Using

BladeRunnerJS

to build Front-end JavaScript Apps that Scale

QCon London 2014

Overview

- **What is a Large Scale front-end App?**

- **What are the signs of scaling?**

- **What are the solutions? (with demos)**

What is a large-scale JavaScript app?

In my view, large-scale JavaScript apps are non-trivial applications requiring significant developer effort to maintain, where most heavy lifting of data manipulation and display falls to the browser.

–Addy Osmani, Patterns For Large-Scale JavaScript Application Architecture

Great. More detail please!

Large Codebase

More functionality === More code

Caplin Trader

- SDK:

  - ~1,000 JavaScript files

  - ~131,000 LoC

  - ~131 lines per file

  - ~650 test files

  - ~95,000 test LoC

- Getting Started Apps:

  - ~425 JavaScript files

  - ~50,000 LoC

  - ~117 lines per file

  - ~200 test files

  - ~21,000 test LoC

Complexity

Google

Mail ▾

□ ▾   ↻   More ▾   1–50 of 57   ‹   ›   ⚙ ▾

COMPOSE

📥 Primary   👥 Social   🏷 Promotions   ℹ Updates   💬 Forums   +

Inbox (3)
Starred   □ ☆ ▢   Gmail Team   Welcome to the new Gmail inbox - Hi Philip Meet the new inbox Inbox tabs put you back in control with simple   5:38 pm
Important
Sent Mail   □ ☆ ▢   ProjectLocker   [ProjectLocker] Faster Access with   New Message   _ ⤢ ✕
Drafts (3)
All Mail   □ ☆ ▢   e-Documents   New eDocument arrived - Please a
Spam (12)   To   Cc Bcc
[Imap]/Drafts   □ ☆ ▢   Adam Todd   Newly Business Information - Hi, M
                                                                                              Subject
[Imap]/Sent   □ ☆ ▢   service, me (2)   Receipt for your PayPal payment t
[Imap]/Trash (13)
Accounts   □ ☆ ▢   Microsoft BizSpark   Call for Startup videos, where dev
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Deleted Items (18)   □ ☆ ▢   FollowUp   Your email account, phil@pusher.
Domains   □ ☆ ▢   Expensify   [Expensify] Please approve expens
Expenses   □ ☆ ▢   Pooja   New Business Enquiry - Hi Phil, I b
GetGravatar (23)   □ ☆ ▢   Joe Benjamin   Your Invitation to the 2013 New En
HMRC   □ ☆ ▢   e-Documents   New eDocument arrived - Please a

💬   □ ☆ ▢   Boomerang for Gmail Grab your Capes! Boomerang for /   Send   A   🖉   +   🗑   ▾

My Tiles   Other Tile Set   Other Tile Set

N. Europe   Europe   Asia

EURUSD +

CCY Pair	Bid	Ask	Sparkline
EURRUB	▲ 29.3423	▼ 29.3643	
EURRUB	29.3423	▲ 29.3643	
EURRUB	29.3423	29.3643	
EURRUB	▲ 29.3423	▼ 29.3643	
EURRUB	29.3423	▲ 29.3643	
EURRUB	29.3423	29.3643	

USDDKK SP FW SW ✕

USD ⌄ enter amount GFA 8.888M RFS ODR

SELL USD   BUY USD

5.71 SPOT 65₅	20/12/12 SPOT	5.72 SPOT 25₅
5.71 -2.5 40₅	27/12/12 1W GFA 8.888M	5.72 -1.75 08₀
5.71 -4.75 18₀	03/01/13 2W GFA 8.888M	5.72 -4.25 18₅
5.70 -11.25 53₀	24/01/13 1M GFA 8.888M	5.71 -10.25 23₀
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5.66 -510 55₅	21/03/13 3M GFA 8.888M	5.67 -490 35₅
5.58 +134 25₅	20/06/13 5M GFA 8.888M	5.59 +124 85₅
5.48 -230 65₅	19/09/13 6M GFA 8.888M	5.51 -210 25₅

USDCHF SP FW SW ✕

SELL USD 0.96   BUY USD 0.96
45₇   **65₀**

USD ⌄ 5M GFA 8.888M RFS
20/12/2012 (SPOT)   ORDER

GBPUSD SP FW SW ✕

SELL GBP 1.56   BUY GBP 1.56
30₆   **32₈**

You are about to buy 5M GBP and sell 7,816,400 USD at 1.56328 for settlement on 20/12/2012   ✕ ✓

EURJPY SP FW SW ✕

SELL EUR 108.   BUY EUR 108.
63₅   **85₂**

EUR ⌄ enter amount GFA 8.888M RFS
20/12/2012 (SPOT)   ORDER

SELL EUR   GFA 8.888M   BUY EUR
108. SPOT 63₅	enter amount	108. SPOT 85₂
108. SPOT 63₅	enter amount	108. SPOT 85₂
108. SPOT 63₅	enter amount	108. SPOT 85₂

USDMUR

USD ⌄ enter am...
SELL USD
5.71 SPOT 65₅	20/12...
5.71 -2.5 35₅	27/12...
5.71 -4.75 15₅	03/01...

EURUSD

SELL EUR 1.24
87₄

EUR ⌄ enter am...
20/12/2012 (SPOT)

New Tile Set
Open Tile Set
Save Tile Set As..

○ 1 Click Trading
● Standard Trading

Close All Tiles

Other Watchlist   My Watchlist

EURUSD +

CCY Pair	Bid	Ask	Sparkline
✕ EURRUB	▲ 29.3423	▼ 29.3643	
✕ EURRUB	29.3423	▲ 29.3643	
✕ EURRUB	29.3423	29.3643	
✕ EURRUB	▲ 29.3423	▼ 29.3643	
✕ EURRUB	29.3423	▲ 29.3643	
✕ EURRUB	29.3423	29.3643	

News   Other Tile Set

Top Stories ⌄

Barclays to shut wealth management services in 130 countries Reuters

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Reuters

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EURUSD   Other Tile Set   Other Tile Set

EURUSD 🔍

1y ⌄ Sep 25, 2012 - Sep 25,2013

Open

1.3208

Vol.
Nov '12 Jan '13 Mar '13 May '13 Jul '13 Sep '13

Activity Blotter   Historic Blotter   Orders   Positions

NOVOBANK

Foreign Exchange   FX Research   FX Options   Fixed Income   FI Analysis   Equities   New Layout

Trade Panel

Add Currency Pair:

EURUSD

SELL EUR	BUY EUR
1.37**22**⁰	1.37**44**⁰

500,000 EUR   EUR USD

GFA 30M EUR   05/03/2014 (SPOT)

USDJPY

SELL USD	BUY USD
101.**40**⁹	101.**43**¹

500,000 USD   USD JPY

GFA 30M USD   05/03/2014 (SPOT)

GBPUSD

SELL GBP	BUY GBP
1.66**48**⁰	1.66**70**⁰

500,000 GBP   GBP USD

GFA 30M GBP   05/03/2014 (SPOT)

GBPUSD Outrights

SELL		SPOT		BUY
SELL 1.66 48⁰	0	SPOT	0	BUY 1.66 70⁰
SELL 1.66 48⁰	17	5D	17	BUY 1.66 70⁰
SELL 1.66 73⁰	25	1W	25	BUY 1.66 95⁰
SELL 1.66 81³	33	2W	33	BUY 1.67 03³
SELL 1.66 89⁶	42	3W	42	BUY 1.67 11⁷
SELL 1.67 06³	58	1M	58	BUY 1.67 28³
SELL 1.67 14⁶	67	2M	67	BUY 1.67 36⁷
SELL 1.67 22⁹	75	3M	75	BUY 1.67 45⁰
SELL 1.67 31²	83	4M	83	BUY 1.67 53⁴
SELL 1.67 39⁶	92	5M	92	BUY 1.67 61⁷
SELL 1.67 47⁹	100	6M	100	BUY 1.67 70⁰
SELL 1.67 56²	108	7M	108	BUY 1.67 78⁴
SELL 1.67 64⁵	117	8M	117	BUY 1.67 86⁷
SELL 1.67 72⁹	125	9M	125	BUY 1.67 95⁰
SELL 1.66 48⁰	133	10M	133	BUY 1.66 70⁰
SELL 1.67 89⁵	142	11M	142	BUY 1.68 11⁷

Major   G8   Emerging   Depth

Currency	Bid	Ask
EURUSD	1.37220	1.37440
USDJPY	101.409	101.431
GBPUSD	1.66480	1.66700
USDCHF	0.88190	0.88440
AUDUSD	0.89150	0.89400
USDCAD	1.10700	1.10930
NZDUSD	0.83500	0.83770
EURJPY	139.152	139.407
EURGBP	0.82127	0.82744

E Europe   Europe   SE Asia   S Asia   Metals   OPEC

Currency	Bid	Ask
EURUSD	1.37220	1.37440
GBPUSD	1.66480	1.66700
GBPEUR	1.2094	1.2169
EURCHF	1.20914	1.21624
EURNOK	8.2955	8.3179
EURSEK	8.8853	8.9068
EURDKK	7.4541	7.4715

GBPUSD Liquidity

SELL	Amount	BUY
SELL 1.66 48⁰	1,000,000	BUY 1.66 70⁰
SELL 1.66 47⁰	10,000,000	BUY 1.66 71⁰
SELL 1.66 46⁰	30,000,000	BUY 1.66 72⁰

FX Blotter   FX Order Blotter   FX Position Blotter

Trade ID	Currency P	Dealt Curr	Status	B/S	Amount	Rate	S/D	T/D	Account	Time	Submitted For

No trade data available

This blotter will show your trades as you place them.

P&L: $0.00   Initial Balance: $50,000,000.00   Buying Power: $50,000,000.00   Used: 0.00%

CAPLIN   Alerts   Connected

Gmail & Caplin Trader

- Large Single Page Apps (SPAs)

- Complex functionality

- Complex interactions

    - User

    - Technology

- Leave open all day
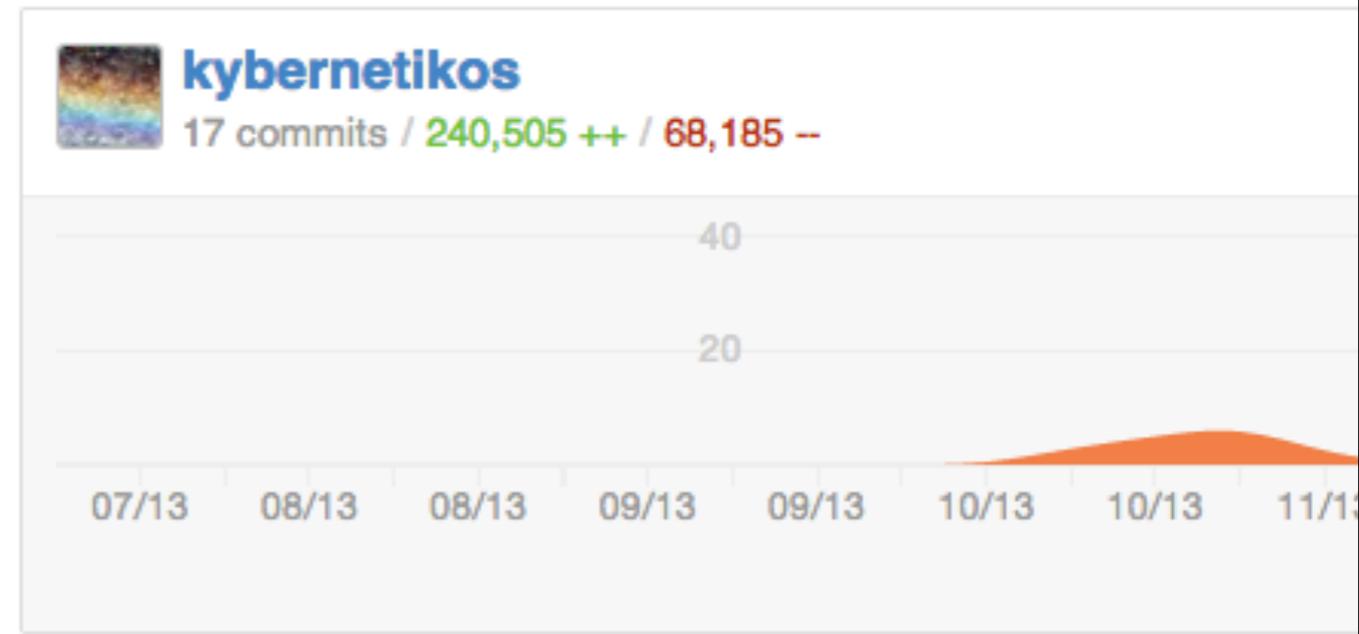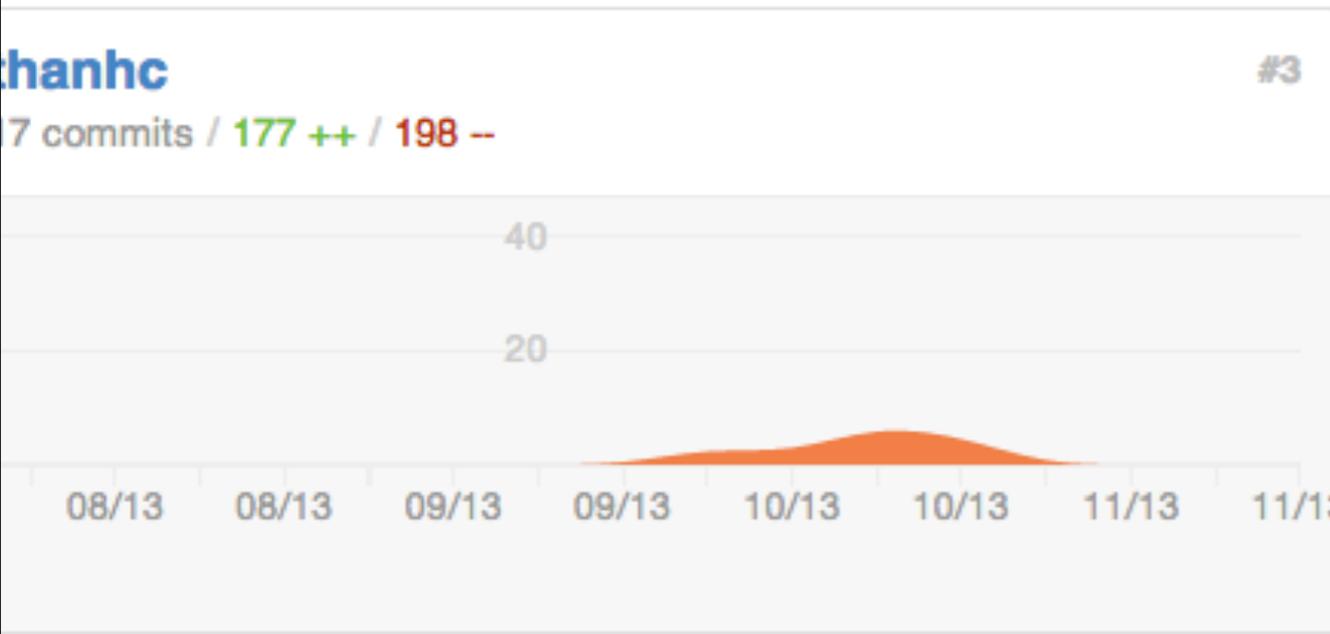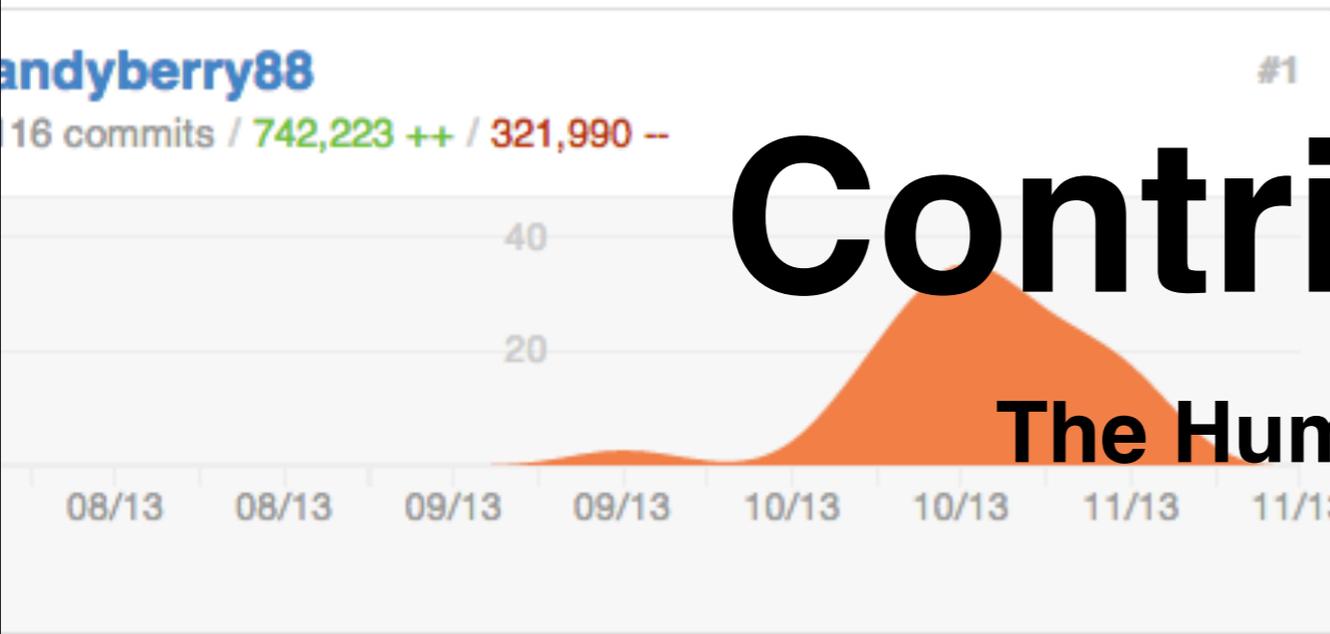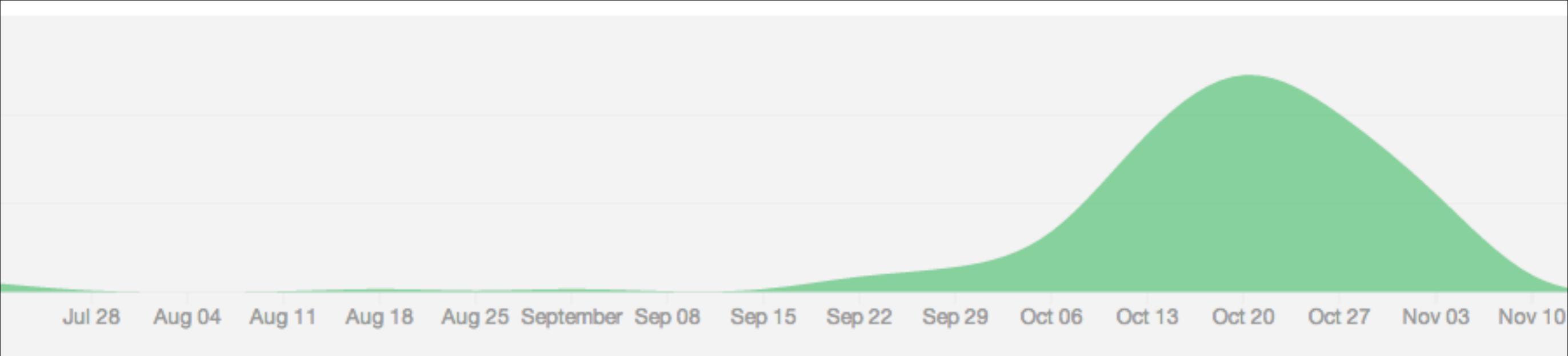
Contributors

The Human Factor

andyberry88 #1
16 commits / 742,223 ++ / 321,990 --

leggetter
18 commits / 398 ++ / 100 --

thanhc #3
17 commits / 177 ++ / 198 --

kybernetikos
17 commits / 240,505 ++ / 68,185 --

Jul 28 Aug 04 Aug 11 Aug 18 Aug 25 September Sep 08 Sep 15 Sep 22 Sep 29 Oct 06 Oct 13 Oct 20 Oct 27 Nov 03 Nov 10

08/13 08/13 09/13 09/13 10/13 10/13 11/13 11/13

07/13 08/13 08/13 09/13 09/13 10/13 10/13 11/13

Who contributes to an app?

- Front-end devs

- Back-end devs

- Designers

- QA

- Infrastructure and release engineers

- Technical authors

People who are part of...

- Large teams

- Multiple teams

- Teams spread across an organisation

- Teams spread across multiple organisations

So, how do you ensure an application is maintainable?

1. structure a massive codebase (js, css, html, i18n, images, config etc.)

2. an architecture for complex functionality and interaction (UI and other components)

3. make sure that all contributors can work in harmony

4. development must be a productive experience

5. ensure all these compliment each other

Seven signs of scaling
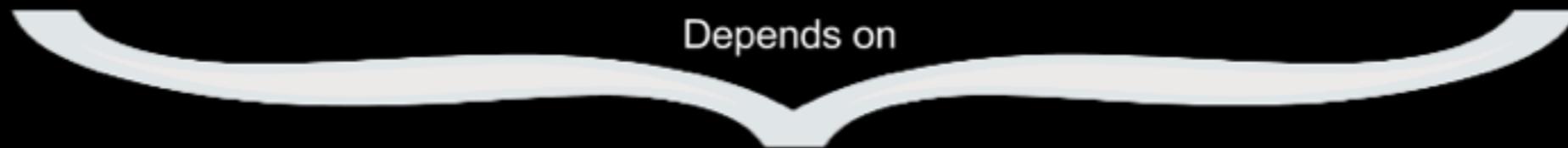
My App won't load!

- Run full application

- All back-end components running

- Lots of moving parts
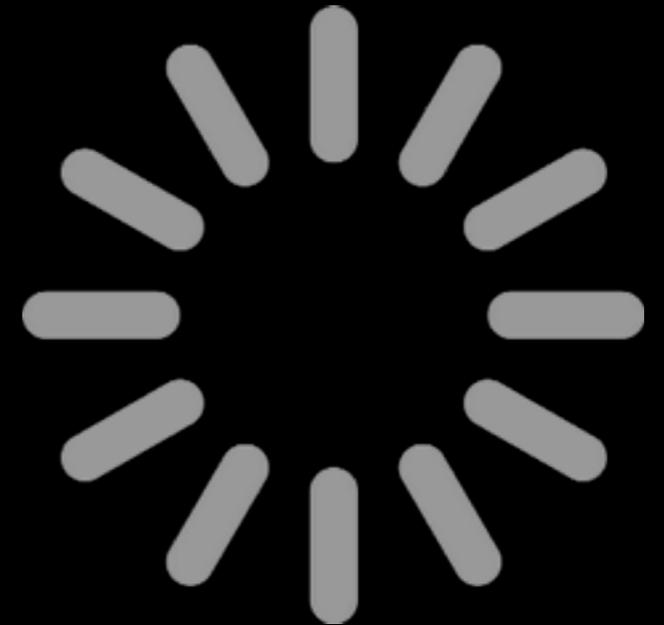
My App isn't working!

- Other contributors breaking functionality

- Code accessed and modified from elsewhere

- Dependency Analysis and out of order file concatenation
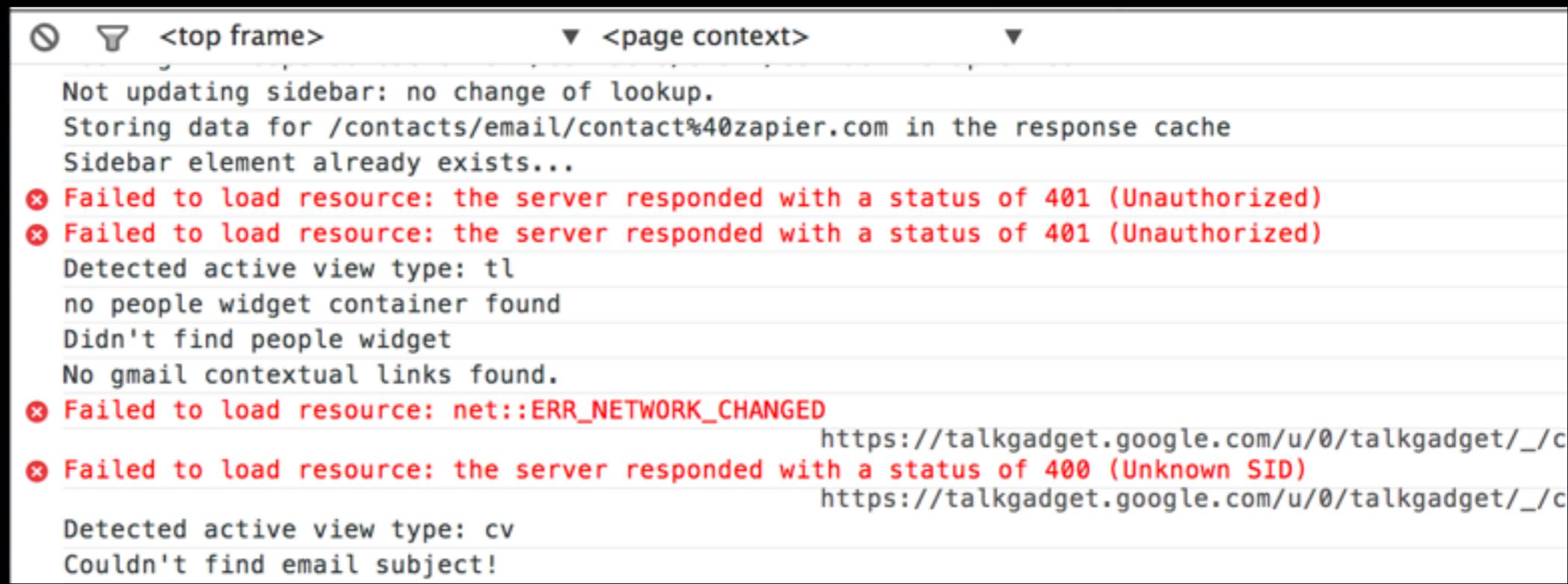
```
⊘  ▽  <top frame>              ▼  <page context>              ▼

    Not updating sidebar: no change of lookup.
    Storing data for /contacts/email/contact%40zapier.com in the response cache
    Sidebar element already exists...
❌  Failed to load resource: the server responded with a status of 401 (Unauthorized)
❌  Failed to load resource: the server responded with a status of 401 (Unauthorized)
    Detected active view type: tl
    no people widget container found
    Didn't find people widget
    No gmail contextual links found.
❌  Failed to load resource: net::ERR_NETWORK_CHANGED
                                              https://talkgadget.google.com/u/0/talkgadget/_/c
❌  Failed to load resource: the server responded with a status of 400 (Unknown SID)
                                              https://talkgadget.google.com/u/0/talkgadget/_/c
    Detected active view type: cv
    Couldn't find email subject!
```

Finding assets is hard

caplintrader
├ acceptance-tests
├ build
├ caplinx
│ ├ i18n
│ ├ src
│ │ ├ caplinx
│ │ │ ├ chart
│ │ │ ├ chat
│ │ │ ├ component
│ │ │ ├ composite
│ │ │ ├ element
│ │ │ │ ├ formatter
│ │ │ │ ├ handler
│ │ │ │ ├ styler
│ │ │ ├ fields
│ │ │ ├ grid
│ │ │ ├ historicdata
│ │ │ ├ integration
│ │ │ ├ latency
│ │ │ │ ├ LatencyGenerator.js #0/4 <text>
│ │ │ │ ├ LatencyListener.js #0/1 <text>
│ │ │ │ ├ LatencySubscriber.js #0/4 <text>
│ │ │ │ ├ StatusBarLatencyDisplay.js #0/3 <text>
│ │ │ ├ permissioning
│ │ │ ├ portfolio
│ │ │ ├ renderer
│ │ │ ├ tobo
│ │ │ ├ trading
│ │ │ │ ├ fi
│ │ │ │ │ ├ bonds
│ │ │ │ │ │ ├ builders
│ │ │ │ │ │ ├ presentation
│ │ │ │ │ │ ├ viewconfig
│ │ │ │ │ │ │ ├ BondsPricingModel.js #0/1 <text>
│ │ │ │ │ │ │ ├ BondsSubjectMapper.js #0/2 <text>
│ │ │ │ │ │ │ ├ BondsTrade.js #0/3 <text>
│ │ │ │ │ │ │ ├ BondsTradeLeg.js #0/1 <text>
│ │ │ │ │ ├ fx
│ │ │ │ │ ├ presentation
│ │ │ │ │ │ ├ listeners
│ │ │ │ │ │ ├ tile
│ │ │ │ │ │ │ ├ FxTile.js #0/20 <text>
│ │ │ │ │ │ │ ├ FxTileController.js #0/8 <text>
│ │ │ │ │ │ │ ├ FxTileCurrencyPairChooser.js #0/9 <text>
│ │ │ │ │ │ │ ├ FxTilePriceButton.js #0/2 <text>
│ │ │ │ │ │ │ ├ FxTileRenderer.js #0/7 <text>
│ │ │ │ │ │ │ ├ FxTileStatus.js #0/1 <text>
│ │ │ │ │ │ │ ├ FxTileViewHeader.js #0/7 <text>
│ │ │ │ │ │ │ ├ PermissionModel.js #0/1 <text>
│ │ │ │ │ │ ├ FxTradeTicket.js #0/38 <text>
│ │ │ │ │ │ ├ FxTradeTicketController.js #0/3 <text>
│ │ │ │ │ ├ trademodel
│ │ │ │ │ │ ├ ObjectMapper.js #0/1 <text>
│ │ │ │ ├ utilities
│ │ │ │ ├ widget
│ │ │ │ │ ├ CaplinFactory.js #0/47 <text>
│ │ │ ├ caplinx-resources.xml #0/23 <text>
│ │ ├ test-unit
│ │ ├ WEB-INF
│ │ ├ build.xml #0/57 <text>
│ │ ├ pom.xml #0/38 <text>
│ ├ conf
│ │ ├ certs
│ │ ├ hibernate
│ │ ├ keymaster
│ │ ├ sl4b
│ ├ demo
│ ├ lib
│ ├ webapp
│ ├ build.xml #0/151 <text>
│ ├ pom.xml #0/76 <text>
│ ├ README-creating-your-xeque-restart-ant-target.txt #0/2 <text>
│ ├ README-database-configuration.txt #0/2 <text>
│ ├ README-first.txt #0/24 <text>
│ ├ README-generating-self-signed-certificates.txt #0/5 <text>
│ ├ README-to-baseline-your-trading-application.txt #0/21 <text>
│ ├ README-upgrading-your-baselined-application.txt #0/3 <text>
│ ├ trader.bat #0/11 <text>
│ ├ trader.properties #0/43 <text>
│ ├ trader.sh #0/1 <text>
│ ├ user.properties #0/3 <text>
├ conf
├ docs
├ libraries
│ ├ alerts
│ │ ├ src
│ │ │ ├ caplin
│ │ │ │ ├ alerts

What does this code do?

- Inconsistent coding style

- Inconsistent code structure

- Side effects through unexpected overrides

```javascript
var MyObjDefinition = {
    property: 'thing',
    method: function() {
        return 'hello';
    }
};

var myInstance = Object.create( MyObjDefinition );

function MyObjDefinition() {
    this.property = 'thing';
    this.method = function() {
        return 'hello';
    }
}

var myInstance = new MyObjDefinition();

function myObjDefinition() {
    this.property = 'thing';
}
myObjDefinition.prototype.method = function() {
    return 'hello';
};
```

Long App Reloads

Have the tests finished yet?

- Having to run all the tests

- UI-based tests

- Continuous Integration…taking 8 hours!

- **Bonus: Are these tests reliable?**

Scaling Solutions

Goals

- Streamlined developer workflow

- Consistency

- Focus on building a single feature (in isolation)

- Scalable loosely-coupled application architecture

- Quality at its core (maintainability)

Developer Workflow

Setup

Create app skeleton

Develop

Create a feature skeleton

Write some code (JS, HTML, CSS)

Write and run tests

Run in isolation

Manually test feature

Feature complete?

Integrate feature into **App**

Write and run **App** tests

Manually test app
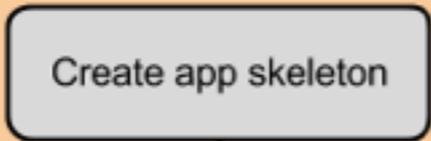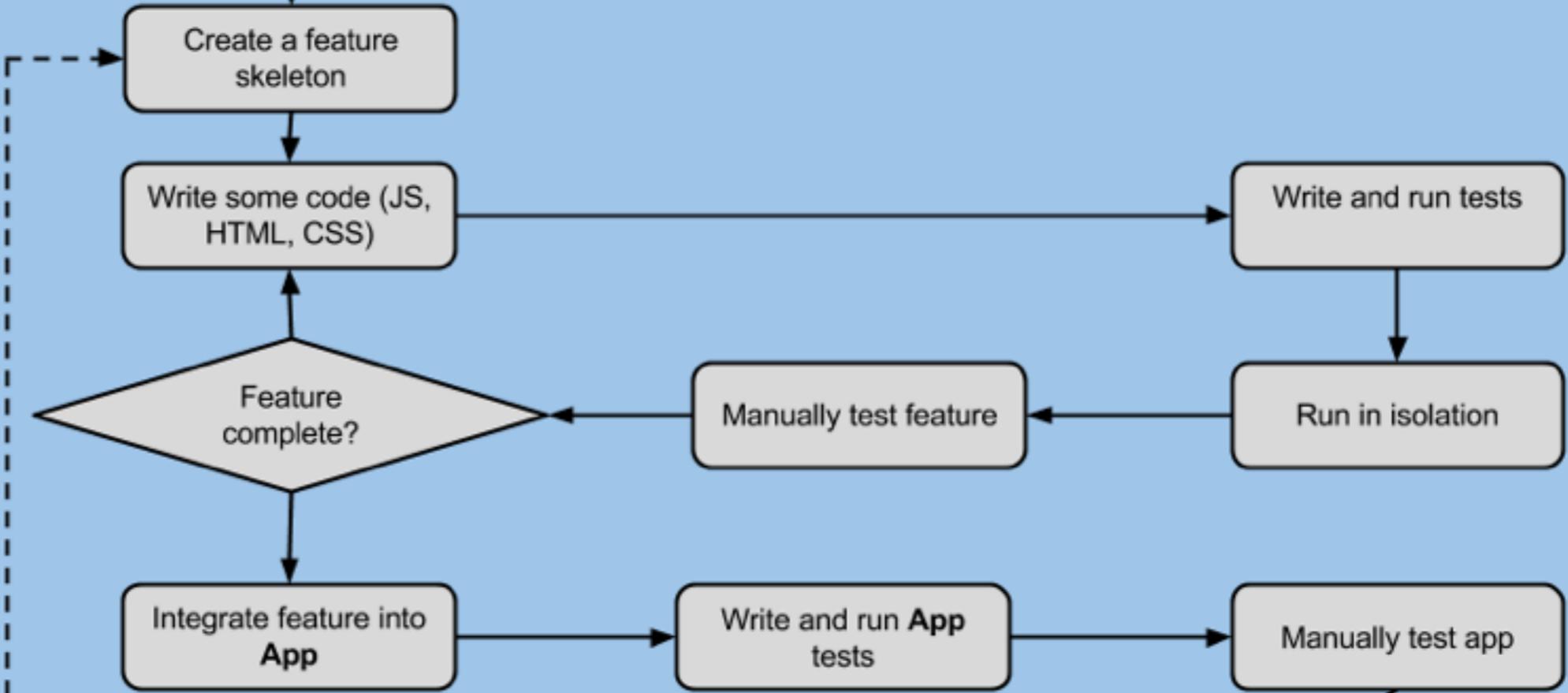
Deploy

Deploy

Build

Building a single feature in isolation

Blades

Google

phil@independentsoftwaresolutions.com ▾

Mail ▾

1–50 of 57 ‹ › ⚙ ▾

COMPOSE

☐ ▾   ↻   More ▾

| | Primary | 👥 Social | 🏷 Promotions | ⓘ Updates | 💬 Forums | + |

Inbox (3)
Starred
Important
Sent Mail
Drafts (3)
All Mail
Spam (12)
[Imap]/Drafts ▾
[Imap]/Sent
[Imap]/Trash (13)
▸ Accounts
BeeFound
Company Informati...
Contractor Sourci...
Deleted Items (18)
Domains
Expenses
GetGravatar (23)
HMRC

☐ ☆ ▢	**Gmail Team**	**Welcome to the new Gmail inbox** - Hi Philip Meet the new inbox Inbox tabs put you back in control with simple	5:38 pm
☐ ☆ ▢	**ProjectLocker**	**[ProjectLocker] Faster Access** with	
☐ ☆ ▢	**e-Documents**	**New eDocument arrived** - Please	
☐ ☆ ▢	**Adam Todd**	**Newly Business Information** - Hi	
☐ ☆ ▢	**service**, me (2)	**Receipt for your PayPal payment** t	
☐ ☆ ▢	**Microsoft BizSpark**	**Call for Startup videos, where d**	
☐ ☆ ▢	**e-Documents**	**New eDocument arrived** - Please	
☐ ☆ ▢	**Adam Todd**	**Business Leads** - Hi, We are a le	
☐ ☆ ▢	**FollowUp**	**Your email account, phil@push** r.	
☐ ☆ ▢	**Expensify**	**[Expensify] Please approve exp**	
☐ ☆ ▢	**Pooja**	**New Business Enquiry** - Hi Phil,	
☐ ☆ ▢	**Joe Benjamin**	**Your Invitation to the 2013 New E**	
☐ ☆ ▢	**e-Documents**	**New eDocument arrived** - Please	
☐ ☆ ▢	**Boomerang for Gmail**	**Grab your Capes! Boomerang fo**	

New Message _ ⤢ ✕

To   Cc Bcc

Subject

Send   A   📎   +   🗑   ▾

My Tiles   Other Tile Set   Other Tile Set

N. Europe   Europe   Asia

EURUSD +

| USDDKK | SP | FW | SW |
| USD | enter amount | GFA 8.888M | RFS | ODR |

SELL USD   BUY USD

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108. SPOT 63₅   enter amount   108. SPOT 85₂
108. SPOT 63₅   enter amount   108. SPOT 85₂
108. SPOT 63₅   enter amount   108. SPOT 85₂

USDMUR
USD   enter am
SELL USD
5.71 SPOT 65₅   20/12
5.71 -2.6 35₅   27/12/1
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EURUSD
SELL EUR 1.24
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20/12/2012 (SPOT)

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EURRUB	29.3423	29.3423	
EURRUB	▲ 29.3423	▼ 29.3643	
EURRUB	29.3423	▲ 29.3643	
EURRUB	29.3423	29.3643	

Other Watchlist   My Watchlist

EURUSD +

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×	EURRUB	▲ 29.3423	▼ 29.3643	
×	EURRUB	29.3423	▲ 29.3643	
×	EURRUB	29.3423	29.3643	
×	EURRUB	▲ 29.3423	▼ 29.3643	
×	EURRUB	29.3423	▲ 29.3643	
×	EURRUB	29.3423	29.3643	

News   Other Tile Set

Top Stories

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Japan shares rally, U.S. budget fuels caution elsewhere Reuters

EURUSD   Other Tile Set   Other Tile Set

EURUSD

Sep 25, 2012 - Sep 25,2013

Open   1.3208

Nov '12   Jan '13   Mar '13   May '13   Jul '13   Sep '13

Activity Blotter   Historic Blotter   Orders   Positions

Blade Demo

todos

What needs to be done?

✔ Demo at QCon

✔ Prepare for QCon

2 items left   Clear completed (0)

Double-click to edit a todo

Created by The BladeRunnerJS team

Part of TodoMVC
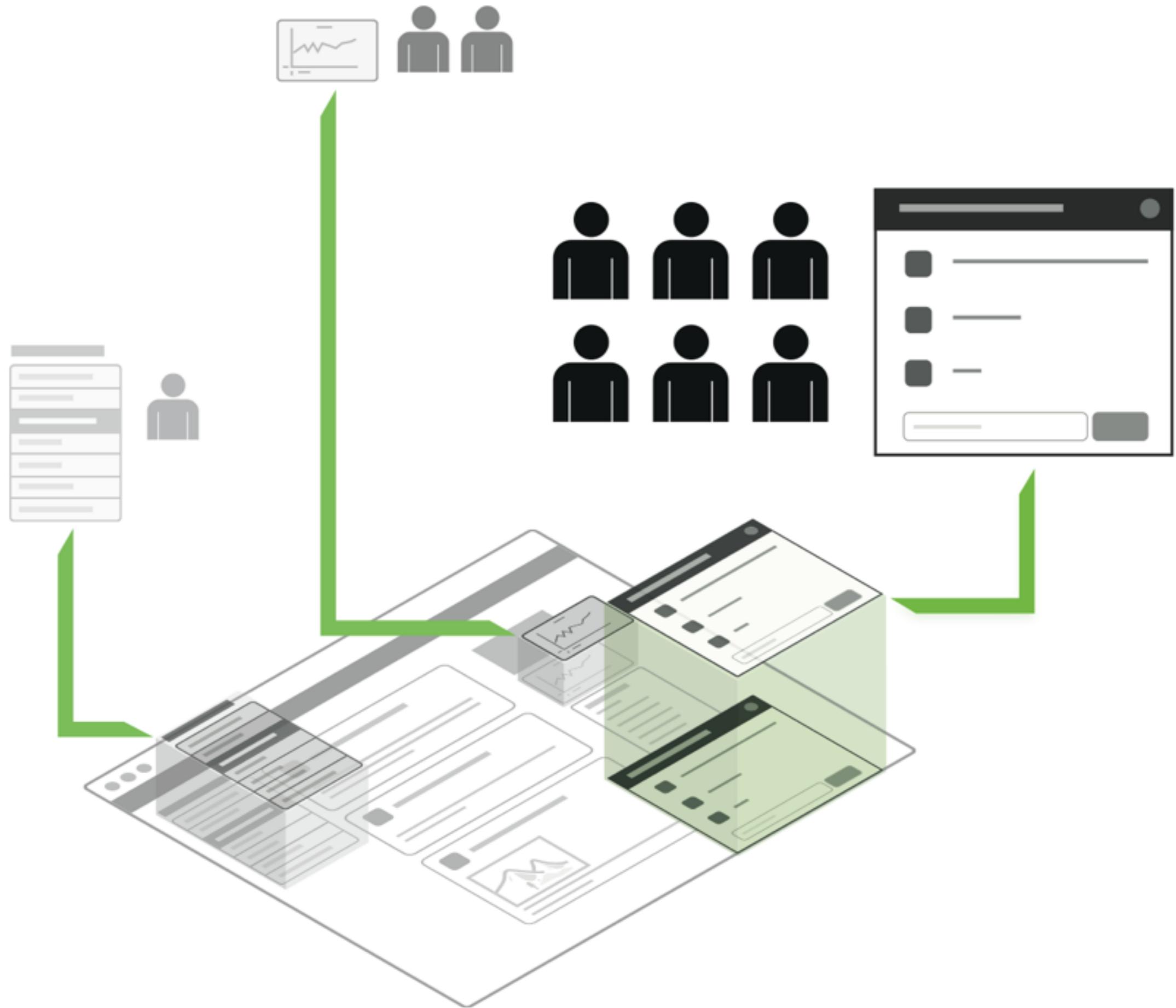
2.0.0-p353 in **sdk/**
>

Goals

✓ • Streamlined developer workflow

✓ • Consistency

✓ • Focus on building a single feature (in isolation)

• Scalable loosely-coupled application architecture

• Quality at its core (maintainability)
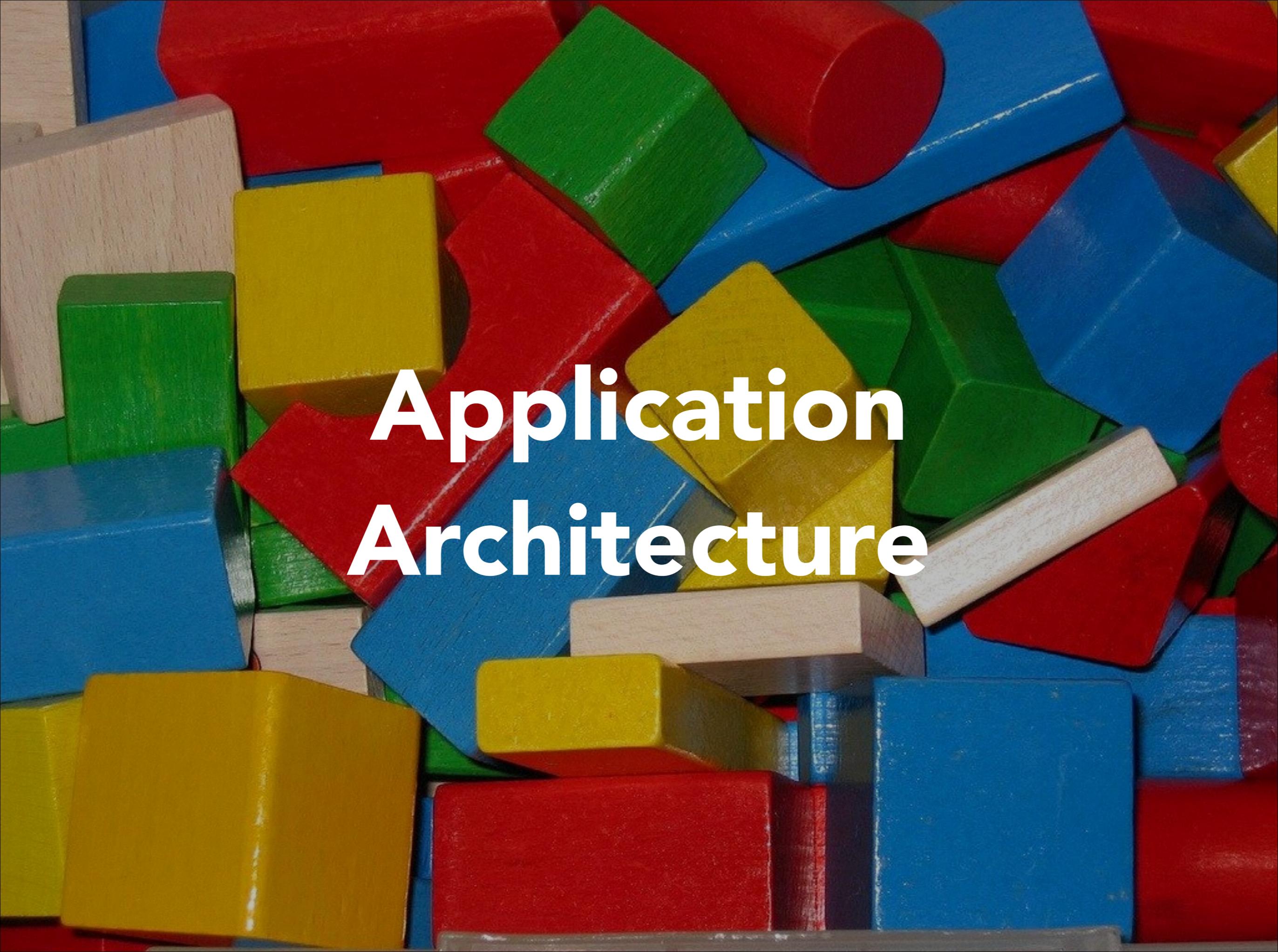
Application Architecture

Requires an Architecture that…

- Allows complex interactions

- Allows components to be changed without side effects

  - At launch and during runtime

- Is easily extended

- Is easily tested

- Is easily maintained

Blades (again)
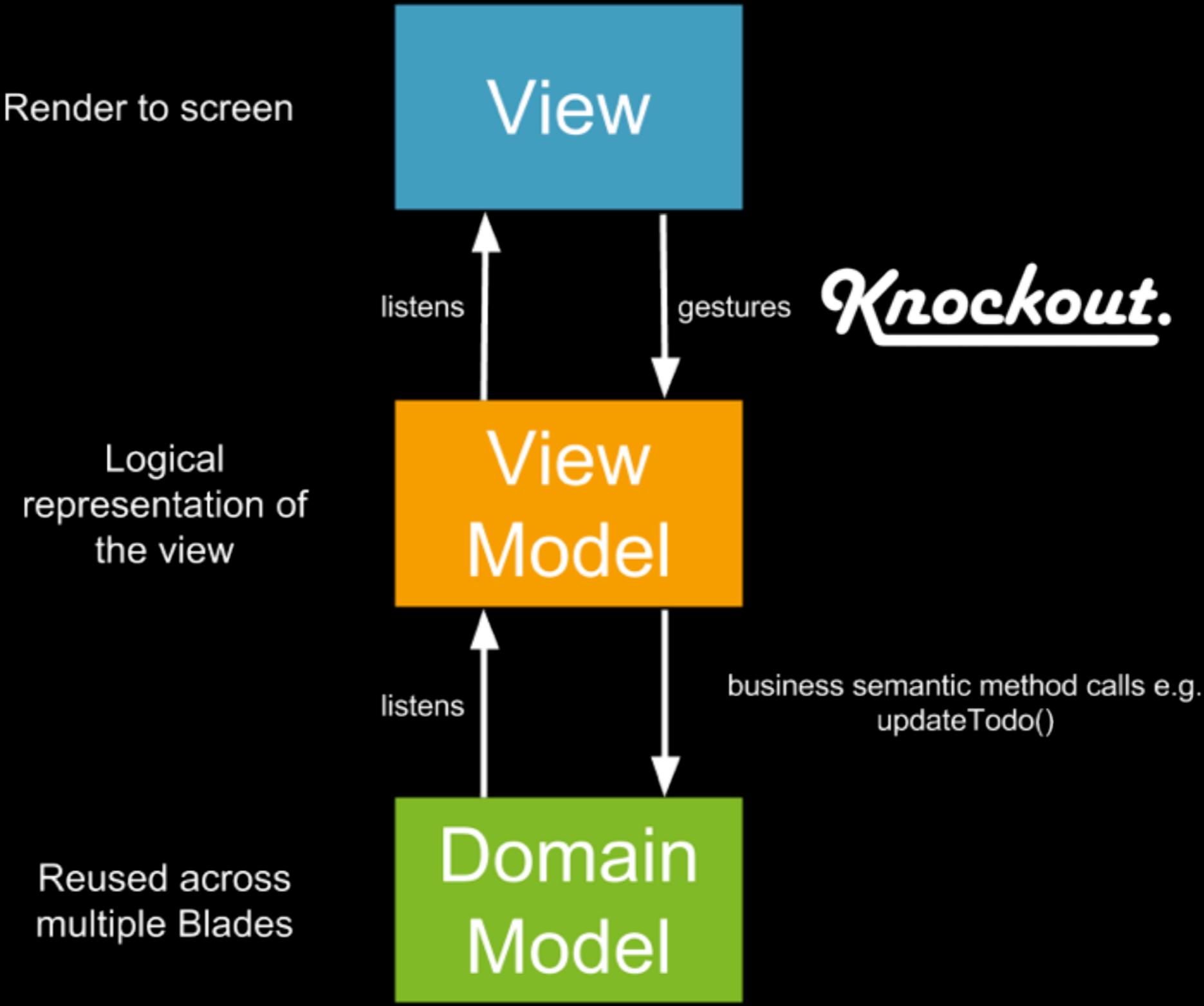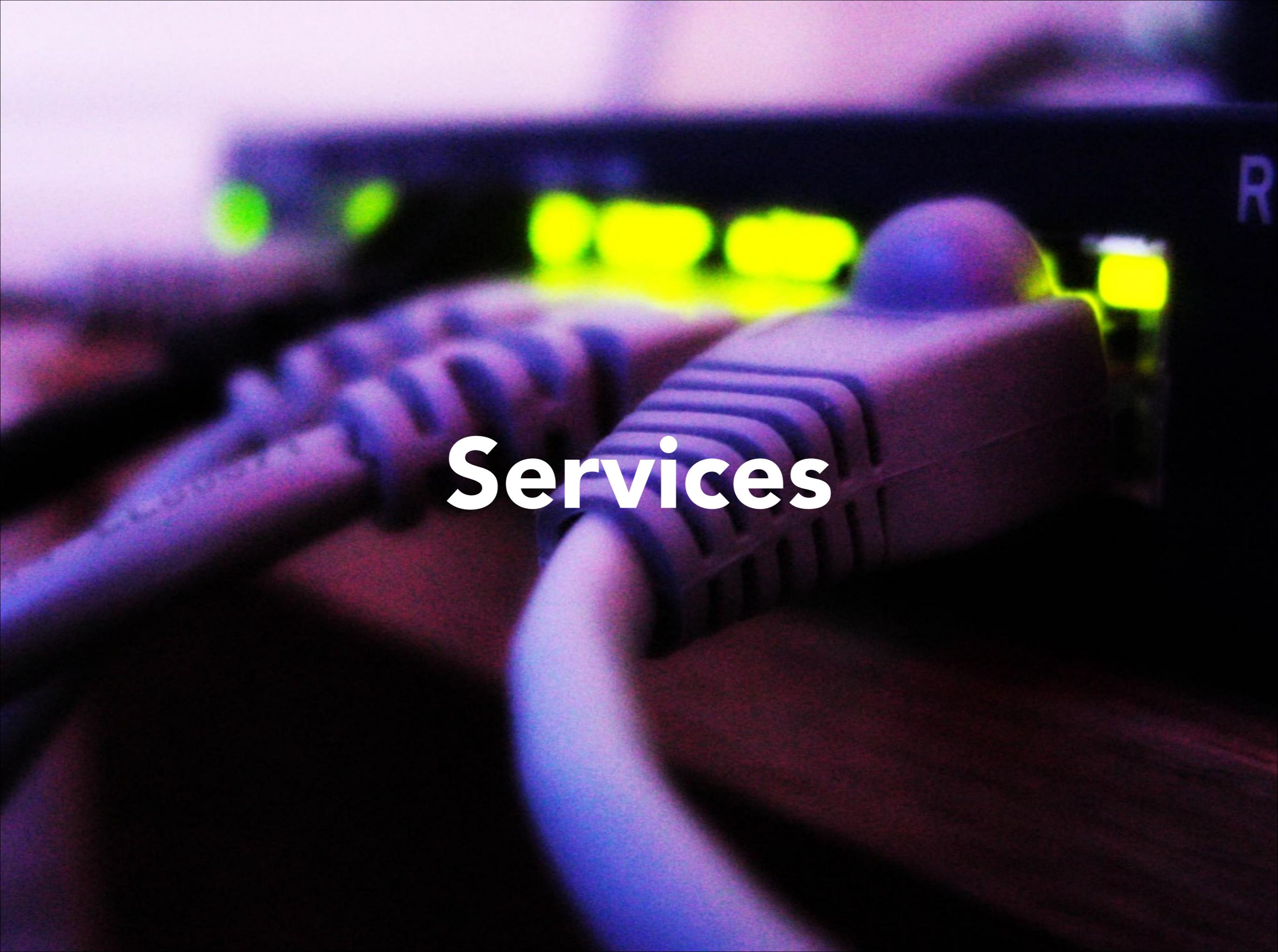
Services

What is a service?

- Use services to access shared resources

  - Persistence Service

  - RESTful Service

  - Realtime Service

- Services registered and accessed via a ***ServiceRegistry***

  - Dynamic Service Locator[1]

1 http://martinfowler.com/articles/injection.html#ADynamicServiceLocator

Why use services?

- Single shared instance for accessing resources

- Functionality encapsulated behind an interface

- Loose-coupled communication

- Dependencies can be injected for different scenarios:

  - App

  - Workbench

  - Test

Services Demo

Goals

- ✓ Streamlined developer workflow

- ✓ Consistency

- ✓ Focus on building a single feature (in isolation)

- ✓ Scalable loosely-coupled application architecture

- Quality at its core (maintainability)

Quality

Manually test in the workbench as part of iterative development cycle

Simple Wins

- Consistency

  - Architecture

  - Coding style and structure

- Loose coupling: MVVM, Services & Interfaces

  - Facilitates testing

  - Can easily swap out implementations

- MVVM: Avoid testing the DOM

Test Demo

localhost:7070/brjstodo/

todos

What needs to be done?
✔   Fake todo 1
✔   Fake todo 2
✔   Demo event hub working!
✔   Be pleased!

Biggest Win

- Testing features in isolation

- Change view model and assert against mocked Service

- Inject mock service, make calls and assert View Model
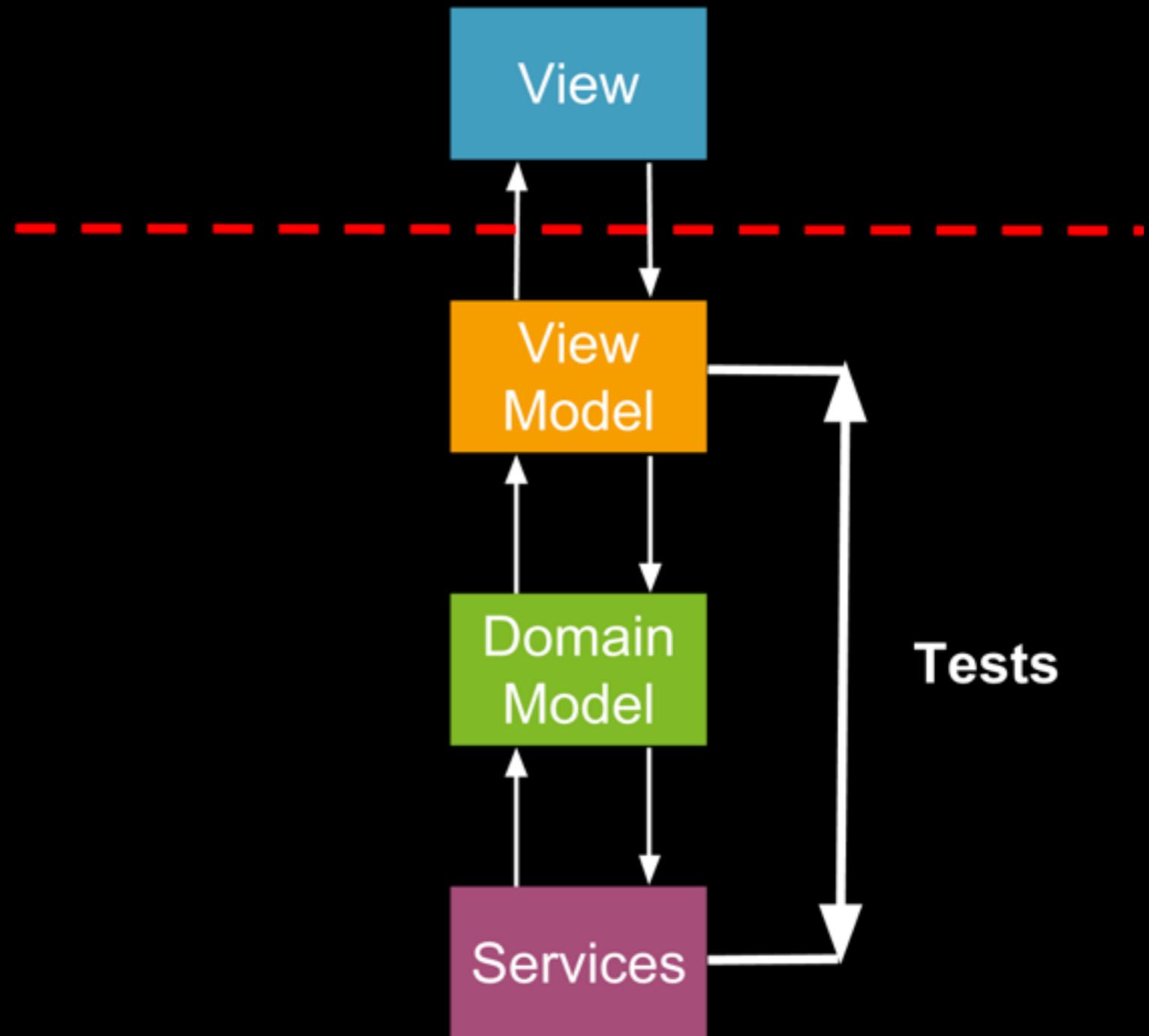
View

- - - - - - - - - - - - - - - - - - - -

View Model

Domain Model

Services

Tests

Need Proof?

Our full suite Caplin Trader testing time went from

>8 Hours
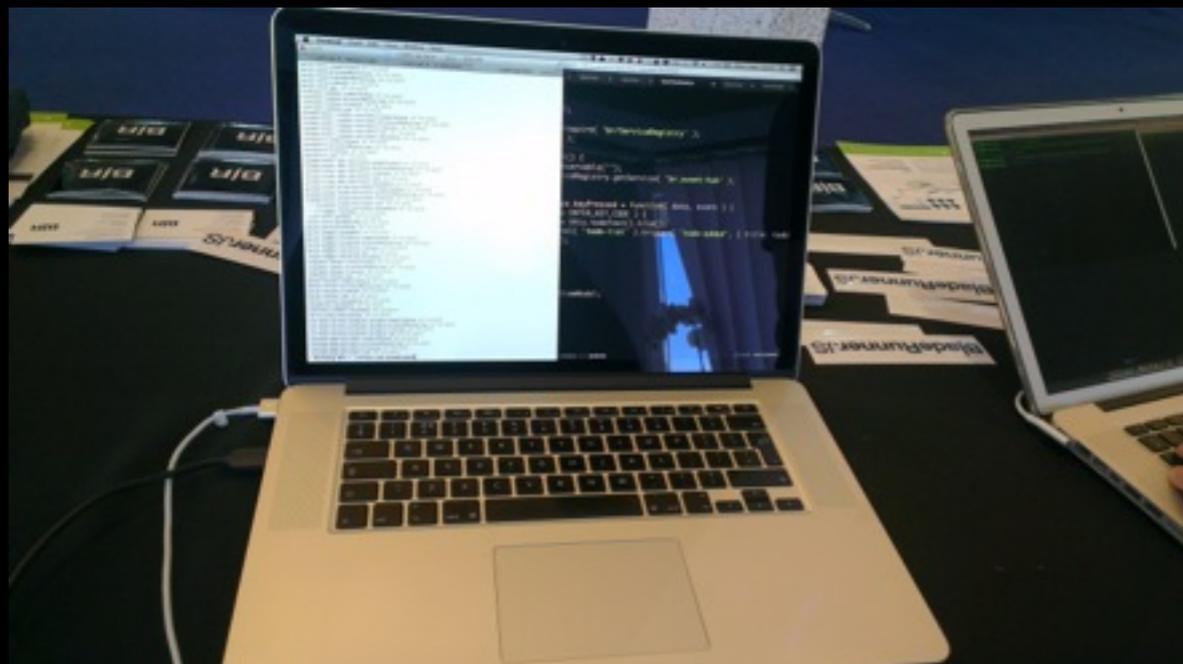
< 30 minutes

Goals

✔ • Streamlined developer workflow

✔ • Consistency

✔ • Focus on building a single feature (in isolation)

✔ • Scalable loosely-coupled application architecture

✔ • Quality at its core (maintainability)

Summary

- **BladeRunnerJS toolkit**: Streamline developer workflow

- **Blades**: Build features in isolation (grouping assets together)

- **Services**: loose coupled communication e.g. EventHub

- **Quality**: Test *units* (classes), *features* (ViewModel < - > Service) & keep DOM testing to a minimum.

BRJS at QCon

- **BladeRunnerJS (BRJS) is a new open source**

- **v0.4 released today (used in demos)**

- **We're on 5th floor, Booth 28 (next to Google)**

- **Come have a chat, even just about the concepts**

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