

MTSU / ACM

November 4, 2016



Presenters



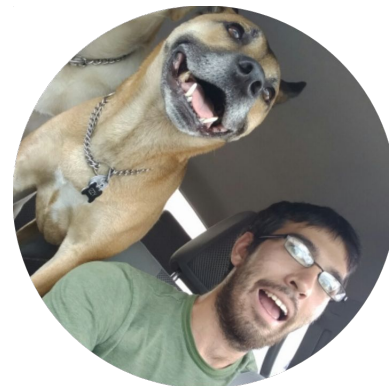
Aaron S. West
VP Engineering



Jon Staples
Software Engineer



Tennis Smith
DevOps Engineer



Rob Ferguson
Software Engineer

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





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



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**



Hospital utilization management tool.

Customers include:

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



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

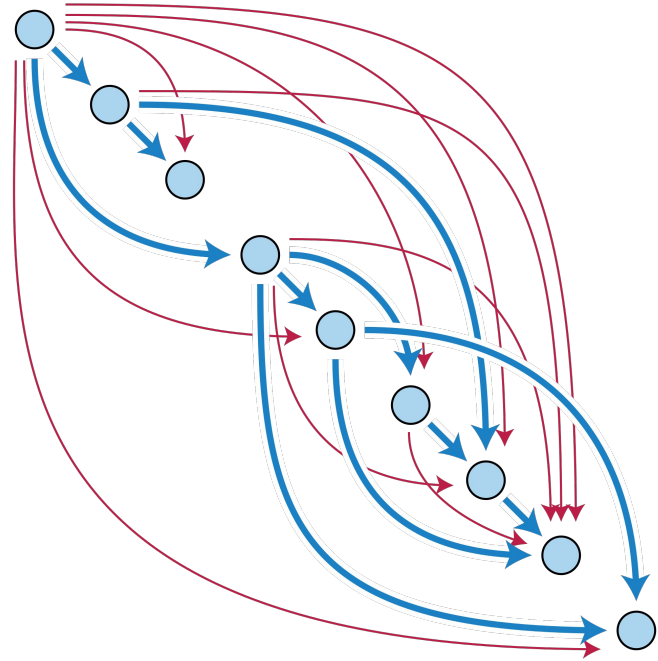


git

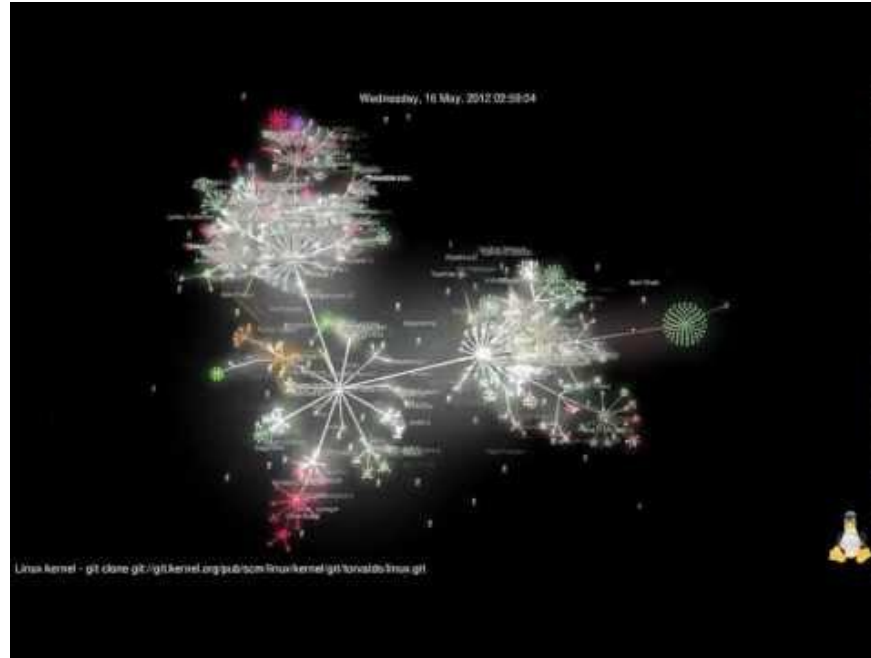
- *CLI, source tree, etc*
- *Most popular VCS tool?*
- *3rd party providers*
 - *Github, bitbucket, others*

Why git?

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

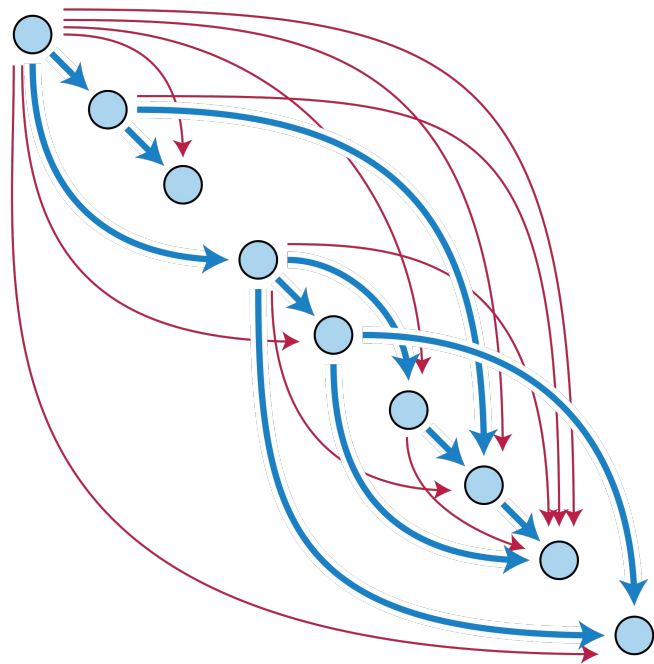


A git history (DAG) visualized



Major Concepts

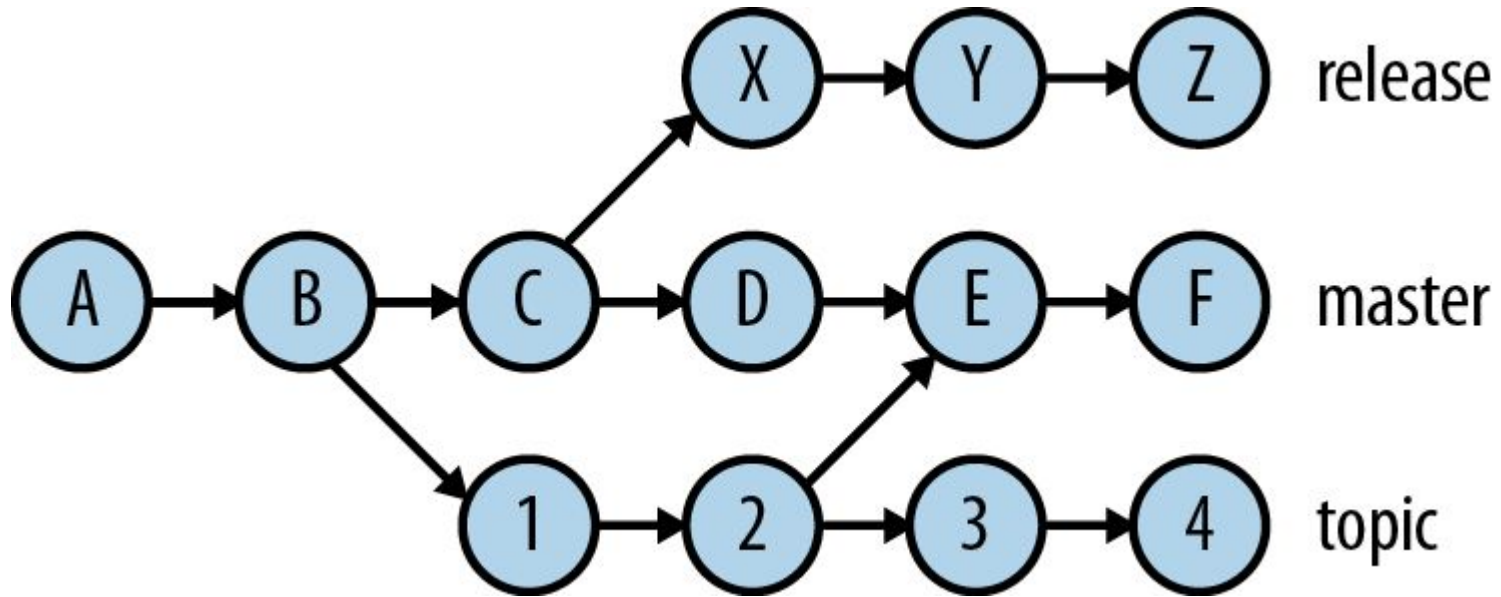
- *Commit*
- *Branch*
- *Merge*




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


PUBLIC  TeamMentor / TeamMentor-Documentation

[Pull Request](#) [Unwatch](#) [Star](#) 3 [Fork](#) 3



Code Network **Pull Requests 1** Issues 1 Wiki Graphs Admin

Open roman87 wants to merge 1 commit into TeamMentor:master from roman87:master 161  #4


[Discussion](#) [Commits 1](#) [Files Changed 6](#)


 roman87 opened this pull request 2 days ago [Edit](#)


Some additions to docs


No one is assigned  No milestone 

Minimum Requirements
Troubleshooting
Debugging TeamMentor
Made some minor typographical fixes

1 participant 

 Roman87 added a commit 2 days ago

 Roman87 Added: ... [23bb660](#)

 This pull request can be automatically merged. [Merge pull request](#)



Pull-Requests are *peer-review*

Added file #4

 **neolytics** wants to merge 3 commits into `master` from `ugly-commit-history`

 Conversation **0**  Commits **3**  Files changed **1**



neolytics commented 3 days ago

NextGxDx, Inc member



aded file

 added file 9b93336

 neolytics added some commits 6 days ago

 renamed file 767140f

 renamed file again 4546187

 neolytics changed the title from **Ugly commit history** to **Uncurated commit history** 3 days ago

 neolytics changed the title from **Uncurated commit history** to **Added file** 3 days ago

feat: Added empty demo file #3

 **neolytics** wants to merge 1 commit into `master` from `curated-commit-history`

 Conversation **0**  Commits **1**  Files changed **1**




neolytics commented 3 days ago • edited

NextGxDx, Inc member



In this pull request, I've created an example of a well documented change that I am now submitted for review to the maintainers of the repository. If this weren't a demo I would talk about the major changes I made, and what the ramifications are.

 feat: Excellent commit ... eaa917a

 neolytics changed the title from **feat: Excellent commit** to **feat: Added empty demo file** 3 days ago

Add more commits by pushing to the `curated-commit-history` branch on `nextgxdx/eng-talks`.

Not all commits are made equal

```
commit eaa917af390ddf2baafea32ad8e894073d316cc5
```

```
Author: Jon Staples <jstaples@nextgdx.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/nextgdx/eng-talks/issues/1> you can see that I am referencing my demo issue in the footer below. Another nice feature of github and other cloud based VCS systems is 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@nextgdx.com>
```

```
Date: Fri Oct 28 17:47:19 2016 +0000
```

```
renamed file again
```

```
commit 767140f90d062599da928c47bfec0bc2793fea2
```

```
Author: Jon Staples <jstaples@nextgdx.com>
```

```
Date: Fri Oct 28 17:46:59 2016 +0000
```

```
renamed file
```

```
commit 9b93336d70854ec2c27381b7ed5ec8ea09560799
```

```
Author: Jon Staples <jstaples@nextgdx.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

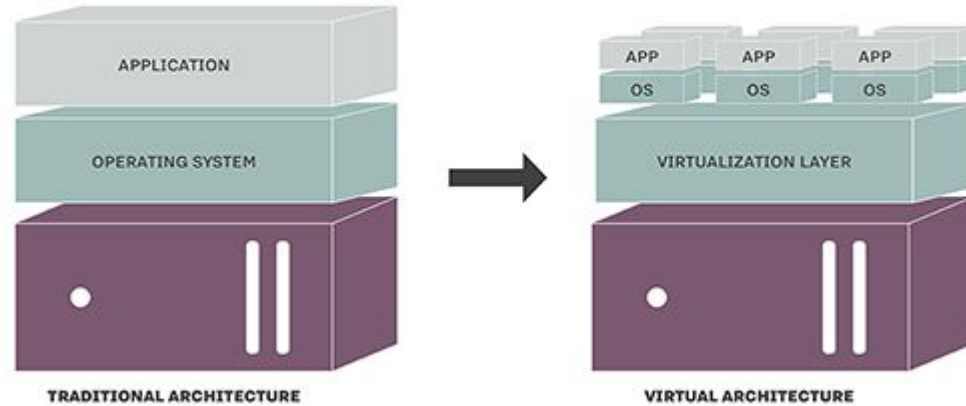


What is virtualization?

“...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



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

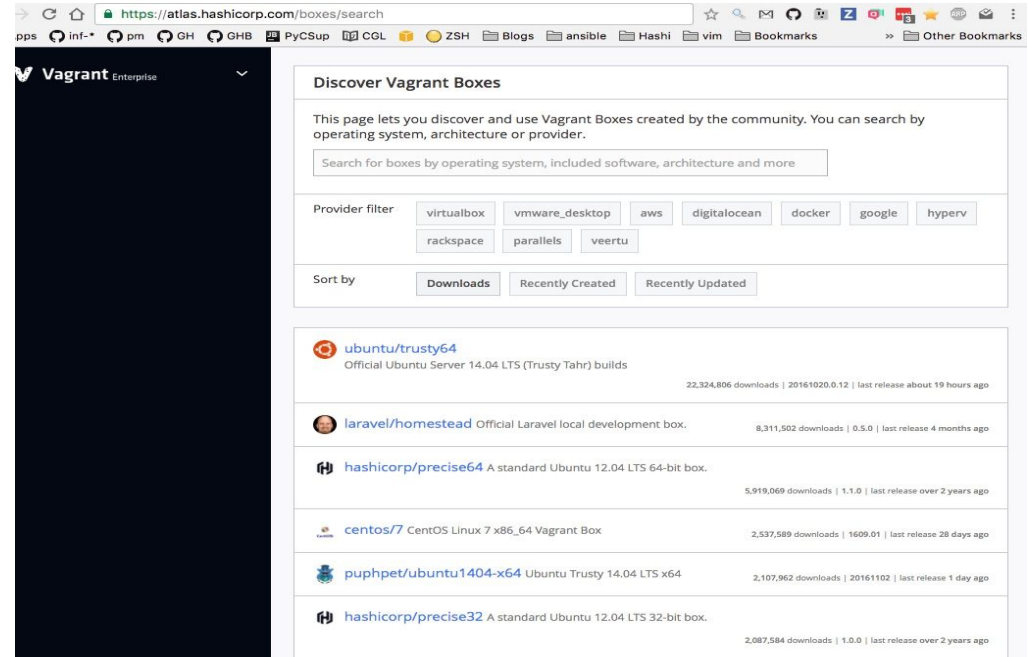
- *Virtualization tool*
- *Runs in most environments
(e.g. Mac, Windows, Linux)*
- *Free*

Vagrant

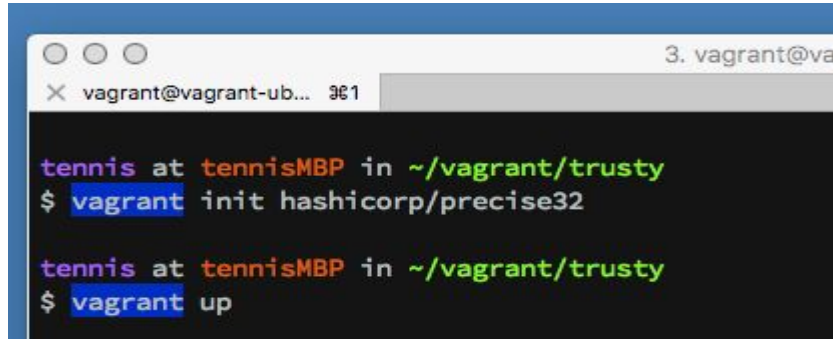
- *A user-friendly wrapper for Virtualbox*
 - *Automates development environments*
 - *Also free*
-

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?

A terminal window with a dark background and light-colored text. The window title bar shows three window control buttons and the text '3. vagrant@va'. The terminal content shows a user named 'tennis' at a host named 'tennisMBP' in the directory '~/vagrant/trusty'. The user enters the command '\$ vagrant init hashicorp/precise32'. The prompt changes to '\$', and the user enters '\$ vagrant up'.

```
tennis at tennisMBP in ~/vagrant/trusty
$ vagrant init hashicorp/precise32

tennis at tennisMBP in ~/vagrant/trusty
$ vagrant up
```

Vagrant

Demo



Pitfalls?

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

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

NextGxDx, Inc [US]

https://www.nextgxdx.com

NextGxDx

The Genetic Testing Resource.

Products ▾

Contact

FAQs

About

Press

Insights

Login

Register

Search, compare, and order genetic tests.

Start searching GeneSource™ right now.

Enter a disorder, gene, or test.

Search tests, disorders...

Search

NextGxDx News

NextGxDx Enters Health Insurance Market with Solutions to Bring Transparency to Genetic Testing Reimbursement

[\(Read more\)](#)

GENEPAYER

LAB BENEFIT ANALYTICS SOLUTIONS

NextGxDx is a healthcare technology company dedicated to making genetic testing more transparent and efficient for stakeholders across the healthcare system.

Hospitals

Utilize **GeneConnect™** to access tools that can lower costs and address workflow inefficiencies associated with genetic test ordering.

Healthcare Providers

Utilize **GeneSource™**, the most comprehensive, current and easy-to-use tool available to search, compare, and order genetic tests in a secure way.

Health Plans

Use **GenePayer™** to achieve transparency into your genetic testing claims, manage costs and keep pace with the rapid change in the market.

Genetic Testing Labs

Feature your laboratory and test catalog on GeneSource™ and GeneConnect™ to expand brand awareness and simplify communication to core industry users.

NextGxDx

CONFIDENTIAL


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



The Genetic Testing Resource.

Types

☐ 22

☐ 10

Techniques

☐ Deletion/Duplication 8

☐ Gene Expression 1

☐ Gene Rearrangement 1

☐ Methylation 3

☐ Microsatellite Analysis 2

☐ Multiple Exon Analysis 4

☐ Protein Analysis 3

☐ Sequencing 12

☐ Single Exon Analysis 3

☐ Targeted Mutation Analysis 11

Targets☐ BRAF 21☐ HRAS 4☐ KRAS 10☐ MAP2K1 2

Product Bins

BRAF Targeted Mutation Analysis Test	TAT 7-28 days	Price \$200-\$990	Labs 9	<input type="button" value="Add"/>
Tumor Specific BRAF Targeted Mutation Analysis Test	TAT 1-21 days	Price \$400	Labs 59	<input type="button" value="Add"/>
BRAF Sequencing Test	TAT 14-60 days	Price \$990-\$2000	Labs 15	<input type="button" value="Add"/>
Tumor Specific BRAF Gene Rearrangement Test	TAT 3-14 days	Price -	Labs 2	<input type="button" value="Add"/>
BRAF Deletion/Duplication Test	TAT 14-35 days	Price \$690-\$1200	Labs 8	<input type="button" value="Add"/>
BRAF (7q34) FISH Test	TAT 3-10 days	Price -	Labs 1	<input type="button" value="Add"/>
Tumor Specific BRAF Deletion/Duplication Test	TAT -	Price -	Labs 1	<input type="button" value="Add"/>
Tumor Specific BRAF Sequencing Test	TAT 5-28 days	Price \$795	Labs 3	<input type="button" value="Add"/>
Cardiofaciocutaneous Syndrome Panels	TAT 14-42 days	Price \$525-\$4257	Labs 8	<input type="button" value="Add"/>
Tumor Specific RAS Panels	TAT 4-20 days	Price -	Labs 14	<input type="button" value="Add"/>
Tumor Specific Microsatellite Instability (MSI) and Immunohistochemistry (IHC) Panels	TAT 6-21 days	Price -	Labs 7	<input type="button" value="Add"/>

How Search Works

CONFIDENTIAL

Dashboard	Diff: PREVGEN	9/2/16 2:45 PM	File: -	Status: -	Issues: -	mp To: 1458	Import
View	Code	Before	After				
		1458 Nail-Patella Syndrome via the LMX1B Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Labs		1466 Usher Syndrome Type 2C and Deafness, Autosomal Recessive 57 (DFNB57) via the PDZD7 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
View		1467 Deafness-Dystonia-Optic Neuropathy (Mohr-Tranebjaerg/Jensen) Syndrome via the TIMM8A Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Create		1469 Waardenburg Syndrome Type IVA via the EDNRB Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Utilities		1471 Waardenburg Syndrome Type IVB via the EDN3 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
URL Traversal		1473 Branchiootorenal syndrome via the EYA1 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Selectors		1474 Branchiootorenal syndrome via the SIX1 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
PDF Parser		1476 Branchiootorenal syndrome via the SIX5 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Logs		1477 WFS1-Related Disorders via the WFS1 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Squid		1478 Wolfram Syndrome Type 2 via the C12orf2 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Standardizr		1479 Deafness, Autosomal Recessive 6 (DFNB6) via the TMIE Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
View		1481 Oculocutaneous Albinism Type 2 (OCA1) via the OCA2 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Create		1482 Oculocutaneous Albinism Type 1 (OCA1) via the TYR Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Diff		1483 Aniridia via The PAX6 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
View		1486 Osteopetrosis via the OSTM1 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Schedule		1492 Dystroglycanopathy via the GMPGB Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Replications		1495 Oculocutaneous Albinism Type 3 (OCA1) via the TYRP1 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
Diff: s		1496 Cone-Rod Dystrophy (CORDX3) via the CACNA1F Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
		150 Cystic Fibrosis and CF-Related Disorders via the CFTR Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
		1509 Familial Hypocalcemic Hypercalcemia (FHH) via the AP2S1 gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
		1515 Limb Girdle Muscular Dystrophy Type 2S (LGMD2S) via the TRAPPC11 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
		1519 Smith-Magenis and Potocki-Lupski syndromes via the RAI1 Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
		152 Amyotrophic Lateral Sclerosis / Motor Neuron Disease via the FUS Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			
		153 Amyotrophic Lateral Sclerosis / Motor Neuron Disease via the TARDBP Gene	✓ ✓	TC NA UR SP TAL TAH LP DE ME ST SC SP SC CC TA TE ME DI PA ON PR FM RE			

←

→

↺

https://www.pizzahut.com/#/menu/pizza/popular-pizzas

☆

📄

🔄

🔍

⋮

PIZZA

POPULAR PIZZAS

MEATS

CHICKEN

VEGGIE

GLUTEN FREE

CREATE YOUR OWN

COUPON CODE

APPLY

CHEESE

Classic marinara sauce topped with whole milk mozzarella cheese.

\$10.49

Hand-Tossed Pizza

Large

ADD TO ORDER

PEPPERONI

Classic marinara sauce with authentic old-world style pepperoni.

\$10.49

Hand-Tossed Pizza

Large

ADD TO ORDER

MEAT LOVER'S®

Classic marinara sauce, authentic old-world pepperoni, all-natural Italian sausage, slow-roasted ham, hardwood smoked bacon, [More...](#)

\$15.49

Original Pan™ Pizz

Large

ADD TO ORDER

SUPREME

Classic marinara sauce, authentic old-world pepperoni, seasoned pork, beef, fresh mushrooms, fresh green bell peppers and fresh [More...](#)

\$15.49

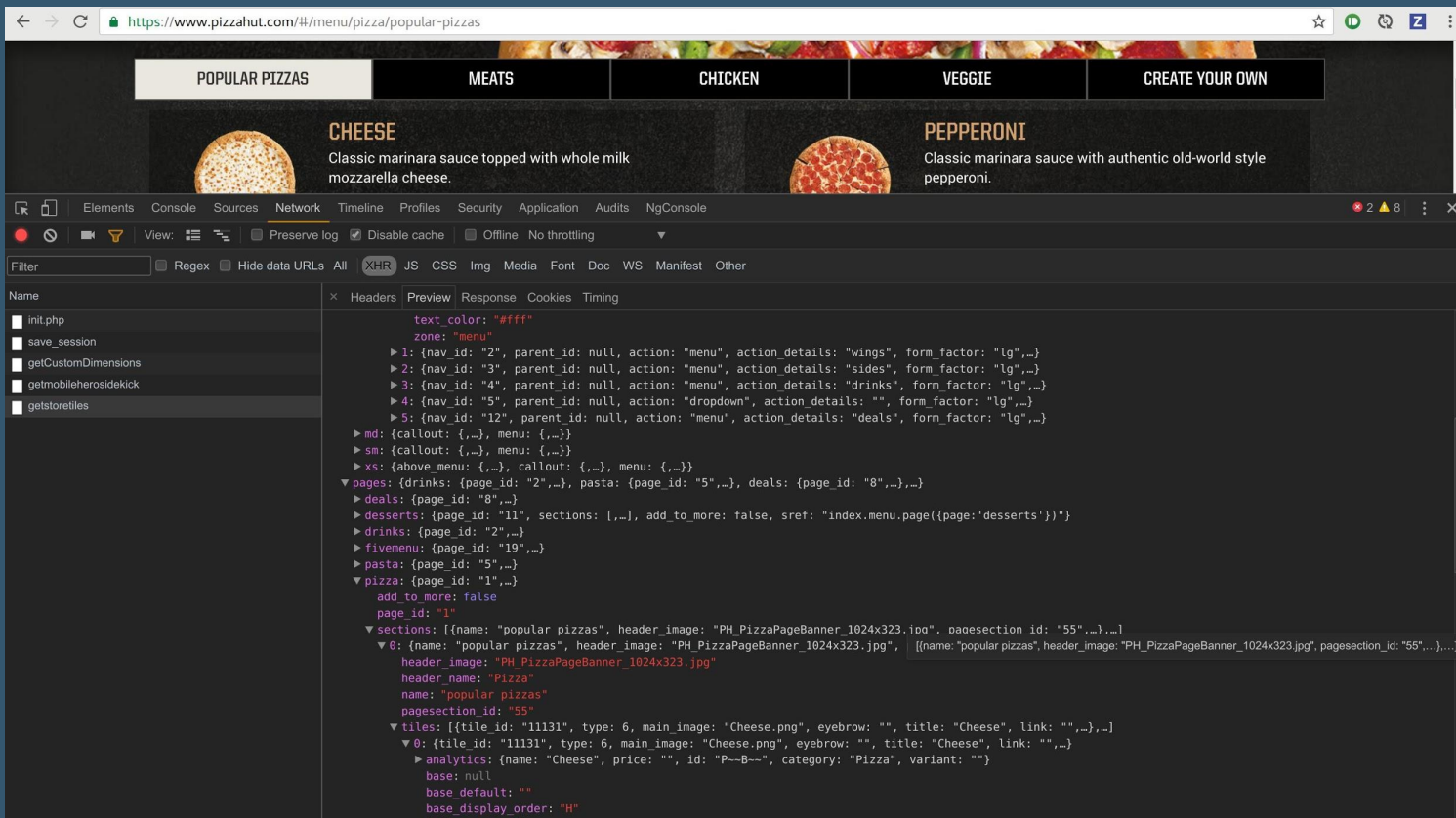
Original Pan™ Pizz

Large

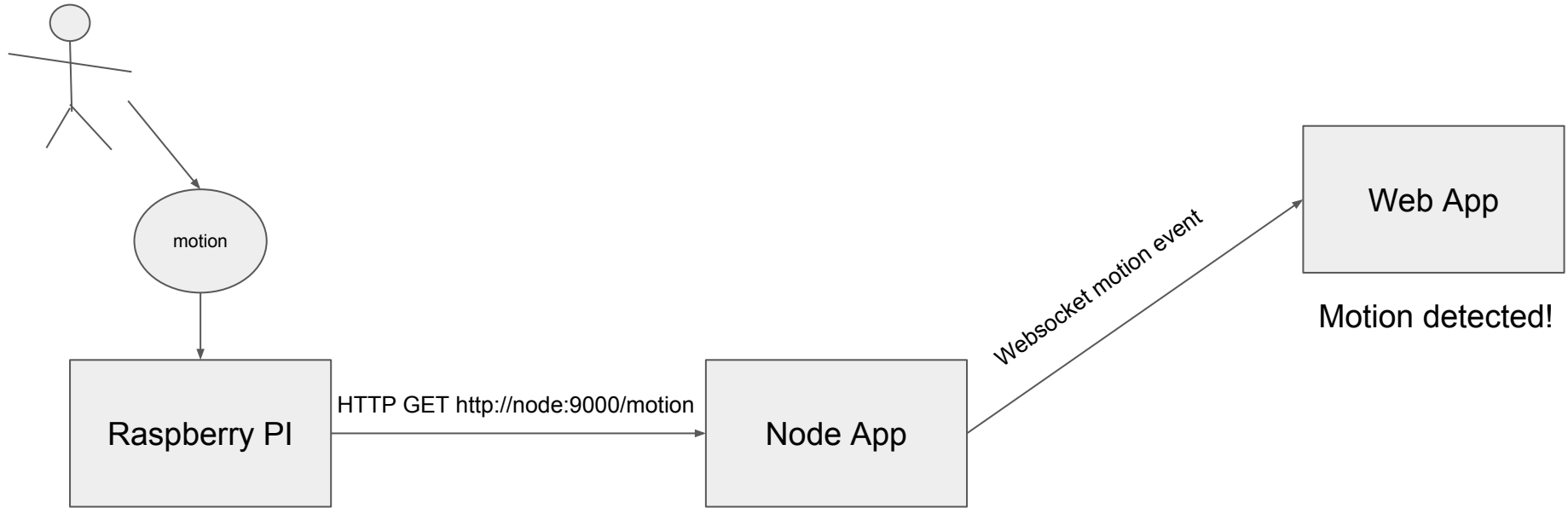
ADD TO ORDER

NEXT
GDX

CONFIDENTIAL



Demo



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

Q&A

Thank you!

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