MTSU / ACM

November 4, 2016

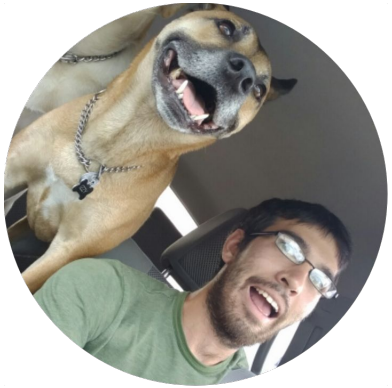
NEXT GDx

Presenters

Aaron S. West
VP Engineering

Jon Staples
Software Engineer

Tennis Smith
DevOps Engineer



Rob Ferguson
Software Engineer

Using **data** to make genetic testing more efficient, transparent, and cost-effective.

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NEXT GXDX

Technology company dedicated to making genetic testing more efficient, transparent, and cost-effective.

GENE SOURCE

Searchable database of genetic tests.

Used by clinicians at:
14 of the top **15** adult hospitals
11 of the top **12** children's hospitals
39 of the top **50** hospitals for cancer

Gene Connect

Hospital utilization management tool.

Customers include:
Dartmouth-Hitchcock Medical Center
Seattle Children's Hospital
Cincinnati Children's Hospital
Oregon Health & Sciences University

GENE PAYER
LAB BENEFIT ANALYTICS SOLUTIONS

Health plan cost management solution.

Engaged with several top 10 commercial health plans, as well as leading integrated health systems.

Version Control like a boss

Git and the art of maintaining beautiful codebases

Jon Staples M.S.[2]
Director of Analytics, Data Scientist/Engineer

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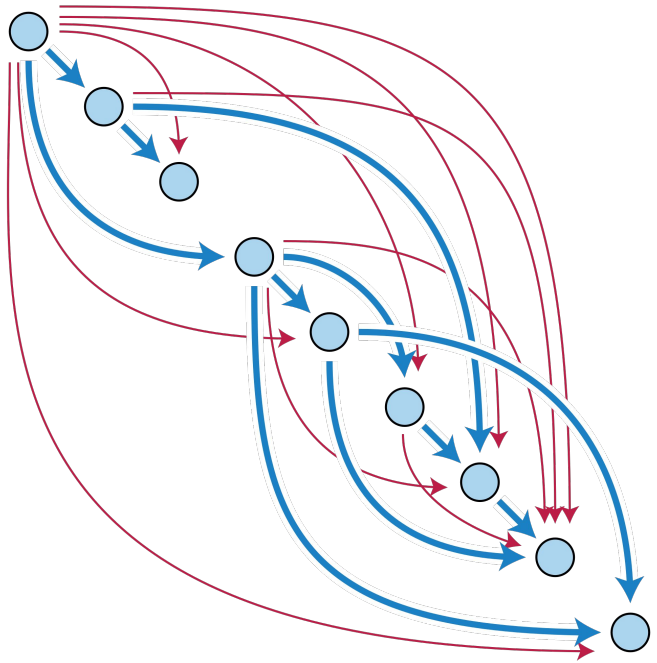
git

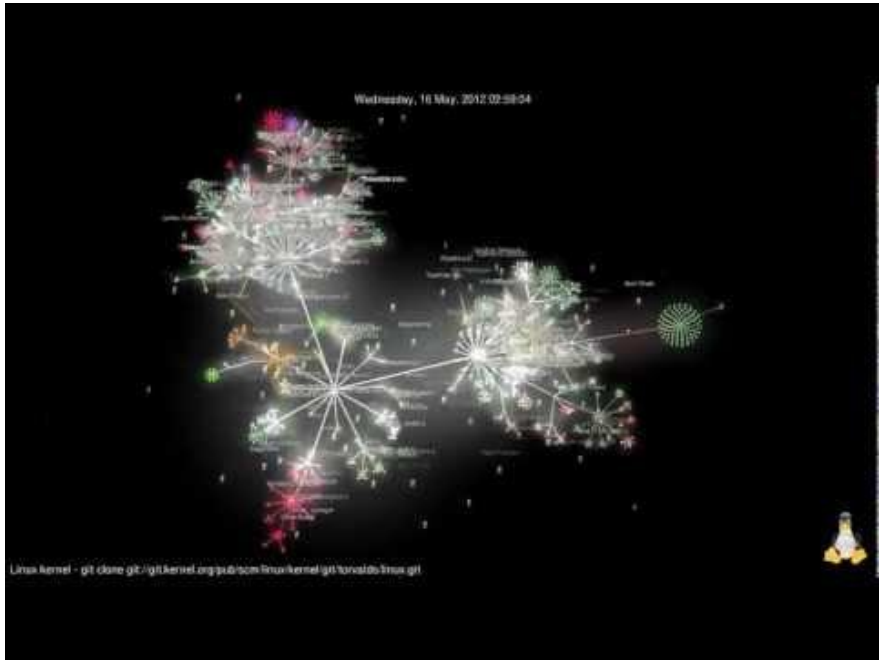
- *CLI, source tree, etc*
- *Most popular VCS tool?*
- *3rd party providers*
  - *Github, bitbucket, others*

Why git?

- *Code development as a vector through time.*
- *A git repository is Directed Acylic Graph (DAG)*
- *git graphs are Comprised of*
  - *Commits > Branches*
- *The DAG is the entire history of your code.*

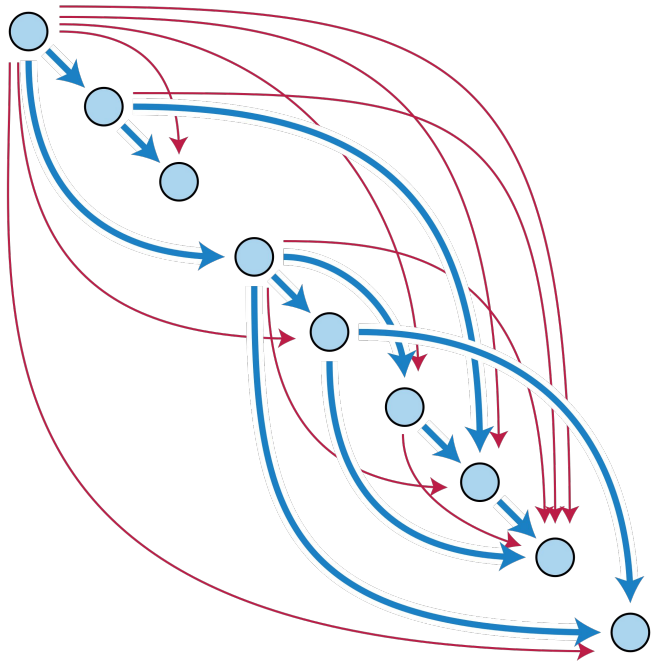


A git history (DAG) visualized



Major Concepts

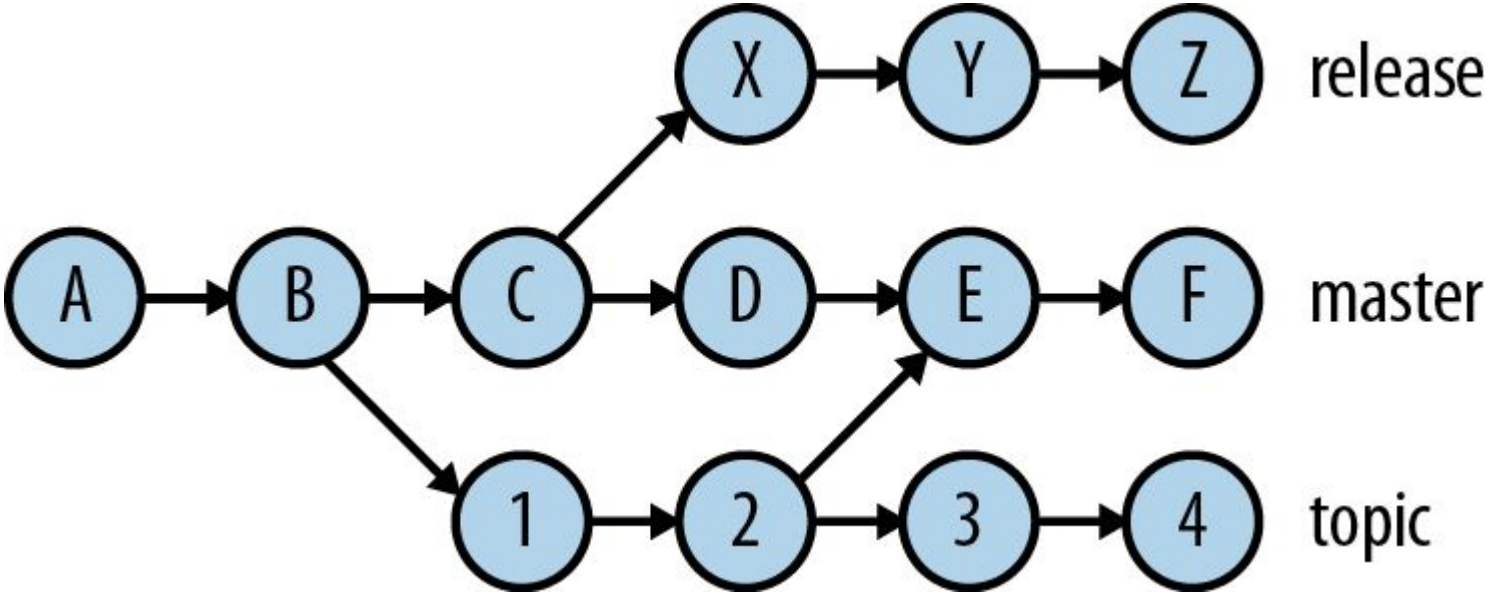
- *Commit*
- *Branch*
- *Merge*



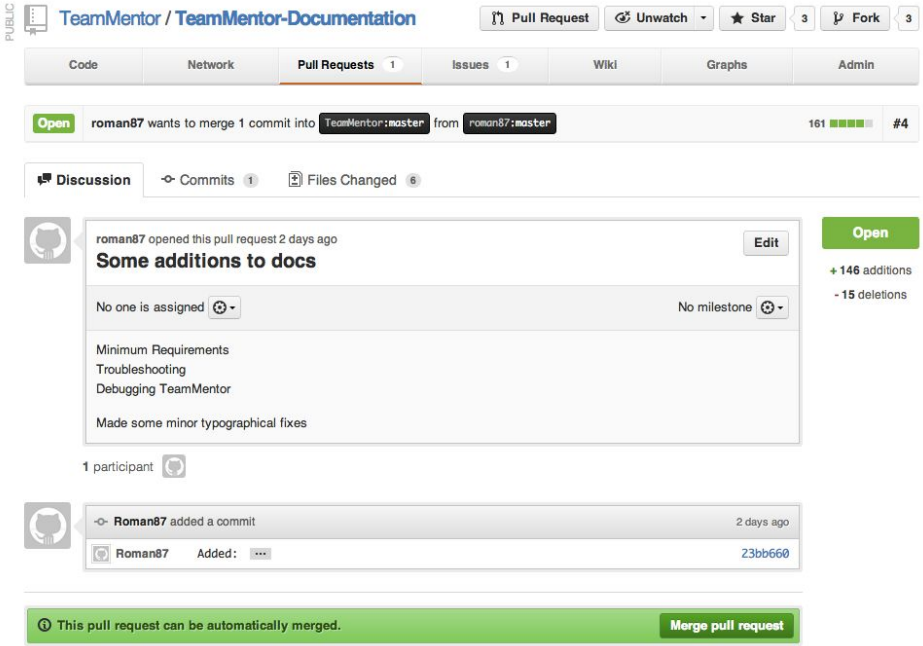
Commits

- Basic unit of the graph
- Intentional Changes
- Eg.
  - Adding an optimized ML algorithm to the codebase
  - Adding new dependencies
  - Update documentations
  - ...

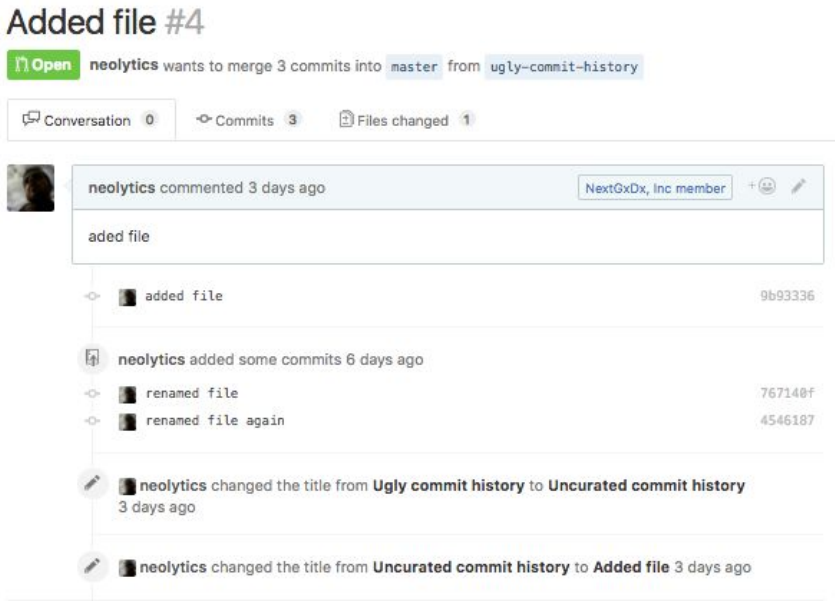
branches

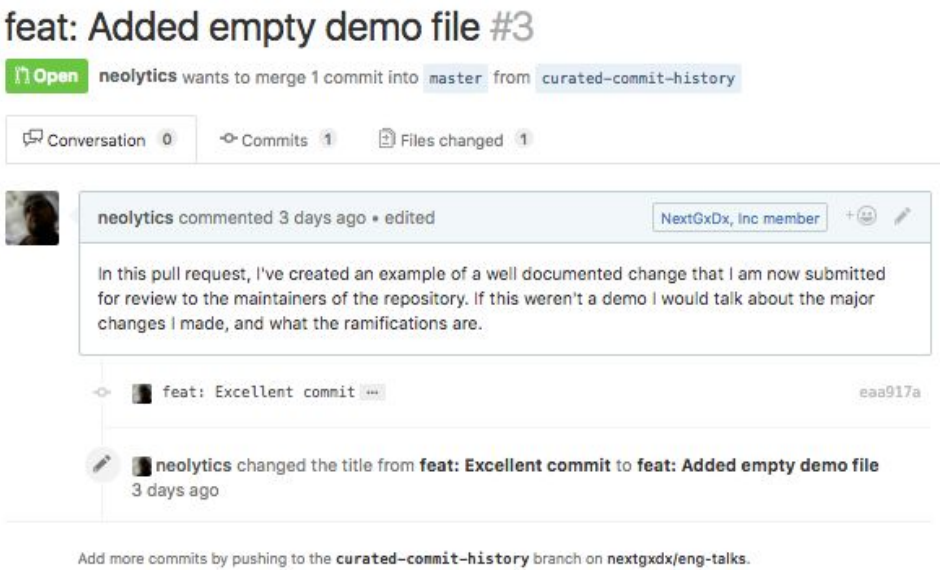


Github and Merging/Pull requests



Pull-Requests are *peer-review*





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Not all commits are made equal

```
commit eaa917af390ddf2baafea32ad8e894073d316cc5
Author: Jon Staples <jstaples@nextgxdx.com>
Date:   Fri Oct 28 17:46:35 2016 +0000

    feat: Excellent commit

    In terms of actual code, all I've done is add the file empty.txt to this
    repository.  I got rid of the other commits because frankly, you don't
    care about how many times I changed my mind about what to name it.  All
    you really wanted to know is that I added the file.

    Furthermore this is an example of a commit that follows conventional changelog
    commit formatting guidelines.  It is an example of version control as
    documentation and is a powerful way to communicate your thoughts and
    rationale to other developers. Because I've created a demo issue on our
    eng-talks repository located at
    https://github.com/nextgxdx/eng-talks/issues/1 you can see that I a
    referencing my demo issue in the footer below. Another nice feature of
    github and other cloud based VCS systems it that it automatically links
    to the demo issue I created using the hash syntax, linking this commit
    and the issue in our repository.

    Issue #1
```

```
commit 4546187e76ca7dd6e29e4818d095493d1ff7914f
Author: Jon Staples <jstaples@nextgxdx.com>
Date:   Fri Oct 28 17:47:19 2016 +0000

    renamed file again

commit 767140f90d062599da928c47bfece0bc2793fea2
Author: Jon Staples <jstaples@nextgxdx.com>
Date:   Fri Oct 28 17:46:59 2016 +0000

    renamed file

commit 9b93336d70854ec2c27381b7ed5ec8ea09560799
Author: Jon Staples <jstaples@nextgxdx.com>
Date:   Fri Oct 28 17:46:35 2016 +0000

    added file
```

Software Engineering in a nutshell

```
while True:
    create branch from master
    commit changes to branch
    submit a pull request
    merge changes to master
```

What am I going to discuss?

Virtualization

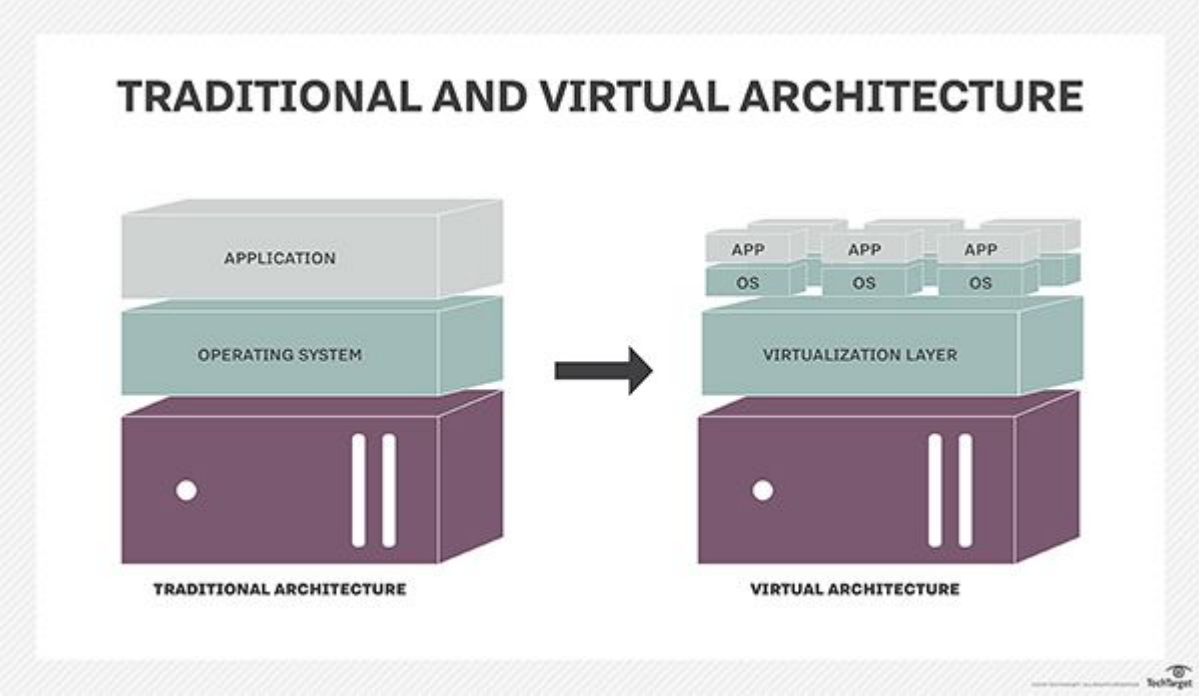
Who am I?

Tennis Smith (yeah, it is my real name)

- Began programming in 1985
- 30 years in Silicon Valley (Visa, Cisco, Apple, etc)
- Developer, QA, SysAdmin, etc
- Patent holder
- Moved to Nashville in 2014

What is virtualization?

"…typically full implementations of standard operating systems, such as Windows Vista or RedHat Enterprise Linux, running simultaneously on the same physical hardware"


TRADITIONAL AND VIRTUAL ARCHITECTURE
APPLICATION
OPERATING SYSTEM
TRADITIONAL ARCHITECTURE
APP
APP
APP
OS
OS
OS
VIRTUALIZATION LAYER
VIRTUAL ARCHITECTURE

Why is it useful?

- *Multiple, Simultaneous, OSs on the same hardware*
- *Complete isolation from host environment*
- *Easier software development*
- *Easier software testing*

How to use it yourself?

- *Virtualbox* *(www.virtualbox.org)*
- *Vagrant* *(www.vagrantup.com)*

Virtualbox

- *Virtualization tool*
- *Runs in most environments (e.g. Mac, Windows, Linux)*
- *Free*

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Vagrant

- *A user-friendly wrapper for Virtualbox*
- *Automates development environments*
- *Also free*

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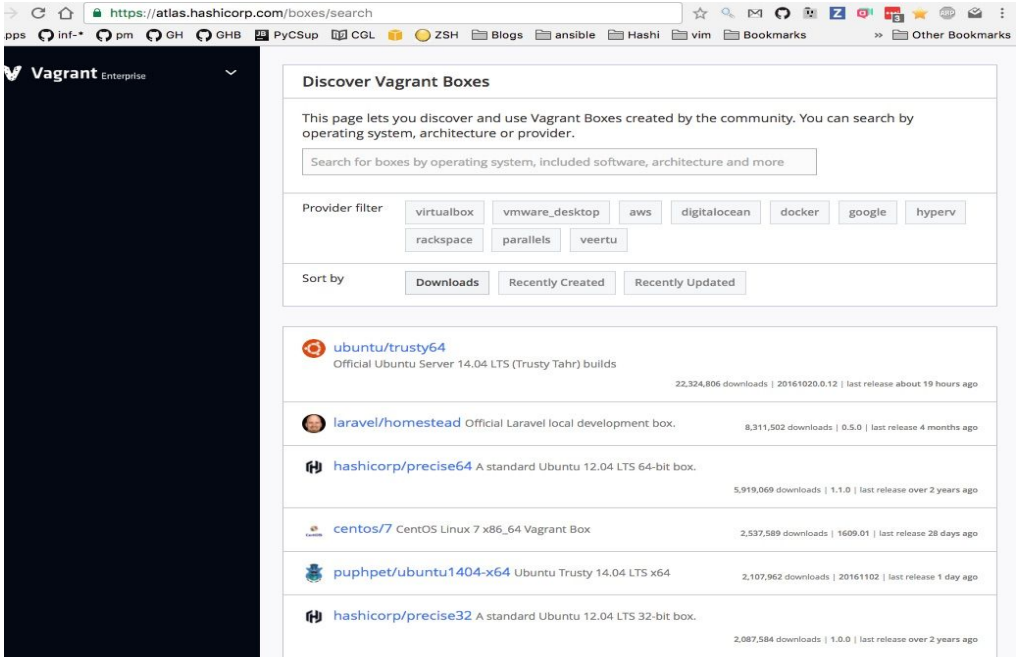
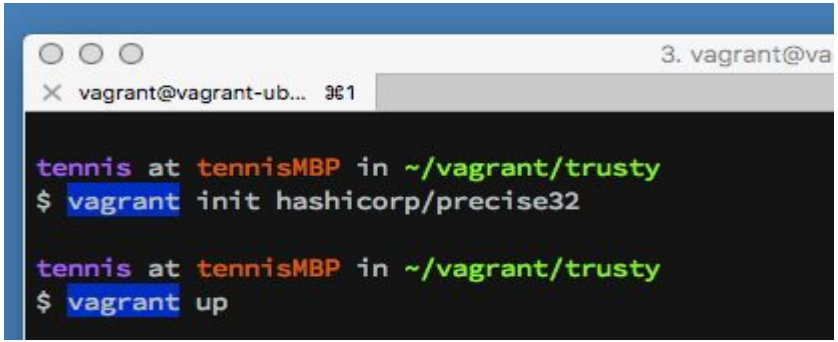
Where to get Vagrant“boxes”?

- *Online libraries of prebuilt boxes (see https://github.com/nextgxdx/eng-talks)*
- *Build Your Own*



How do you start a Vagrant box?



Vagrant

Demo

Pitfalls?

- *Performance is suboptimal*
- *Networking is complex*
- *Security is rudimentary*

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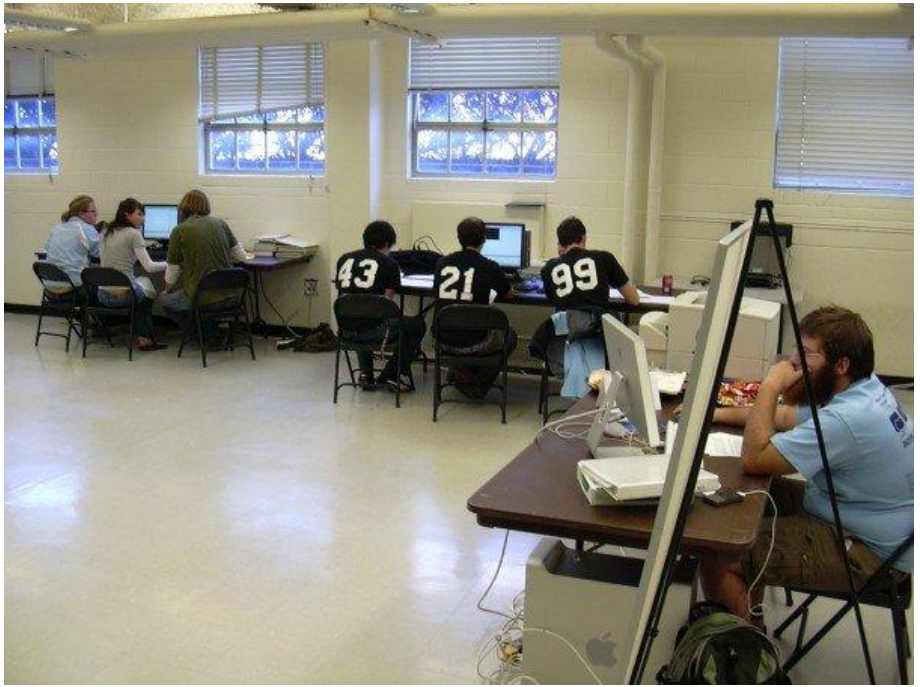
Rob Ferguson

NextGxDx - JS Frameworks

Background

- Developer at NextGxDx since 2013
- TTU
- From Franklin
- Ultimate



Outline

- What is a javascript framework?
- When is it appropriate to leverage a javascript framework?
- How does NextGxDx use Angular to address software needs?

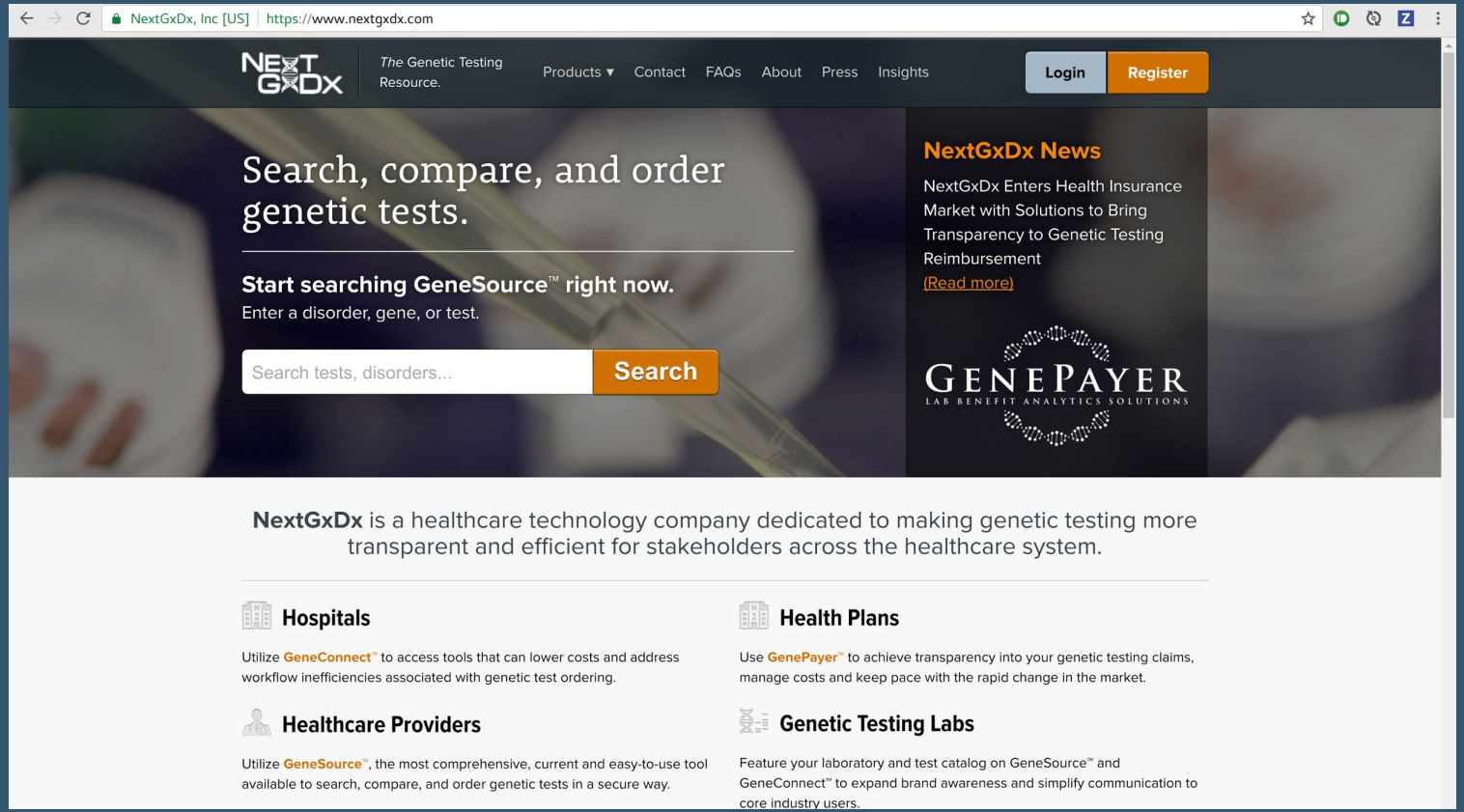
JS Framework

- JavaScript was not designed for application development.
- It’s a collection of cohesive tools that provide the foundation for building web applications.
- JS is a little rough around the edges.
- http://todomvc.com/

Framework Overkill

- Marketing page
- Personal website
- Static content
- http://vanilla-js.com/

NextGxDx.com - no angular



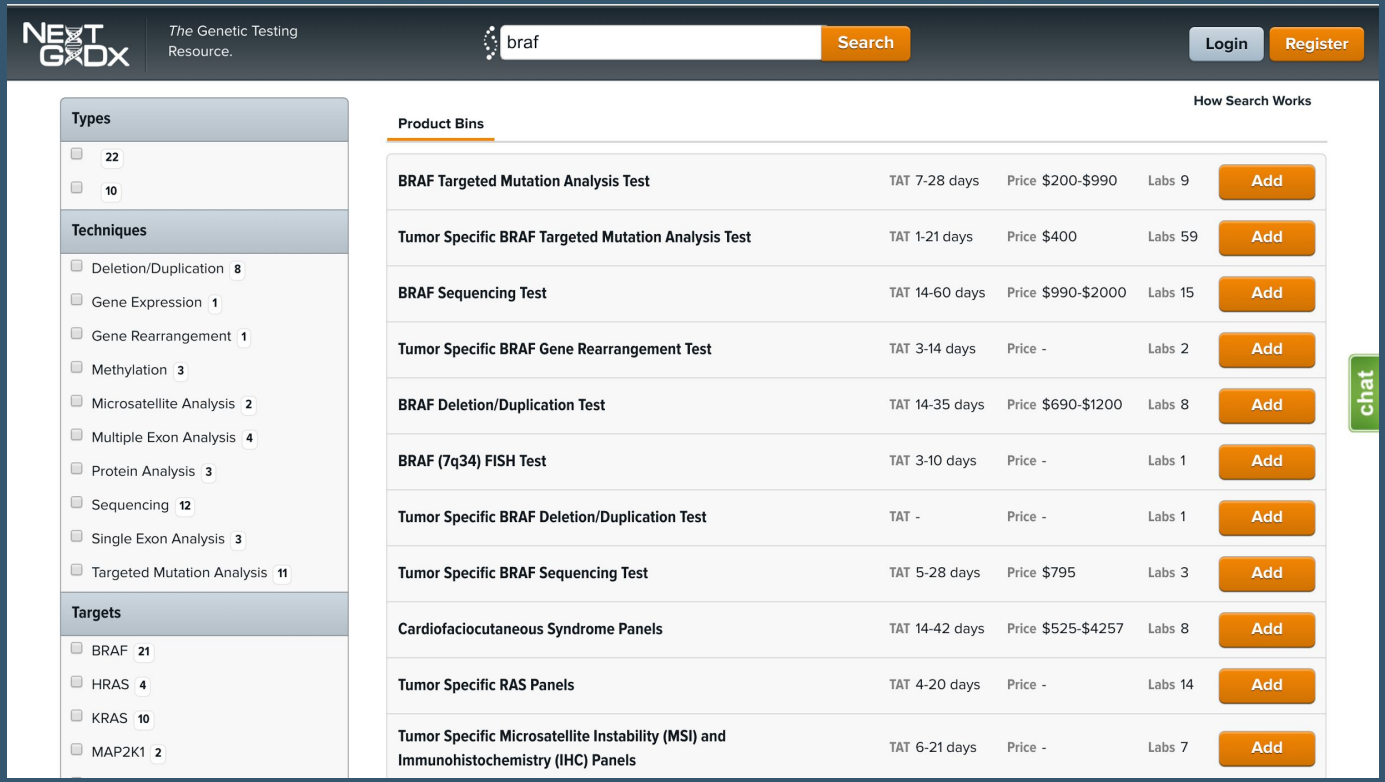
When do I need a framework?

- Desktop-like functionality
  - Google docs - MS Office
  - Lots of data
  - Interactive
- Engineering scale (tooling, framework vs. library)
  - More than a couple of people working on a project
  - Modular component structure
  - Testable

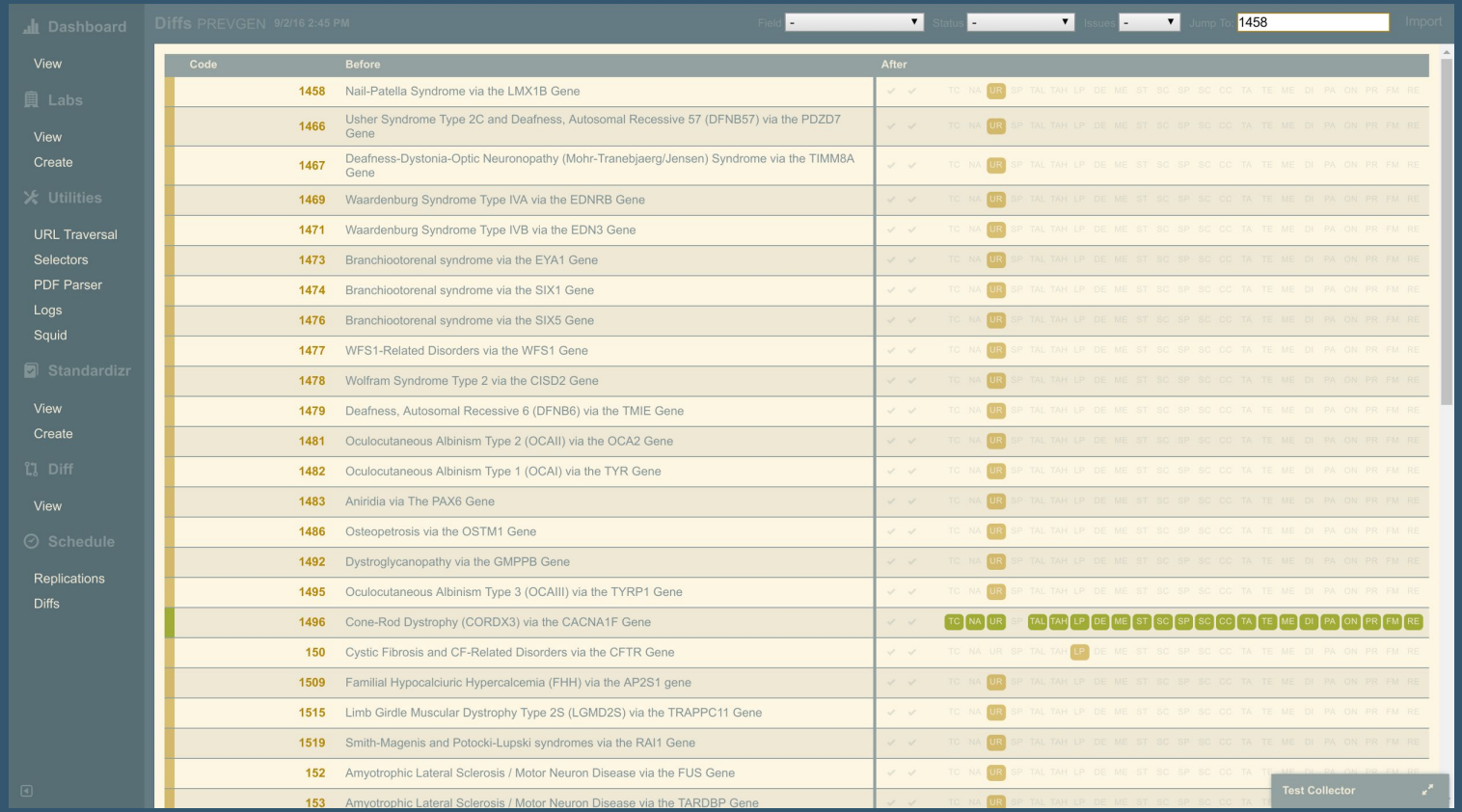
Angular @ NextGxDx

- 10+ Angular projects
- Five different people contribute to front-end code.
- We utilize Angular-supported test frameworks.
- We’re in the data business.
- We use internal angular apps to manage the data that feeds our external angular apps.

Customer Facing - searching and ordering genetic tests



Internal tool - manage and curate our marketplace data



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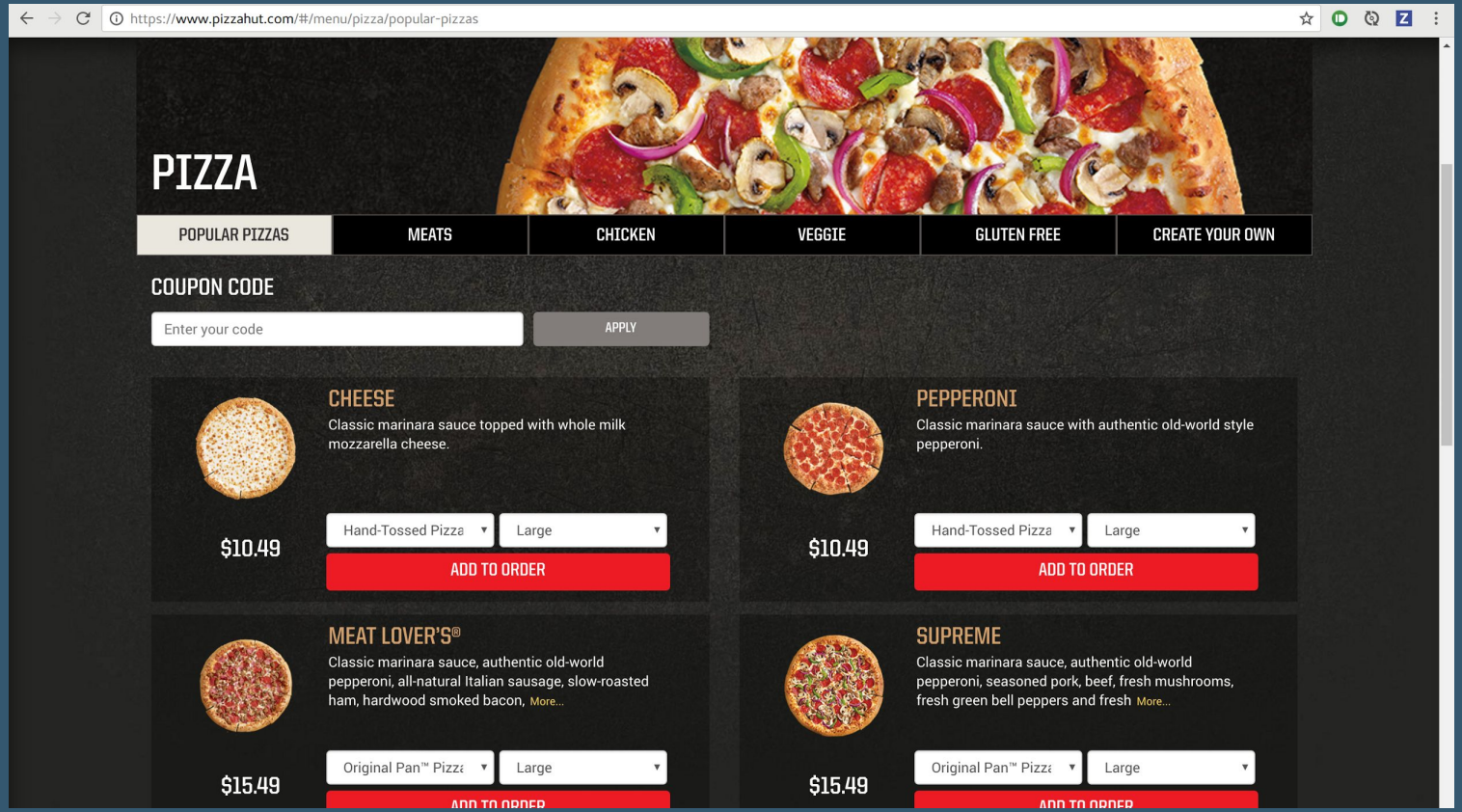

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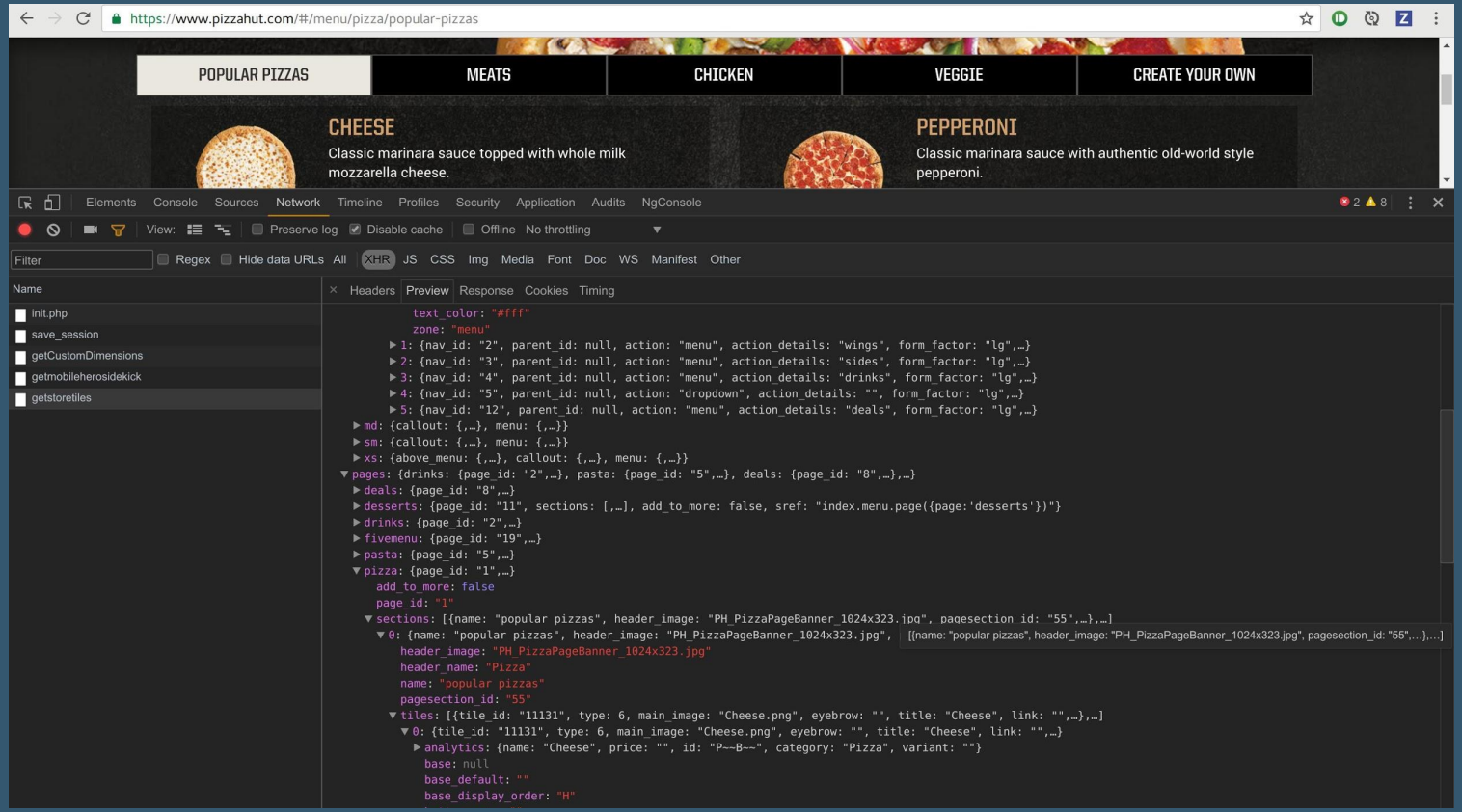

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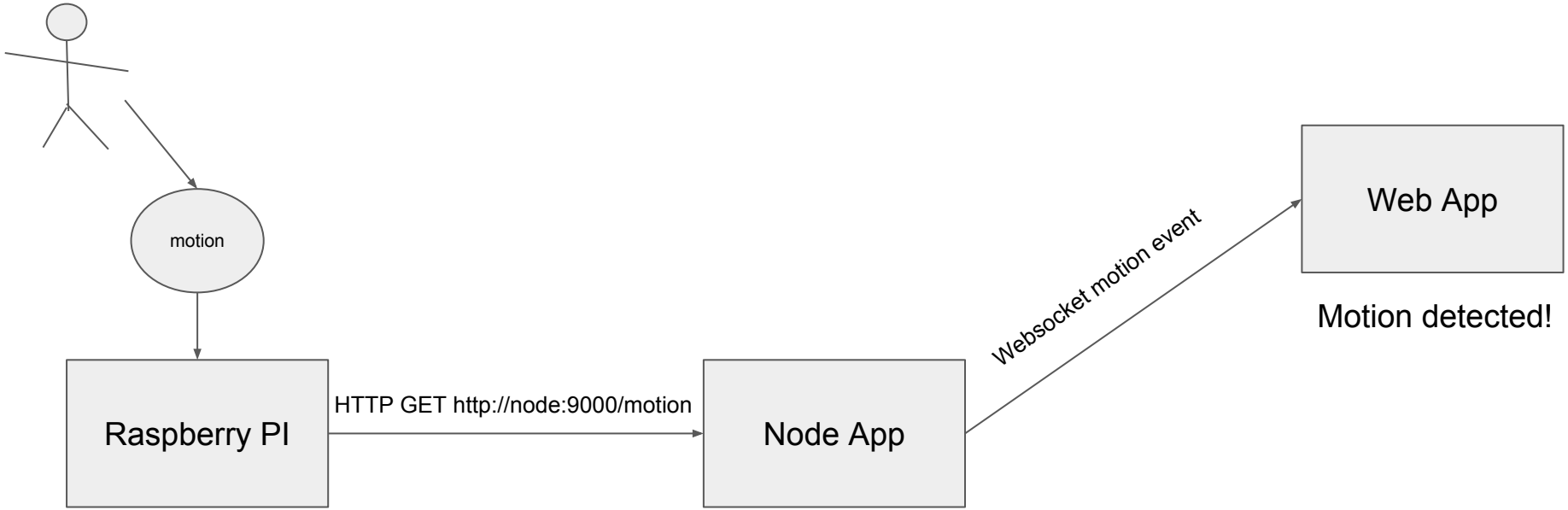
Demo


motion
Raspberry PI
HTTP GET http://node:9000/motion
Node App
Websocket motion event
Web App
Motion detected!

https://github.com/nextgxdx/eng-talks

Q&A

Thank you!

https://github.com/nextgxdx/eng-talks