Application Architecture Overview

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About Dean...

- Engineering degree from Olin College in 2007 (Bioengineering concentration)
- co-founded a YC company in college
- systems engineer for a defense contractor
- instructor / program director at a karate school
- Startup Institute alum (summer ‘12)
- software engineer at Tapjoy
- teacher/mentor for SI RampUp

What is a...

- Server
- Database
- Cache
- Load Balancer
- Service
- Queue

What does it mean to...

- Scale Vertically
- Scale Horizontally

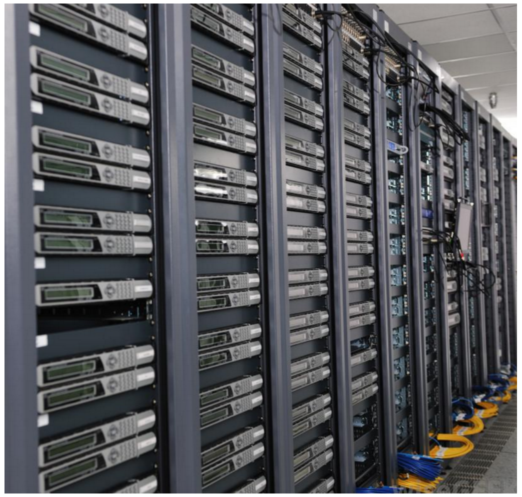
Server

Servers are referred to as ‘machines’ or ‘boxes’. If you develop locally, you might imagine a server looking like this...

http://www.visualpharm.com
http://images.wisegeek.com
http://en.wikipedia.org/wiki/Server_(computing)

Server

When in reality it looks like this...



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Server

But we can still think of it like this.

A server is just “a system (software and suitable computer hardware) that responds to requests across a computer network.” (Wikipedia)

Basically we can imagine a server as being a place where our application, database, webserver, and all dependencies (e.g. Python) are configured in such a way to actually respond to and process network requests.

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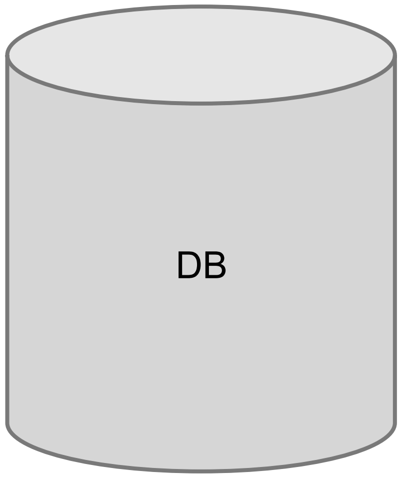
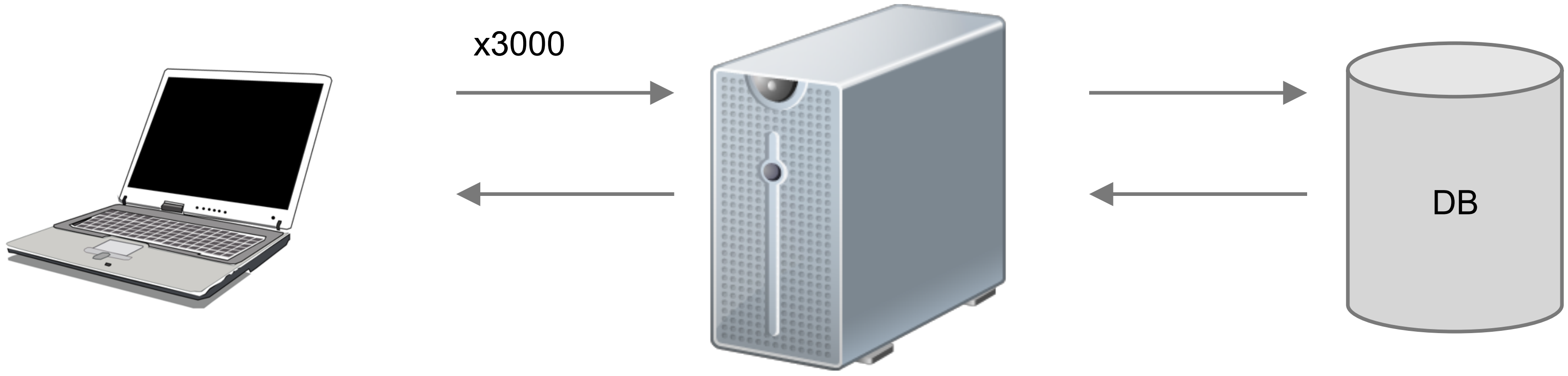
Database

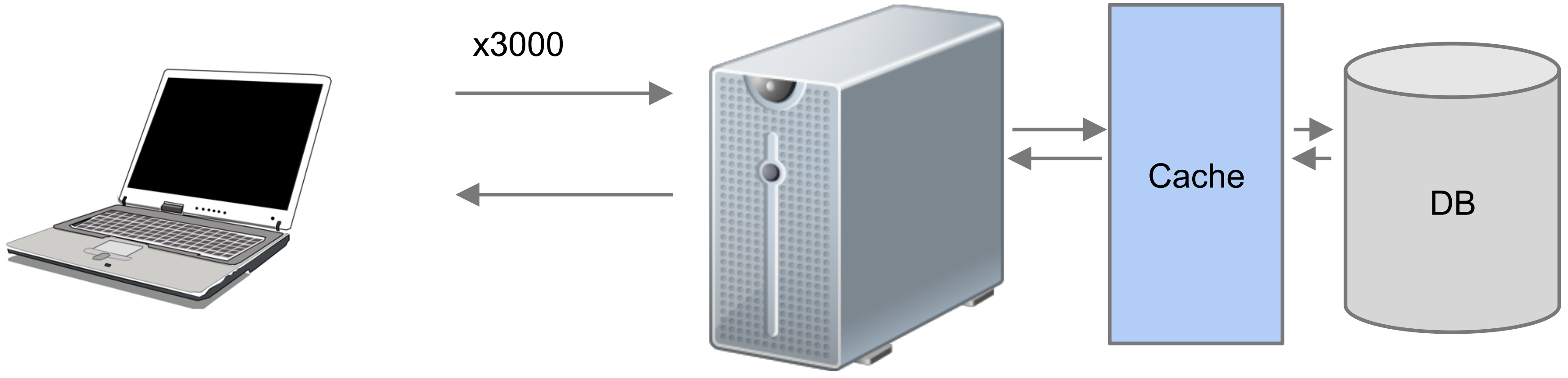
- **Relational**- mySQL, SQLite 3
- **Non-Relational**- MongoDB, CouchDB
- **Key - Value**- Redis, Riak



Cache



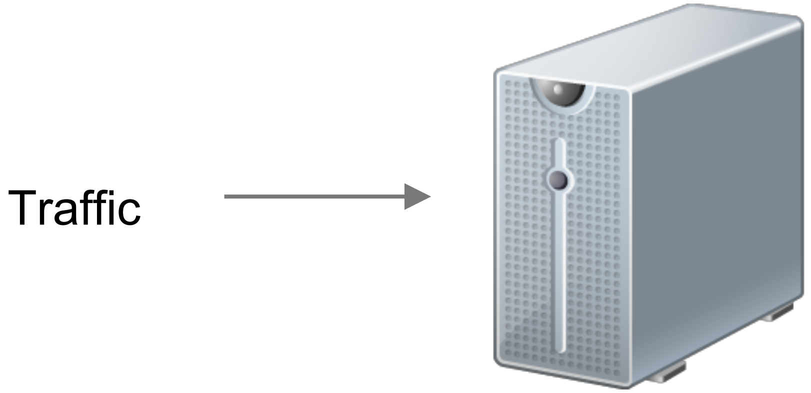
Cache



Caches are great for:

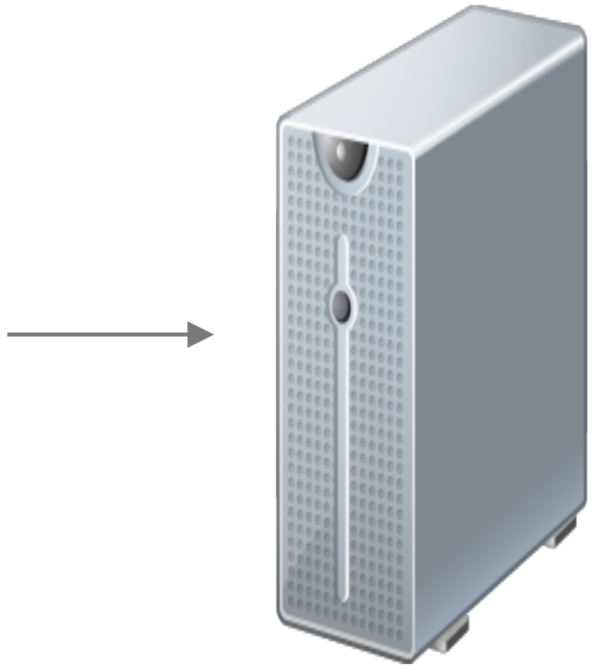
- Repetitive requests
- Predictable requests
- Data that needs to be accessed more quickly than is possible with a database query

Vertical Scaling



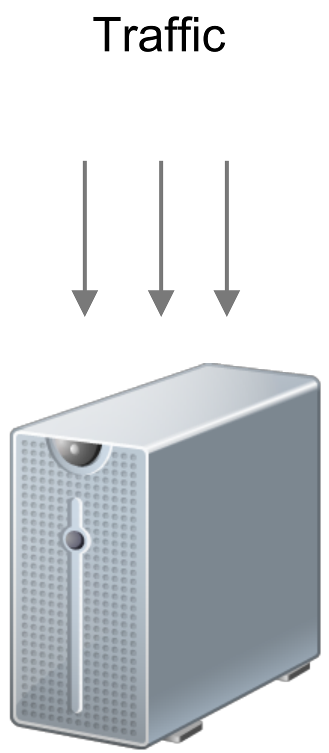
Vertical Scaling

Traffic



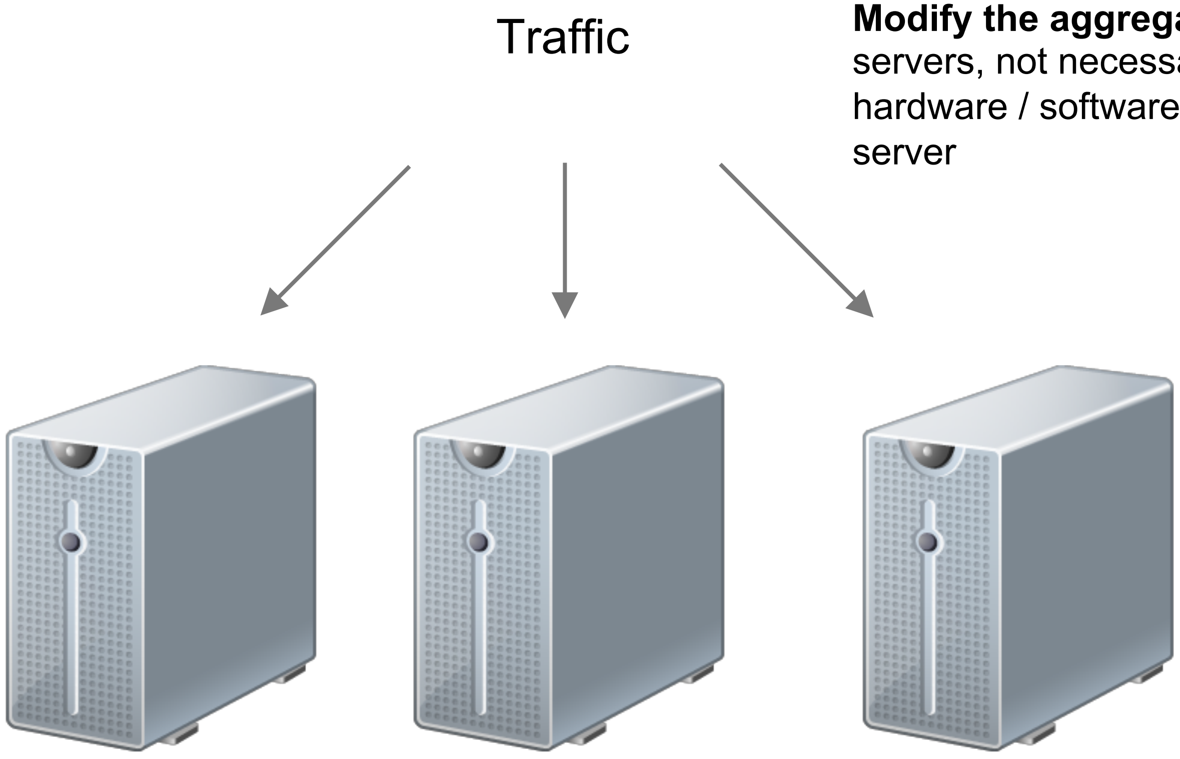
Improve each individual server:
- More / less RAM
- More / less / faster Storage
- Faster / Slower / more core CPU

Horizontal Scaling

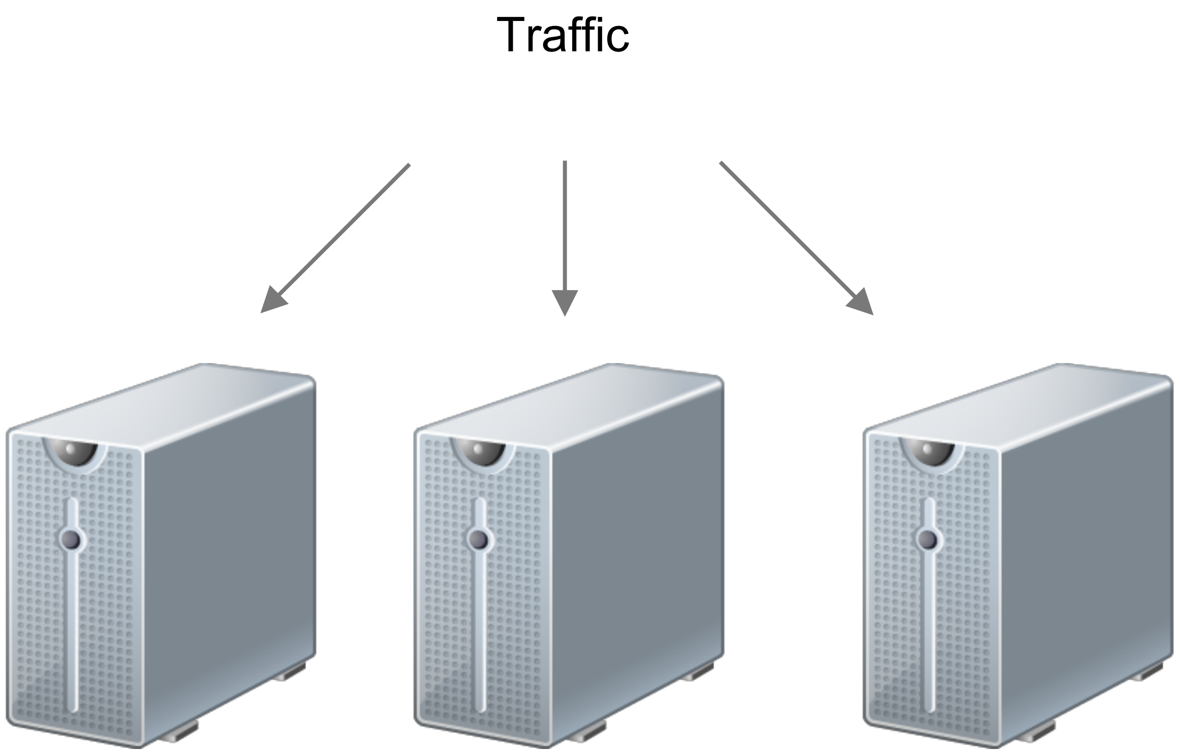


Horizontal Scaling

Modify the aggregate by adding more servers, not necessarily changing the hardware / software of each individual server



Load Balancer



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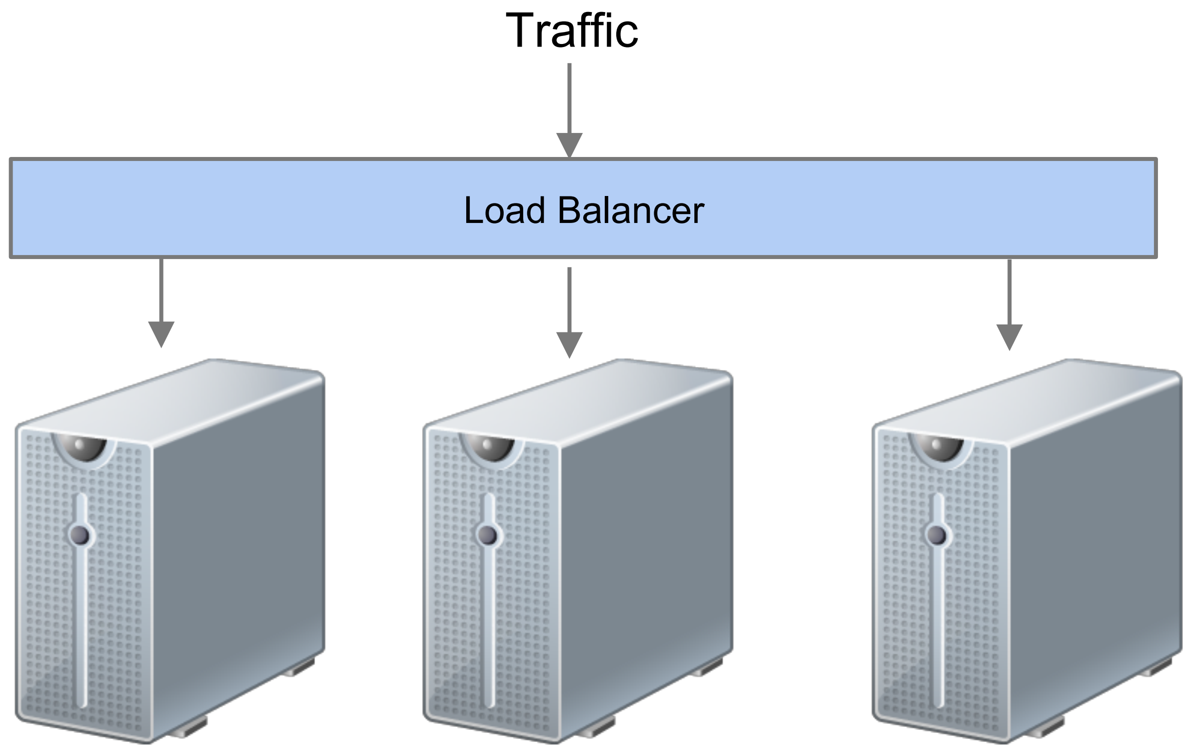

Service

Imagine a site that lets pet owners text their pets with updates while on vacation.

Considerations:

1. Registering a pet to the site is very performance-expensive
2. Processing the texts is quick, but has a lot of throughput
3. We experience seasonal spikes (Winter Holidays, Thanksgiving, etc.)

Image: http://www.mid-day.com/

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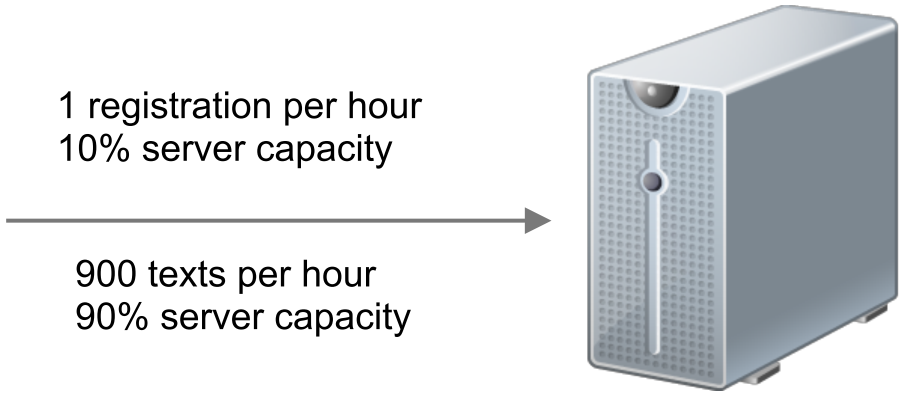

Text My Pet Server

If we get one additional registration per hour, we need a second server. That costs $$.

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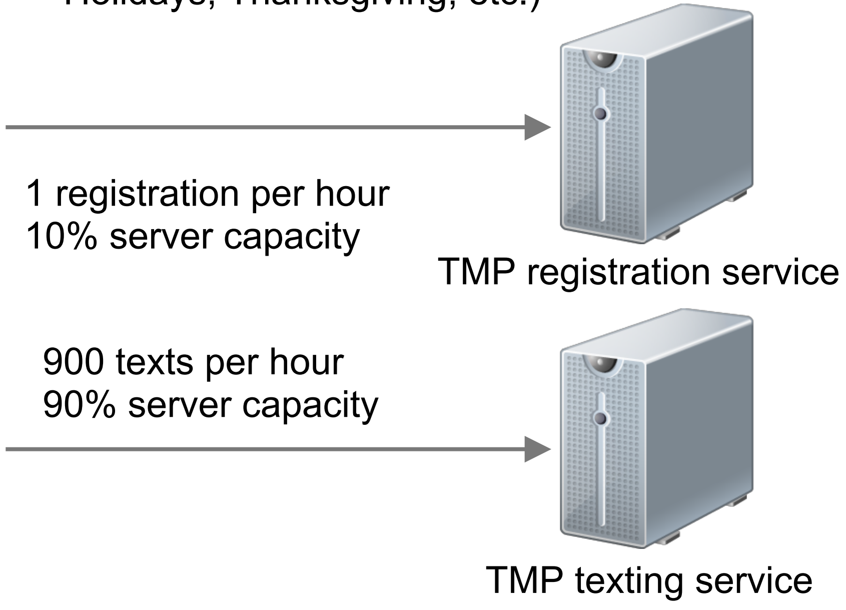


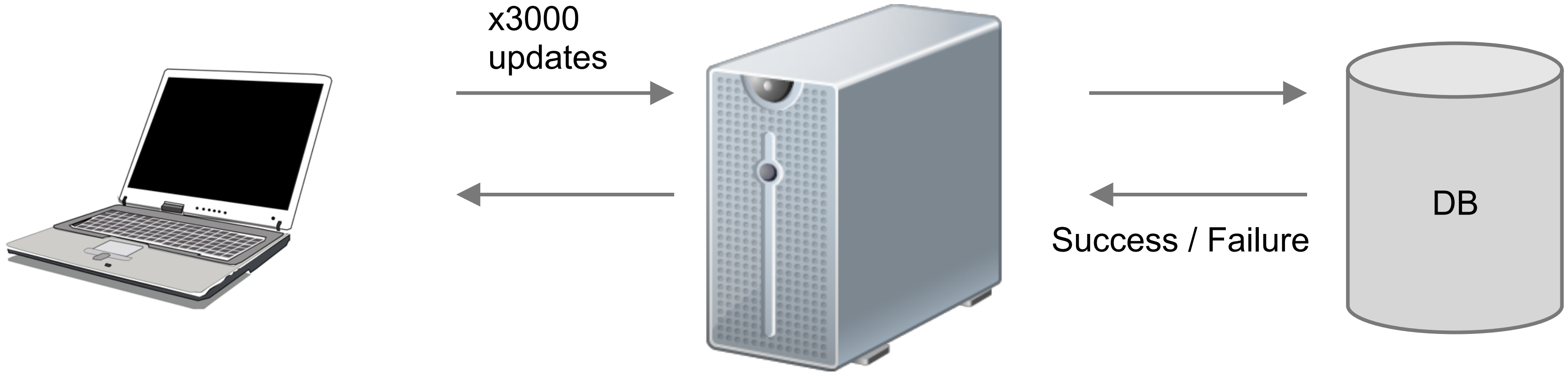
Now we can scale our registration and texting services separately, and can get more appropriate ‘sized’ servers for each.

Image: http://www.mid-day.com/

Cases for Service Oriented Architecture

- Performance Profiles
  - process A is really compute-intensive!
  - process B is really memory-intensive!
  - process C is bound by long IO times to a db!
- Maintainability
  - If I make a change to process A, does it somehow impact (or break!) process B?
  - How easy is it to phase in / phase out functionality?
- Testability
  - Can I guarantee that I can quickly find the root cause?
  - If I add a feature, can I know the scope of the performance impact?

Queue



For the special case where:

- the request doesn’t need to know if the transaction was successful or not
- it is acceptable to complete the transaction ‘out of band’ (a.k.a. out of the request cycle)
- long running transactions (resizing images, video)
- Multiple services should know about the request at the same time

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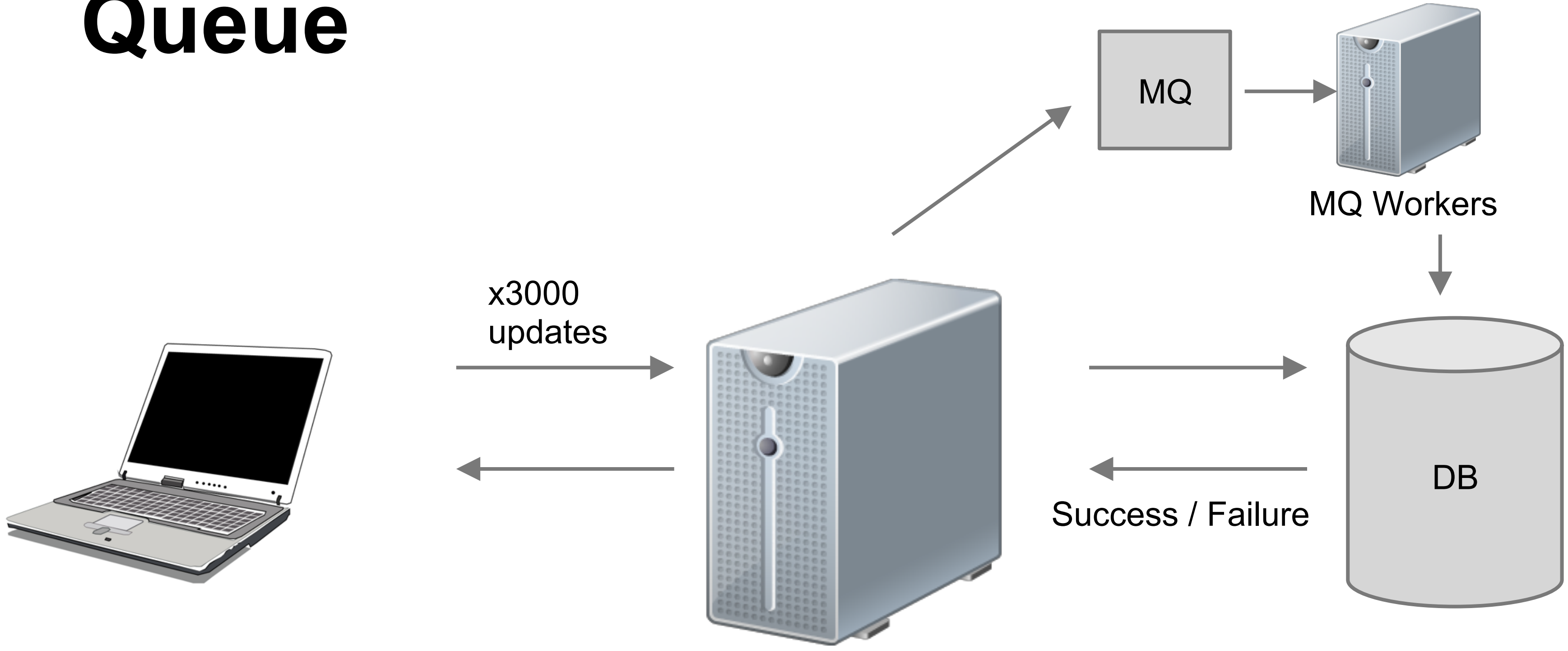

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Exercise!

Congratulations! You are a software engineer at a startup. You have been asked to come up with some ideas on how to make a system more scalable. What you know:

- The database and application are on the same server
- There are three types of requests:
  - Registration - require DB access, and knowledge of successful transaction
  - Lookups - generally very **repetitive**, may not require direct access to the database
  - Updates - should eventually update information from the DB; we do not need to know if they are successful right away.

What would you do?

Questions!

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