

Tools

SWE 432, Fall 2016

Design and Implementation of Software for the Web

Today

- Before we can really make anything, there's a bunch of technical stuff to get out of the way
- Tools make our lives so much easier
- Actually, this is what a lot of software engineering research is - making better tools for making software!
- Today we'll cover version control, and some really basic hello world stuff in HTML* and Javascript*

***See next 2 lectures for a lot more detail**

Version Control

We've always had some kind of version control



Carbon copies?

Git

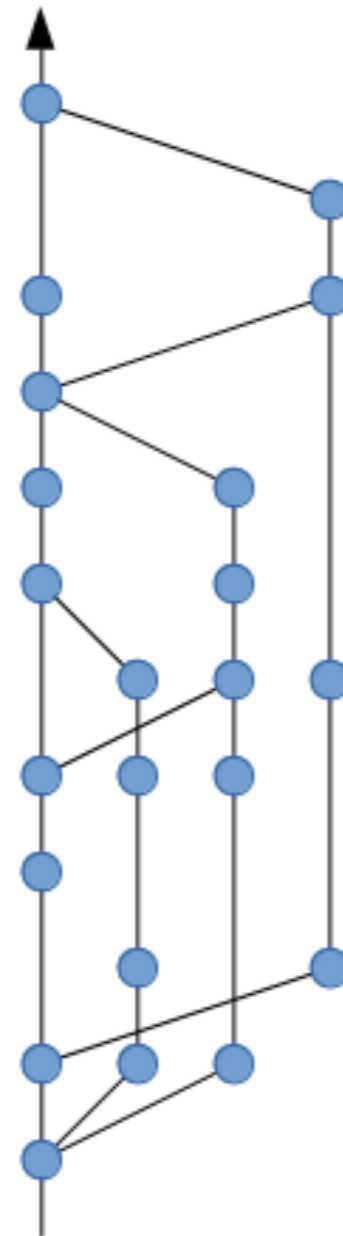
- One of the latest generation of **V**ersion **C**ontrol **S**ystems (VCS)
- Came out of the Linux development community
- Fast
- Supports non-linear development
- Fully distributed (no need for “central” server)
- Able to handle large projects effectively

Linear vs Nonlinear Development

Linear history

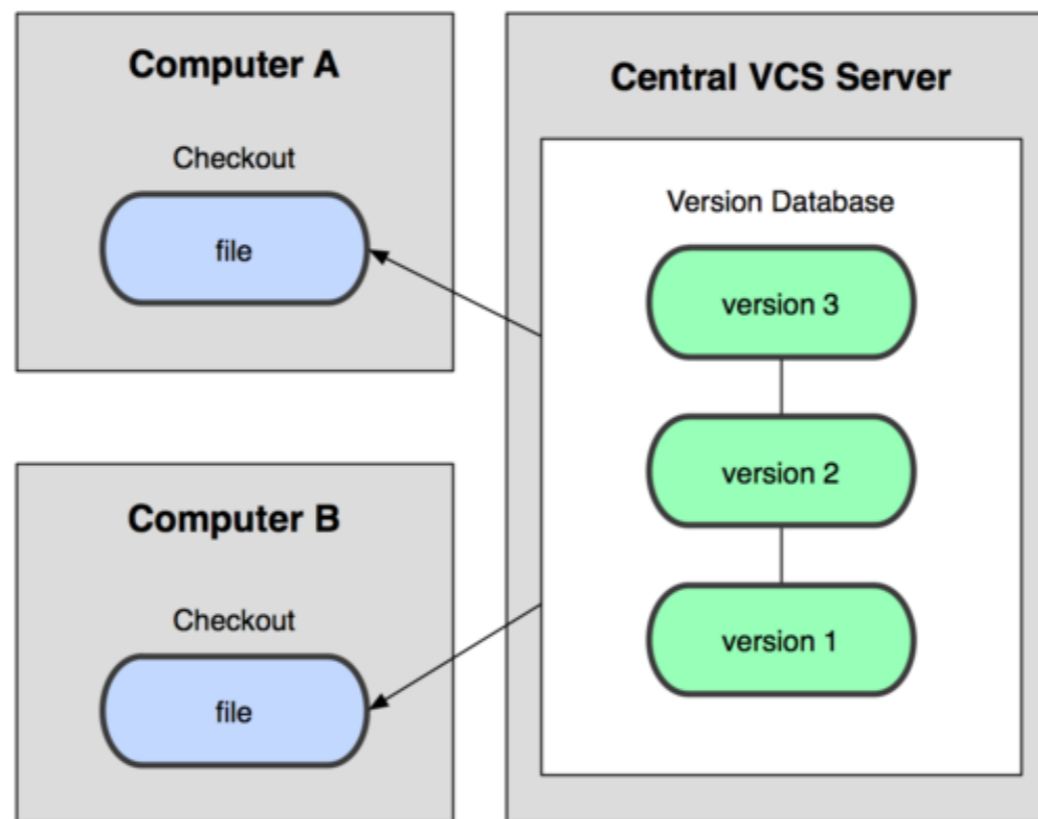


Non-linear history



Distribution Model

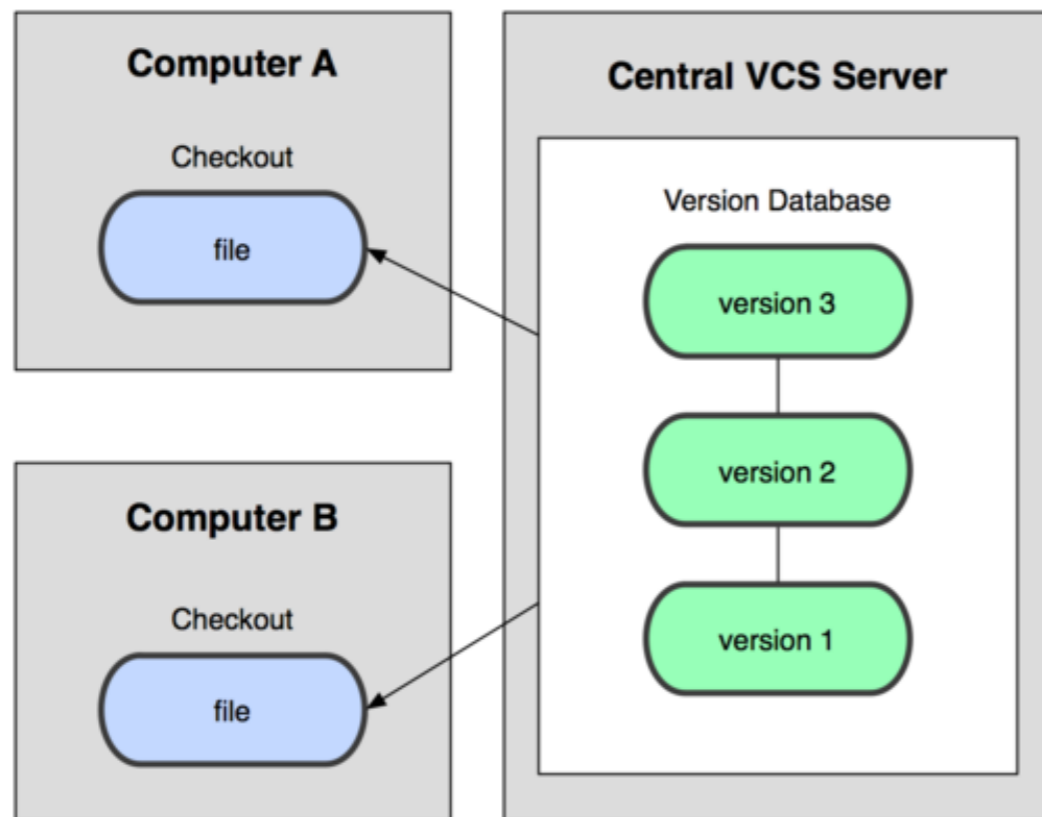
Centralized Model



Examples:
CVS, Subversion, Perforce

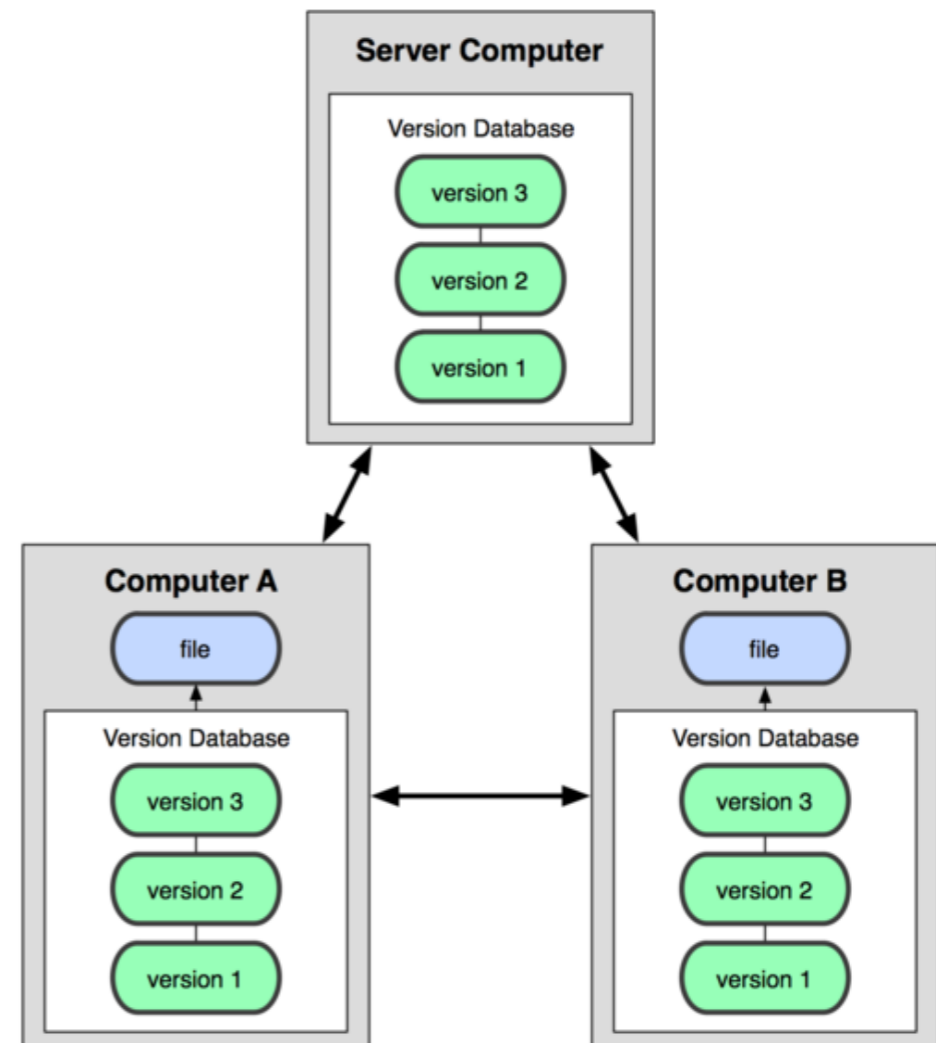
Distribution Model

Centralized Model



Examples:
CVS, Subversion, Perforce

Distributed Model



Examples:
Git, Mercurial

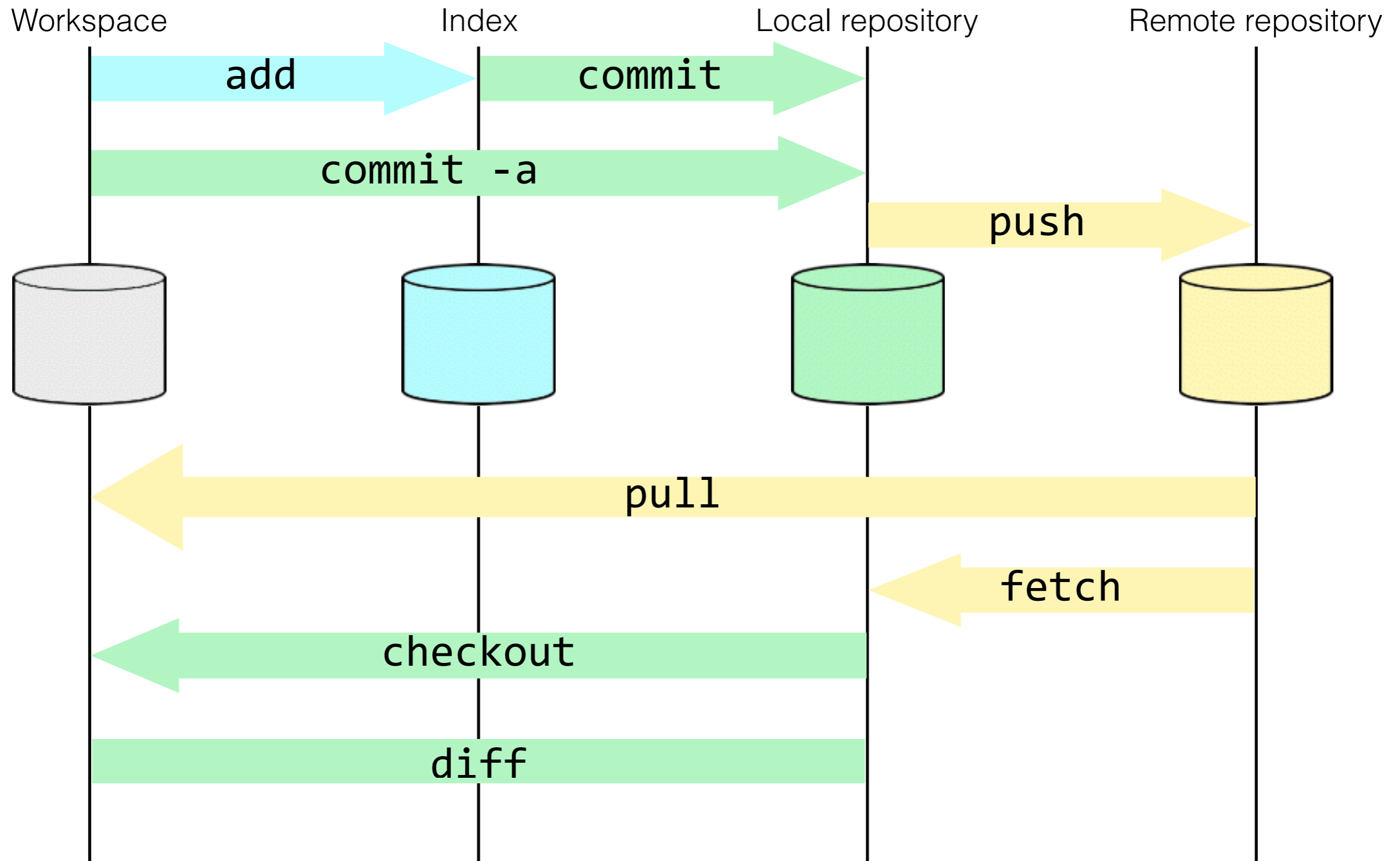
No central point of failure
No latency when doing most operations

GitHub



- You don't need a central server to use git
- But it sure makes it easier
- GitHub: Free open source hosting site
 - For students, free private repositories too!
- Set up a user account
- Create a repository
- Add collaborators

Git, High level



E.g. The files you see

Git's local record of changes

Git's local repository

E.g. GitHub

Typical Use Case



Person 1

Create Project & Repo
Push to Github
Edit/commit
Edit/commit
Edit/commit

Pull/push



Person 2

Clone from Github
Edit/commit/push
Edit/commit
Edit/commit



Github

Git Demo

<https://try.github.io/levels/1/challenges/1>

Download and install git:

<https://git-scm.com/downloads>

Also: Git Cheat Sheet

<https://services.github.com/kits/downloads/github-git-cheat-sheet.pdf>

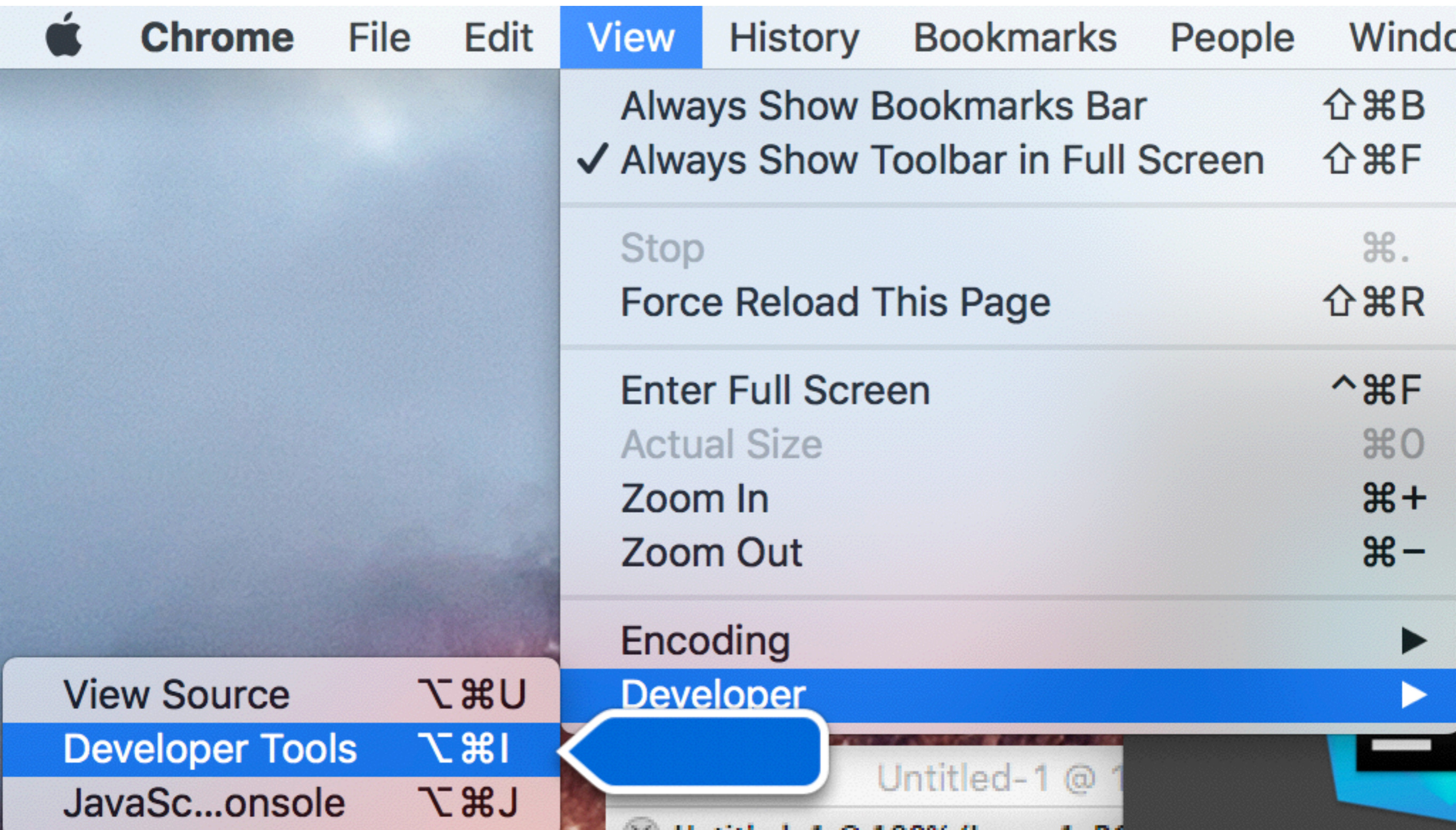


Chrome Developer Tools
+ HTML + JavaScript

Chrome Developer Tools

- A suite of tools built into Chrome (Safari and other browsers have similar tools) to help with debugging web apps
- Key features:
 - View the HTML elements that make up the current page
 - Access a JavaScript Console
 - View all supplemental files loaded by a page
 - View all outbound requests that a page made
 - Plus more (we'll skip for now)
- Let's all open Chrome together now!

Accessing Chrome Dev Tools



Inspecting HTML Elements

George Mason University Depa x

cs.gmu.edu

GEORGE MASON UNIVERSITY

Department of Computer Science

Volgenau School of Engineering

Search

The Department

Home

Contact/Visit Information

About the Faculty

Recruitment

Office Hours

Information for Faculty

Departmental Report

Distinguished Lecture Series

Research

Research Areas

Labs and Centers

Technical Reports

Books and Software

Seminars and Events

Academics

Undergraduate Programs

Masters Programs

Ph.D. Programs

Graduate Certificates

Admissions

Student Information

Student FAQs

Courses and Syllabi

Student Organizations

Welcome to the Department of Computer Science. The department offers a PhD program in Computer Science with various concentrations. The department also offers concentrations in the interdisciplinary [MS in Data Analytics Engineering](#) and the [PhD in Information Technology](#) offered by the Volgenau School of Engineering.

Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers concentrations in the interdisciplinary [MS in Data Analytics Engineering](#) and the [PhD in Information Technology](#) offered by the Volgenau School of Engineering.

Teleoperated knee surgery can be improved by building a graphical m from the patient's MRI scan. From P Jim Chen and the GMU Graphics Gro (link)

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, secu information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events

(Details) (Calendar)

News

(Details)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

Prof. Zoran Duric appoir as Deputy Editor of jour Pattern Recognition (mo Prof. Zoran Duric has b

Click the inspector to highlight actual HTML elements in browser

html body

Styles Event Listeners DOM Breakpoints Properties

Filter :hov .cls +

element.style {

body {

margin: 0px;

padding: 0px;

border: 0px;

font-family: 'Lucida Grande', Helvetica, Arial, Gen... Vera Sans', Sans-Serif;

font-size: 100%;

width: 100%;

line-height: 130%;

body {

display: block;

margin: 0px;

body {

display: block;

margin: 0px;

margin border padding 819 x 4069

border-bottom-col... rgb(...

border-bottom-sty... none

border-bottom-wid... 0px

border-image-outs... 0px

border-image-repe... stretch

George Mason University Department of Computer Science

Volgenau School of Engineering

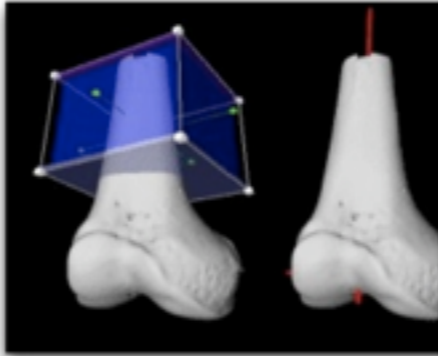
Search

The Department

- Home
- Contact/Visit Information
- About the Faculty
- Recruitment
- Office Hours
- Information for Faculty
- Departmental Report**
- Distinguished Lecture Series

Research

Welcome to the Department of Computer Science. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers concentrations in the Inter



Teleoperated knee surgery can be improved by building a graphical m from the patient's MRI scan. From Pi

```

<br>
<a href="/recruitment/2015" target="_parent">Recruitment</a>
<br>
<a href="/wiki/pmwiki.php/Main/FacultyOfficeHours" target="_parent">Office Hours</a>
<br>
<!--
<a href="/alumni/" target="_parent">Alumni&nbsp;Chapter</a><br>
-->
<a href="/facultywiki/pmwiki.php/Main/HomePage" target="_parent">Information&nbsp;for&nbsp;Faculty</a>
<br>
<a href="/news/report/" target="_parent">Departmental Report</a>
  
```

After highlighting an element in the browser, the “elements” section filters to highlight the code that generates that element

Masters Programs
Ph.D. Programs
Graduate Certificates
Admissions

Student Information

- Student FAQs
- Courses and Syllabi
- Student Organizations

visualization, databases, software engineering, data mining, security information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events [\(Details\)](#) [\(Calendar\)](#) **News** [\(Details\)](#)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

Prof. Zoran Duric appoir as Deputy Editor of jour Pattern Recognition ([mo](#))

Prof. Zoran Duric has b

```

body {
  margin: 0px;
  padding: 0px;
  border: 0px;
  font-family: 'Lucida Grande', Helvetica, Arial, Gen...
  font-size: 100%;
  width: 100%;
  line-height: 130%;
}
  
```

Filter: :hov .cls +

element.style {

body {

margin: 0px;

padding: 0px;

border: 0px;

font-family: 'Lucida Grande', Helvetica, Arial, Gen...

font-size: 100%;

width: 100%;

line-height: 130%;

body {

display: block;

margin: 0px;

Filter: Show all

border-bottom-col... rgb(...)

border-bottom-sty... none

border-bottom-wid... 0px

border-image-outs... 0px

border-image-repe... stretch

Console

top

Preserve log

George Mason University Depa x

mouse pointer icon transparen x


cursor » Legacy Icon Tags » Ic x

086245-rounded-glossy-black x

← → ↻

cs.gmu.edu

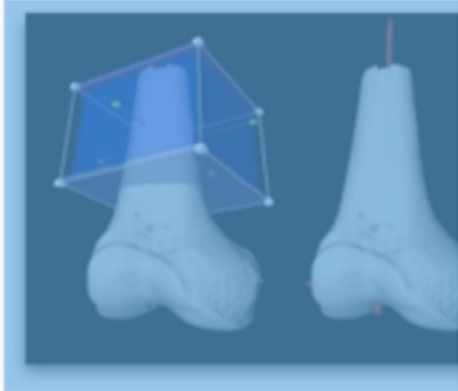
☆ ⋮



Department of Computer Science

Volgenau School of Engineering

img.picture | 272 x 200



Teleoperated knee surgery can be

Search

The Department

Home

Contact/Visit Information

About the Faculty

Recruitment

Office Hours

Information for Faculty

Departmental Report

Distinguished Lecture Series

Research

Research Areas

Labs and Centers

Technical Reports

Books and Software

Seminars and Events

Academics

Undergraduate Programs

Masters Programs

Ph.D. Programs

Graduate Certificates

Admissions

Student Information

Student FAQs

Courses and Syllabi

Student Organizations

Welcome to the Department of Computer Science. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The depart

concer

discipl

[Engine](#)

[Inform](#)

Engine

Faculty

architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, secu

information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events

[\(Details\)](#)

[\(Calendar\)](#)

News

[\(Details\)](#)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

Prof. Zoran Duric appoir as Deputy Editor of jour Pattern Recognition ([mo](#))

Prof. Zoran Duric has b

Elements

Console

Sources

Network

⋮

×

▼<tbody>

▼<tr class="main">

▶<td valign="top" class="nav">_</td>

▼<td valign="top" class="main">

▶<map name="bannermap">_</map>

<!-- Random Picture and Caption -->

▼<div class="text">

▼<table width="250" class="picture" cellpadding="0" cellspacing="0" border="0" align="right">

▼<tbody>

▼<tr>

▼<td class="picture">

▶<script type="text/javascript" language="Javascript">_</script>

▼

html body

Styles Event Listeners DOM Breakpoints Properties

width: 100%;

line-height: 130%;

}

body {

user agent stylesheet

display: block;

margin: 8px;

}

Filter

☐ Show all

▶border-bottom-col... ■rgb(...

▶border-bottom-sty... none

▶border-bottom-wid... 0px

▶border-image-outs... 0px

▶border-image-repe... stretch

⋮

Console

×

🔇

🔍 top

▼

☐ Preserve log

>

George Mason University Depa x

mouse pointer icon transparen x


cursor » Legacy Icon Tags » Ic x

086245-rounded-glossy-black x

← → ↻

cs.gmu.edu

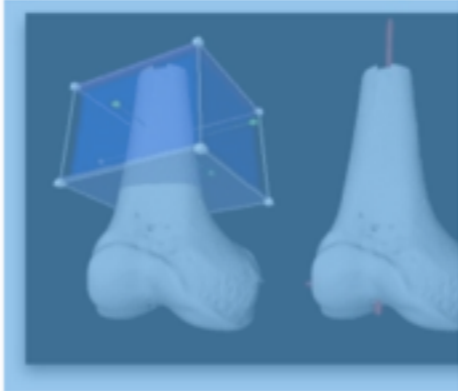
☆ ⋮



Department of Computer Science

Volgenau School of Engineering

img.picture | 272 × 200



Teleoperated knee surgery can be improved by building a graphical m from the patient's MRI scan. From Pi lim Chan and the GMU Graphics Gr

Search

The Department

Home

Contact/Visit Information

About the Faculty

Recruitment

Office Hours

Information for Faculty

Departmental Report

Distinguished Lecture Series

Research

Research Areas

Labs and Centers

Technical Reports

Books and Software

Seminars and Events

Academics

Undergraduate Programs

Masters Programs

Ph.D. Programs

Graduate Certificates

Admissions

Student Information

Student FAQs

Courses and Syllabi

Student Organizations

Welcome to the Department of Computer Science. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers concentrations in the inter-discipl

[Engine](#)
[Inform](#)
[Engine](#)

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, secu information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events

[\(Details\)](#)

[\(Calendar\)](#)

News

[\(Details\)](#)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

Prof. Zoran Duric appoir as Deputy Editor of jour Pattern Recognition ([mo](#))
Prof. Zoran Duric has b

Elements

Console

Sources

Network

⋮

⌵

<tbody>

<tr class="main">

><td valign="top" class="nav">_</td>

><td valign="top" class="main">

><map name="bannermap">_</map>

<!-- Random Picture and Caption -->

><div class="text">

>><table width="250" class="picture" cellpadding="0"

>>>cellspacing="0" border="0" align="right">

>>><tbody>

>>><tr>

>>>><td class="picture">

>>>>><script type="text/javascript" language="

>>>>>>Javascript">_</script>

>>>>>><a class="picture" border="0" href="http://

>>>>>>>graphics.gmu.edu/knee/index.html">

>>>>>>><img class="picture" alt="Splash Image" src=

>>>>>>>>"/covers/cover3.jpg">

html

body

Styles

Event Listeners

DOM Breakpoints

Properties

Filter

:hov

◆

.cls

+

element.style {

margin

-

Grande', Helvetica, Arial, Gen.

Vera Sans', Sans-Serif;

font-size: 100%;

width: 100%;

line-height: 130%;

body {

user agent stylesheet

display: block;

margin: 8px;

Filter

Show all

border-bottom-col...

border-bottom-sty...

border-bottom-wid...

border-image-outs...

border-image-repe...

rgb(...

none

0px

0px

stretch

Console

⌵

top

▼

Preserve log

You can even change the HTML or CSS!

h1 | 230 x 33

The Department

Home
Contact/Visit Information
About the Faculty
Recruitment
Office Hours
Information for Faculty
Departmental Report
Distinguished Lecture Series

Research

- Research Areas
- Labs and Centers
- Technical Reports
- Books and Software
- Seminars and Events

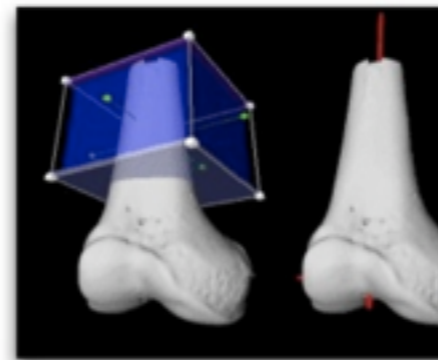
Academics

Undergraduate Programs
Masters Programs
Ph.D. Programs
Graduate Certificates
Admissions

Student Information

[Student FAQs](#)
[Courses and Syllabi](#)
[Student Organizations](#)

Welcome to the **Department of Computer Science**. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers concentrations in the inter-



Teleoperated knee surgery can be improved by building a graphical n

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, security information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events ([Details](#)) ([Calendar](#))

Oral Defense of Doctoral Dissertation: Energy Management in Performance-Sensitive Wireless Sensor Networks

News (*Details*)

Prof. Zoran Duric appoin
as Deputy Editor of jour
Pattern Recognition ([mo](#)
Prof. Zoran Duric has b

You can even change the HTML or CSS!

Elements Console Sources Network

```

    <body>
      <div class="spacer"></div>
      <div class="navbody">
        <table border="0" cellpadding="0" cellspacing="0" class="search">_</table>
        ...
        <h1>The&nbsp;Department</h1> == $0
        <div class="list">_</div>
        <h1>Research</h1>
        <div class="list">_</div>
        <h1>Academics</h1>
        <div class="list">_</div>
        <h1>Student&nbsp;Information</h1>
        <div class="list">_</div>
      </div>
      <!-- Navigation Skipper, see top of this page -->
      <a name="#skip"></a>
    <script type="text/javascript">_</script>
  
```

html body table tbody tr td iframe.nav html body div.navbody h1

Styles Event Listeners DOM Breakpoints Properties

Filter :hov .cls +

element.style {

margin -

Using the JavaScript Console

George Mason University Depa x mouse pointer icon transpar x cursor » Legacy Icon Tags » ic x 086245-rounded-glossy-blac x

cs.gmu.edu

George MASON UNIVERSITY

Department of Computer Science

Volgenau School of Engineering

Search

The Department

Home

Contact/Visit Information

About the Faculty

Recruitment

Office Hours

Information for Faculty

Departmental Report

Distinguished Lecture Series

Research

Research Areas

Labs and Centers

Technical Reports

Books and Software

Seminars and Events

Academics

Undergraduate Programs

Masters Programs

Ph.D. Programs

Graduate Certificates

Admissions

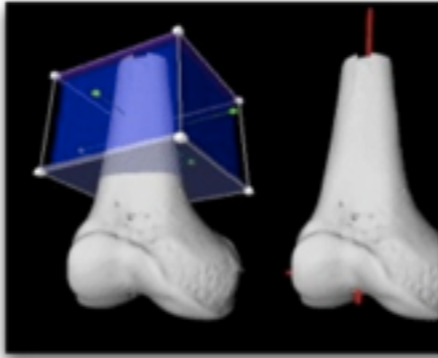
Student Information

Student FAQs

Courses and Syllabi

Student Organizations

Welcome to the **Department of Computer Science**. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers concentrations in the interdisciplinary [MS in Data Analytics Engineering](#) and the [PhD in Information Technology](#) offered by the Volgenau School of Engineering.



Teleoperated knee surgery can be improved by building a graphical model from the patient's MRI scan. From Prof. Jim Chen and the GMU Graphics Group ([link](#))

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, security information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events

[\(Details\)](#)

[\(Calendar\)](#)

News

[\(Details\)](#)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

Prof. Zoran Duric appointed as Deputy Editor of Journal of Pattern Recognition ([more](#))
Prof. Zoran Duric has been

Elements

Console

Sources

Network

»

top

Preserve log

> |

Console

George Mason University Depa x mouse pointer icon transpar x cursor » Legacy Icon Tags » ic x 086245-rounded-glossy-blac x

cs.gmu.edu

GEORGE MASON UNIVERSITY

Department of Computer Science

Volgenau School of Engineering

Search

The Best Department

Home

Contact/Visit Information

About the Faculty

Recruitment

Office Hours

Information for Faculty

Departmental Report

Distinguished Lecture Series

Research

Research Areas

Labs and Centers

Technical Reports

Books and Software

Seminars and Events

Academics

Undergraduate Programs

Masters Programs

Ph.D. Programs

Graduate Certificates

Admissions

Student Information

Student FAQs

Courses and Syllabi

Student Organizations

Welcome to the **Department of Computer Science**. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers concentrations in the inter-disciplinary [MS in Data Analytics Engineering](#) and the [PhD in Information Technology](#) offered by the Volgenau School of Engineering.



Teleoperated knee surgery can be improved by building a graphical model from the patient's MRI scan. From Pi Jim Chen and the GMU Graphics Group ([link](#))

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, security information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events

(Details) (Calendar)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

News

(Details)

Prof. Zoran Duric appoir as Deputy Editor of jour Pattern Recognition ([mo](#))

Prof. Zoran Duric has b

Elements Console Sources Network >>


nav.html ▾ Preserve log

> console.log("Hello World");|

Console

George Mason University Depa x mouse pointer icon transparen x cursor » Legacy Icon Tags » ic x 086245-rounded-glossy-blac x

cs.gmu.edu



Department of Computer Science

Volgenau School of Engineering

Search

The Best Department

- Home
- Contact/Visit Information
- About the Faculty
- Recruitment
- Office Hours
- Information for Faculty
- Departmental Report
- Distinguished Lecture Series

Research

- Research Areas
- Labs and Centers
- Technical Reports
- Books and Software
- Seminars and Events

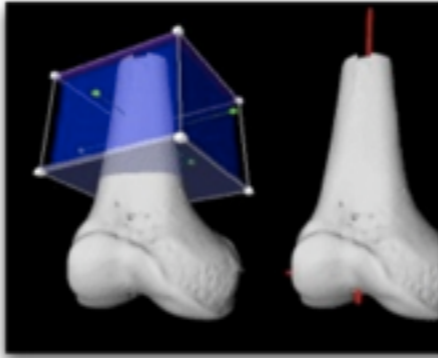
Academics

- Undergraduate Programs
- Masters Programs
- Ph.D. Programs
- Graduate Certificates
- Admissions

Student Information

- Student FAQs
- Courses and Syllabi
- Student Organizations

Welcome to the **Department of Computer Science**. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers concentrations in the inter-disciplinary [MS in Data Analytics Engineering](#) and the [PhD in Information Technology](#) offered by the Volgenau School of Engineering.



Teleoperated knee surgery can be improved by building a graphical model from the patient's MRI scan. From Prof. Jim Chen and the GMU Graphics Group ([link](#))

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, security information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events [\(Details\)](#) [\(Calendar\)](#)

News [\(Details\)](#)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

Prof. Zoran Duric appointed as Deputy Editor of Journal of Pattern Recognition ([more](#))
Prof. Zoran Duric has been

Elements Console Sources Network >>

nav.html ☐ Preserve log

```
> console.log("Hello World");
Hello World VM2668:1
< undefined
>
```

Console

Sources Panel

George Mason University Depa x

mouse pointer icon transpar x

cursor » Legacy Icon Tags » Ic x

086245-rounded-glossy-blac x

cs.gmu.edu

GEORGE MASON UNIVERSITY

Department of Computer Science

Volgenau School of Engineering

Search

The Best Department

Home

Contact/Visit Information

About the Faculty

Recruitment

Office Hours

Information for Faculty

Departmental Report

Distinguished Lecture Series

Research

Research Areas

Labs and Centers

Technical Reports

Books and Software

Seminars and Events

Academics

Undergraduate Programs

Masters Programs

Ph.D. Programs

Graduate Certificates

Admissions

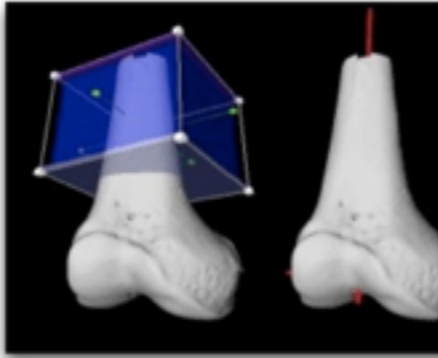
Student Information

Student FAQs

Courses and Syllabi

Student Organizations

Welcome to the Department of Computer Science. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The depart



Teleoperated knee surgery can be

concer

discipl

[Engine](#)

[Inform](#)

Engine

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, secu information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events

[\(Details\)](#) [\(Calendar\)](#)

Oral Defense of Doctoral Dissertation: [Energy Management in Performance-Sensitive Wireless Sensor Networks](#)

News

[\(Details\)](#)

Prof. Zoran Duric appoir as Deputy Editor of jour Pattern Recognition ([mo](#))

Prof. Zoran Duric has b

Elements

Console

Sources

Network >>

Sources

Content sc...

Snippets

site.css x

1 /***** GENERAL *****/

2

3 BODY {

4 margin: 0px;

5 padding: 0px;

6 border: 0px;

7 font-family: 'Lucida Grande

8 font-size: 100%;

9 width: 100%;

10 line-height: 130%;

11 }

12

13 /* We say this instead of just

14 A:link, A:visited, A:active {

15 text-decoration: none;

16 border-bottom: 1px dotted

17 /* IE can't do dotted! A

18 use the standard stuff. >

19 _text-decoration: underlin

20 _border-bottom: none;

21 }

22

23

top

cs.gmu.edu

covers

events

images

(index)

site.css

nav.html

Breakpoints

No Breakpoints

DOM Breakpoints

XHR Breakpoints +

Event Listener Breakpoints

Event Listeners

Console

nav.html

Preserve log

> console.log("Hello World");

Hello World VM2660:1

< undefined

> console.log(\$0);

<h1>The Best Department</h1> VM2689:1

< undefined

>

View and edit CSS and JavaScript files (we'll talk about that later!)

Network Panel

Department of Computer Science
Volgenau School of Engineering

Volgenau School of Engineering

Search

The Best Department

[Home](#)
[Contact/Visit Information](#)
[About the Faculty](#)
[Recruitment](#)
[Office Hours](#)
[Information for Faculty](#)
[Departmental Report](#)
[Distinguished Lecture Series](#)

Research

Research Areas
Labs and Centers
Technical Reports
Books and Software
Seminars and Events

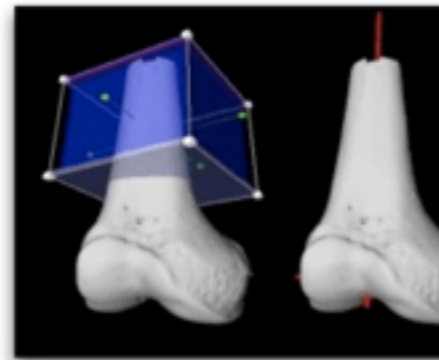
Academics

Undergraduate Programs
Masters Programs
Ph.D. Programs
Graduate Certificates
Admissions

Student Information

Student FAQs
Courses and Syllabi
Student Organizations

Welcome to the **Department of Computer Science**. The department offers BS, MS, and PhD programs in Computer Science; MS programs in Software Engineering, Information Systems, and Information Security and Assurance; and a BS program in Applied Computer Science with various concentrations. The department also offers



Teleoperated knee surgery can be improved by building a graphical model from the patient's MRI scan. From Po-

concer
discipl
[Engine](#)
[Inform](#)
Engine

Faculty in the department have research interests in networking, architecture, parallel and distributed computing, performance evaluation, software engineering, multimedia, graphics and visualization, databases, software engineering, data mining, security information systems, artificial intelligence, computer vision, and robotics.

The Department is part of the [Volgenau School of Engineering](#) at [George Mason University](#).

Events

[\(Details\)](#) [\(Calendar\)](#)

Oral Defense of Doctoral Dissertation: Energy Management in Performance-Sensitive Wireless Sensor Networks

News


(Details)

Prof. Zoran Duric appointed as Deputy Editor of Journal of Pattern Recognition ([more](#))

The screenshot shows the Chrome DevTools Network tab. The top panel displays a waterfall chart of network requests over a 1000ms timeline. The bottom panel is a table of these requests.

Name	St..	Ty...	Initiator	Size	TL..	Timeline - Start Time
nav.css	200	st..	nav.ht...	2...	5...	
spacer.png	200	png	nav.ht...	3...	4...	
ga.js	307		nav.ht...	0 B	0...	
ga.js	200	sc..	http://...	15...	6...	
_utm.gif?ut...	307		Other	0 B	14...	
_utm.gif?ut...	200	gif	http://...	18...	13...	
favicon.ico	200	vn..	Other	2...	3...	

View all resources loaded in a timeline



7 / 13 requests | 19.2 KB / 158 KB transferred | Finish: 397 ms | [DOMContentLoaded...](#)

Console

nav.html ▾ ☐ Preserve log

Let's spend 5 minutes
playing with Chrome
Developer Tools



IDEs

Integrated Development Environments (IDEs)

- **Integrates** everything you need to **develop** into a single **environment**
- E.g. text editor (with complex highlighting, auto complete, etc), version control access, debugger, etc.
- You don't have to use one. It sure makes things handy though!
- We recommend you use WebStorm for this class. You can get a free student license: **<https://www.jetbrains.com/student/>**

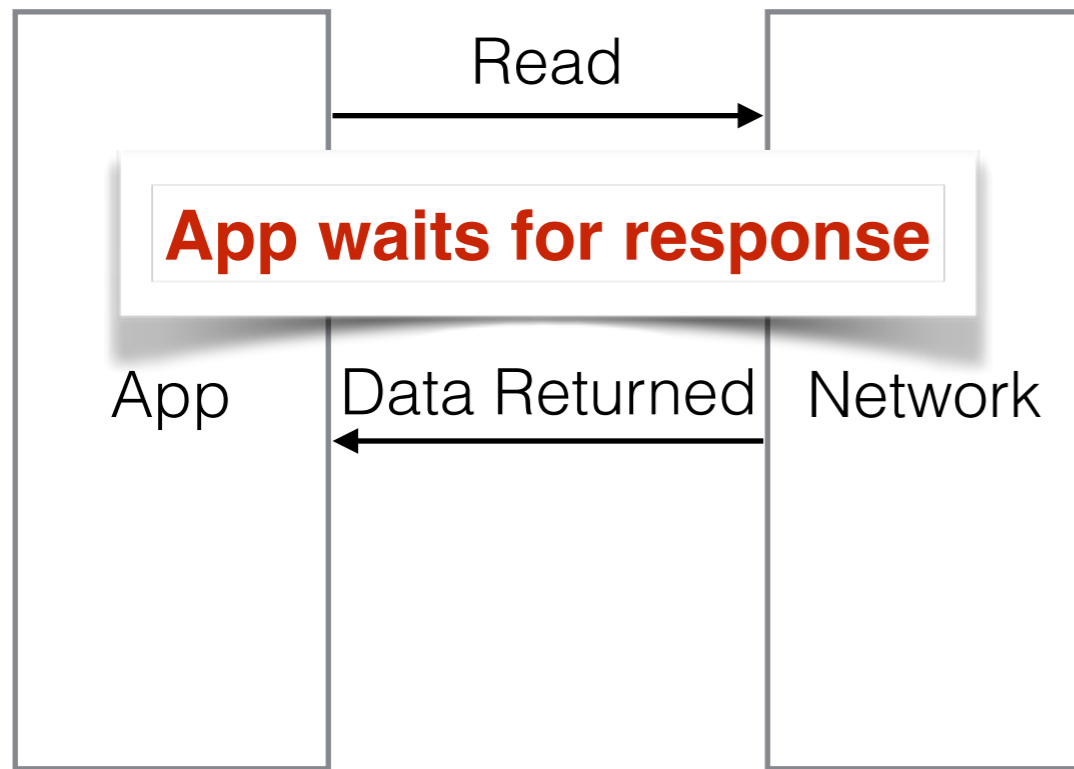
Node.js

Node.js

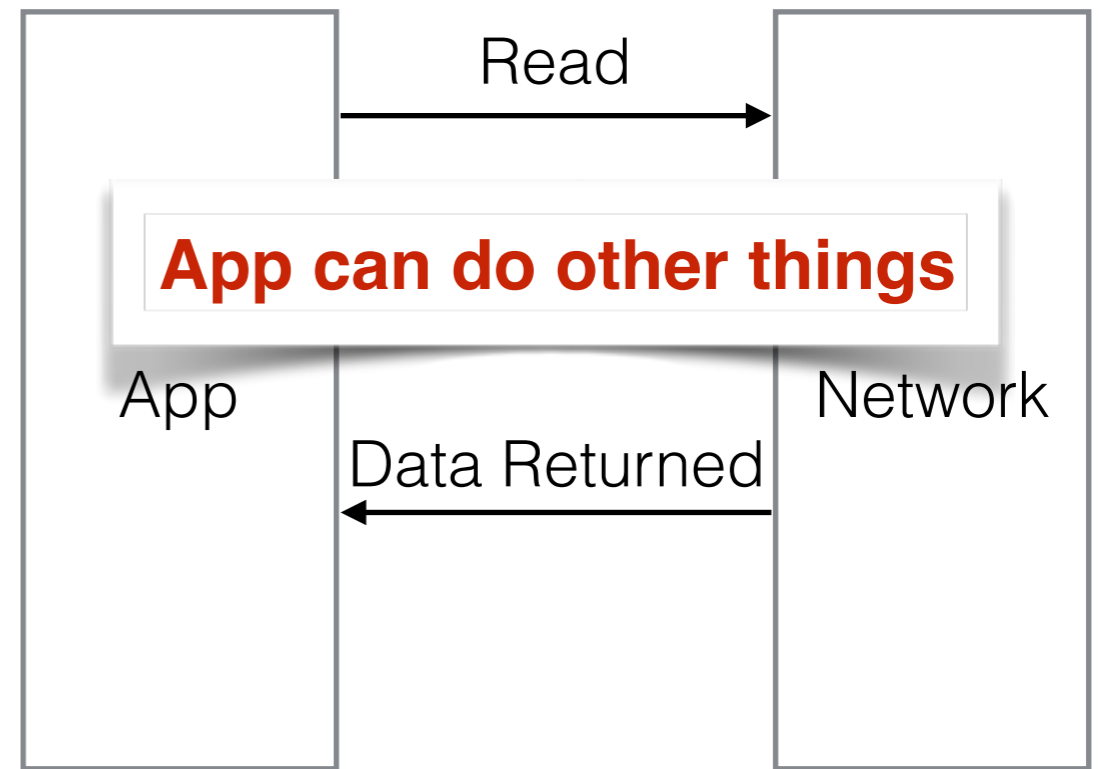
- Node.js is not a web server
- Node.js is a *runtime* for JavaScript based on Chrome's JavaScript runtime
- Uses an **event-driven, non-blocking I/O model**
- Your code runs single threaded
- Has a large ecosystem of packages (**npm**)

Non-Blocking I/O

Regular (blocking) I/O

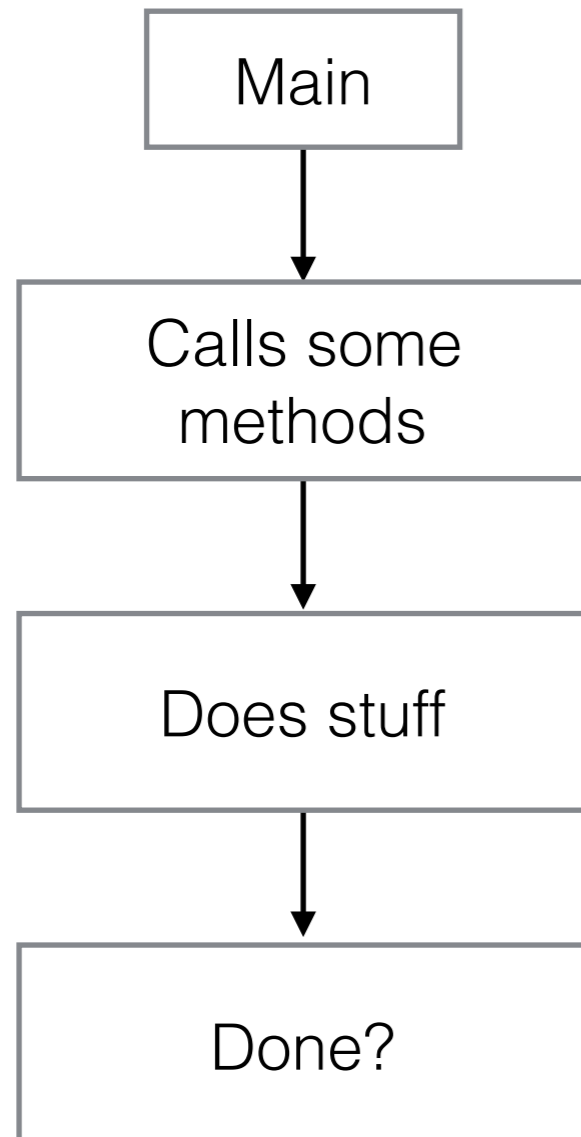


Non-Blocking I/O

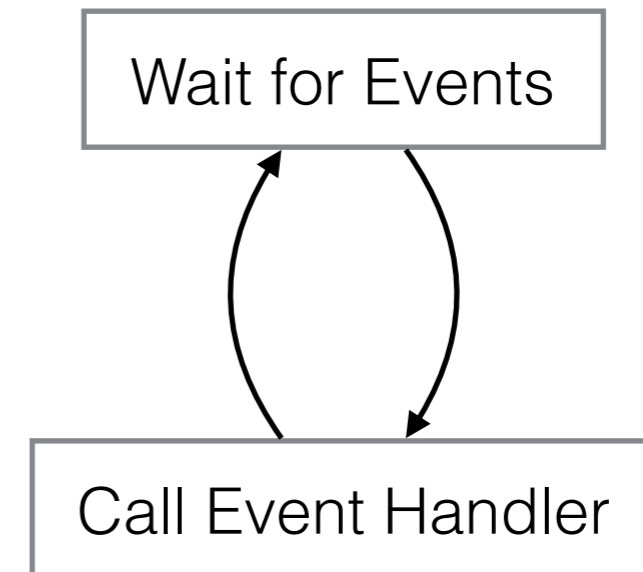


Event-Driven Programming

Procedural



Event-Driven



Event-driven programming relies on non-blocking I/O

Non-blocking I/O is easy with events... data being returned is just an event!

Packages

- Easily re-use libraries written by others
- npm manages libraries that your app uses: it downloads them, keeps them up to date, and ensures that they are in the right spot
- Example packages:
 - express (web server)
 - gulp (build system)

Node.js Getting Started

- Download and install it: <https://nodejs.org/en/>
- We recommend v4.5.0 LTS (LTS -> Long Term Support, designed to be super stable)
- Demo: Hello world server
- Demo will show:
 - Using package manager to get a package (express)
 - Running a simple node application

Demo: Hello World Server

1: Make a directory, myapp

2: Enter that directory, type **npm init** (accept all defaults),

3: Type **npm install express --save**

4: Create text file app.js:

```
var express = require('express');
var app = express();
var port = process.env.port || 3000;
app.get('/', function (req, res) {
  res.send('Hello World!');
});
```

```
app.listen(port, function () {
  console.log('Example app listening on port' + port);
});
```

5: Type **node app.js**

6: Point your browser to <http://localhost:3000>

**Creates a configuration file
for your project**

**Tells NPM that you want to use
express, and to save that in your
project config**

**Let's not worry about JavaScript
syntax until next Thursday!**

Runs your app

Building & Grunt

Build Systems & JavaScript

- You've probably used a build system before
 - Make, ant, maven, gradle, etc.
- Apps written in JavaScript get a build system too!
 - Need to package together modules that we use, possibly also compile the JavaScript into some intermediate language before running it
- Why use a build system?
 - Builds should be repeatable
 - Builds should be reproducible
 - Builds should be standard

What else does a build system do for JS?

- Transcompile
- Transform modules
- Minification
- Preprocess stylesheets
- Cache Busting
- Image Optimization
- Run Tests

Grunt: A JS Build System

- One of many build systems for JS
- Configuration is written in JS
- Grunt is installed as an npm module (see <http://gruntjs.com/getting-started>)

Example Grunt Configuration

```
module.exports = function(grunt) {  
  
  // Project configuration.  
  grunt.initConfig({  
    pkg: grunt.file.readJSON('package.json'),  
    uglify: {  
      options: {  
        banner: '/*! <%= pkg.name %> <%= grunt.template.today("yyyy-mm-dd") %> */\n',  
      },  
      build: {  
        src: 'src/<%= pkg.name %>.js',  
        dest: 'build/<%= pkg.name %>.min.js'  
      }  
    }  
  });  
  
  // Load the plugin that provides the "uglify" task.  
  grunt.loadNpmTasks('grunt-contrib-uglify');  
  
  // Default task(s).  
  grunt.registerTask('default', ['uglify']);  
  
};
```

Deploying & Heroku

Deployment

- Our little hello world example was cool, but how do we share with our friends?
- We need somewhere to run our node scripts
- Option 1: Use a machine that you have access to
- Option 2: Use a deployment service

Heroku

Hosts personal projects for free
Uses git as an interface

Create Project & Repo

Push to Github

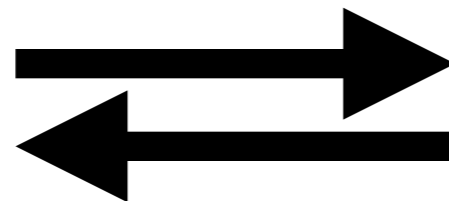
Edit/commit

Edit/commit

Edit/commit

Pull/push

Push



Magic deployment!

Github

Heroku

Heroku Example!

Let's adapt our example to run on Heroku

(See <https://devcenter.heroku.com/articles/getting-started-with-nodejs> for reference)

Heroku Example

1: Create account, install Heroku on your machine

2: In our app directory, create file “Procfile” with following contents:

```
web: node app.js
```

**Tells Heroku what to do
when it gets your app**

3: Make the app a git repository: `git init; git add app.js Procfile package.json; git commit -m “Initial Commit”`

Because Heroku uses git

4: Type `heroku create` and follow instructions

Deploys your code

5: `git push heroku master`

6: Visit your app at the site listed in the result of the push (e.g. <https://salty-depths-97600.herokuapp.com>)

Reminder: HW0 due
Tuesday!

Exit-Ticket Activity

Go to socrative.com and select “Student Login”

Class: SWE4320001 (Prof LaToza) or SWE4320002 (Prof Bell)

ID is your [@gmu.edu](mailto:yourname@gmu.edu) email

For question 3:

Write one project idea that you have