Evolution of Web Application Architecture

PHPDay Italy

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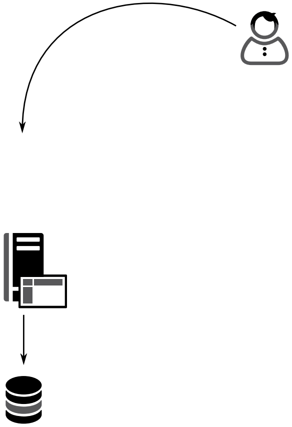
Hi, I'm Kore

Architecture

Evolution



Too many visitors

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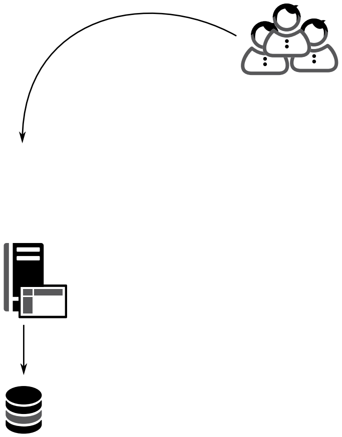
Evolution



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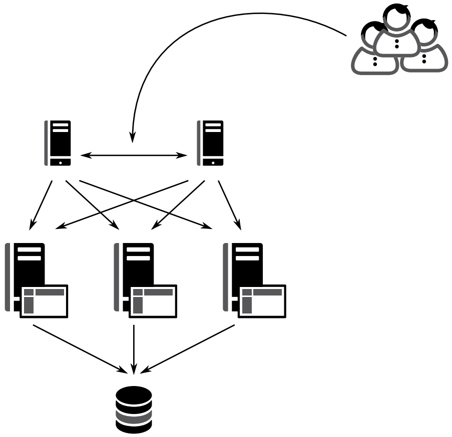

Lessons Learned: Load Balancing

- Works because of HTTP & PHP
  - HTTP is LCoDC$SS
  - PHP is build for shared-nothing
- Round Robin works best
  - Sticky sessions will overload certain servers

Non sticky session – how?

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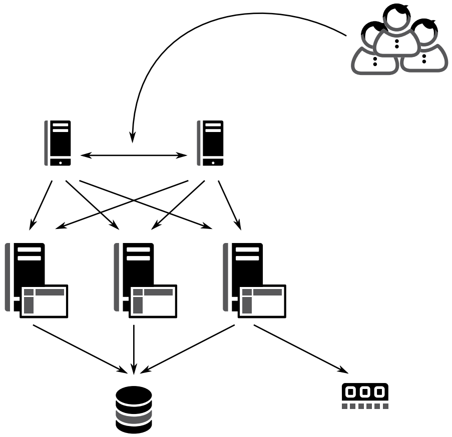


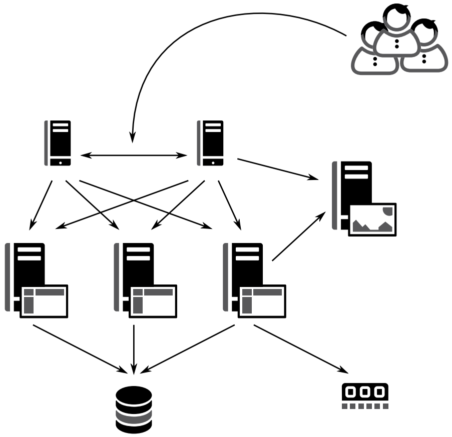
Lessons Learned: Non-Sticky Session

- Put session on memcached / Redis
  - Mostly trivial because of existing extensions

Where to put the static data?

!

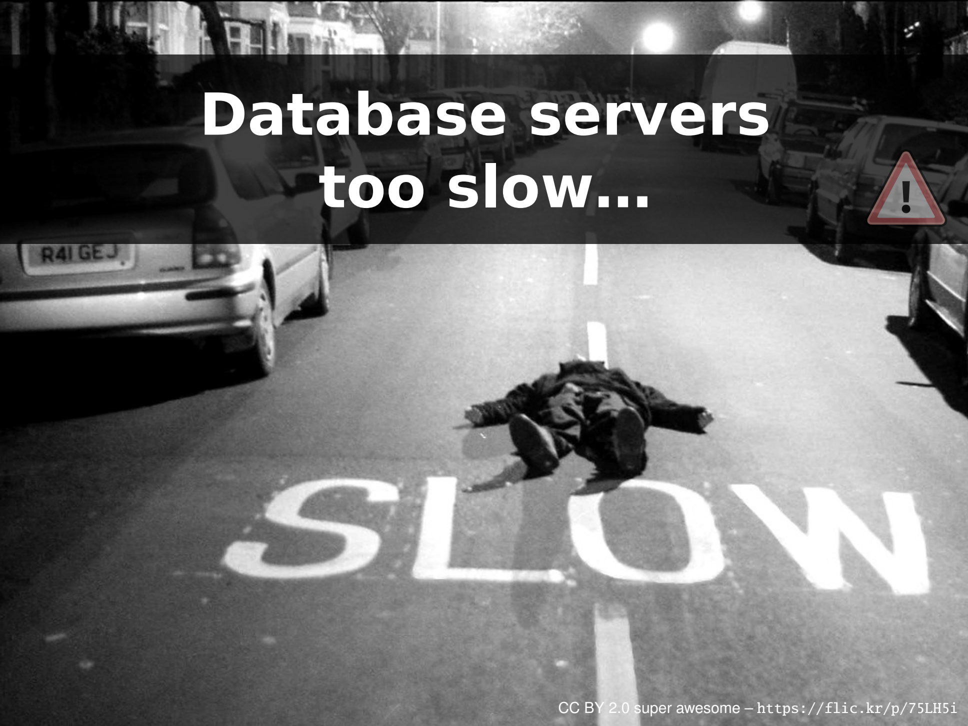
Evolution



Lessons Learned: Static Files

- NFS will eventually lead to dead locks
  - . . . still seems the most popular solution around.
- Multiple domains can hurt performance (TCP slow start)
- Using dedicated CDN providers can help
  - Content locality

Database servers too slow…



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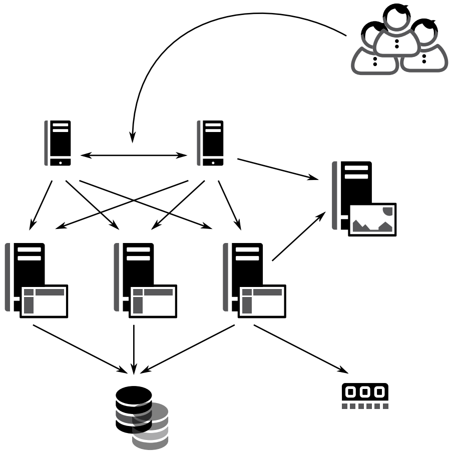

Lessons Learned: Replicate Database

- Master Slave Replication is fairly easy to set up
  - Obviously only scales READs
  - WRITEs are usually not your first problem

Database servers too expensive…

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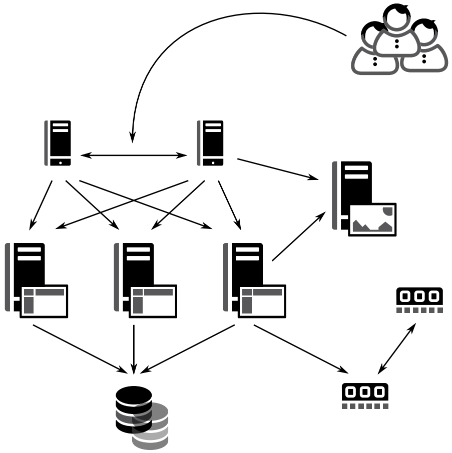
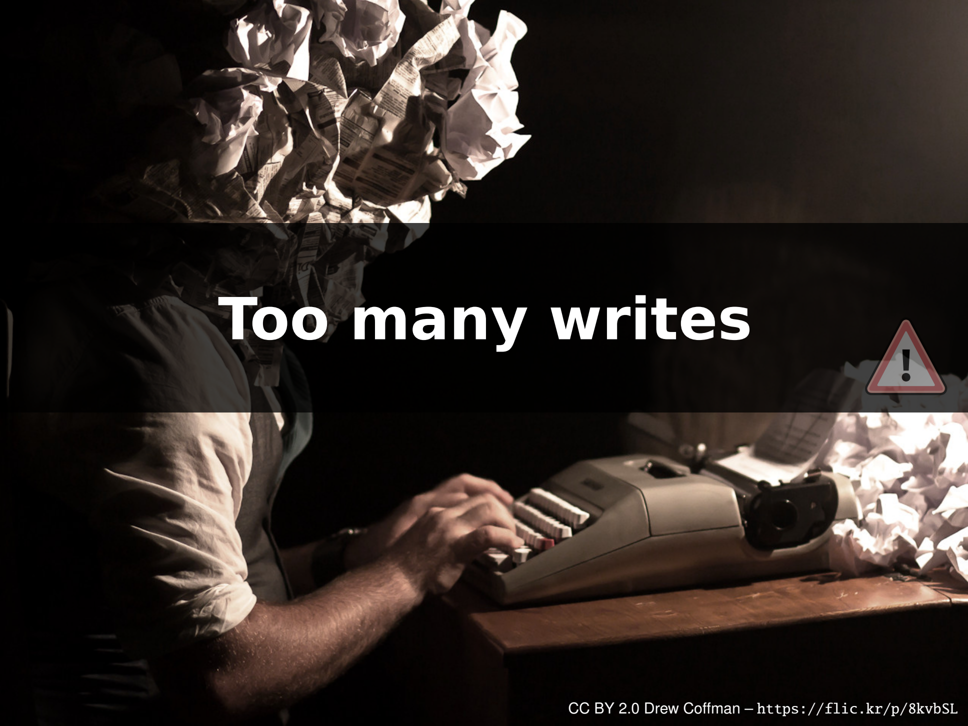


Lessons Learned: Cache With Memcache

- Cache all the things in *memory*
  - Cache entities
  - Cache collections
  - Full page cache
- Cache invalidation

There are three hard things in Computer Science: Cache invalidation and off by one errors.

  - Cache dependency calculation
  - The paging problem



Too many writes

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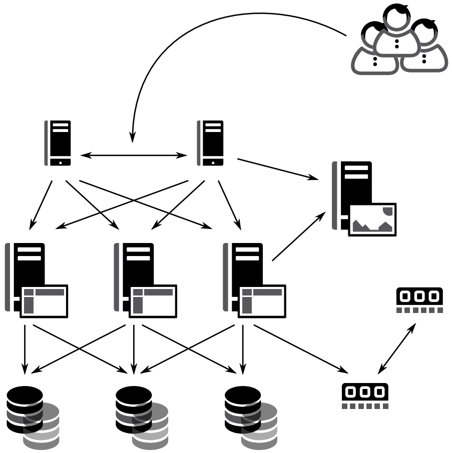
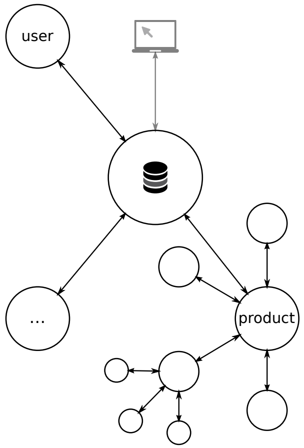


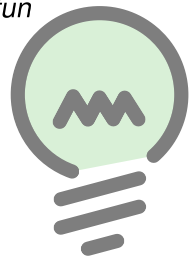
Sharding

- Split tables across multiple nodes
  - Vertical sharding
- Shard by consistent hashing
  - Horizontal sharding



Lessons Learned: Sharding

- Shard by table
  - . . . or even shard by consistent hash per entity
- No referential integrity checking
- Queries are limited to sharding solution
- Schema updates across multiple shards are *fun*



Setup too complex

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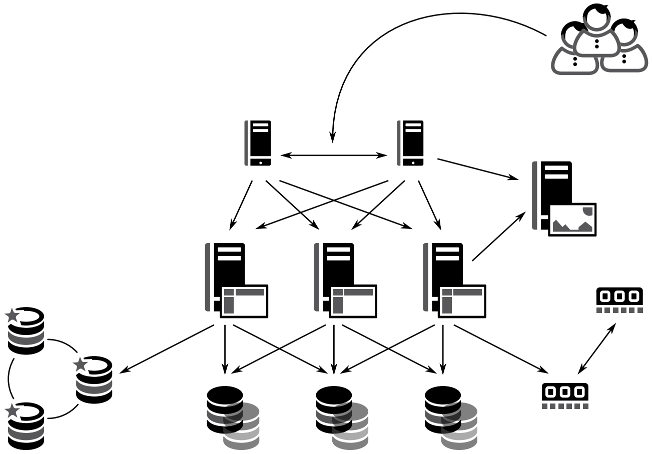
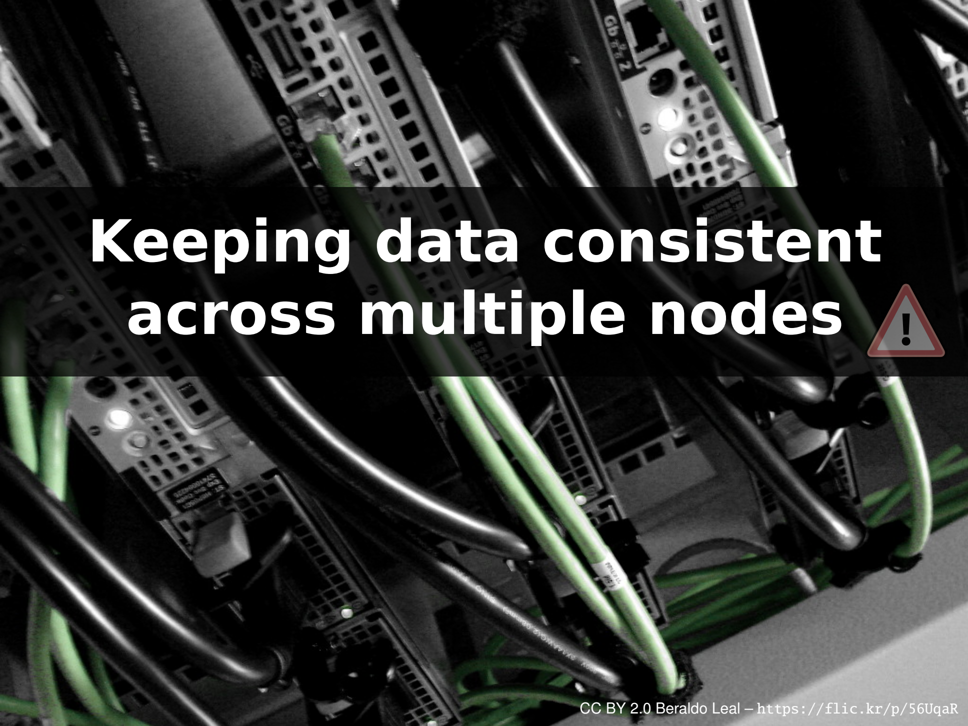


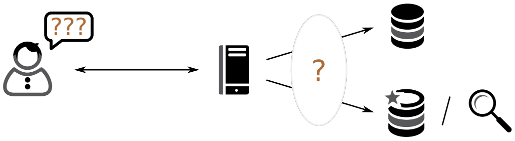
Lessons Learned: NoSQL

- Usually solves one problem really well:
  - Sharding
  - Multi-Master-Replication
  - Cross-shard queries
- Usually omits:
  - SQL
  - Referential Integrity
- . . . we lost all relevant features from Relational Database Management Systems anyways. . .

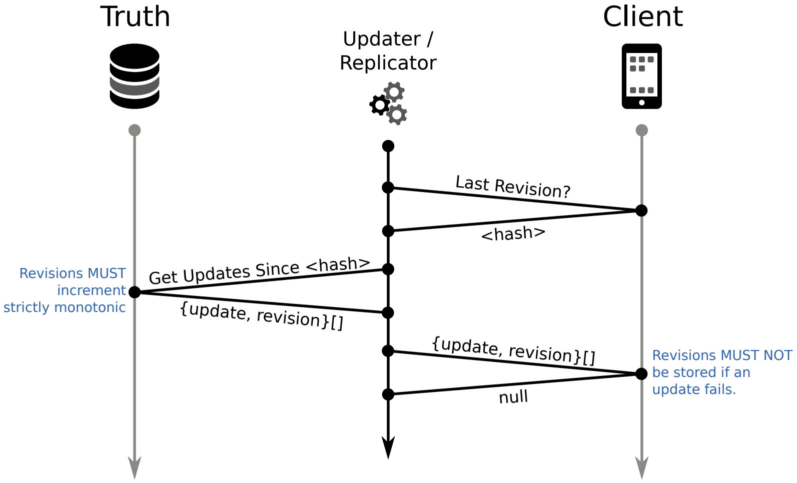


Keeping data consistent across multiple nodes ⚠

Data Consistency Across Nodes



Eventual Consistency



Lessons Learned: Data Consistency

- Embrace Eventual Consistency
  - Compaction is hard
  - Data migrations are hard

Business wants to query data

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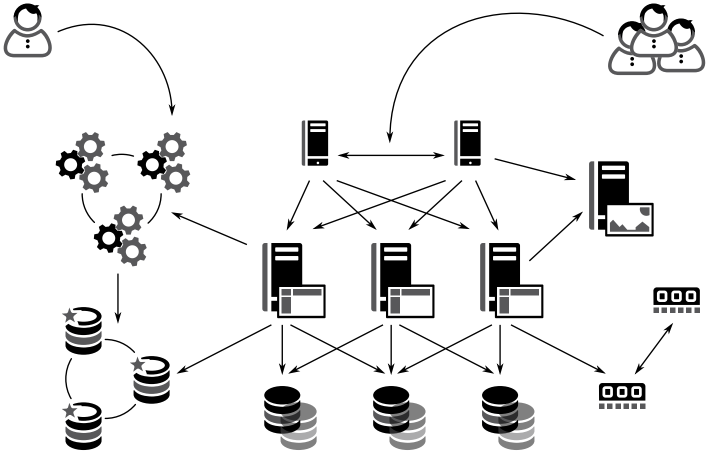

Lessons Learned: Map-Reduce

- Execute queries on distributed databases
- New query language to learn
  - Your developers write analysis scripts, instead of the business analysts writing slow SQL queries

How to orchestrate?

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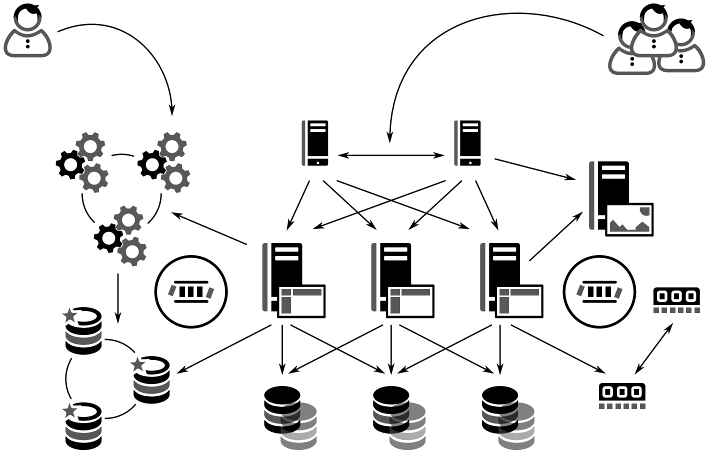

Lessons Learned: Queues

- Queues can ensure data is processed asynchronously
  - Data consistency must be ensured even when pushing into queues
  - Following the data flow of an action can be “tricky”
- Used to distribute data between systems

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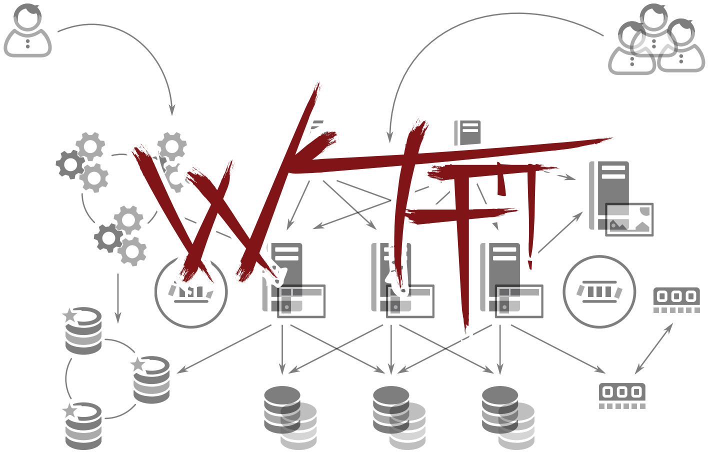

Microservices

*Apply **Seperation of Concerns** on service level to allow for seperate teams & technologies per concern.*

- Microservices **can** simplify things:
  - Choose optimal technology stack per team & concern
- Microservices **will** also complicate things:
  - Automated deployment is a must
  - Service orchestration is still a problem
  - Service downtimes and latency must be handled gracefully (Eventual Consistency)
- Big Data$^{\text{TM}}$ will stay a problem
- Sensible services are often not *micro* any more. . .

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Lessons Learned (subjective)

- Boring technology choices will often work best
  - Just start & stay with LAMP?
- Only bring in shiny new technologies with care
  - There are enough reasons to eventually do that, though

The Hipster Says:

* Except you evaluated
it as the correct solution
for your case

Conclusion

- There are many developers, documentation & experience for boring technologies
- Evaluate before adding new technologies (ATAM)
- Do not jump on every bandwagon – this includes microservices
- Data Consistency accross nodes is hard & important

https://joind.in/talk/3152e

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THANK YOU

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