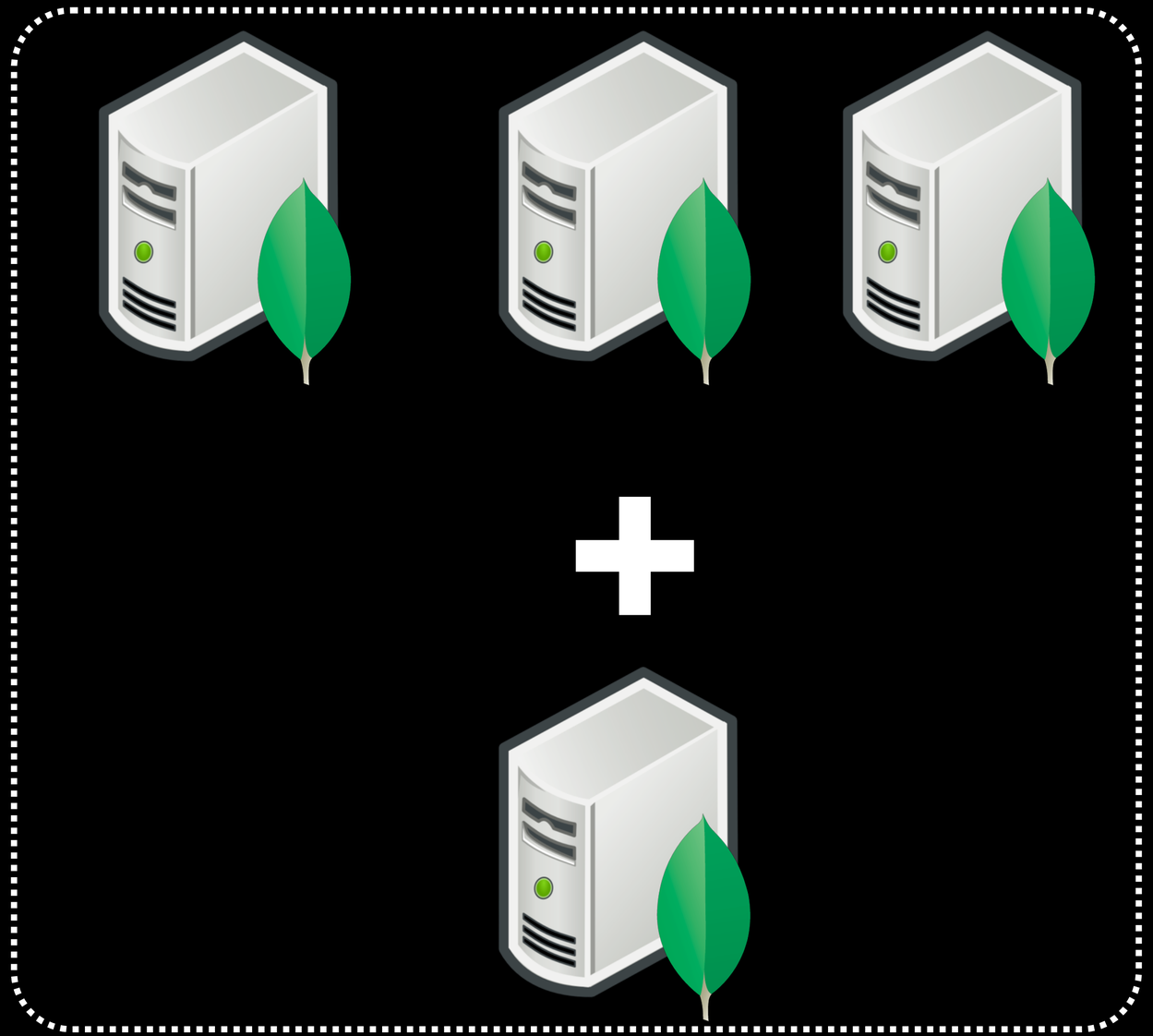


Non-Relational

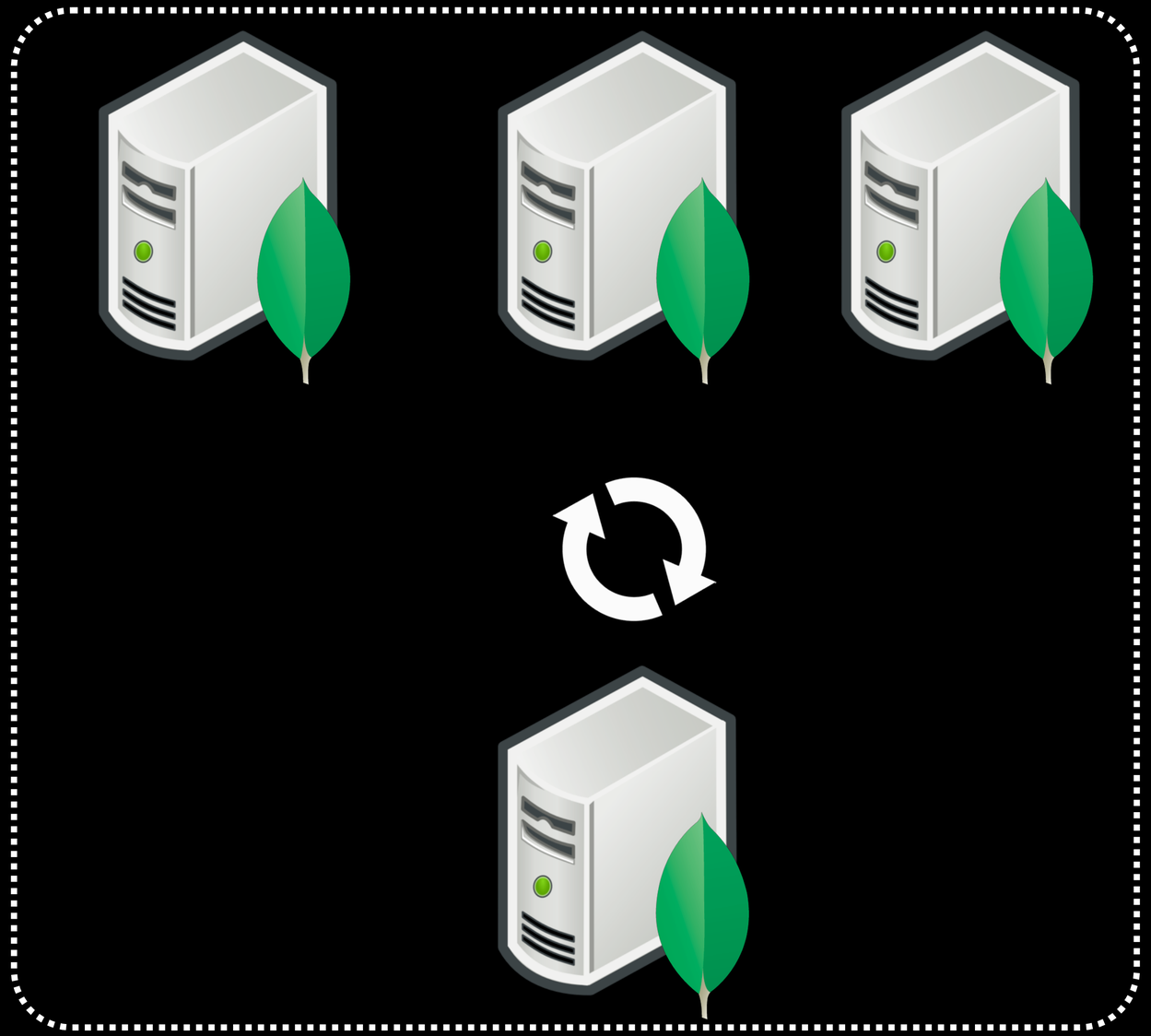
Eventual-Consistency

Non-Relational

Balancer



Non-Relational Balancer



Non-Relational

Balancer

Non-Relational

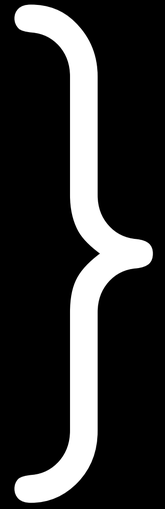
Resilience

Non-Relational

Resilience

DB Level (2.2)

Document Level (3.x)



Non-Relational

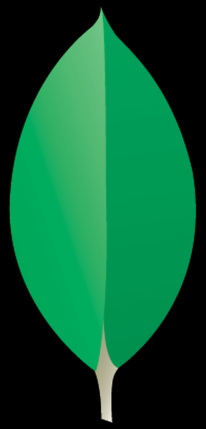
Locking

Point-in-time 🕐

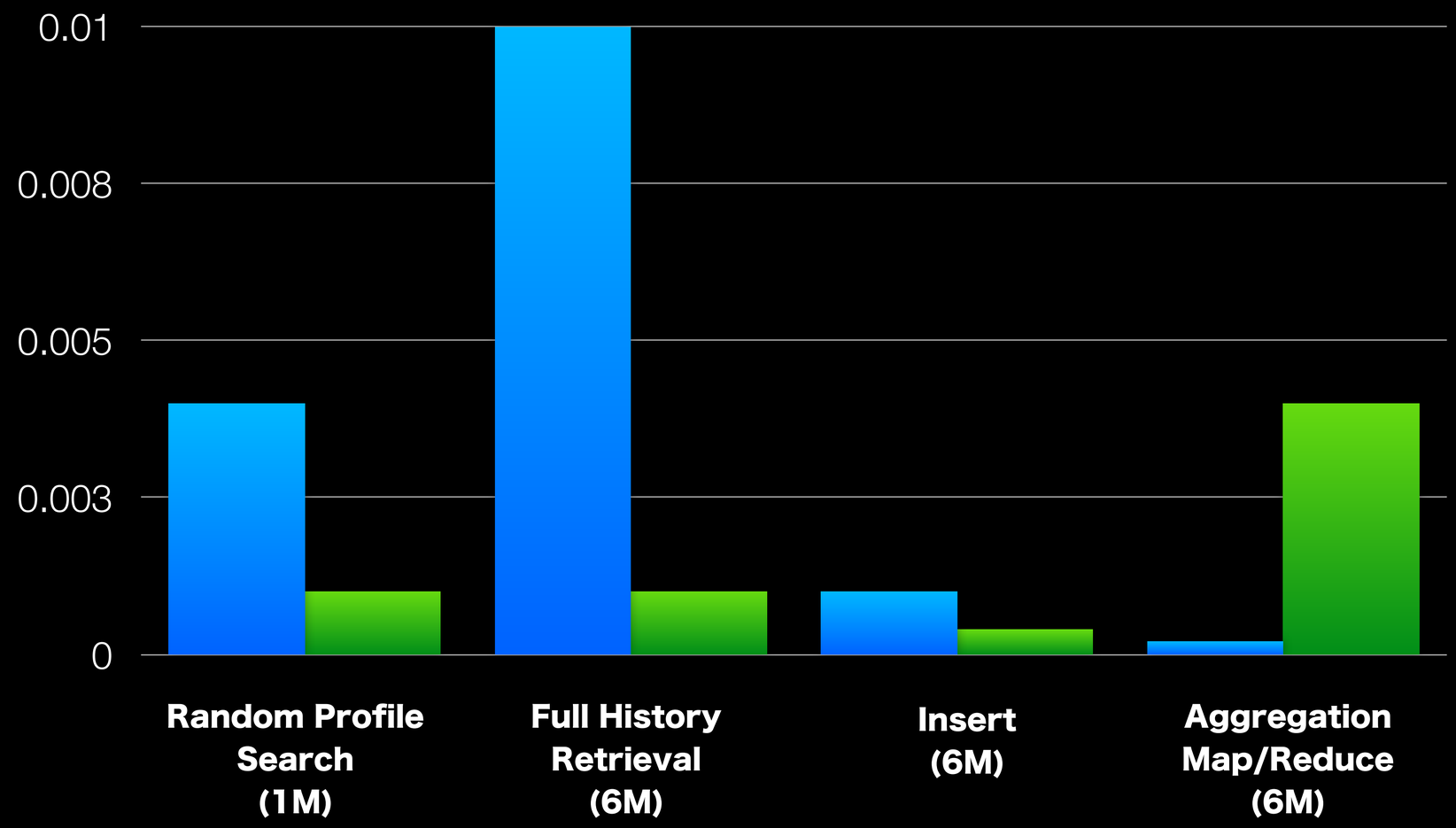
Non-Relational

Backup

Schema-Less
Aggregated Data
Large Scale Data
Sharding
Map/Reduce
Memory Storage
Journaling



Denormalized data
Disk Space
Expertise
Complex Querying
Eventual Consistency
Resource Usage
DB-Level Locking


0.01
0.008
0.005
0.003
0
Random Profile Search (1M)
Full History Retrieval (6M)
Insert (6M)
Aggregation Map/Reduce (6M)
MySQL
MongoDB

Polyglot
Persistence

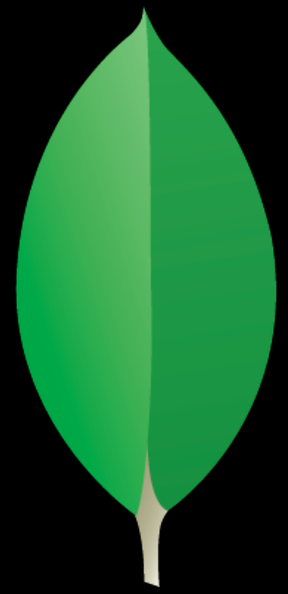
Relational Data

Players' Profile

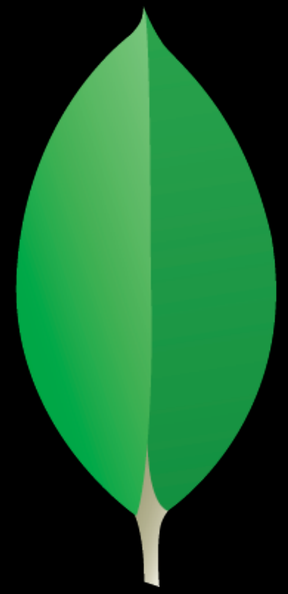
Leaderboards

Activity Details

Schema-less Sharding



MySQL

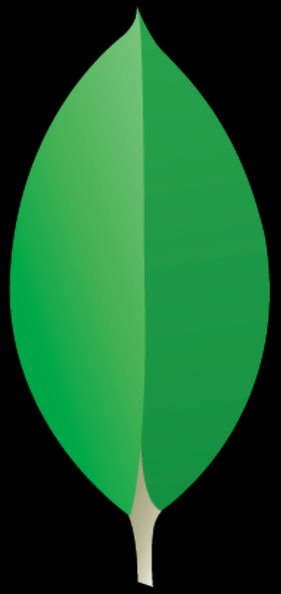


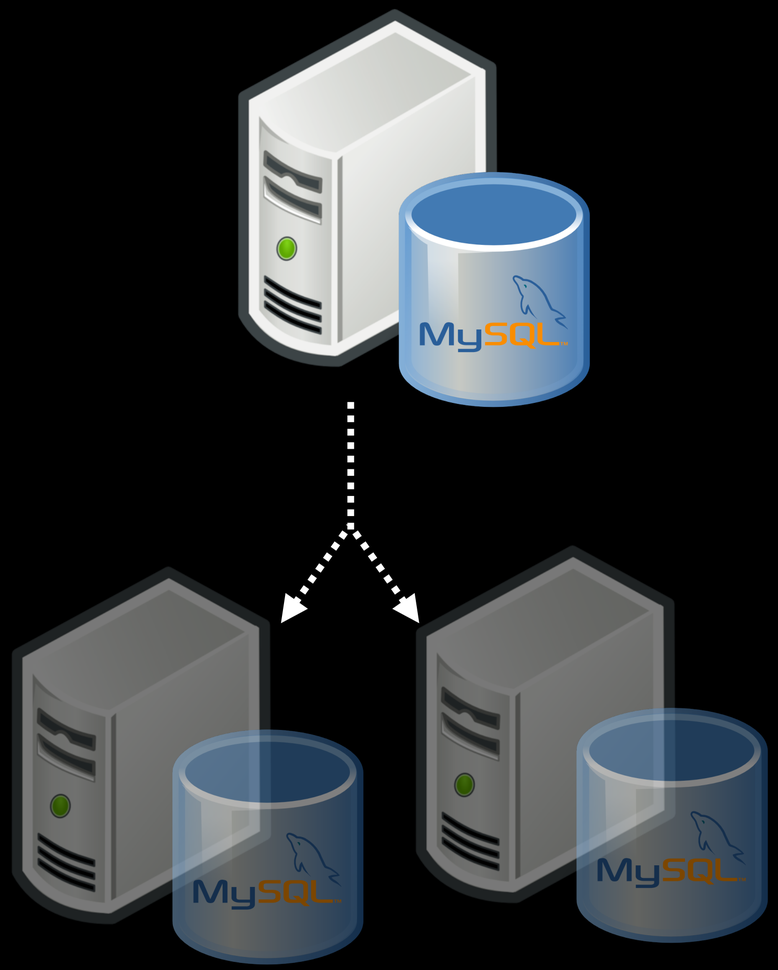
Total Sum

Activity 1

Activity n

Activity m





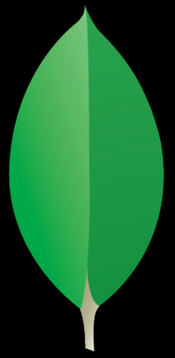
Config

Shard 1

Shard 2

Application

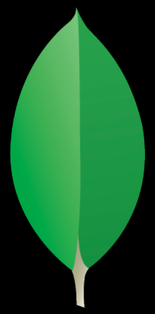
Data Access Layer



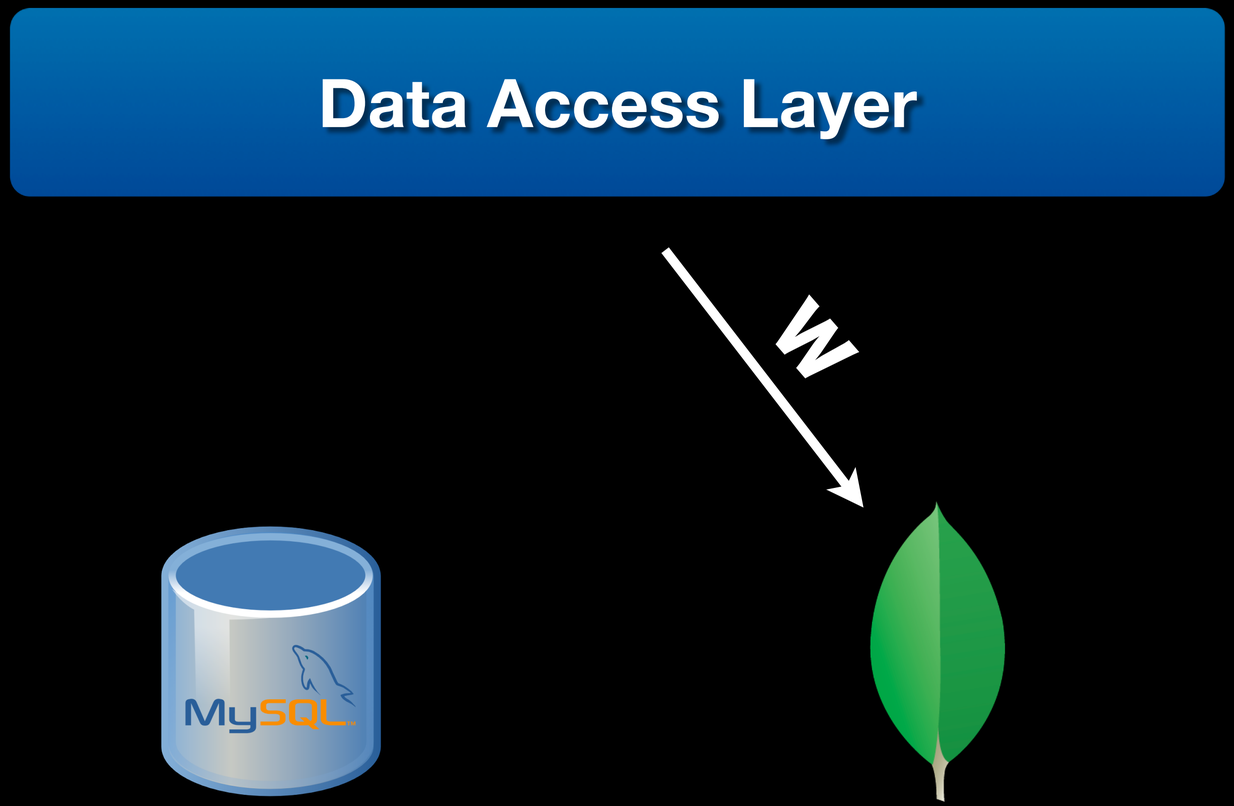
The Challenge

Inconsistency

Data Access Layer



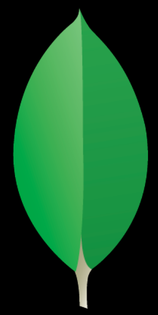
2-Phase Commit



2-Phase Commit

Data Access Layer

W

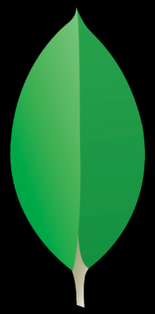


Pending

2-Phase Commit

Data Access Layer

2-Phase Commit



Done

Latency

Latency
vs. Consistency

Operations

Operations

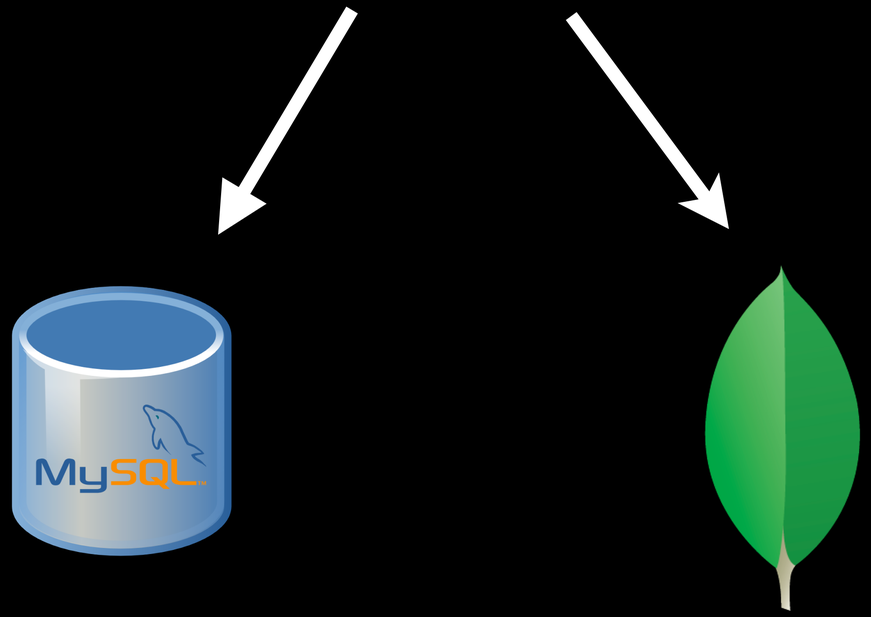
Exponential complexity

Availability

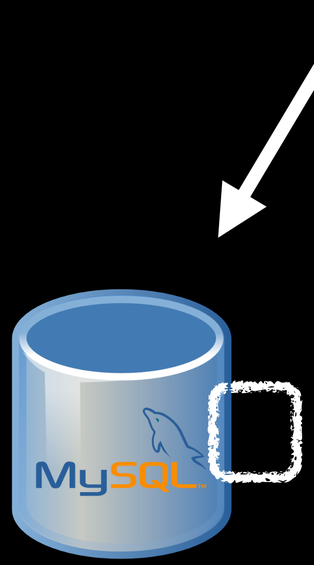
Availability

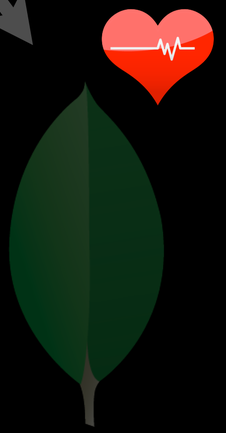
Plan for failure

Data Access Layer

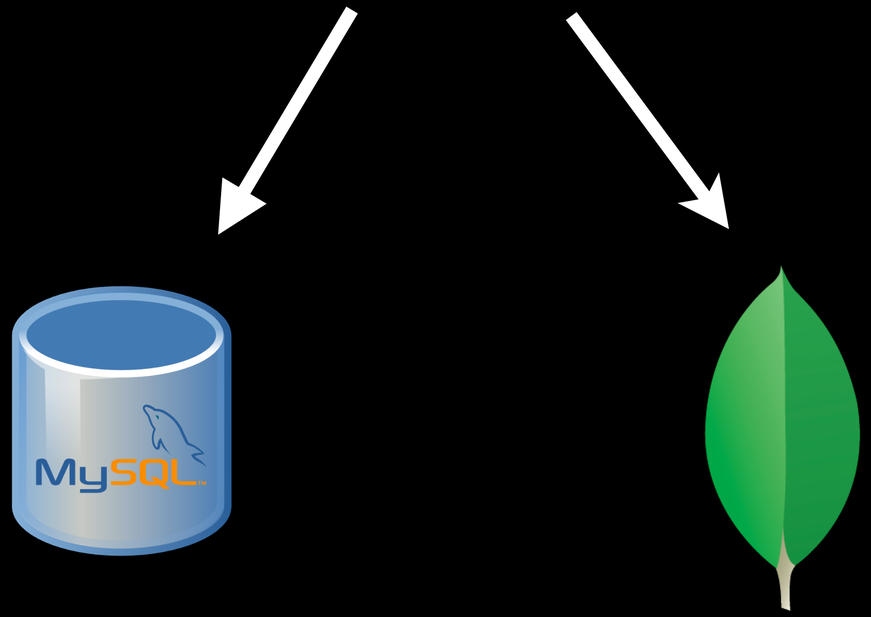


Data Access Layer





Data Access Layer



Data Integrity

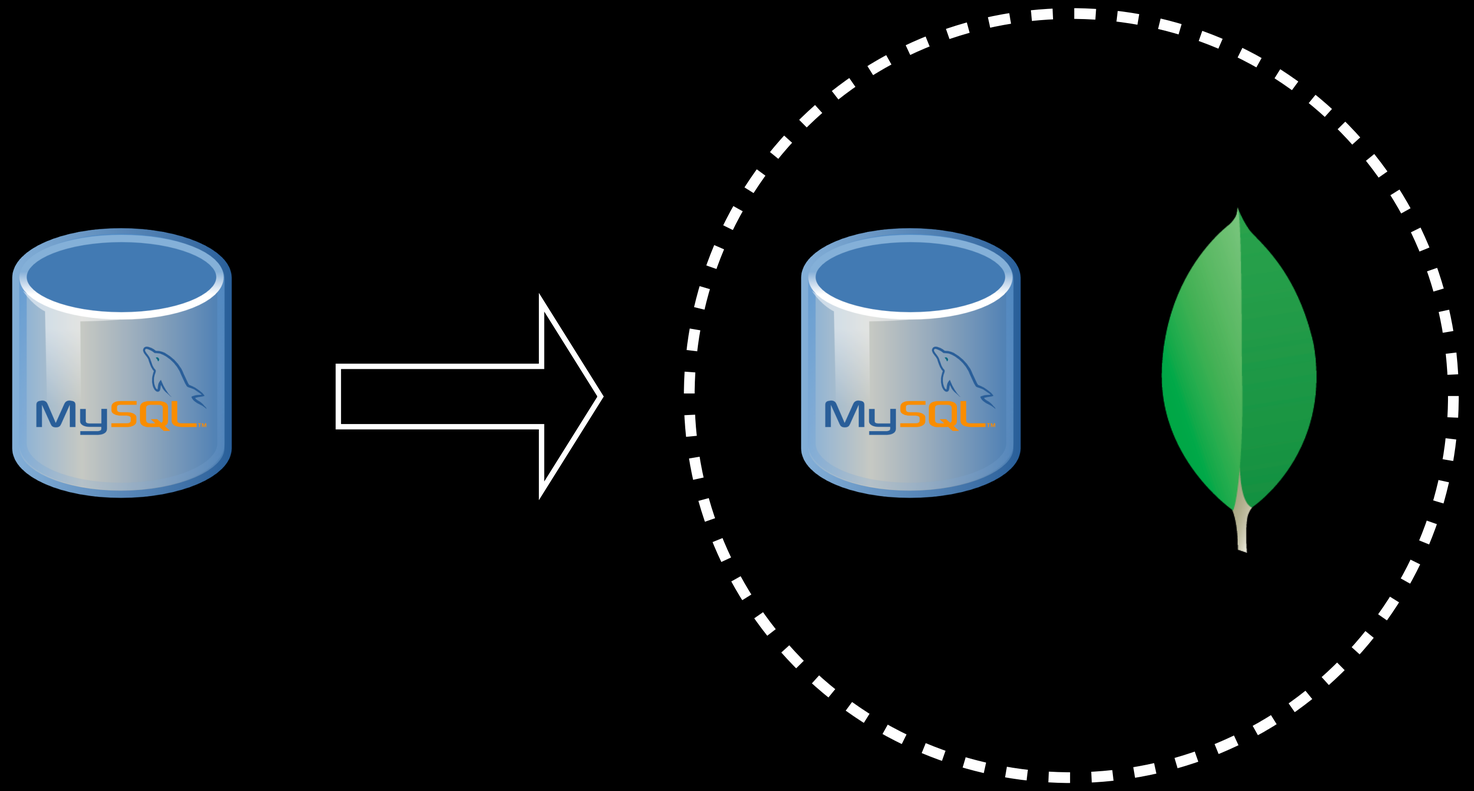
Data Integrity

Backward compatibility

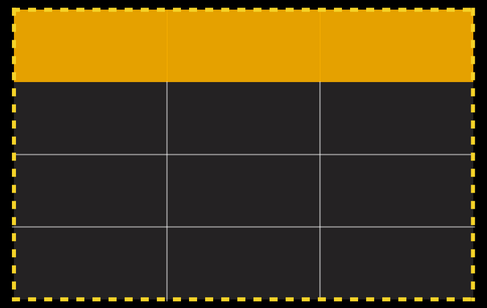
TEST

- Unit
- **Integration**
- Functional

Data Migration

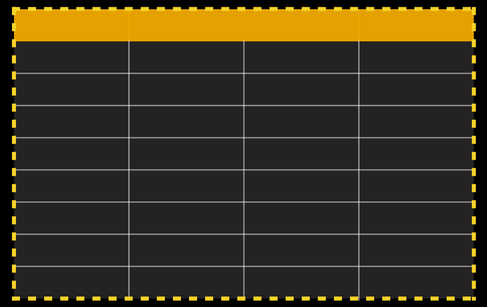

MySQL
MySQL

Profile



3rd Party

History



```
{
  profile:
  {
    GUID:…,
    platform:
    {
      name:'xbox',
      xuid:…
    }
  },
  activity:…,
  duration:…,
  datetime:…
}
```

① One-Shot Migration

① One-Shot Migration

4 hours !!

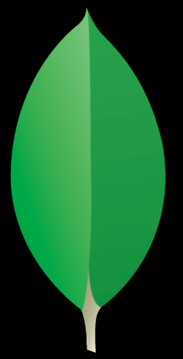
① One-Shot Migration

4 hours !!

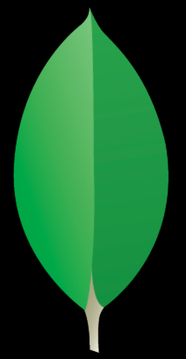
② Profile versioning

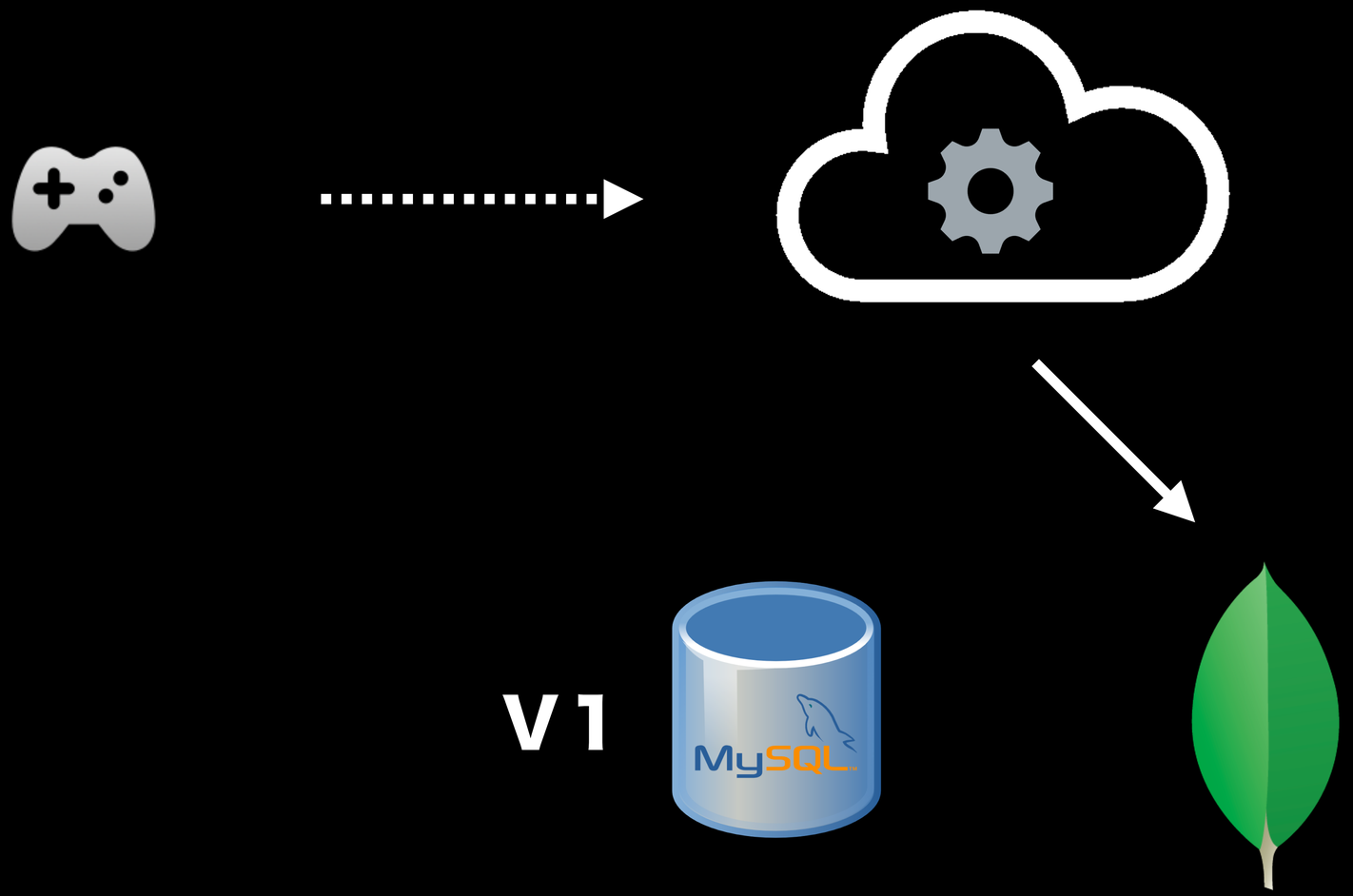
Live !!

MySQL

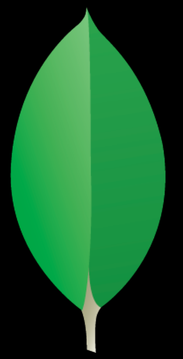


V1




V1
MySQL

V2



Final
Results

Scalability

2011

2012

2013

2014

9x response time

3 years uptime

Go Hybrid!

Go Hybrid!

Thoughtfully

Thank YOU!

@majidfn

References

NoSQL Distilled

Polyglot Persistence