



GENERAL ASSEMBLY

Hello World!

Programming for Non-Programmers

GENERAL ASSEMBLY IS A
GLOBAL COMMUNITY OF
INDIVIDUALS EMPOWERED
TO PURSUE THE WORK
WE LOVE.



Our 2-day sprint

You will get a high level understanding of:

- How the Web works
- HTML, CSS
- Web APIs
- Basic Javascript
- Create a personal profile website
- Create a working web application

Stretches

Depending on how well things go, we might be able to...

- jQuery & jQuery plugins

Stretches

Depending on how well things go, we might be able to...

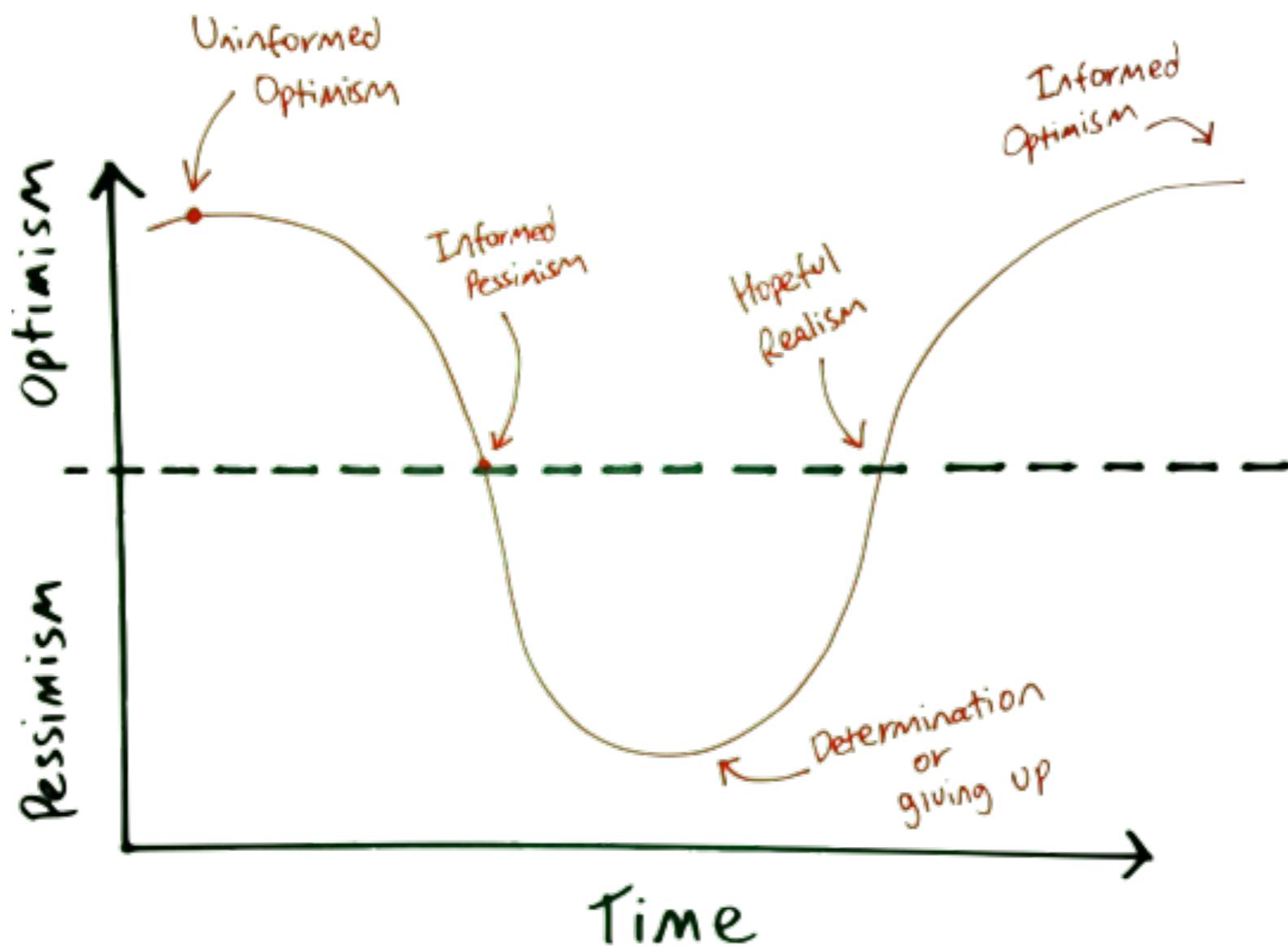
- Deploy our portfolio site to GitHub and the live web for all to see.
- Basic Express JS

Goals

My biggest hope for this class

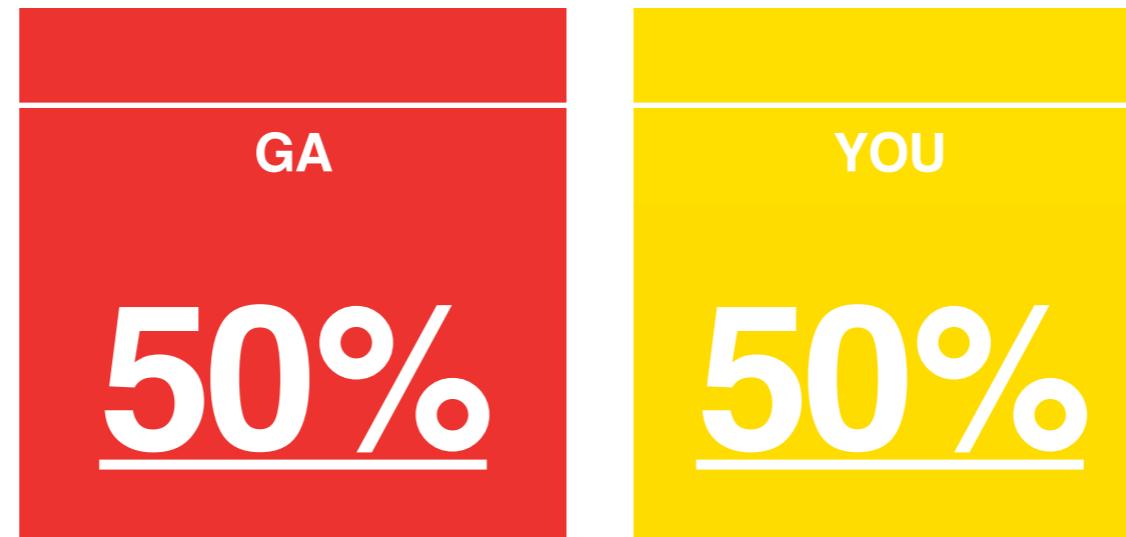
- You understand the web on a non-muggle level
- You understand what developers are up to
- Learn the essential words and concepts that are used on a daily basis by engineers and project/product managers on the job.
- Demystify programming
- Know how to keep learning if you are into it.

EMOTIONAL CYCLE OF CHANGE



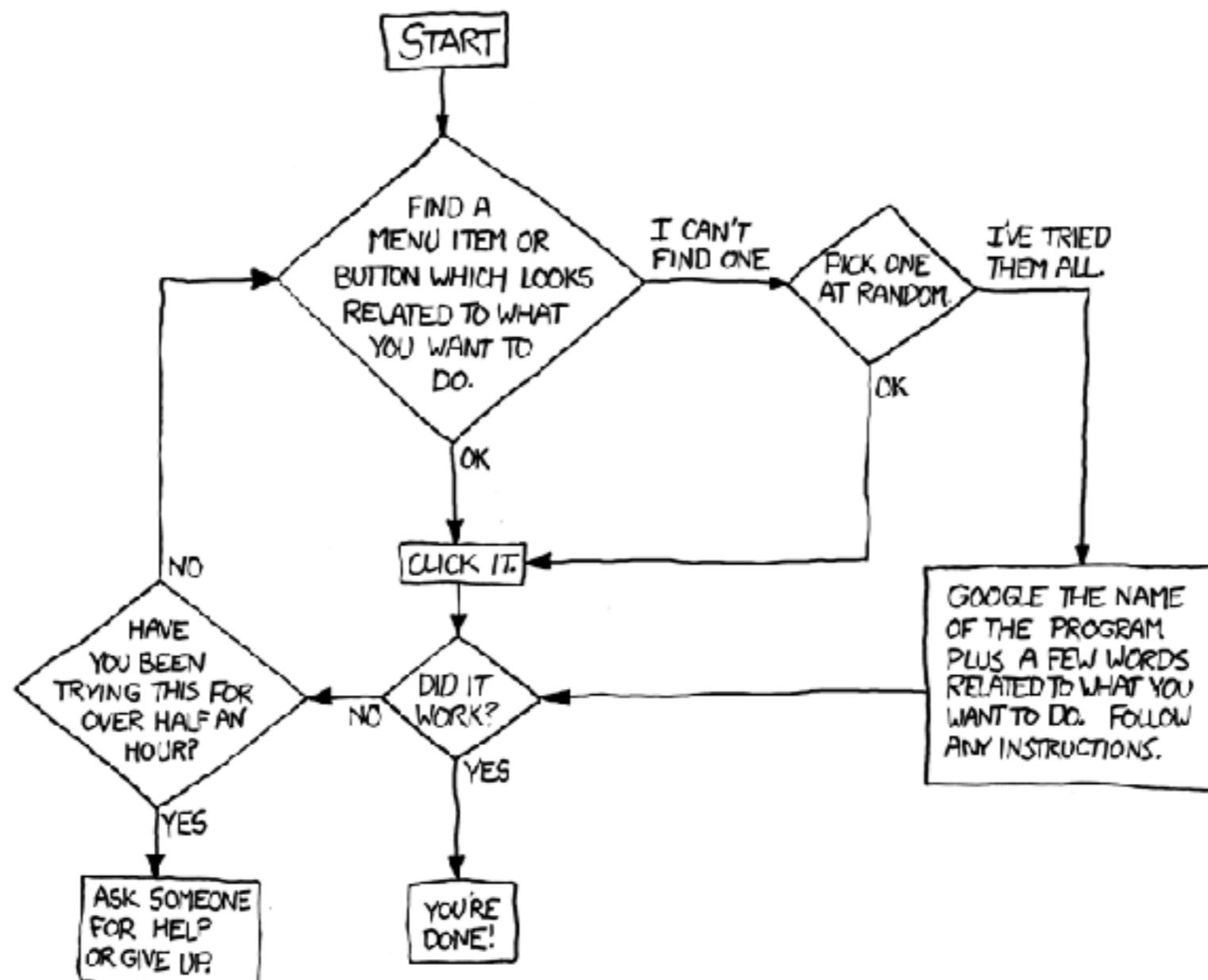
Student Responsibility

As a self directed program, we view students as a crucial part of the skill acquisition process.



DEAR VARIOUS PARENTS, GRANDPARENTS, CO-WORKERS,
AND OTHER "NOT COMPUTER PEOPLE."

WE DON'T MAGICALLY KNOW HOW TO DO EVERYTHING IN EVERY
PROGRAM. WHEN WE HELP YOU, WE'RE USUALLY JUST DOING THIS:



PLEASE PRINT THIS FLOWCHART OUT AND TAPE IT NEAR YOUR SCREEN.
CONGRATULATIONS; YOU'RE NOW THE LOCAL COMPUTER EXPERT!

Practice + concepts

FYI this is a default stock photo from Keynote that just fits.

For this class, we will do a little of hands on practice, but the main takeaway is understanding, not practical ability.

We WILL however get to the point where you can create your own personal resume in HTML and CSS. I've padded the class time to allow plenty of time for questions, or extra practice.



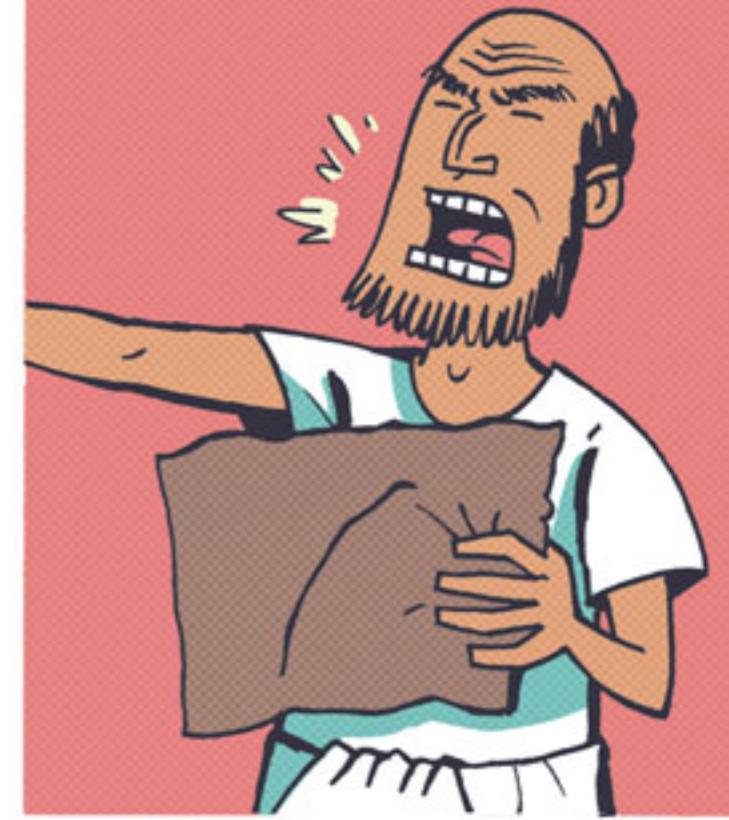
*If you want
to build a ship...*

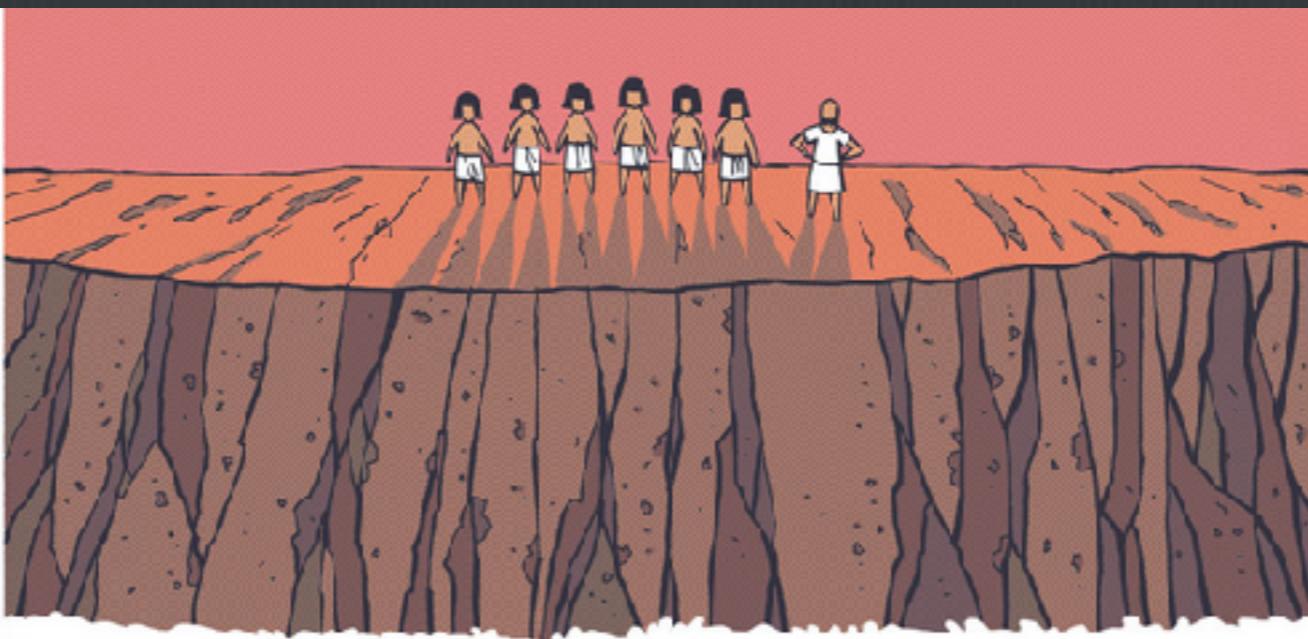


*... don't drum up the
men to gather wood ...*



*... divide the work
and give orders.*





...teach them
to yearn for
the vast and
ENDLESS
SEA.

- Antoine de Saint-Exupéry



The characters for "beginner's mind" in calligraphy by Shunryu Suzuki

In the beginner's mind
there are many
possibilities, in the
expert's mind there are
few.

-Suzuki Shunryu

I promise that's the last inspirational
quote you will hear from me today

Hi, I'm Vincent

- Former English teacher and Journalist
- Started learning Ruby in like 2012
- Took a night class at GA
- In early 2014 I decided to take WDI in this very building
- 3 weeks later, started working at 2U, an education technology company
- Currently Lead (and only) Developer at StudyAbroadApartments
- When not coding, I bike and read a lot and I like taking pictures with old-school technology.
- I really really like teaching people about technology and minting future coders.

Your turn

- What's your story? What are you doing now?
- What's your programming background if any?
- What first got you interested in web development?
- What you hope to get achieve in this class?
- What are your goals beyond this class?

**First, let's just install two
things**

Text Editor & Browser

- If you haven't already, please download Google's Chrome browser.
- Also, you will need a “text editor,” which lets you edit plain text and highlights syntax to help you. MS Word doesn't cut it for coding. For this class, I recommend Atom. (Which was made in JavaScript!)

Some essential terminology

What is Programming? (...and why do I care?)

PROGRAMMING

- a set of instructions
- used to solve a problem

**Terms that apply to any
programming language**

Declarations

- We can store and retrieve data in our programs by associating them with intermediary values that we call variables
- For example, $x = 5$
- We declare that x is just a placeholder for 5 this way
- Think of variables like pronouns, or the x in algebra

Expressions and evaluation

- We use expressions to evaluate stuff.
- For example, $2 + 2$ is an example of an expression
- That evaluates to 4
- We can use expressions and declarations in tandem to perform complex tasks. For instance, we can reference a variable we declared in an expression to help us evaluate new values which can then be stored.

Statements

- **Statements are often used to determine control flow.**
- **Control flow is essentially the order in which declarations, expressions, and other statements are executed.**
- **Here is a statement:** The temperature is lower than 80 degrees.
- Perhaps your program will tell you to turn the AC off *if* the temperature is lower than 80.

Algorithms

Algorithms

- People tend to talk about algorithms like they are mysterious forces of nature, but I guarantee that you know a few algorithms yourself.

- All an algorithm is is a series of declarations, expressions, and statements that can be used over and over again to solve well defined problems of a certain type.

Let's pseudo-code an algorithm!

Tell a robot to convert temperatures

- In plain English (pseudo code), work with a neighbor to give precise, exact instructions to a dumb robot to spit out celsius, given a temperature in farenheit.
- Write it down on your desk. Use regular English, but use declarations, statements, and expressions. When you finish, try to identify those in your algorithm.
- If you finish, write out an ‘algorithm’ for making a PB&J sandwich.

**Like the five positions in ballet,
these universal concepts make up
ALL programming in ALL
languages.**

A word on computer science.

**“Computer Science is no more
about computers than astronomy
is about telescopes”**

— Edsger Dijkstra

Abstraction

Some languages are ‘closer to the metal’

- All code eventually translates into electrons popping in and out of a processor.
- Processors get binary. Ones and Zeros
- Nobody understands that. No humans at least.

Abstraction

- Most computers run some version of Assembly, which is an analogue to the actual machine code that a processor architecture understands
- If you need a program to be as fast as possible, this is what you would write. Example, a friend of a friend of mine writes software for the Navy which guides air to air missiles mid flight.
- I have never written a line of any assembly in my life. It's crazy hard, so hard that it costs lives.
- Therac-25 — the ultimate bad software. Worth reading about.

HELLO WORLD IN C, ASSEMBLY, AND RUBY

```
section      .text
global       _start
_start:
        ;must be declared for linker (ld)
        ;tell linker entry point

        mov    edx,len
        mov    ecx,msg
        mov    ebx,1
        mov    eax,4
        int    0x80
        ;message length
        ;message to write
        ;file descriptor (stdout)
        ;system call number (sys_write)
        ;call kernel

        mov    eax,1
        int    0x80
        ;system call number (sys_exit)
        ;call kernel

section      .data
msg     db    'Hello, world!',0xa
len     equ    $ - msg
        ;our dear string
        ;length of our dear string
```

Assembly

```
#include<stdio.h>

main()
{
    printf("Hello World");
}
```

C

puts "Hello world!"

Ruby

What is open source?

WEB DEVELOPMENT BASICS

VCS: Version Control Systems

- allow you keep track of the version of your files
- view, retrieve, and see different between previous versions of files
- work across environments and machines
- collaborate with others and keep track of contributions
- different software: **git**, subversion, mercurial

Popular Services:

- GitHub: <https://github.com/>
- Bitbucket: <https://bitbucket.org/>

Programming languages

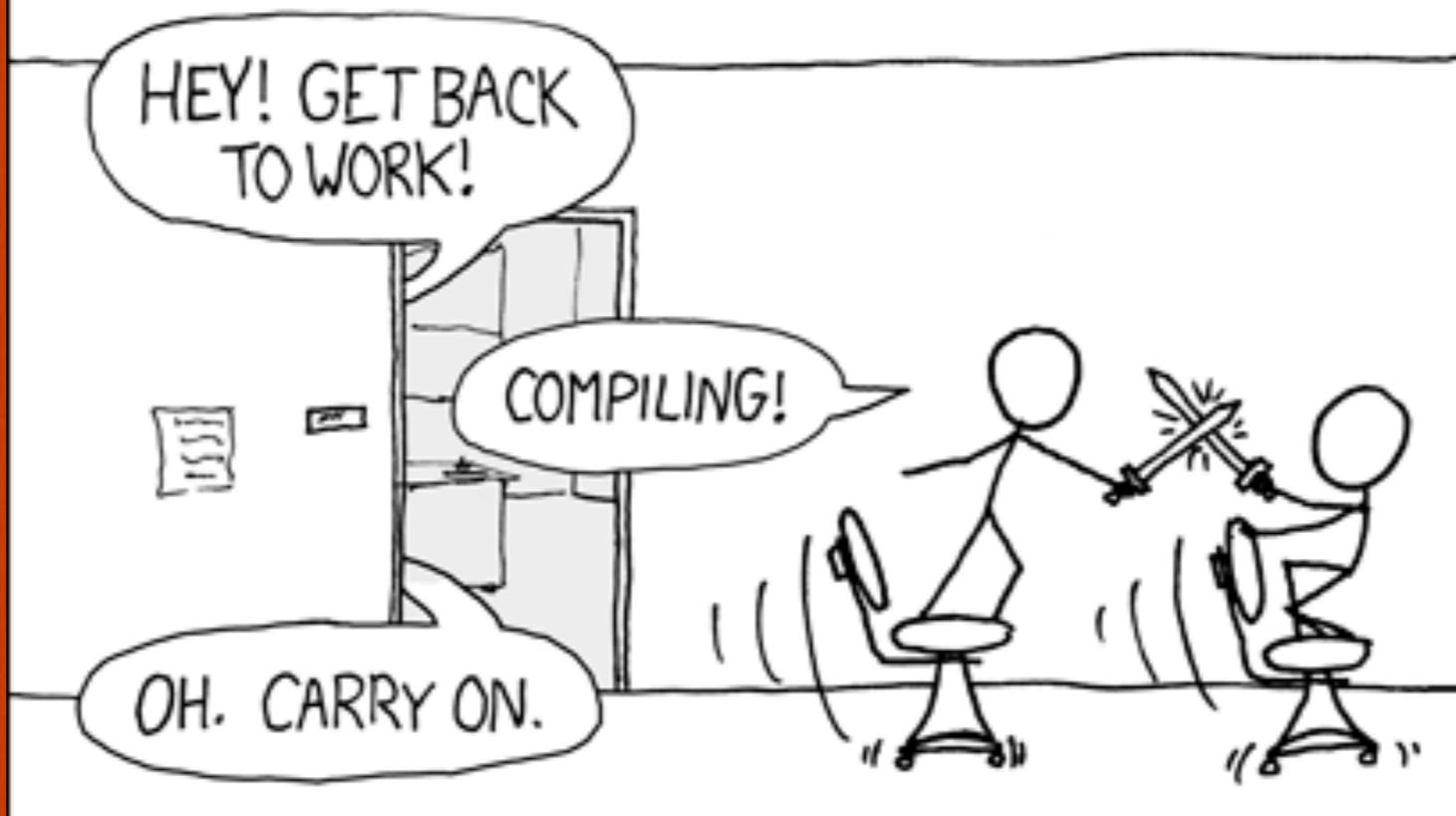
Programming languages

- A programming language is a series of grammar and rules that we can define towards writing source code.
- Languages are effectively different approaches towards communicating the same ideas in programming. Essentially, we can communicate in say both French and English, what mainly differs is the structure of our sentences and the actual words and sounds themselves.
- The same analogy can be made with programming languages.

Interpreted and compiled languages

- Luckily, we don't have to write arcane procedural programs anymore.
- For the most part, programming languages are either compiled or interpreted.
- C is an example of a compiled language. You write your code, something compiles it, and it either works or it doesn't.
- Languages like Ruby and Python are basically cheat codes for C. They are interpreted, meaning another program just reads your code and figures out what C code to turn it into.

THE #1 PROGRAMMER EXCUSE
FOR LEGITIMATELY SLACKING OFF:
"MY CODE'S COMPILING."



Interpreted languages

- C is wicked fast but a pain to get your head around.
- Ruby, Python and many others do the boring work of selecting spots in memory, clearing them out, and having deep conversations with the processor so you don't have to.
- Interpreted languages also tell you precisely where your bug is, and therefore it's so much easier to work with.

Which programming
languages do what

PROGRAMMING FOR NON-PROGRAMMERS

VOCABULARY



In a browser

- ▶ CHROME
- ▶ FIREFOX
- ▶ INTERNET EXPLORER
- ▶ SAFARI
- ▶ OPERA



Directly on your Operating System

- ▶ IPHONE
- ▶ ANDROID
- ▶ OSX
- ▶ WINDOWS



- ▶ DECODE THE GENOME
- ▶ XBOX
- ▶ VIDEO GAMES
- ▶ OTHER HARDWARE
- ▶ ANYTHING ELSE I MAY HAVE MISSED

**Some programming
languages and what they
generally do**

C

- Started in the 60s, still going strong.
- Used to create Unix, which is basically the same OS as Linux and Mac OS X. When you count servers and phones, that's the majority of computers there.
- Procedural — one line executes after another.
- Most people find it hard, present company included.
- Mainly used for operating systems, databases, creating other language interpreters. Great for learning how computers work, but fortunately, you don't necessarily have to if you want to just get some stuff done.

C++

- **++ is a common idiom for iteration (this plus one)**
- **It's a huge improvement on C.**
- **Mainly used for desktop applications. Very big deal in the games industry.**

Java

- Named for the amount of coffee consumed during its creation.
- Object oriented, fast, high-level, and easy to understand (compared to other languages)
- Used to be SO COOL for making interactive webpages with “applets”
- Runs in a Virtual Machine, so a Java program can theoretically run on any platform.
- Still enormous because of Android, the most successful OS ever.
- Owned by a patent control freak unfortunately.

Python

- Made in 1995 by the gorgeously named Guido Van Rossum, a Dutch mathematician.
- All purpose, great for making web apps, desktop apps, you name it.
- Truly shines in science and data analysis. Python's library Pandas just owns other data science tools.

Ruby!

- My personal favorite.
- Made in 1995 by Matsumoto Yukihiro (Matz). He wanted to make a pleasurable language that emphasizes programmer happiness above all else.
- Amazing for making full-fledged web apps with Ruby on Rails. Also used extensively in automating tasks for devops.

C#

- Basically Microsoft's thing. Used for Windows apps and Microsoft's .NET framework.

Objective-C and Swift

- Apple stuff. If Mac OS X or iOS apps are your jam, you should learn one of these.
- Swift came out just over 2 years ago, and it's much easier to understand than the lower level Obj C. Swift syntax borrows heavily from JavaScript.

Which brings me to the
500 lb gorilla that is
JavaScript

JavaScript

- Has the most oddball history of any programming language

JavaScript

- **Created over the course of TEN FREAKING DAYS in 1995 (what a year for programming languages!) for Netscape**
- **Most widely used of all, by a huge margin.**
- **Named JavaScript to capitalize on the contemporary popularity of Java. A crappy marketing decision that we still live with.**

Make the monkey dance

- **JavaScript, for years, was solely used to manipulate and animate web pages.**
- **It's the only real programming language that any browser you can find understands. That's just how it is.**
- **This makes it THE language of front end development.**

Why new programmers should learn JavaScript first

- Most popular, despite its massive flaws
- You can make something that does something on day one since it runs in the browser. With Python or Ruby, you have no choice but to start out with command line programs.
- The browser is the most successful runtime environment ever conceived.
- Don't have to install a delicate development environment

Why new programmers should learn JavaScript first

- Enormous job market
- Easy to get started
- Massive community — any problem that you come across has been made by others, and solved.
- Currently undergoing a Cambrian explosion.
- JS deserves credit for dramatically democratizing programming.

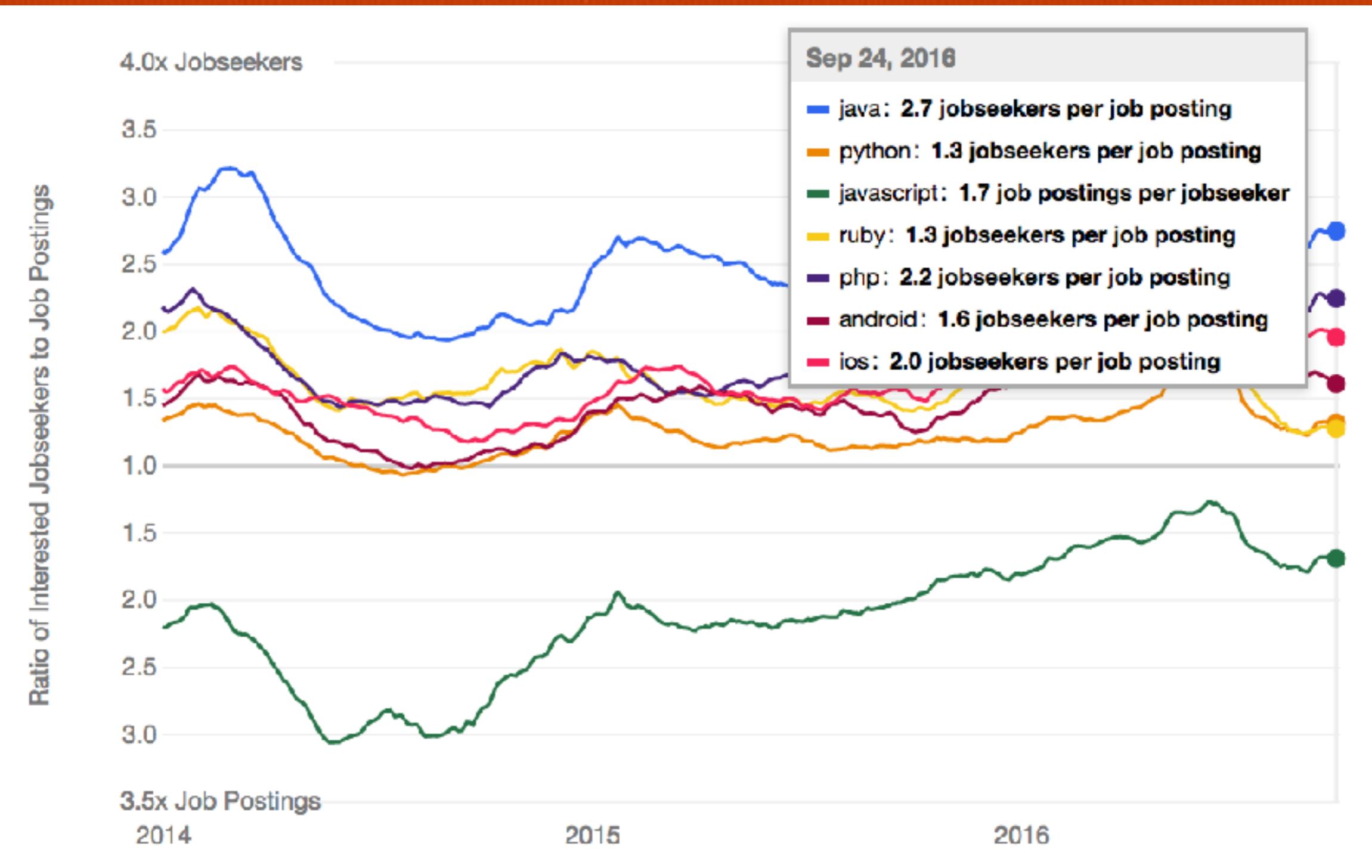
**“Anything the can be written in
JavaScript, will b written in
JavaScript.”**

—Jeff Atwood

Node and universal JavaScript

- Thanks to Node.js, you can now use JavaScript practically anywhere.
- The front end of a website is the start, but from there you can do server side code, home automation, robotics, and even fine art.

Job market



Open source action

15 most popular languages used on GitHub by opened Pull Request and percentage change from previous period



Community

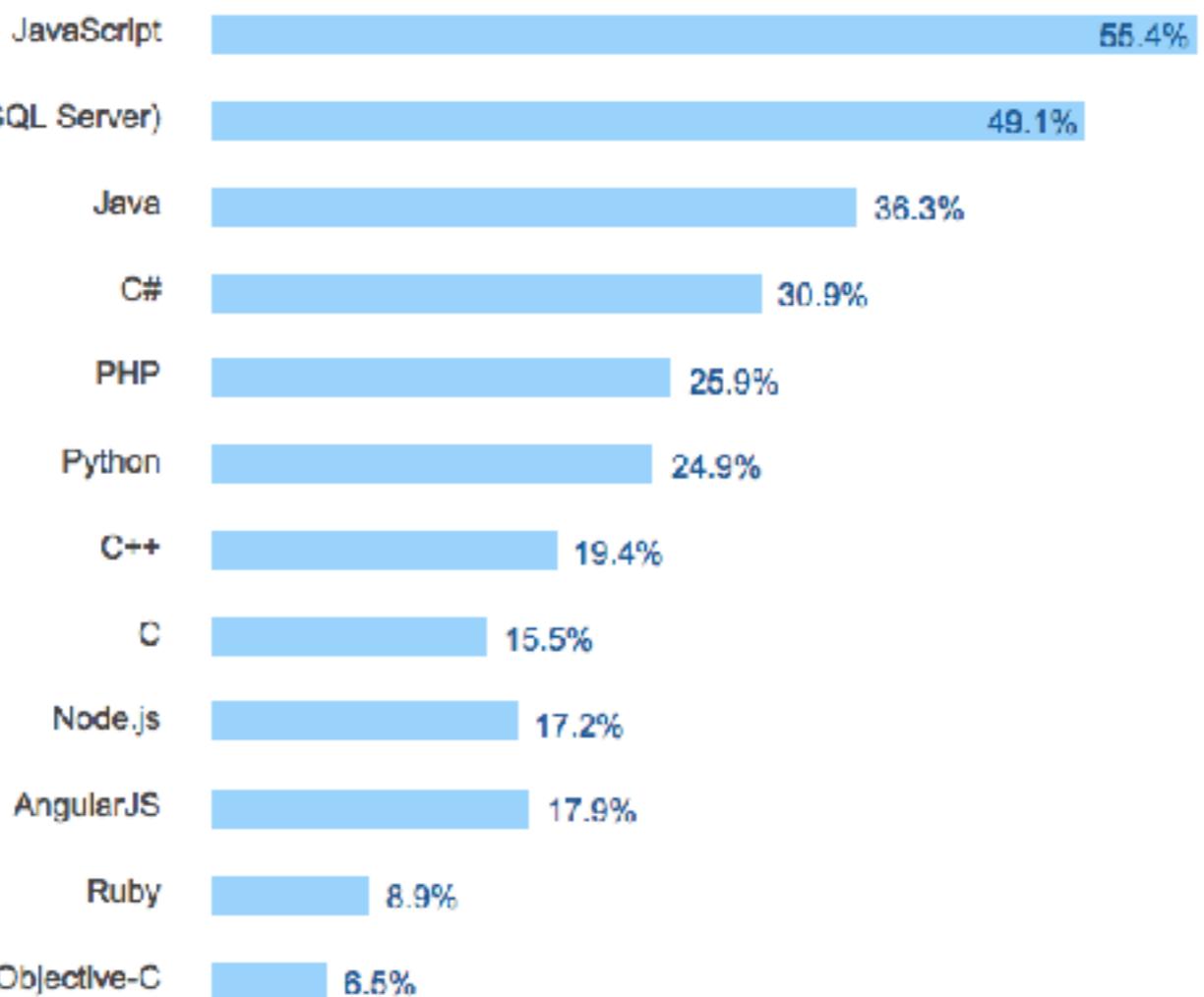
I. Most Popular Technologies

2016

2015

2014

2013



Documentation and help

- MDN
- Stack Overflow

What are some other programming languages that you would like to hear about?

Questions?

WEB DEVELOPMENT

Programming for Non-Programmers

WHAT IS WEB DEVELOPMENT?

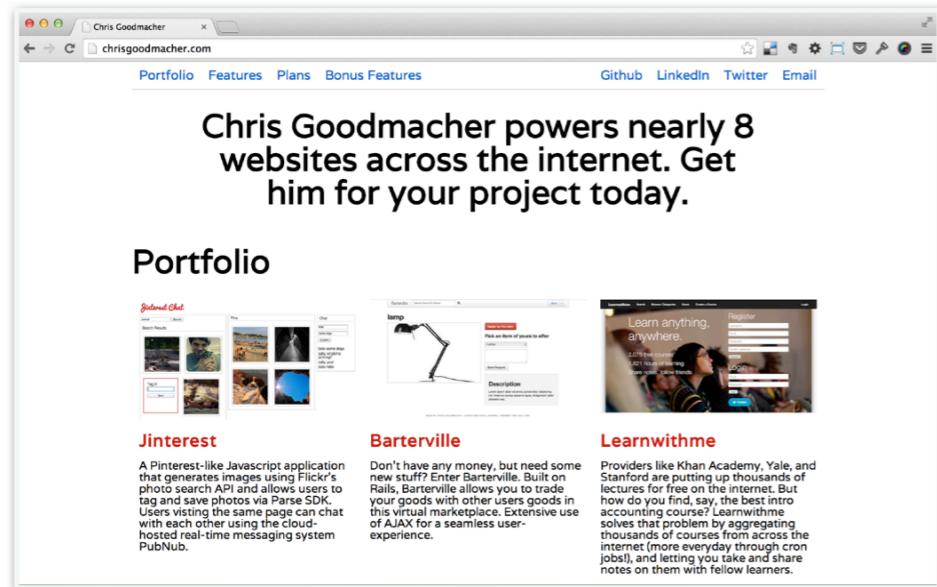
- The use of programming languages and concepts towards producing a system that listens to user requests over the internet and serves back HTML, CSS, and interaction code to the client.

WEB APPS VS WEB SITES

- Web sites are more static. Think of them as sort of like interactive brochures. They typically don't hold any state and are usually just information. They are amnesiac little things that could be gorgeous and interactive, but that's it.
- A web app is more like an iOS or Android app. It holds state, does not refresh itself and in general does something vs showing something.
- Almost invariably, a web app is connected to a persistent data storage.
- Generally, if you can log into it, its a web app.

WEB DEVELOPMENT BASICS

1. HARDCODED



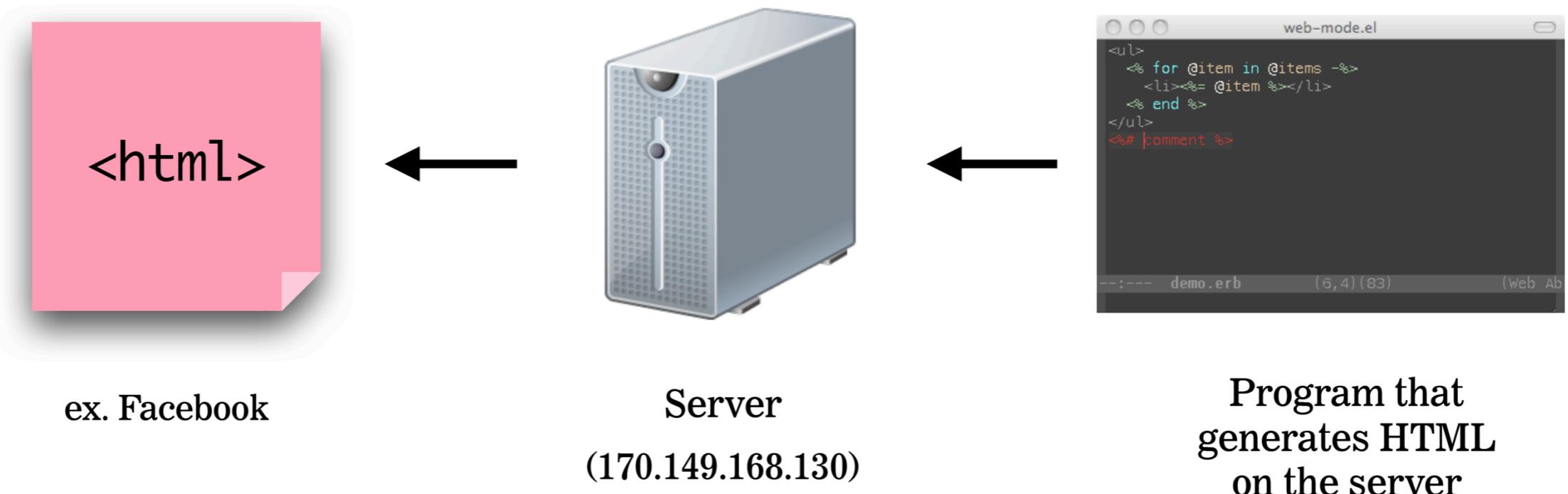
ex. portfolio page



Server
(170.149.168.130)

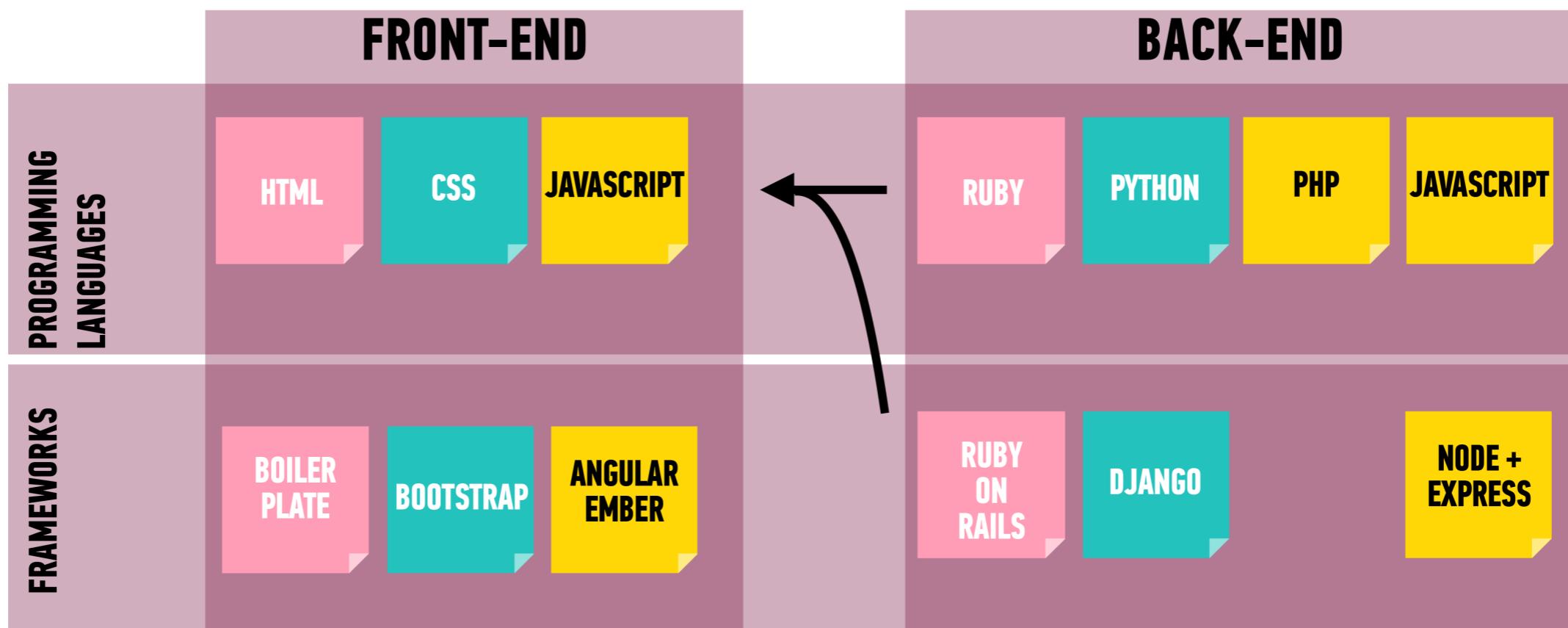
WEB DEVELOPMENT BASICS

2. DYNAMIC



WEB DEVELOPMENT BASICS

FRONT-END VS. BACK-END



WEB DEVELOPMENT BASICS

API: Application Programming Interface

- allow you to retrieve and/or submit information from a source
- some are private, i.e. for internal use within the company
- some are public, i.e. for use by outside individuals
- public APIs may require registration, payment, security measures, and rate limits

Examples:

- NYT: <http://developer.nytimes.com/docs>
- Instagram: <https://www.instagram.com/developer/>
- Twitter: <https://dev.twitter.com/overview/documentation>

PROCESS

We won't get too involved in this for time's sake

- Big companies typically, have a UX phase, a Design phase, a Development phase bundled with extensive QA. When I worked at 2U, a massive, publicly traded company, this is how it was.
- Currently, I am in a startup where design and development kind of happen simultaneously. There is a lot more room for iteration and testing out ideas by putting something up for users to use and deliver feedback.
- Agile vs waterfall

**GET READY FOR THE MOST
COMMON INTERVIEW
QUESTION EVER**

WHAT DO YOU RECKON
HAPPENS WHEN YOU VISIT A
WEBSITE IN YOUR BROWSER?

TALK TO YOUR CLOSEST NEIGHBOR

- Draw out what you think transpires across the internet when you do that? Go into as much detail as you can.
- Feel free to use your markers on your desk.
- Then we will talk over a few key terms and revisit this.
- Just so you know, this is the takeaway that I find most important from this class.

FIRST OF ALL

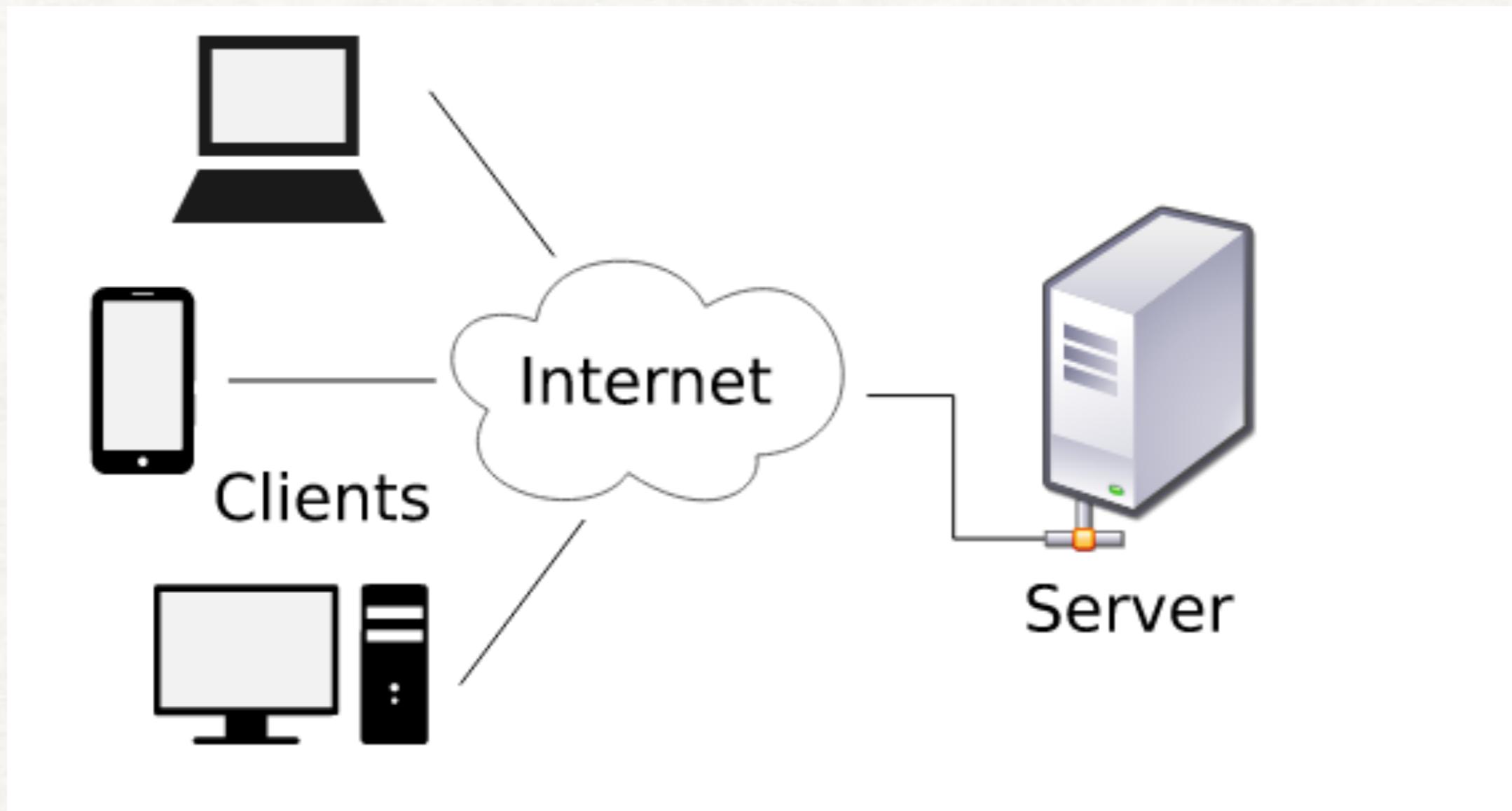
WHAT IS THE INTERNET

- First of all, it aint the web.
- The internet (lower case in AP style, finally) refers to the global telecommunications infrastructure that enables computers to send messages to one another. It's been around since the 1960s.
- Can be partially destroyed by squirrels.



THE WEB

- The World Wide Web is a system of *servers* and *clients* that send requests and receive responses in the form of “hypertext”
- Hypertext is a type of document that can be interconnected with others, such as a link in text that opens up another document, or a photo embedded in that text.



WHAT'S A SERVER?

- A server is just someone else's computer. Usually one without a screen that is just responsible for listening to HTTP requests.
- You can run a server on your own laptop too.
- You might have heard of 'THE CLOUD' which is basically another word for server infrastructure in some massive data center using ridiculous amount of electricity. It weighs a ton more than a cloud.
- Servers also have to have IP addresses that don't change periodically, as your home internet router does.

CLIENTS?

- A client is usually a browser or a mobile application.
- In modern web development, your client is often another application. For example, logging in with Facebook on a web app.

HTTP REQUESTS

What happens when you press enter in the url bar

- Chrome has no idea what `http://www.google.com` actually means, so first, it looks up the IP Address for Google.
- DNS, or Domain Name System, is a phone book containing IP Addresses for all the websites that exist on the internet.
- A few weeks ago, assholes attacked large DNS servers, and disrupted a ton of business.
- Chrome then sends an HTTP Request to the IP address associated with Google. An HTTP Request is essentially a text message asking Google for data.

SERVER SIDE

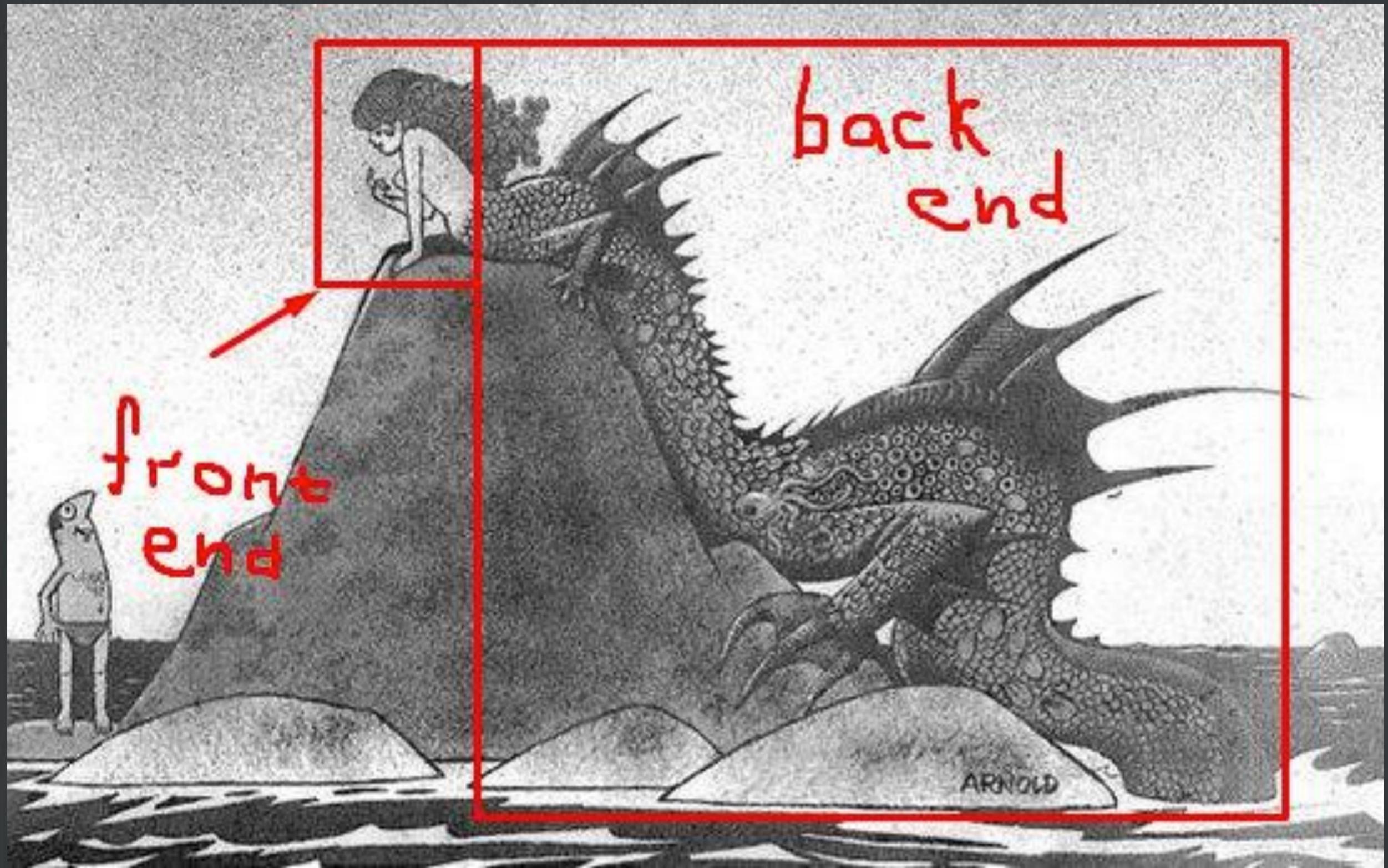
- Google's server will issue a server Response back to your browser. This response is parsed by Chrome (ie: should Chrome display this response data? download it? etc)
- The response always comes with a Status Code. Does 404 sound familiar?
- A bunch of code gets executed on Google's server. For example, if you searched for "bars near me" Google will look at the IP info embedded in the request, figure out where you are (roughly) and respond with bars that are near you rather than just any random bar. If you are signed in, (we'll explain what that entails soon) you will see other personalized stuff.
- Depending on what the server decides to send you, it sends code your browser understands. HTML, CSS, and JavaScript.

HTTP Methods and Their Meaning

Method	Meaning
GET	Read data
POST	Insert data
PUT or PATCH	Update data, or insert if a new id
DELETE	Delete data

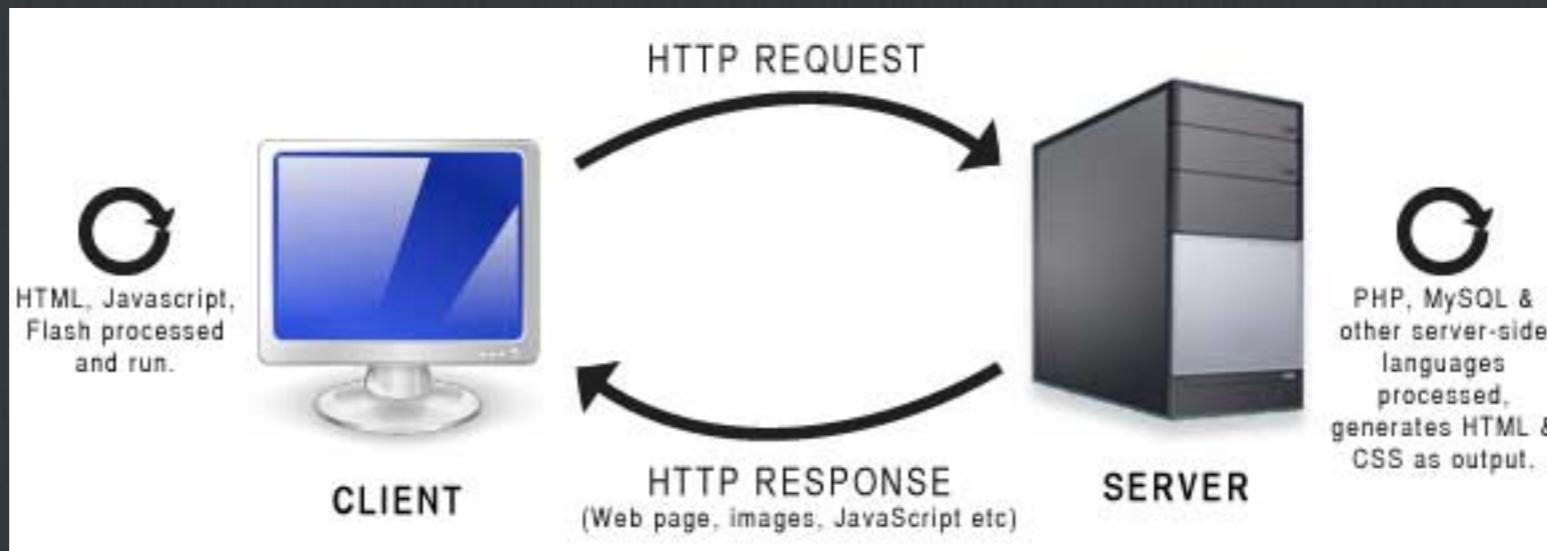
IT'S ALL TEXT

- First and foremost, the main communication mechanism for the internet — you know, that thing that rules our lives — is text. Literally just letters and words and numbers and characters.
- The other main point to take away here is this: the text that is transferred is written in a highly specific manner. It follows a very strict set of rules that can be parsed and understood by the server and the browser. In other words, this text follows a specific set of grammatical rules.
- This is also why you need a code editor like Atom, Sublime Text, Visual Studio Code, etc. I normally use Sublime Text 3 or Vim personally.
- Programmers like to get into some holy war about which editor is the best. I refuse to enter that fray. They all work. Shut up.



FRONT END VS BACK END

- Front end: Client side interactions and structure. This includes stuff like iOS apps and whatever you load in browser.
- Back end: Server side, data storage and retrieval. Needs a client of some sort (not necessarily a browser) to work. Deals with storing and retrieving information.
- Usually there are different programming languages used on the front and back, but nowadays, you can do it all in JavaScript
- Just the front end can be creepily smart
- `clickclickclick.click`
- <http://webkay.robinlinus.com/>
- Cookies



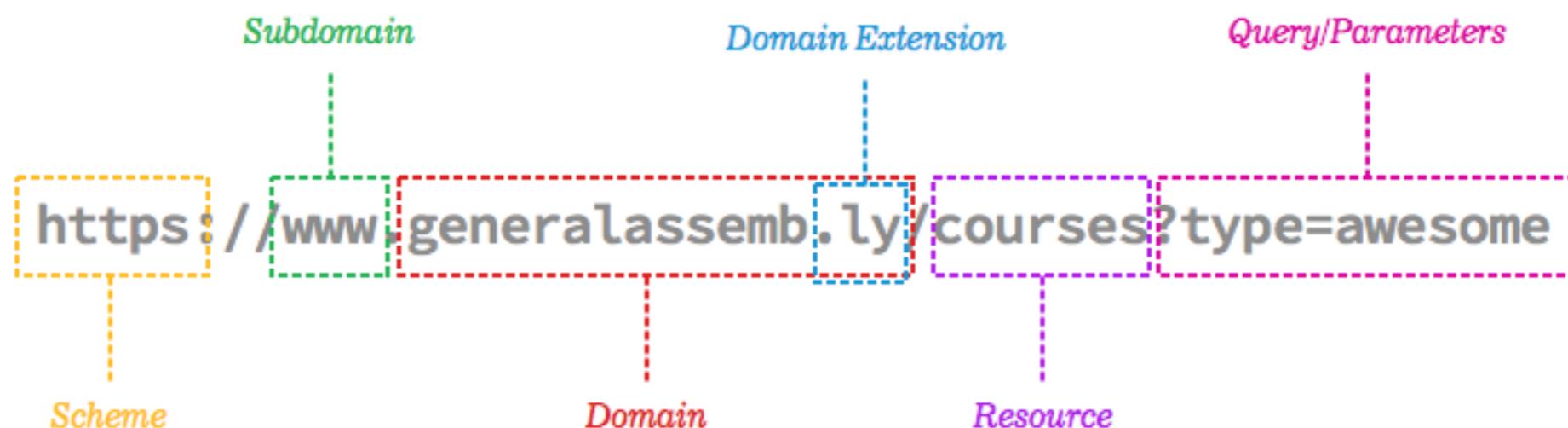
Front end

Back end

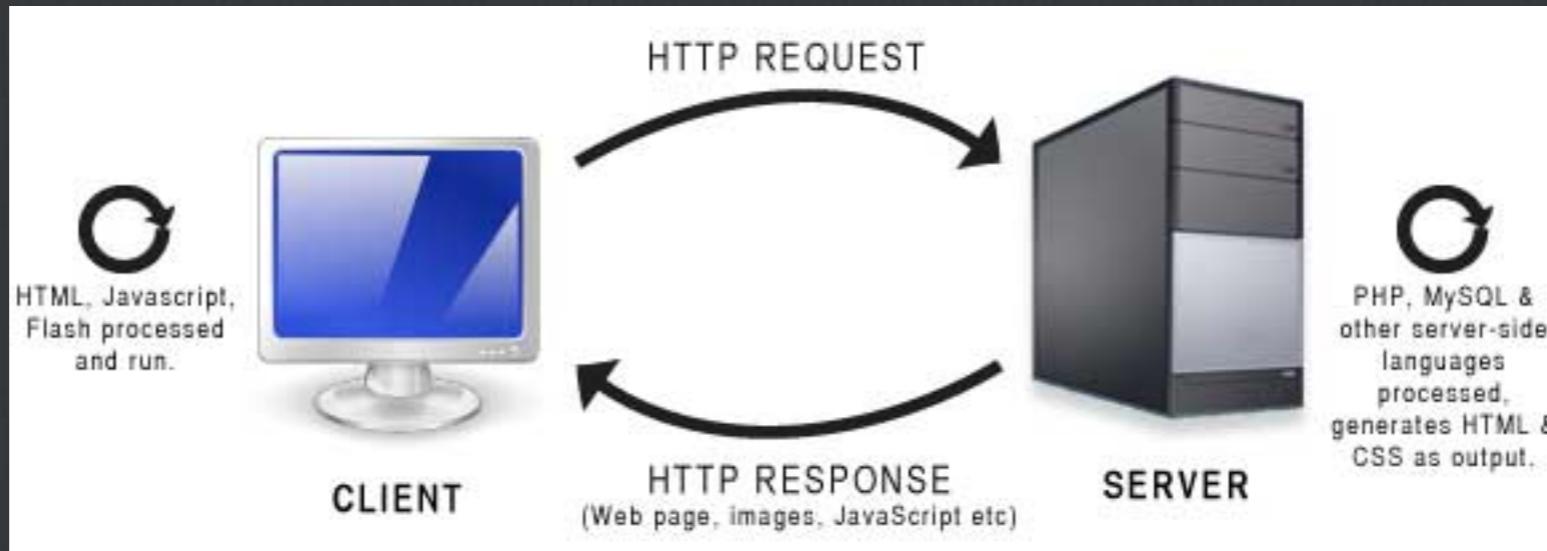
TO REITERATE

- Client sends a request.
- Server executes some server side code (maybe in Ruby, Node.js, PHP) and decides what to send back.
- The client (usually a browser) gets back a bunch of code, but this is code that the browser can understand. The browser uses this code to paint the web page for you.
- The client side (front end) code is not business critical stuff. Google isn't going to put its search algorithm into JS and send it to anyone. That happens on the black box that is the server.

- The back end of a web application is the part that happens on the server.
- Users interact with the front end, and the back end code decides what to do with it.
- Almost invariably, this involves interacting with a database for persistent storage.
- The *client* is whatever consumes the data sent from the back end. This might be a browser or a mobile app.
- We will be focused on just getting the data to a browser, and we don't care about how it looks, really.



URL Structure Diagram



Front end

This is our
focus for the
class

Back end

We will only
learn the bare
minimum of
this

HTML

- HTML is the *structure* of a web page.
- Stands for Hyper Text Markup Language
- HTML 5 is the latest standard, which supports nice semantic naming of your HTML elements.
- It's code, but not a programming language.



CSS

DONEC QUIS NUNC

- On it's own, HTML is quite ugly.
- Like worse than Craigslist ugly.
- To give HTML some game, we use a very simple thing called CSS — Cascading Style Sheets.
- The Cascading part just means that later declarations will take precedence over the earlier ones.
- CSS Zen Garden

Ready to get coding?

Like finally?

WE WILL NEED SOME TOOLS FIRST

- Here is all you need to download to be 100% ready to code:
 - Google Chrome Browser (sorry Firefox, I still love you)
 - <https://www.google.com/chrome/browser/desktop/index.html>
 - Atom (free and open source code editor made by GitHub)
 - <https://atom.io>
 - We will install script and open-in-browser together.
 - Sign up for an account on github.com

Code along and along

Going further

- It's important to pace yourself and focus.
- Every programmer you meet will try and get you to follow his or her perfect holy amazing favorite thing.
- Stick to one thing, get good, then become a polyglot

Going further

- Codecademy**
- Free Code Camp**
- Stick with those two and you will be a maven before you know it**