





From Homogenous Monolith to Radically  
Heterogenous Micro-services\* Architecture

# Wunderlist

For you, @samnewman

“Conway’s Law”

# HELLO WORLD!!!!!!!!!!!!!!

build a todo list application

**Web**

Images

Videos

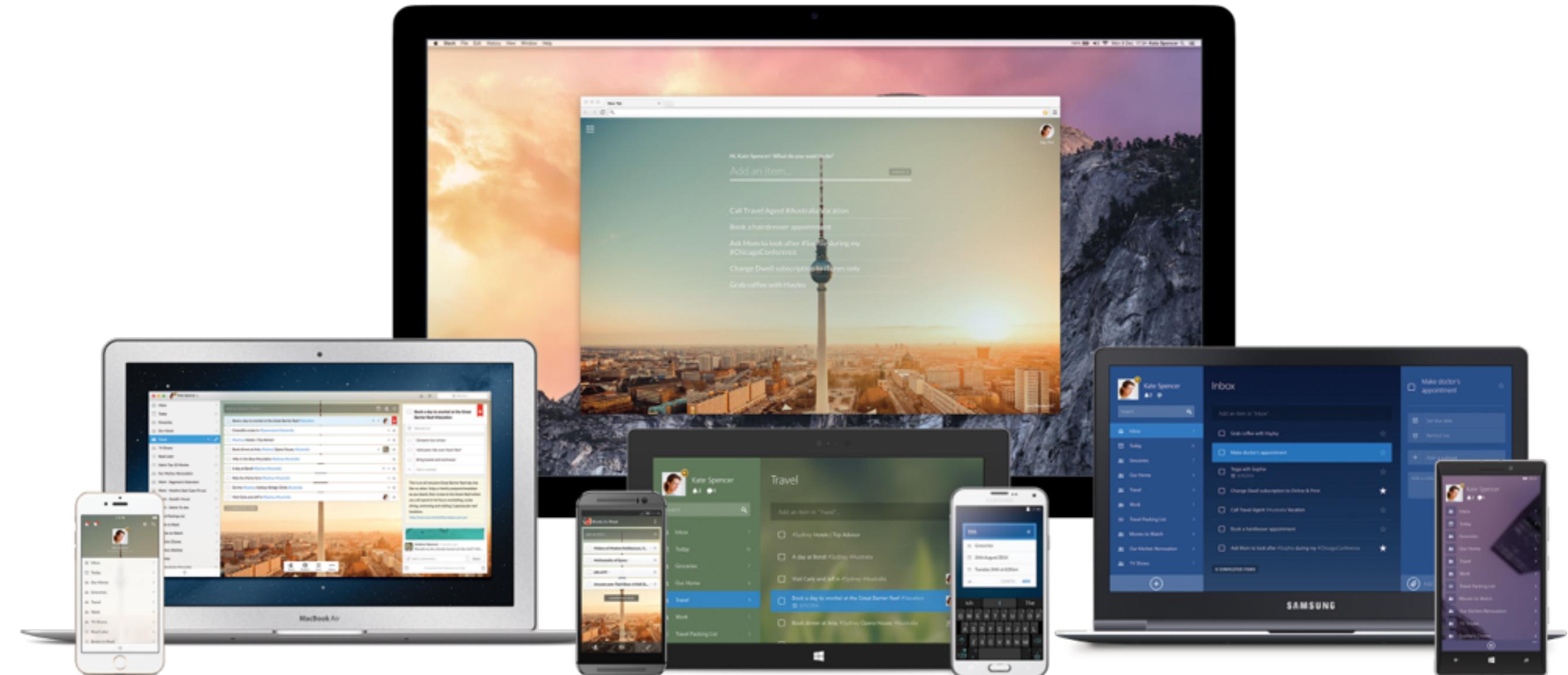
Shopping

Ne

About 228,000,000 results (0.97 seconds)

# What is Wunderlist?

Wunderlist is available on iPhone, iPad, Mac, Web, Android, Windows and Windows Phone

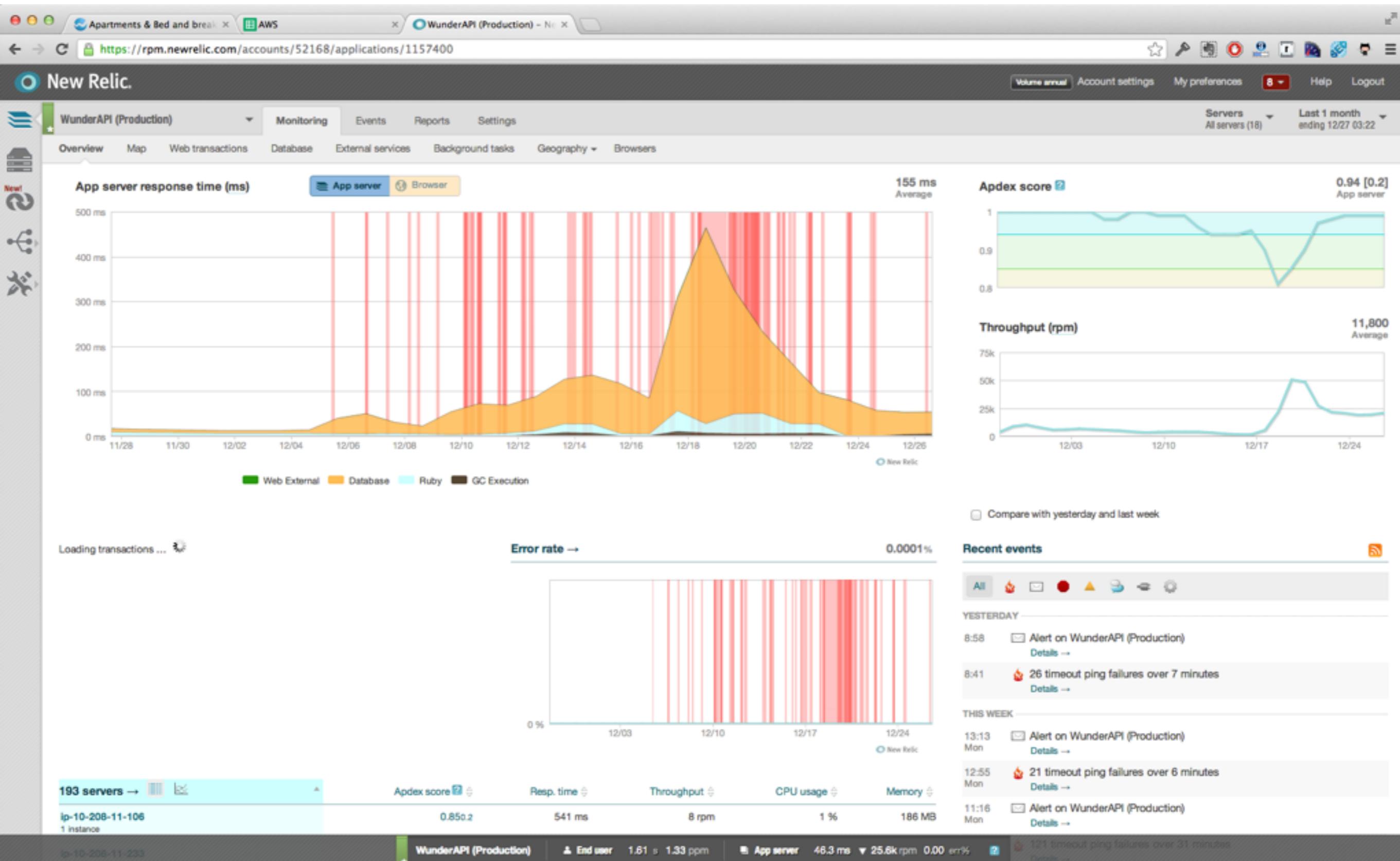




# The wait is over, it's time to unwrap Wunderlist 2

December 18, 2012 - [427 Comments](#)

Just in time for Christmas, we're super excited to deliver you Wunderlist 2. Available on iPhone, Mac, Android, Windows and the Web, Santa's little helpers, aka our entire team, have worked tirelessly day and night to bring this early Christmas gift to you. So, without much further ado let's rip off the gift wrap and take a closer look at Wunderlist 2 - your beautiful and simple to-do list. When you first unwrap Wunderlist 2 you'll notice it's available for your iPhone, Mac, Android, Windows PC and Web Browser. Select your device of choice and let's get started. Once you login we have a...

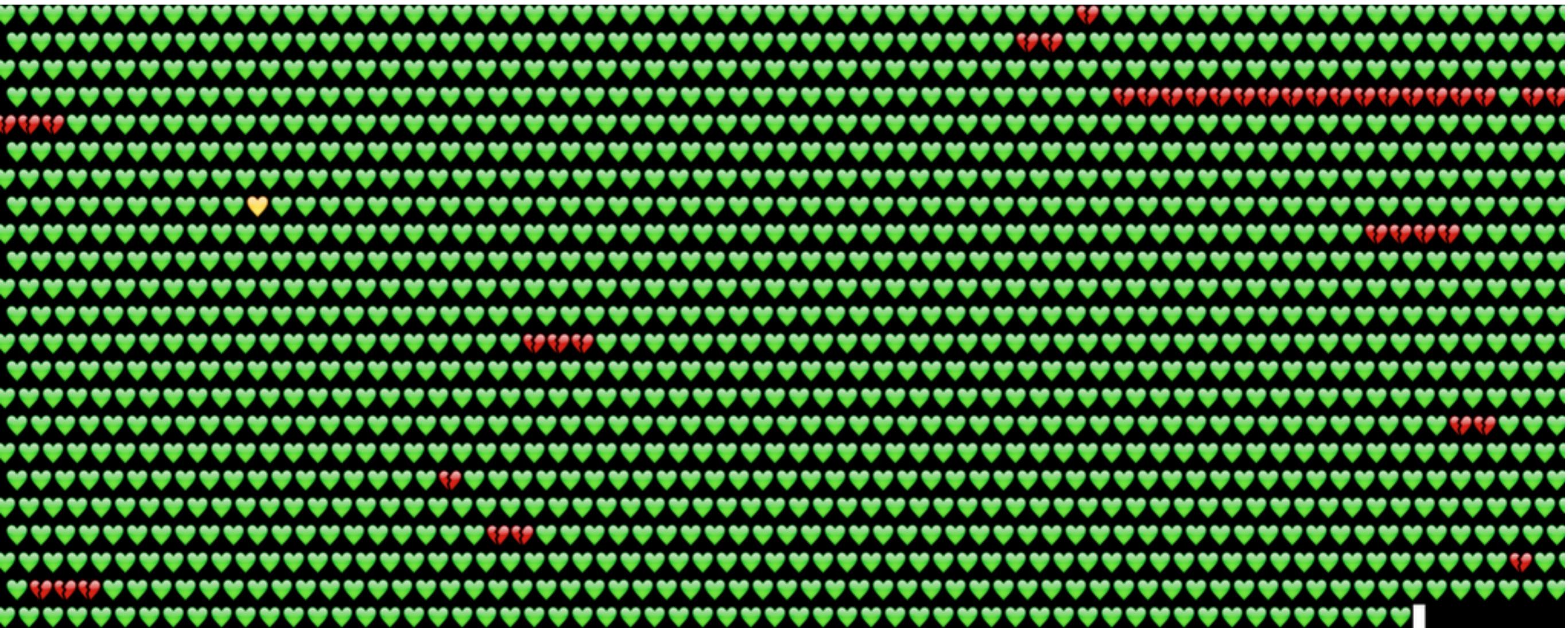


One Monolithic  
Application

One Monolithic  
Database

# One Language (Ruby)

# Test suite slow and brittle



Caching required for  
survival

# Deployment was scary



Logic buried in  
abstractions

# Legacy @chadfowler Systems Euthanizer

## Chad Fowler

the passionate programmer, author, speaker, musician, technologist, CTO

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2006.12.27

### The Big Rewrite

This is the first in a series of articles, discussing why many software rewrite projects end badly and what to do to avoid some of the ways I've seen them go astray.

You've got an existing, successful software product. You've hit the ceiling on extensibility and maintainability. Your project platform is inflexible, and your application is a software house of cards that can't support another new feature.

You've seen the videos, the weblog posts and the hype, and you've decided you're going to re-implement your product in Rails (or Java, or .NET, or Erlang, etc.).

Beware. This is a longer, harder, more failure-prone path than you expect.

Throughout my career in software development, I've been involved in Big Rewrite after Big Rewrite. I suspect it's because I have an interest in learning eclectic computer languages, operating systems, and development environments. Not being just-a-Java-guy or just-a-Windows-guy has led to me becoming a serial rewriter. I've been on projects to replace C, COBOL, PHP, Visual Basic, Perl, PLSQL, VBX (don't ask!) and all manner of architectural atrocities with the latest and greatest technology of the day.

It's a good idea to start by reading my article on [why big rewrites fail](#). It's also a good idea to read my article on [rewriting vs. refactoring](#). If you're interested in learning about some of the most interesting and challenging computer languages out there, check out my book [Domain Specific Languages](#).

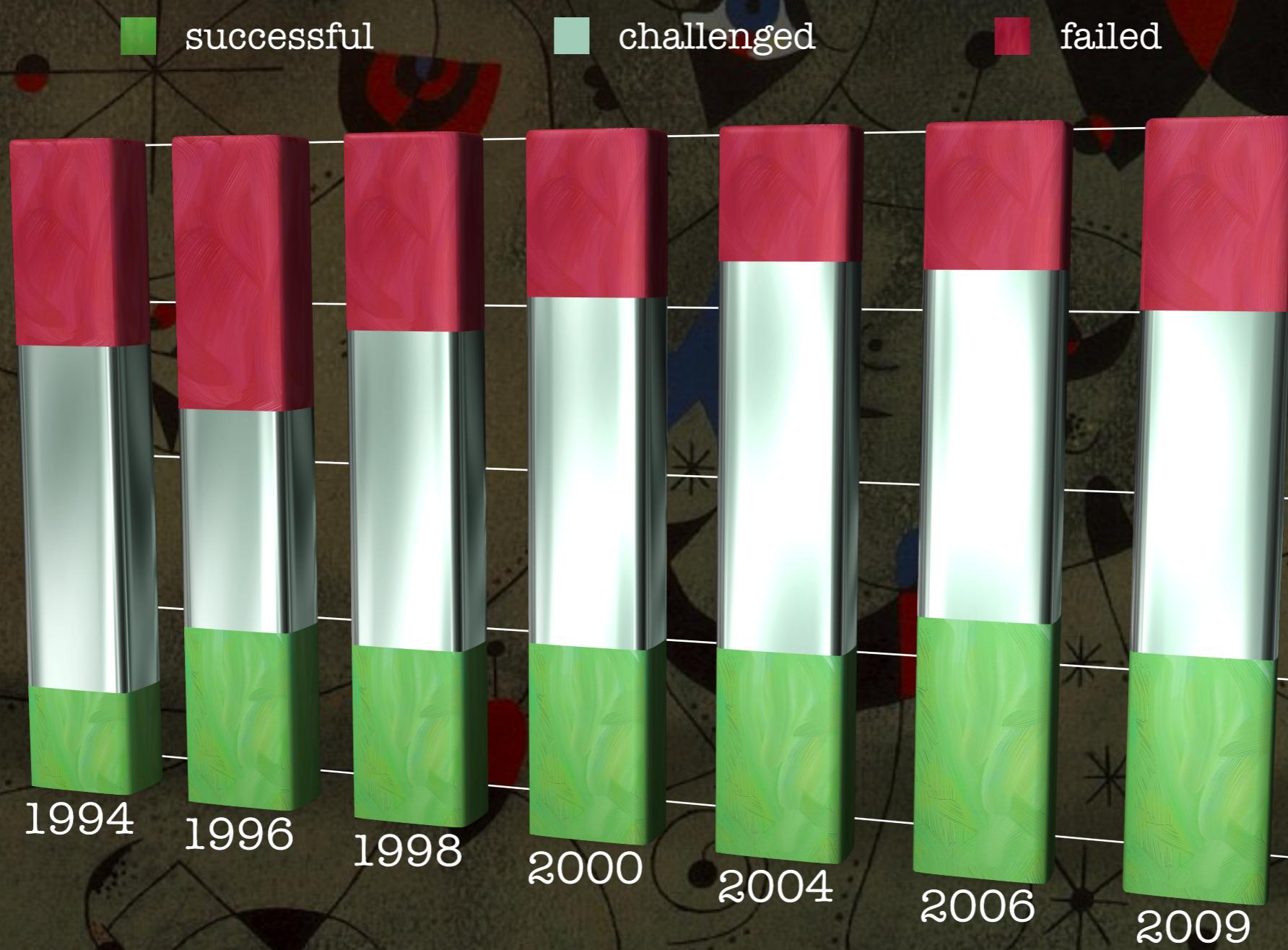
**1** *a legacy from a great aunt:* BEQUEST, inheritance, heritage, endowment, gift, patrimony, settlement, birthright; formal benefaction.

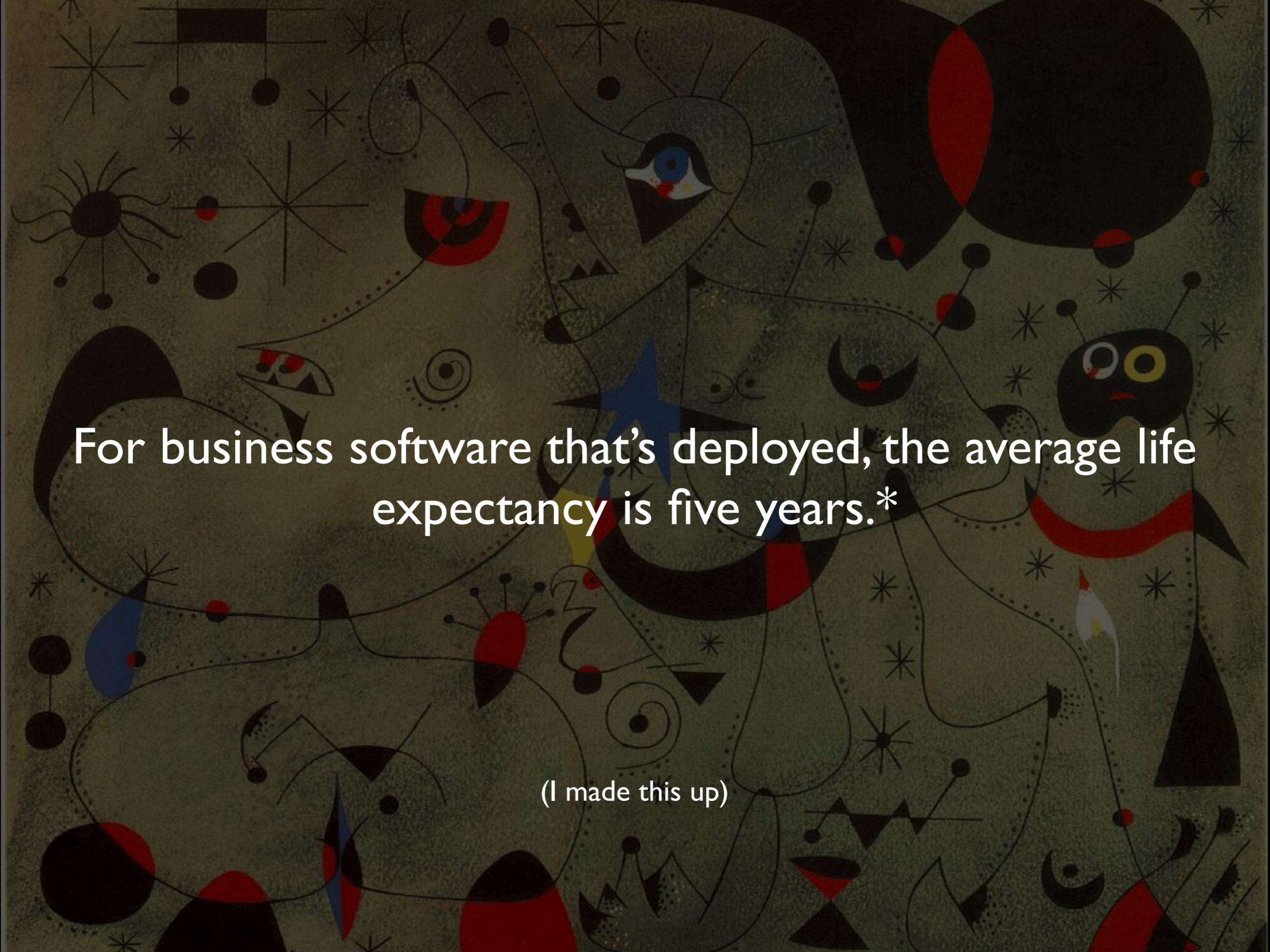
# “legacy”

**2** *a legacy of the wars:* CONSEQUENCE, effect, upshot, spin-off, repercussion, aftermath, by-product, result.







The background of the slide features a dark, textured surface with a variety of abstract, organic shapes. These shapes include stylized, multi-limbed figures in black, red, blue, and yellow; several large, irregular circles in shades of black, red, and grey; and numerous thin, branching lines resembling veins or neural pathways. Some shapes have small, dark dots or speckles on them. The overall aesthetic is reminiscent of a microscopic view of a complex biological or technological system.

For business software that's deployed, the average life expectancy is five years.\*

(I made this up)



Joel on Software

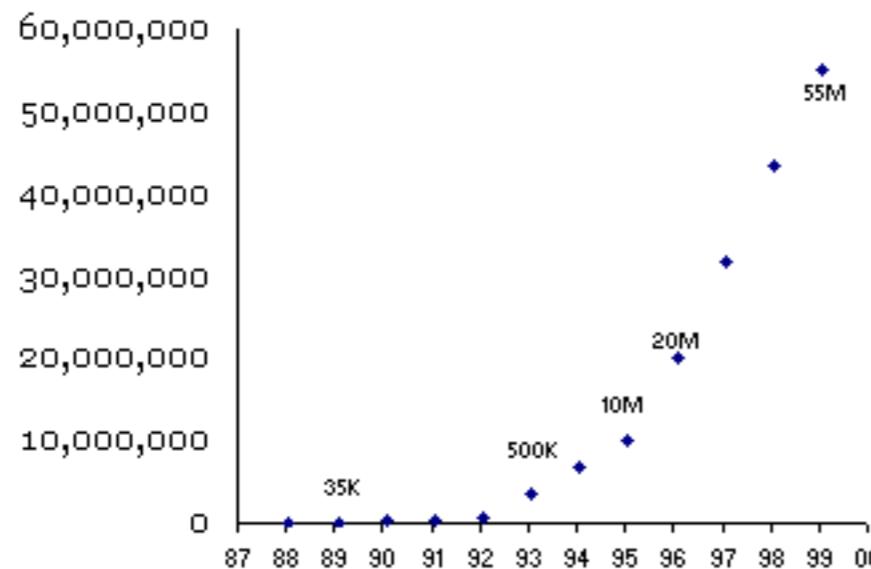
Joel on Software

# Good Software Takes Ten Years. Get Used To It.

by Joel Spolsky

Saturday, July 21, 2001

Have a look at this little chart:



[File a CV](#) and let the great jobs come to you!

**Wanted:** [Golden Website & Database Developers at BullionVault](#) (London, England). See this and other great job listings on [the jobs page](#).



How do you CREATE  
Legacy software?

# richard p. gabriel

Biological  
systems are very much larger than anything (coherent)  
that people have built.



© Pinar Özger

“When a cell is not healthy, an outside cell that's part of the immune system can command the cell to destroy itself without spreading toxins.”



# homeostasis

## Homeostasis

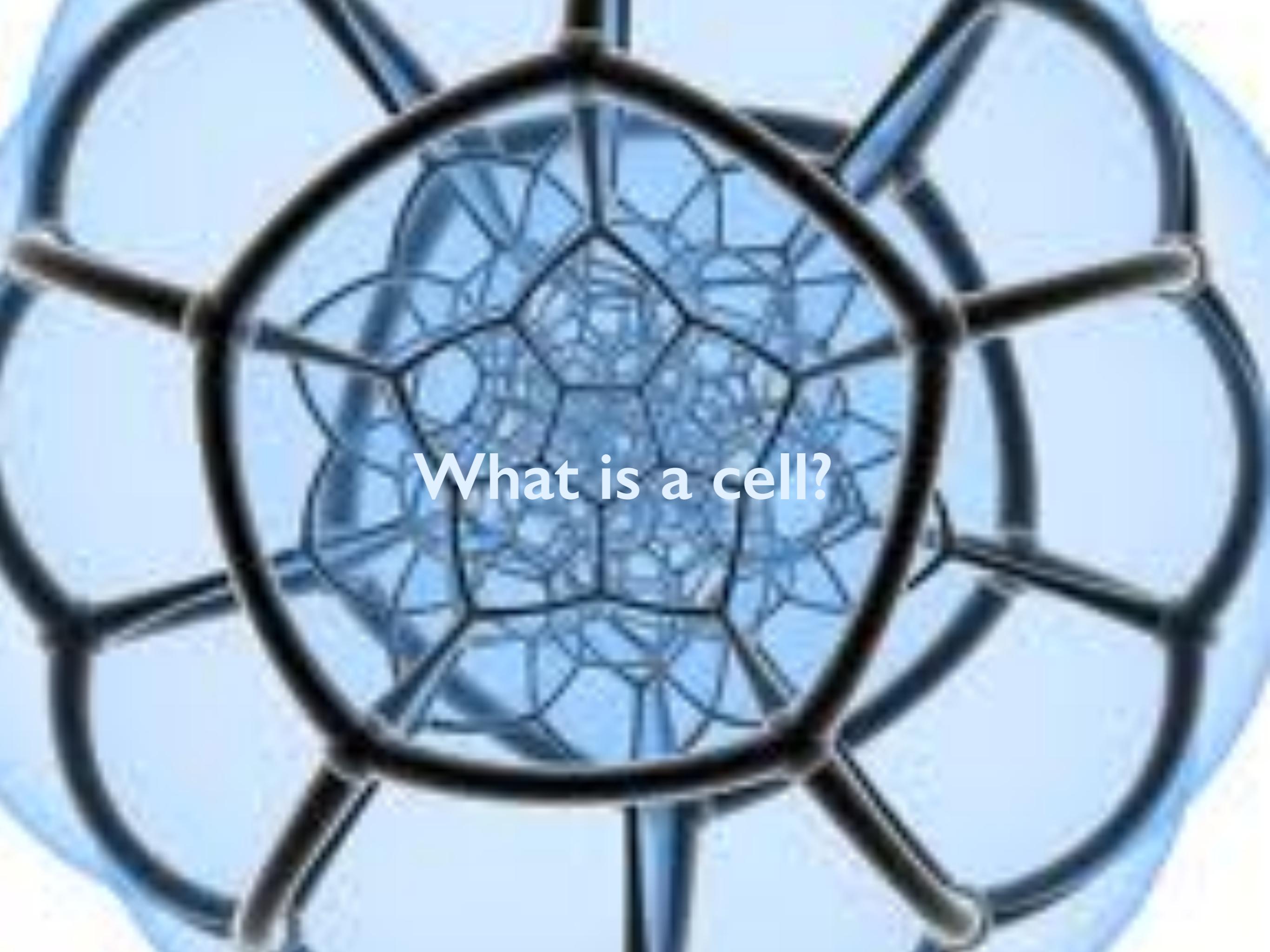
### Definition

*noun*

(Science: Biology)

(1) The tendency of an organism or a cell to regulate its internal conditions, usually by a system of feedback controls, so as to stabilize health and functioning, regardless of the outside changing conditions

(2) The ability of the body or a cell to seek and maintain a condition of equilibrium or stability within its internal environment when dealing with external changes



What is a cell?



What is a system?

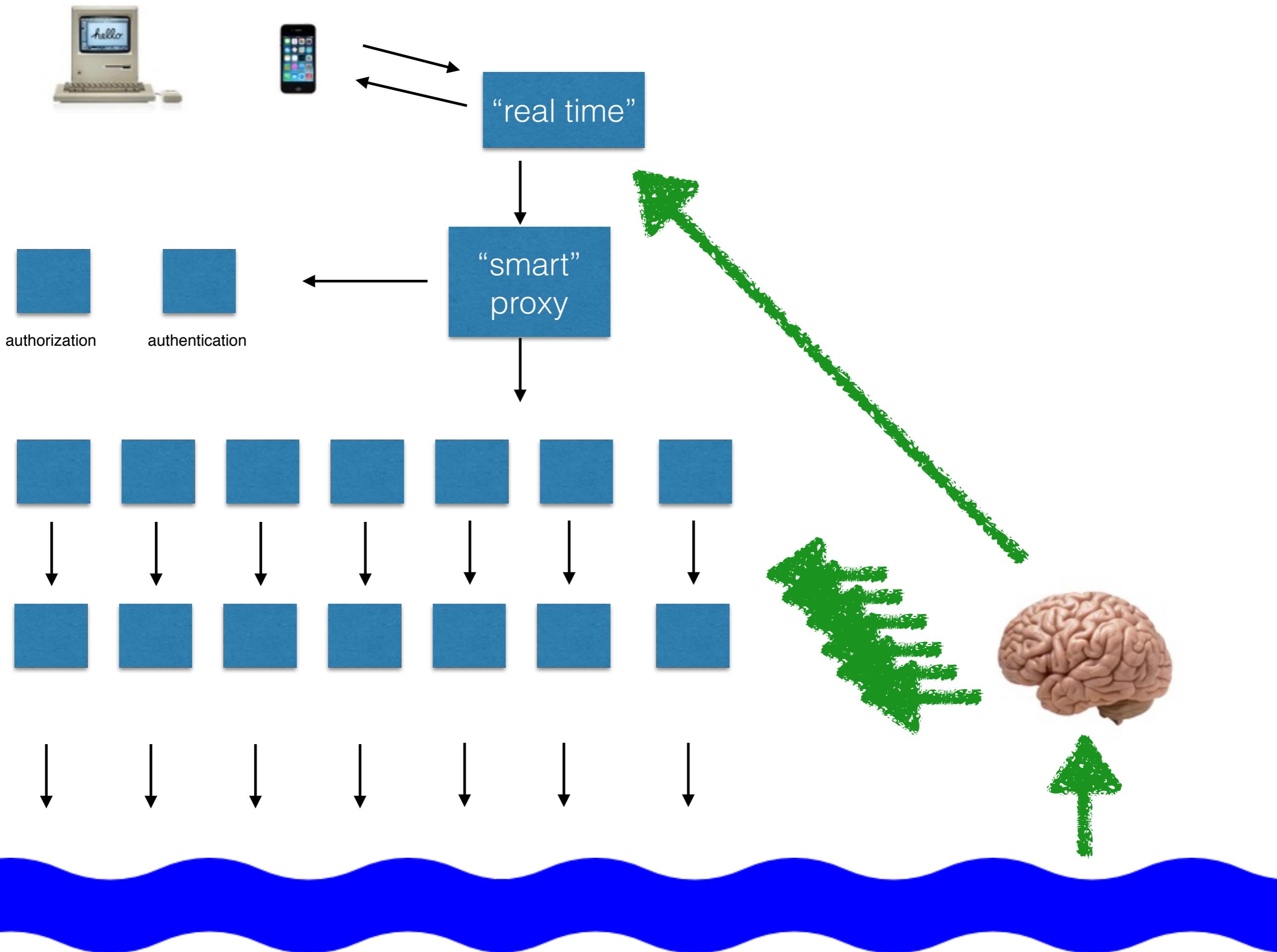
When do you build a system vs. a cell?

Are you building the right one now?



# The Big Rewrite

“Please tell me I’m never  
going to hear you say you  
have to do this again.”

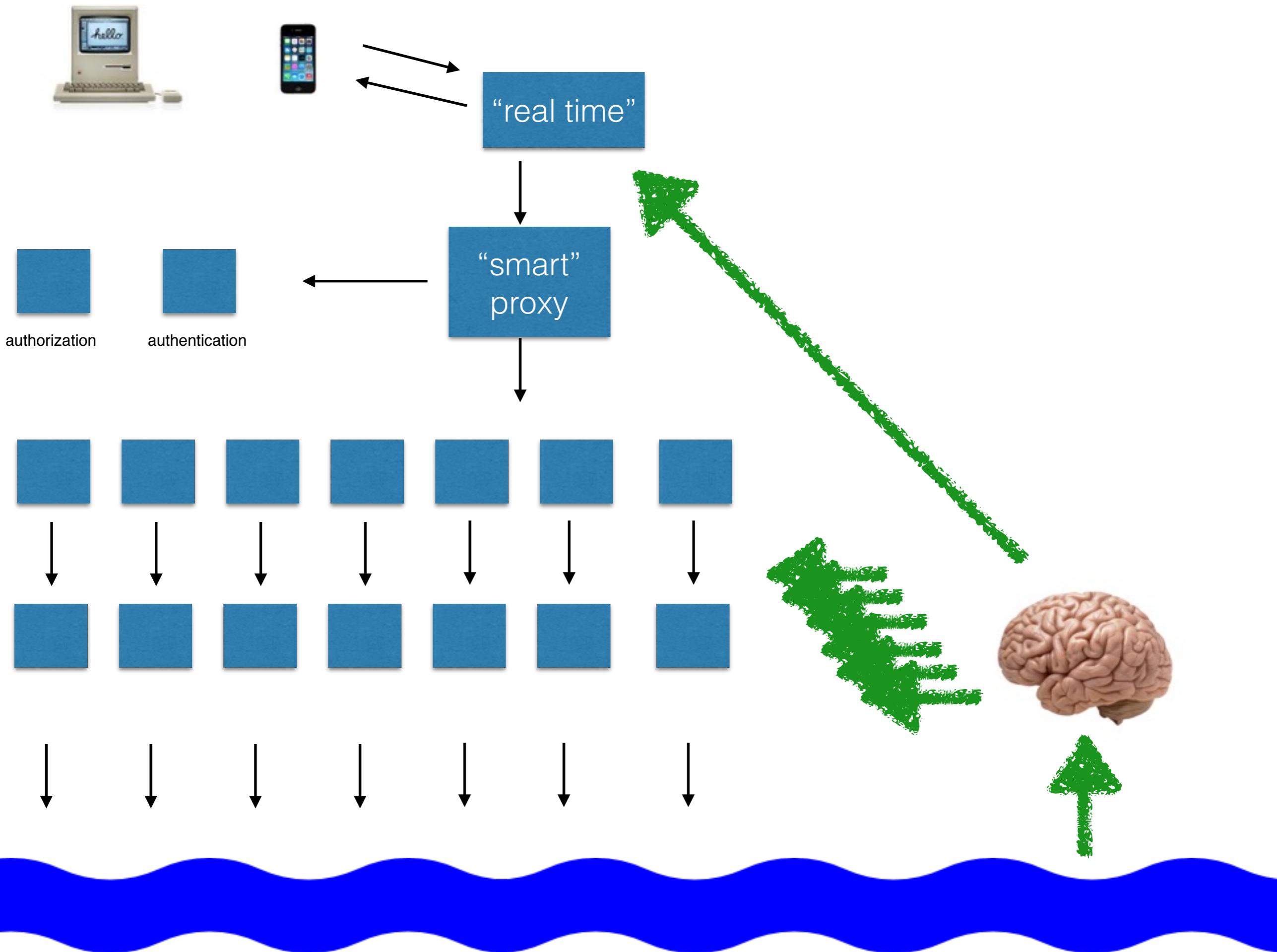


```
%w{rock tilt date INT TERM}.map{|l|trap(l){$r.stop}rescue require l};$u=Date;$z=($u.new.year + 145).abs;puts "— Almost Sinatra/No Version has taken the stage on #$z for development with backup from Webrick"
$n=Module.new[extend Rack;a,D,S,q=Rack::Builder.new,Object.method(:define_method),/\*\*\*(\[\^\n\]+)\n((\?\*\*)\[\^\n\]*\n)*\*/m
%w[get post put delete].map{|m|D.(m){|u,&b|a.map(u){run->(e){[200,{"Content-Type":>"text/html"},[a.instance_eval(&b)]]}}}}
Tilt.mappings.map{|k,v|D.(k){|n,*o|$t||=(h=$u._jisx8301("hash, please"));File.read(caller[0][/\^[:\:]+\]/).scan(S){|a,b|h[a]=b};h;v[0].new(*o){n=="#{n}"?n:$t[n.to_s]}.render(a,o[0].try(:[],:locals)||{})}}
%w[set enable disable configure helpers use register].map{|m|D.(m){|*_,&b|b.try :[]};END{Rack::Handler.get("webrick").run(a,Port:$z){|s|$r=s}}}
%w[params session].map{|m|D.(m){q.send m}};a.use Rack::Session::Cookie;a.use Rack::Lock;D.(before){|&b|a.use Rack::Config,&b};before{|e|q=Rack::Request.new e;q.params.dup.map{|k,v|params[k.to_sym]=v}}}
```

# Code is “this big”

# multi-tiered architecture

- Socket
- Proxy
- English
- German
- “Write layer”



# Disposable Software



Nodes  
are  
Disposable

# Immutable Deployments

*Never Upgrade Software  
on an Existing Node*

# Threw away Chef



```
● ● ● 3. chad@Chads-MBP-2: ~/Documents/monolith (zsh)
➔ monolith wake info as_files
0) AS_files-pgbouncer_production ec2-54-75-141-98.eu-west-1.compute.amazonaws.com 10.85.20.104 i-145e1557 2014-09-27T03:07:27.000Z b ami-a2e43fd5
m3.medium
1) AS_files_production ec2-54-78-168-3.eu-west-1.compute.amazonaws.com 10.193.130.101 i-99e5d27c 2014-11-05T09:34:17.000Z a ami-0c58fa7b
c3.xlarge
2) AS_files_production ec2-54-216-126-12.eu-west-1.compute.amazonaws.com 10.97.19.136 i-9be5d27e 2014-11-05T09:34:17.000Z a ami-0c58fa7b
c3.xlarge
3) AS_files_production ec2-54-74-167-255.eu-west-1.compute.amazonaws.com 10.33.40.43 i-9ae5d27f 2014-11-05T09:34:17.000Z a ami-0c58fa7b
c3.xlarge
4) AS_files_production ec2-54-78-199-87.eu-west-1.compute.amazonaws.com 10.83.139.59 i-1d3f3b5e 2014-11-05T09:34:18.000Z b ami-0c58fa7b
c3.xlarge
5) AS_files_production ec2-54-220-210-198.eu-west-1.compute.amazonaws.com 10.101.2.226 i-1e3f3b5d 2014-11-05T09:34:18.000Z b ami-0c58fa7b
c3.xlarge
6) AS_files_production ec2-54-73-148-53.eu-west-1.compute.amazonaws.com 10.86.7.5 i-1f3f3b5c 2014-11-05T09:34:18.000Z b ami-0c58fa7b
c3.xlarge
7) AS_files_production ec2-54-170-187-191.eu-west-1.compute.amazonaws.com 10.91.128.160 i-87bba7c5 2014-11-05T09:34:19.000Z c ami-0c58fa7b
c3.xlarge
8) AS_files_production ec2-54-216-255-152.eu-west-1.compute.amazonaws.com 10.126.137.96 i-a3b7abe1 2014-11-05T09:34:19.000Z c ami-0c58fa7b
c3.xlarge
9) AS_files_production ec2-54-195-205-215.eu-west-1.compute.amazonaws.com 10.89.144.222 i-a2b7abe0 2014-11-05T09:34:19.000Z c ami-0c58fa7b
➔ monolith
```

3. chad@Chads-MBP-2: ~/Documents/monolith (zsh)

```
➔ monolith wake describe-elb ical
total running: 6
revision: 394d1a8af207e3923345f5de4112c984f5c4e836
  image_id: ami-a0a609d7
    a 2
      in service: i-54e2bab1 i-53e2bab6
    b 2
      in service: i-5abe9319 i-5bbe9318
    c 2
      in service: i-cefd9fb8c i-cffdfb8d
➔ monolith wake scale -a ical -n 3
Removing 3 instances...
wake contract -a ical -e production -n 3 -t AS
Terminating 3 instances...
wake terminate i-54e2bab1 i-53e2bab6 i-5bbe9318
Deregistered i-54e2bab1 i-53e2bab6 i-5bbe9318 from ELB
Waiting for 10 secs..
{
  "TerminatingInstances": [
    {
      "InstanceId": "i-53e2bab6",
      "CurrentState": {
        "Code": 32,
        "Name": "shutting-down"
      },
    }
  ]
}
```

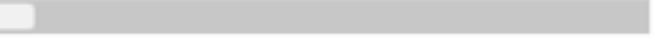


[Home](#) » All Repos » activitiesurl <https://github.com/6wunderkinder/activities>manifest [show manifest](#)travis [build](#) unknown

### production Servers ([calculate cost](#))

AS	count	3 	
	current ami	 <a href="#">ami-a2e653d5 - 63a166bc8</a> (22 days ago)	
	instances	<a href="#">show instances</a>	

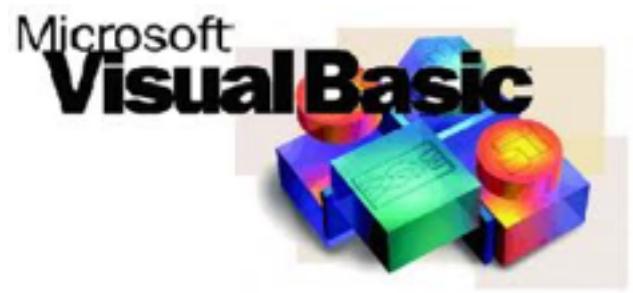
### experimental Servers ([calculate cost](#))

AS	count	0 	
	current ami	nothing deployed	
	instances	<a href="#">show instances</a>	

### Last Commits (upto 10)

To force a rebuild an ami, you can `git commit --allow-empty -m "Rebuild ami"`.

commit	author	commit time	last ami	last ami's env
<a href="#">63a166bc89 - change default logo to https</a>	Chad Fowler <a href="mailto:&lt;chad@chadfowler.com&gt;">&lt;chad@chadfowler.com&gt;</a>	22 days ago	<a href="#">ami-a2e653d5</a>	production
<a href="#">64059e7453 - Grey border</a>	Timothy Achumba <a href="mailto:&lt;tim@6wunderkinder.com&gt;">&lt;tim@6wunderkinder.com&gt;</a>	about a month ago	<a href="#">ami-12c76765</a>	production



Java

C#<sup>Microsoft</sup>.net



Scala



# Tiny Databases

# Conventions

```
for service in $SERVICE_NAMES; do
  rails new $service -m service_template.rb
  cd $service
  git init
  git add . && git commit -m "Initial commit"
done
```

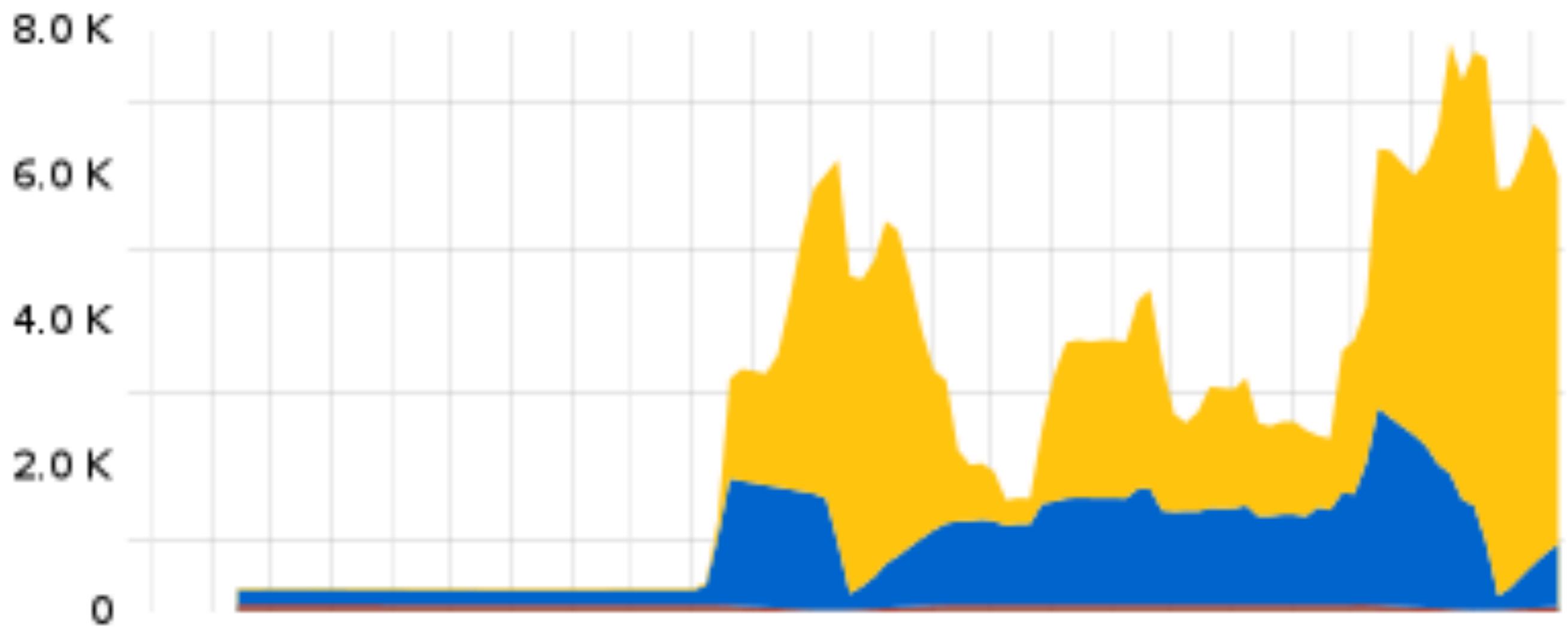
# Conventions

A screenshot of a GitHub repository search results page. The search bar at the top contains the text "api-client". Below the search bar, there are five filter tabs: "All" (which is highlighted with an orange underline), "Forks", "Sources", "Private", and "Public". The main area displays seven repository results, each with a small lock icon followed by the repository name in blue text. The repository names are: 6wunderkinder/api-client, 6wunderkinder/api-client.js, 6wunderkinder/api-client-scala, 6wunderkinder/wunder-api-client-clj, 6wunderkinder/api-client-elixir, 6wunderkinder/wunder-api-client-go, and 6wunderkinder/wunder-api-client-haskell.

Repository
6wunderkinder/api-client
6wunderkinder/api-client.js
6wunderkinder/api-client-scala
6wunderkinder/wunder-api-client-clj
6wunderkinder/api-client-elixir
6wunderkinder/wunder-api-client-go
6wunderkinder/wunder-api-client-haskell

“Smart” proxy

Real-time service



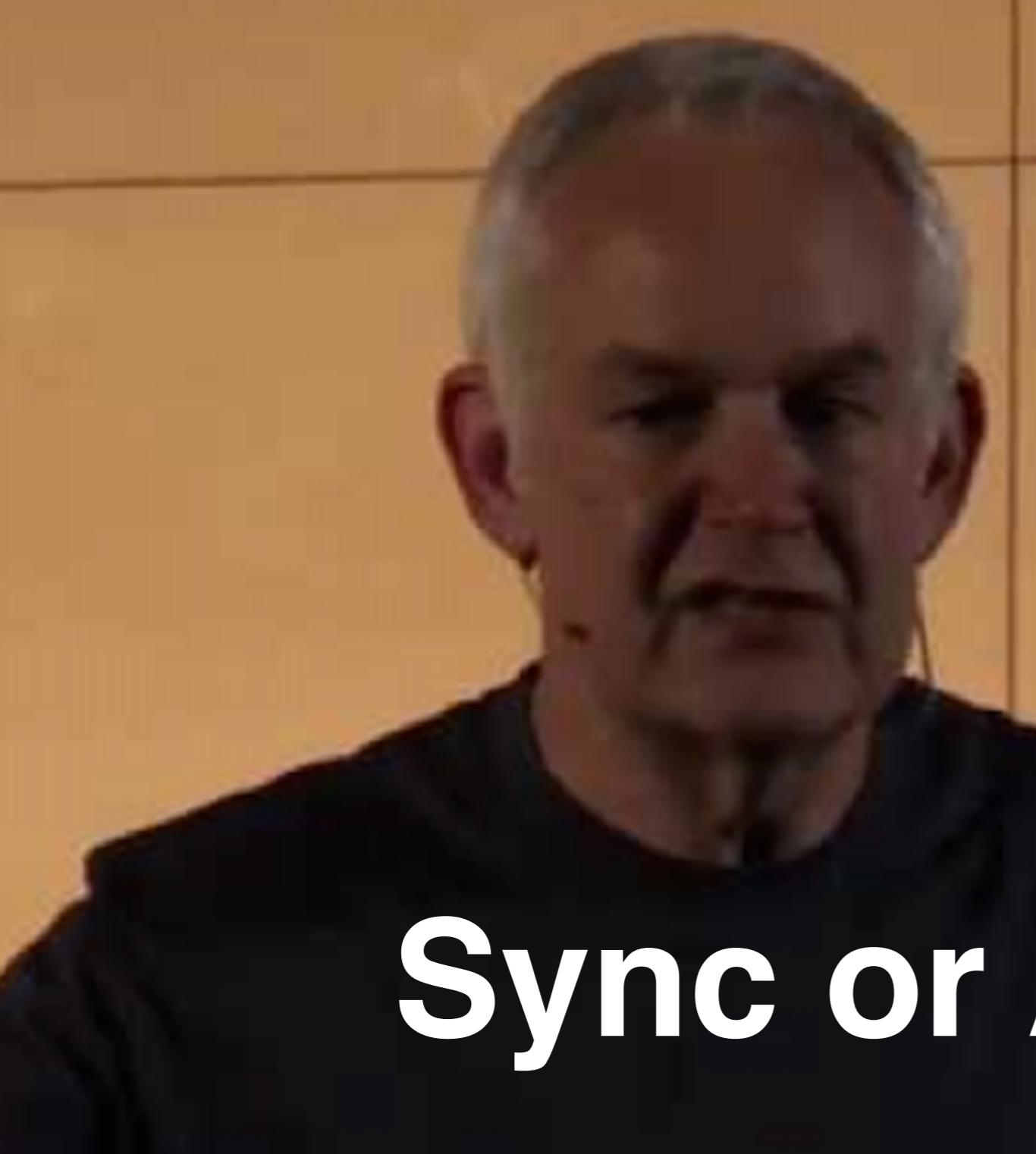
# Many tiny services

```
→ wake-repo git:(master) find config -name manifest.json | wc -l  
151
```

# Service Resolution

YAML -> JSON -> Auto-generated JSON -> Consul

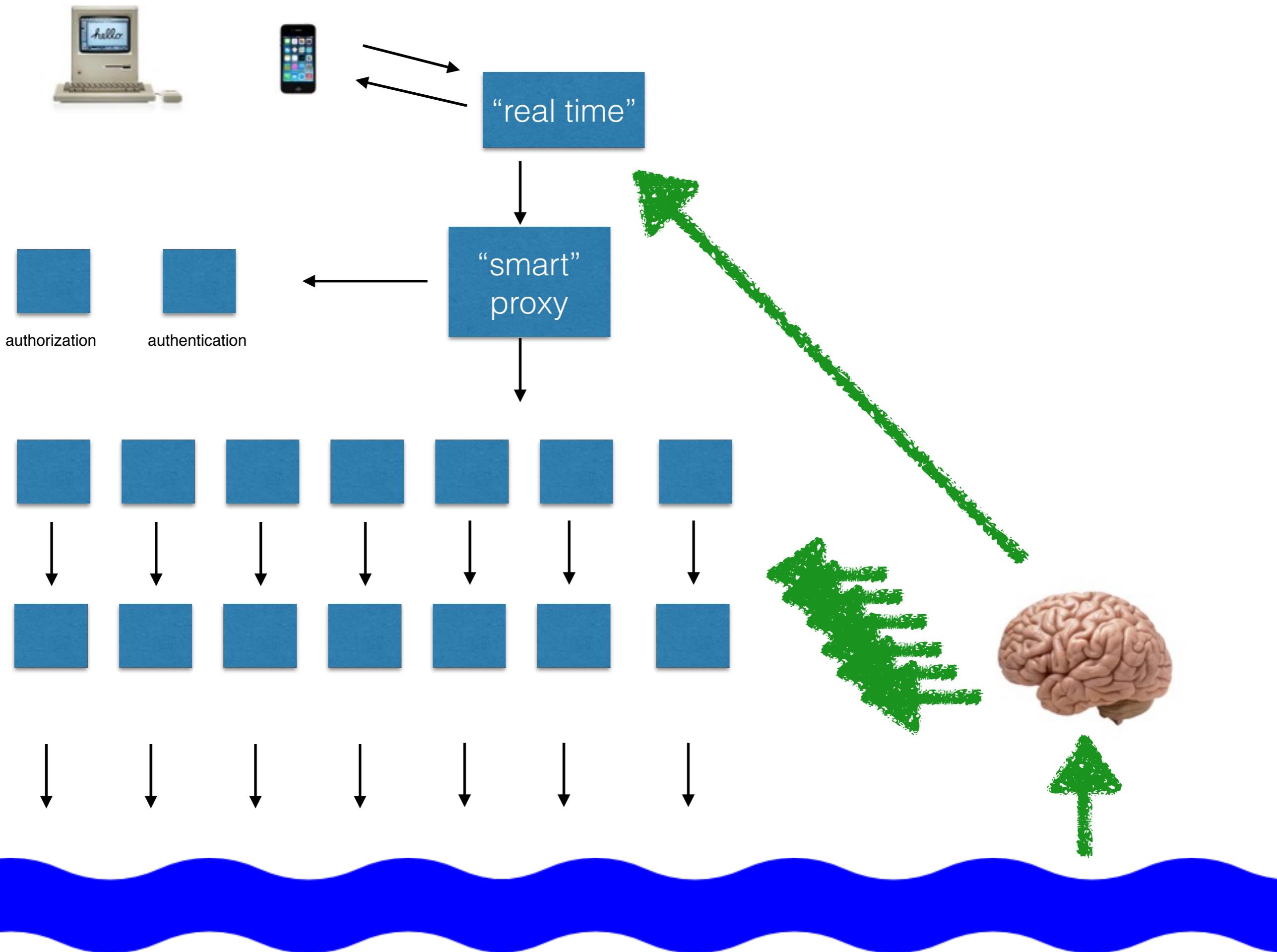
# DEATHMARCH



Sync or Async?

# Message Queuing

- Standardized Mutation flow
- Feeds real-time synchronization to clients
- Feeds anything else, by convention

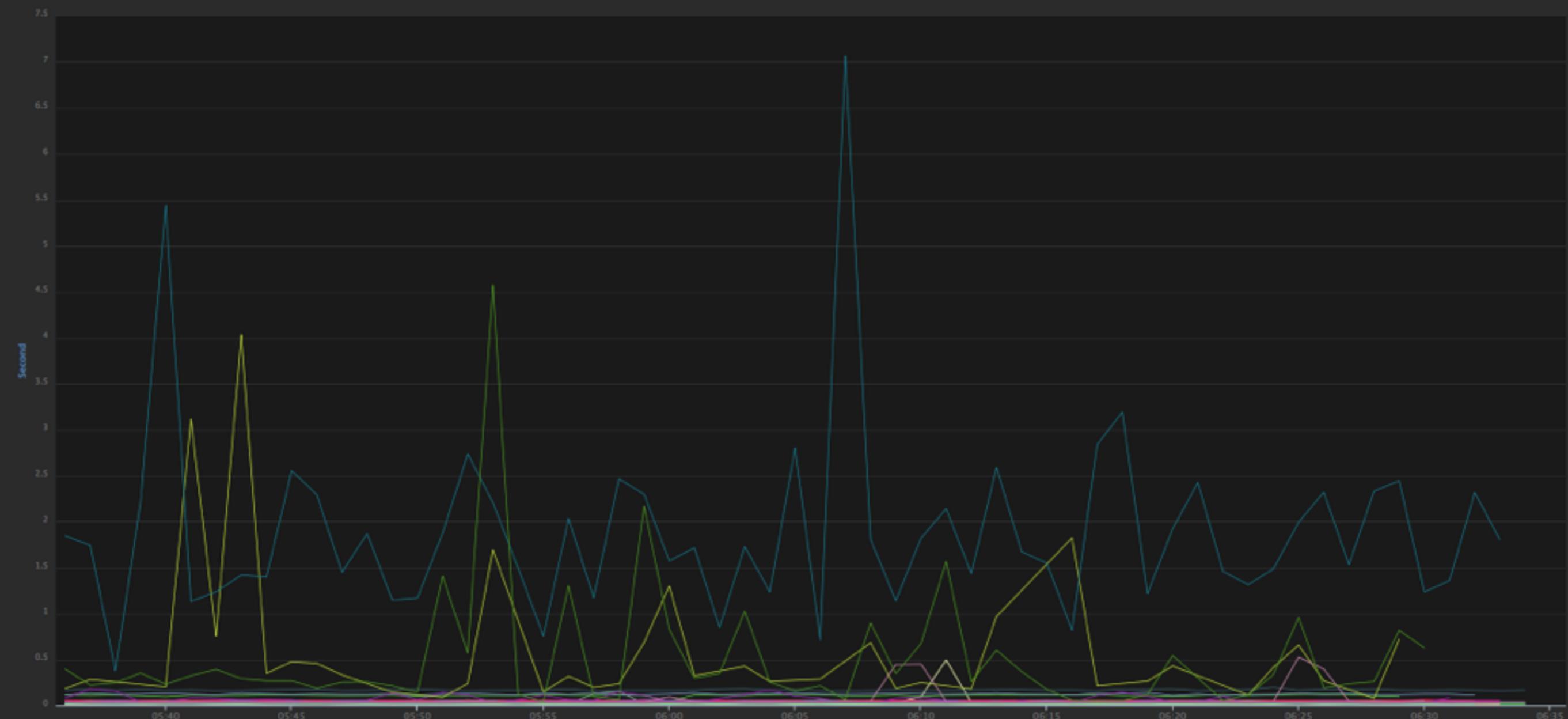


# Monitor Everything

## AWS.ELB.Latency

24 NOV 07, 14 05:35 AM - NOV 07, 14 06:35 AM

UTC





# How We Migrated

- Removed joins
- Separated databases
- New features prototyped new service approach (comments, files)
- New features prototyped real-time/mutation approach (comments)
- Replace database connections in old API with new APIs (some ran as long as 7 months)
- Test under crazy load/behavior (next slide)

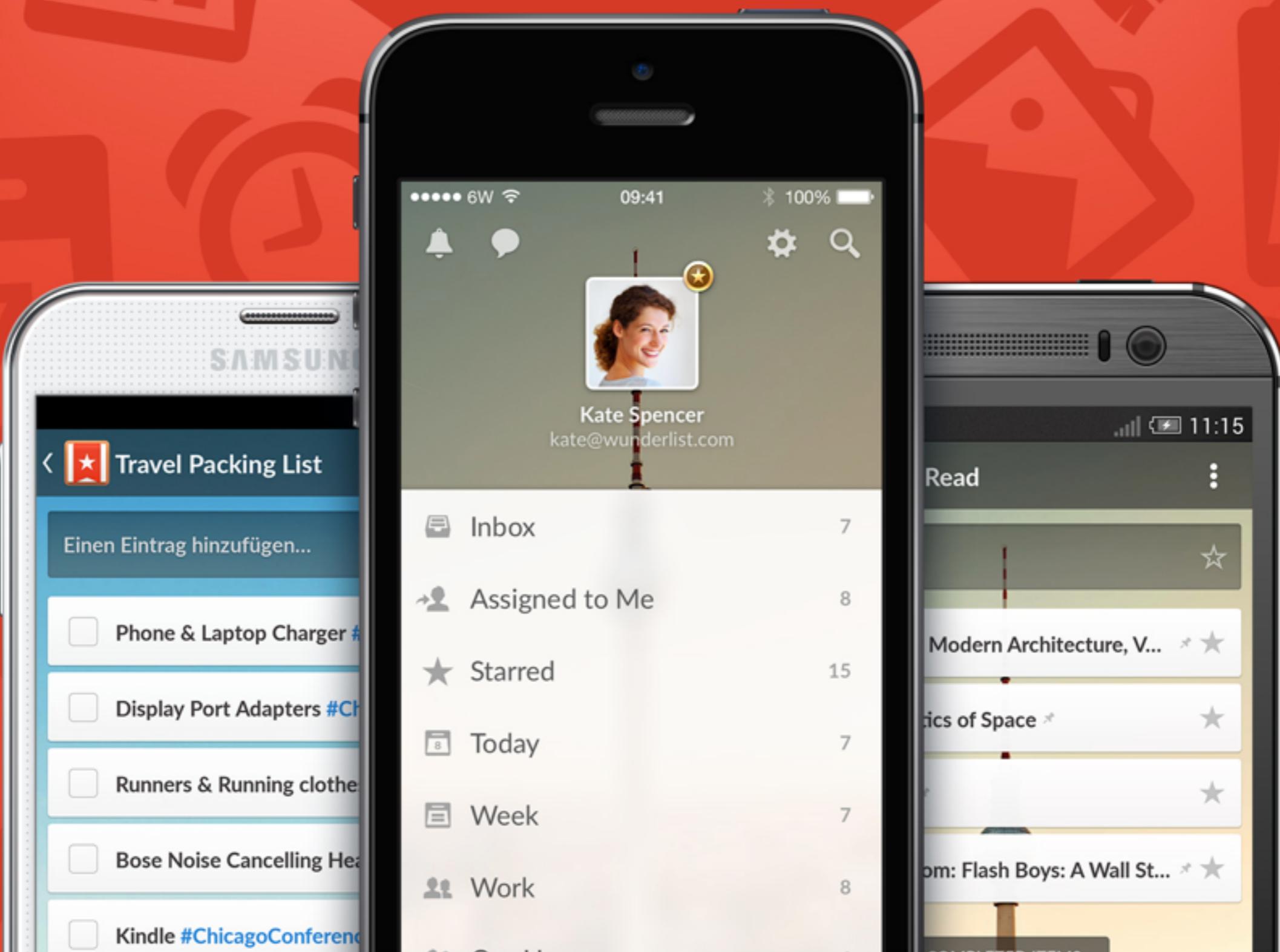
# Böse Gurken

```
def receive = {
    case CreateUsers(userCount) => {
        val user = context.actorOf(Props(classOf[GurkeUser]))
        user ! SignUp
        user ! LogIn
        user ! CreateGurken
    }
}
```

```
def receive = {
    case Tick => {
        roughlyHalfTheTime { createAList }
        prettyOften { createATask }
        roughlyHalfTheTime { completeATask }
        // and so much many more actions...
    }
}
```

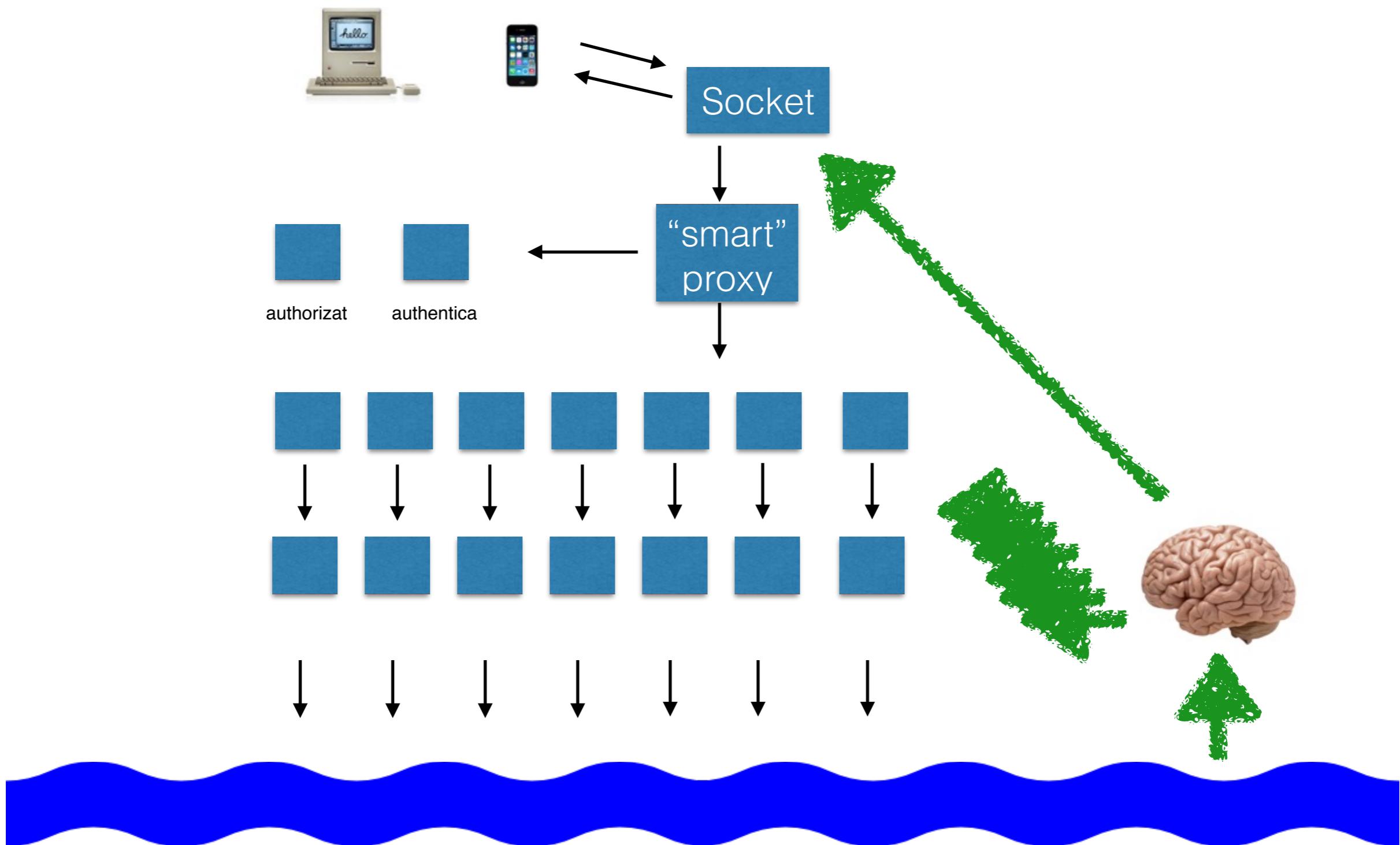


<https://medium.com/tales-from-6w/saving-our-bacon-with-evil-cucumbers-2e3d26cebacc>



# Wunderlist 3 is Here

# The Big *Little* Rewrites



# The Future

# homeostasis

## Homeostasis

### Definition

*noun*

(Science: Biology)

(1) The tendency of an organism or a cell to regulate its internal conditions, usually by a system of feedback controls, so as to stabilize health and functioning, regardless of the outside changing conditions

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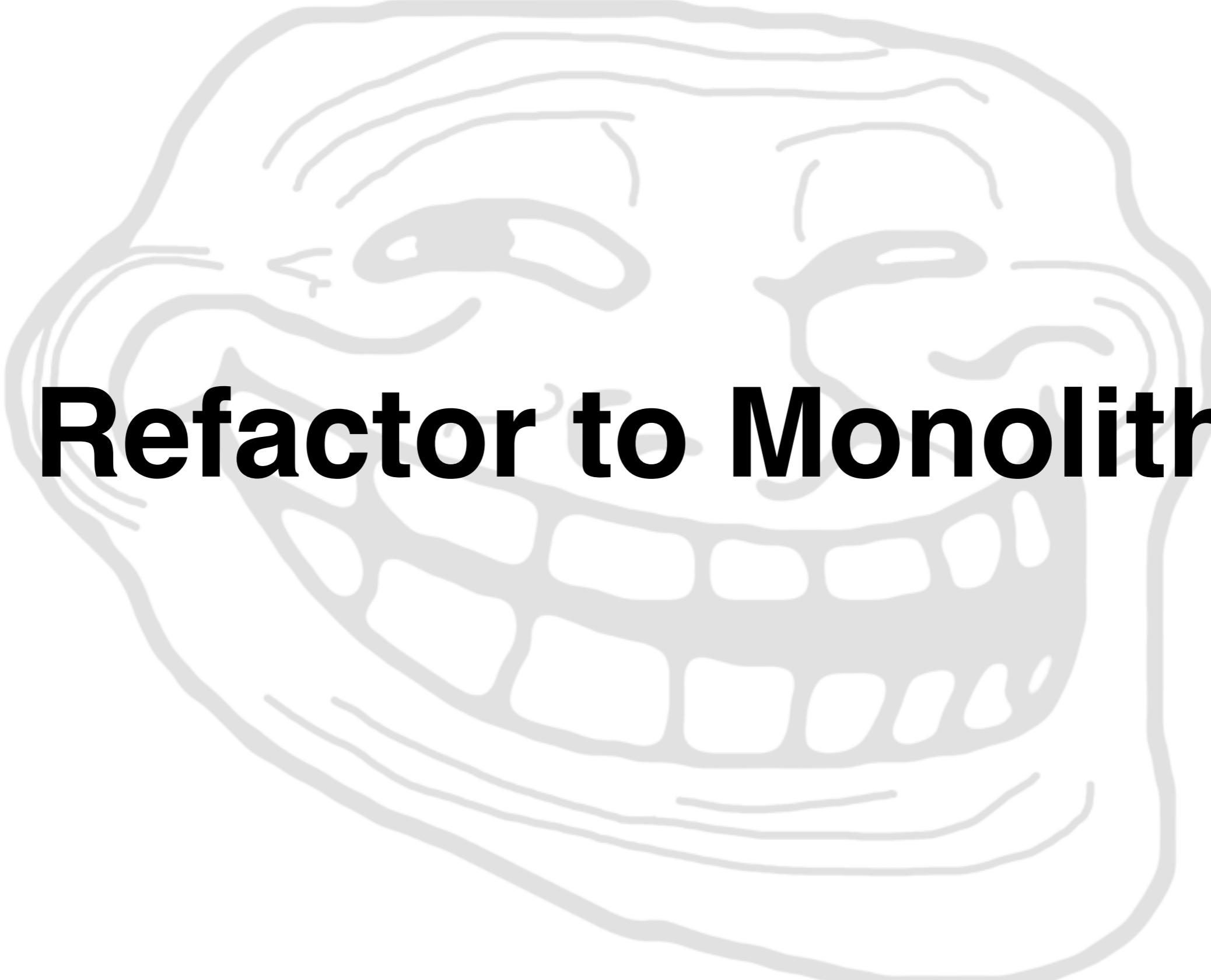


Global  
async  
validation  
middleware

# Cost Reduction

- Make it work
- Make it fast
- Make it cheap

# Deployment Speed



# Refactor to Monolith

Thanks!