01/08: Capstone Overview

The Capstone Experience

Dr. Wayne Dyksen
Department of Computer Science and Engineering
Michigan State University
Spring 2019
The Capstone Experience

CSE 498, Collaborative Design

- “The Capstone Experience”
- Instructors
  - Dr. Wayne Dyksen (“Dr. D.”)
  - James Mariani
  - Ryan Johnson
- Class Meetings
  MW, 3:00-4:20pm, 1279 Anthony
- Syllabus
- Web Site
  - capstone.cse.msu.edu
  - Check it often.
- Email
  - Check your email often.
  - Read my email thoroughly and carefully!
Professional Meeting Expectations

• Seated, Ready to Go by 3:00 p.m.

• No...
  ▪ Electronic Devices
  ▪ Hats or Hoods
  ▪ Coats
  ▪ Eating
  ▪ Sleeping
  ▪ “Breaks”
Capstone Overview

Course Logistics

• Client Projects

• Course Logistics (Continued Next Meeting)
Course Goals

• Give You Experience In
  ▪ Real World
  ▪ Corporate Setting

• Start Your Transition
  ▪ From Student...
  ▪ ...To Professional
Course Goals

• Teams of Students
• Build Significant Software System
  ▪ Design
  ▪ Develop
  ▪ Debug
  ▪ Document
  ▪ Deliver
• For Corporate Clients
• In 15 (Short) Weeks
Course Goals

• Build a Significant Software System
• Work in a Team Environment
• Learn New Tools and Environments
• Build and Administer Systems
• Develop Your Communication Skills
• Develop Interview Talking Points
• Learn to Do Stuff on Your Own
• Etc...
Project Deliverables

• Project Plan Document & Presentation
• Alpha Presentation
• Beta Presentation
• Project Software
• Project Video
• Design Day

See Major Milestones.
All-Hands Meetings

Presentations By
- Dr. D.
- TAs
- Teams
  - Status Reports
  - Formal Presentations
    - Project Plan
    - Alpha
    - Beta
  - Project Videos
- Guest Speaker(s)
All-Hands Meetings Agendas

- 01/08: Capstone Overview
- 01/10: Project Plan
- 01/15: Risks and Prototypes
- 01/17: Team Status Report Presentations
- 01/22: Schedule and Teamwork
- 01/24: Team Status Report Presentations
- 01/29: Team Project Plan Presentations
- 01/31: Team Project Plan Presentations
- 02/05: Team Project Plan Presentations
- 02/07: Team Project Plan Presentations
- 02/12: Resume Writing and Interviewing
- 02/14: Creating and Giving Presentations
- 02/19: Team Alpha Presentations
- 02/21: Team Alpha Presentations
- 02/26: Team Alpha Presentations
- 02/28: Team Alpha Presentations
- 03/05: (Spring Break, No Meeting)
- 03/07: (Spring Break, No Meeting)
- 03/12: Team Status Report Presentations
- 03/14: Intellectual Property
- 03/19: Design Day and the Project Videos
- 03/21: Camtasia Demo
- 03/26: Ethics and Professionalism
- 03/28: Team Status Report Presentations
- 04/02: Team Beta Presentations
- 04/04: Team Beta Presentations
- 04/09: Team Beta Presentations
- 04/11: Team Beta Presentations
- 04/16: Team Status Report Presentations
- 04/18: Team Status Report Presentations
- 04/23: Project Videos
- 04/25: Project Videos and All Deliverables
- 04/25: Design Day Setup
- 04/26: Design Day
- 05/02: Project Videos
Schedules

• **Schedules > All-Hands Meeting**
• **Schedules > Major Milestones**
  - 01/17: Status Report Presentations
  - 01/29: Project Plan Presentations
  - 02/19: Alpha Presentations
  - 04/02: Beta Presentations
  - 04/23: Project Videos
  - 04/24: All Deliverables
  - 04/25: Design Day Setup
  - 04/26: Design Day
  - 05/02: Project Videos

  • Attendance is required.
  • No excuses are accepted.
  • Do not schedule anything during these times including interviews, travel home, etc.
  • Will coordinate with your interviews.
Urban Science Capstone Labs

- **3322EB, 3340EB, 3352EB, 3358EB**
- **Door Lock**
  - Electronic Keypad
  - Code = ############
  - Do Not Give Out to Other Students
- **Systems**
  - Up to Four per Team
    - Two 27” iMacs
    - One Dell Rack-Mounted Server (Optional)
    - One Mac Book Pro (Optional)
  - Team 100% Responsible
    - Building
    - Maintaining
    - Securing
    - Backing Up
- **Books**
- **WiFi**
  - SSID: CSE498, CSE498 5MHz
  - Key: ???????
- **Conference Room (3322EB)**
  - Team Meetings
  - Client Conference Calls
  - Google Conference Calendar
- **Appliances**
  - Water Cooler/Heater
    - Nota Bene: The water cooler is not connected to a drain. Do not pour things into it, like rinsing out your water container.
  - Whirlpool Refrigerator
    - Cold Water From Bottled Water
    - Ice From Bottled Water
  - Microwave
  - Keurig Coffee Maker
- **Lockable Storage**
  - One Drawer Per Team
  - As Needed
  - Assigned by Dr. D. and TAs
  - Obtain Keys from CSE Office
Scheduled Lab Times

• No Formal Lab Sessions
• “Credit” for Scheduled Weekly Meetings
  ▪ Team Meetings
  ▪ Client Conference Calls
  ▪ Triage Meetings with TAs
• Meeting Times TBA With
  ▪ Team
  ▪ Client
  ▪ TAs
• Students must be available to meet in person.
  ▪ Team Meetings
  ▪ Triage Meetings
  ▪ Client Conference Calls
CSE498 Prerequisites

Must Have Successfully Completed

• Tier I Writing Requirement
• CSE335
• CSE410
• Another 400-Level CSE Course Other Than CSE491
Capstone Overview

✓ Course Logistics

➢ Client Projects

• Course Logistics (Continued)
Team / Project Generalities

• Clients
  ▪ Vary in Size and Type
  ▪ Client contacts/mentors are “volunteers.”

• Team Contact Person
  ▪ Picked By Team
  ▪ Main Point of Contact for Client
Team / Project Generalities

• Project Types
  ▪ All Significant Software Development
  ▪ Vary in Specifics

• Project Level of Difficulty
  ▪ Hard Enough
  ▪ But Not too Hard

• Deliverable
  ▪ To the Client
  ▪ By the Due Date
Team / Project Generalities

• Challenges
  ▪ Very Short, Unforgiving Time Line
  ▪ Client Contact
  ▪ Team Dynamics
  ▪ Project Plan (in ~3 Weeks)
  ▪ Entirely New...
    o Languages
    o Environments
    o API’s
    o SDK’s
    o Processes
    o Protocols
    o Etc.
  ▪ Project Management
  ▪ Etc...
Project Specifics

• Vary
  ▪ Type
  ▪ Current State of Specificity

• Challenge
  ▪ Connect with Client
  ▪ “Nail Down” the Project
    o Hard Enough
    o Not too Hard
    o Avoid Feature Creep
  ▪ Course Feature, Not Bug
Intellectual Property and Non-Disclosure Agreements

• Intellectual Property Agreement
  ▪ You agree to assign ownership of intellectual property that may be created as a result of your project to your client.
    ○ Copyrightable Program Code
    ○ Patentable “Ideas”
  ▪ Most clients will require an IP agreement.

• Non-Disclosure Agreement
  ▪ You agree not to disclose client confidential information.
  ▪ Most clients will require an NDA.

• To date...
  ▪ Most code has not gone directly into production.
  ▪ No patents have resulted.

• Use agreements provided by MSU.
• Always Contact Dr. D. Before Signing Anything
Project Teams

- Amazon
- Aptiv
- Auto-Owners
- Consumers Energy
- Dow
- Driven-4
- Evolutio
- Ford
- Google
- Herman Miller
- Humana
- Meijer
- Michigan State University HPCC
- Michigan State University ITS
- Mozilla
- MSUFCU
- Principal
- Proofpoint
- Spectrum Health
- Surge Solutions
- Technology Services Group
- TechSmith
- Union Pacific
- United Airlines
- Urban Science
- Volkswagen
Team Amazon

Project Overview

Browser Sharing for Customer Support

• Functionalities
  ▪ Provide Customer Support
  ▪ Utilize Collaborative Browser Sharing

• Features
  ▪ Share Only Browser View
  ▪ No Download or Plugin Required
  ▪ Pass and Maintain Data Securely
  ▪ Offer Chatting and Annotating
  ▪ Provide Session Logging

• Technologies
  ▪ Amazon Web Services Elastic Cloud 2 (AWS EC2)
  ▪ Amazon Web Services Command Line Interface (AWS CLI)
  ▪ HTML / JavaScript / AJAX
  ▪ React / Angular / Vue
  ▪ REST Web Services / XML
  ▪ Database / SQL
Team Aptiv

Project Overview

Analysis of Autonomous Vehicle Testing Video

• Functionalities
  ▪ Analyze Autonomous Vehicle Testing
  ▪ Post-Process On-Road Video Logs

• Features
  ▪ Identify Various Environmental Features
    ○ Other Vehicles
    ○ Overpasses
    ○ Tunnels
    ○ Bridges
    ○ Overhanging Trees
  ▪ Scan and Tag All Video Logs
  ▪ Synchronize Metadata with Video
  ▪ Support Video Formats from US, Europe and Asia
  ▪ Leverage Machine Learning
  ▪ Integrate into Aptiv’s Servers

• Technologies
  ▪ Video and Image Processing
  ▪ Machine Learning (ML)
  ▪ Database Technologies
Team Auto-Owners

Project Overview

Secretary of State (SoS) Software Robot

• Functionalities
  ▪ Expedite Worker’s Compensation Insurance Claim Submission
  ▪ Reconcile Business Name Against Secretary of State
  ▪ Utilize Software Robots (Soft Bots)

• Features
  ▪ Build Web Application
    o Accept Input with Business Information
    o Search Relevant SoS Website Using RPA
    o Present Results for Validation by Underwriter
    o Record Statistics
  ▪ Leverage Robotic Process Automation (RPA)
  ▪ Handle All 50 Secretary of State Websites
  ▪ Design and Implement Matching Algorithm
    o Exact or Partial
    o Synonym or Alternate Spelling
  ▪ Provide Reporting Dashboard with Metrics

• Technologies
  ▪ Robotic Process Automation (RPA)
  ▪ UiPath Go!
  ▪ CSS / HTML / JavaScript / PHP
  ▪ Database Technologies
Team Consumers Energy

Project Overview

New Customer Service Channel

• Functionalities
  ▪ Improve Customer Call Experience
  ▪ Provide New Channel to Interact with Consumers Energy

• Features
  ▪ Enable Callers to Use Smart Phone Capabilities
    o Text Link to Responsive Web App
    o Interactive Version of Phone Tree or Chatbot
  ▪ Handle All Phone Tree Options with Smart Phone
    o Billing Inquiries
    o Making Payments
    o Setting Up Payment Plans
    o Etc.
  ▪ Maintain Phone Call Connection
  ▪ Support Transition to CE Live Agent

• Technologies
  ▪ CSS / HTML / JavaScript / PHP
  ▪ Chatbot Technologies
  ▪ Consumers Energy APIs
  ▪ Customer Journey Tracking
  ▪ SOAP Web Services

The Capstone Experience

Capstone Overview
Team Dow

Project Overview

VR Model Management Platform

• Functionalities
  ▪ Market Products using Virtual Reality
  ▪ Support Entirety of Dow Chemical

• Features
  ▪ Architect and Build Universal Dow Platform
    o Upload and View 3D Models Easily
    o Support Various Mobile Devices
    o Eliminate “One-and-Done” Solutions
  ▪ Target Dow Stakeholders
    o Sales and Marketing Professionals
    o Customers
  ▪ Build Cloud-Hosted Backend
    o Handle Role-Based Security
    o Manage 3D Models

• Technologies
  ▪ Apple iOS / Swift
  ▪ Google Android / Java
  ▪ Unity Pro / Collab
  ▪ ARKit / Vuforia
  ▪ App Center / TestFlight
  ▪ Microsoft Azure
Team DRIVEN-4

Project Overview

Product Development Portfolio and Planning

- Functionalities
  - Forecast and Track Execution of Annual Product Development Budget
  - Utilize Capacity-Planning Planning Technique
- Features
  - Enable
    - Portfolio Planning for 1, 3 or 5-Year Terms
    - Portfolio Execution with Role-Based Forecast
    - Product Planning for 10-Year Gantt View
  - Provide Web Interface and Visualization
    - Responsive
    - Target End-User
    - Include Administrative Features
  - Deliver Cross-Platform Mobile App
- Technologies
  - CSS / HTML / JavaScript / React
  - PTC Thingworx
  - Xamarin
  - RESTful Web Services

Capstone Overview

The Capstone Experience

DRIVEN-4

St. Joseph, Michigan
Team Evolutio

Project Overview

AppDynamics Platform Configuration Tool

• Functionalities
  ▪ Empower Evolutio Clients to Utilize Cisco AppDynamics
  ▪ Easily Configure, Deploy and Manage Environments

• Features
  ▪ Build a User-Friendly Web Application
    o Configure, Deploy and Manage Environments
    o Easily with “Push of a Button”
  ▪ Support Export and Import of Configurations
  ▪ Provide Environment Migration Utility
  ▪ Support Both New and Existing Environments
  ▪ Explore Use of Natural Language Processing

• Technologies
  ▪ Application Performance Management (APM) Software
  ▪ Cisco AppDynamics
  ▪ CSS / HTML / JavaScript / PHP
  ▪ Angular / React / Web Frameworks
  ▪ Java

The Capstone Experience
Team Ford

Project Overview

Greenfield Labs SHARED Locker System

• Functionalities
  ▪ Encourage Use of Shared High-Value Assets (Devices)
    ○ Showcase Existence
    ○ Track via Easy Check-Out / Check-In
  ▪ Target Ford’s Greenfield Labs (Palo Alto)

• Features
  ▪ Build
    ○ SHARED Mobile Apps
    ○ Web Administrator Portal
  ▪ Implement Various APIs
    ○ Reservations
    ○ Metrics
    ○ Push Notifications
  ▪ Create Event (Check-In/Check-Out) Stream
  ▪ Develop Raspberry PI Event Listener
    ○ Lock/Unlock Cabinet
    ○ Adjust RGB Lighting

• Technologies
  ▪ OAuth 2.0
  ▪ Amazon Cognito
  ▪ Apple iOS and Google Android
  ▪ CSS / HTML / JavaScript / PHP
  ▪ Snipe-IT
  ▪ Raspberry Pi
  ▪ Apache Kafka
  ▪ Amazon Web Services (AWS) Kinesis
  ▪ RGB Light Strip
  ▪ 12V Actuated Lock

Dearborn, Michigan
Team Google

Project Overview

Kubernetes Cluster Inspection Tool

• Functionalities
  ▪ Diagnose Architecture of Kubernetes Cluster
  ▪ Provide Robust Inspection Tool
  ▪ Include Both Current and Historical State

• Features
  ▪ Gather All Cluster Data into Single View
  ▪ Provide Various Insights
    o Health
    o Performance
    o Resource Changes
  ▪ Support Configurable Set of Filters
  ▪ Ingest with K8s Stackdriver Agent
  ▪ Trace Lifecycle of Nodes, Pods and Other Objects
  ▪ Visualize Results Using Default Kubernetes APIs
  ▪ Implement Easily on Any Kubernetes Distribution

• Technologies
  ▪ Kubernetes
  ▪ K8s API
  ▪ Fluentd
  ▪ Stackdriver
  ▪ Prometheus

Kirkland, Washington
Mountain View, California
Team Herman Miller

Project Overview

Office Navigation Using Augmented Reality

• Functionalities
  ▪ Navigate Large Complex Buildings
  ▪ Utilize Augmented Reality

• Features
  ▪ Develop Augmented Reality Mobile App
  ▪ Search for Various Spaces
    o Open Offices
    o Available Conference Rooms
    o Cafeterias
  ▪ Give Turn-by-Turn Instructions
  ▪ Leverage Machine and Deep Learning
  ▪ Build on Open Framework with Exposed APIs
  ▪ Be Trainable, Scalable and Flexible
  ▪ Provide Configuration Interface for Building Managers

• Technologies
  ▪ Apple iOS / Swift
  ▪ Apple ARKit
  ▪ Apple Location Services
  ▪ Machine Learning
  ▪ Deep Learning
Team Humana
Project Overview

Technology Peripheral Inventory Predictor

- Functionalities
  - Improve Availability of Computer Peripherals
  - Predict Demand Based on History
- Features
  - Build Responsive Web App
  - Target End User Technology Staff
  - Leverage Machine Learning
    - Develop Key Predictive Model Attributes
    - Include Ability to Tune Key Parameters
  - Incorporate Feedback Loop
  - Visualize Data Effectively
- Technologies
  - CSS / HTML / JavaScript
  - Machine Learning
    - TensorFlow / sciikit-learn / Spark MLLib
  - Data Visualization
    - D3 / Chart.js
Team Meijer

Project Overview

Location-Based Personalized Shopping

• Functionalities
  ▪ Make Customers Aware of On-Sale Items
  ▪ Provide Personalized mPerks Offers
  ▪ Based on Customer’s Affinity and Location In Store

• Features
  ▪ Provide In-Aisle Engagement Experience
  ▪ Leverage Mist Wireless Network for Location
  ▪ Model Customer Shopping Tendencies Using AI and ML
  ▪ Drive Sales of Additional Items
  ▪ Support Apple iOS and Google Android
  ▪ Implement Customer Customization

• Technologies
  ▪ Apple iOS and Google Android
  ▪ Xamarin
  ▪ MIIST WLAN / SDK
  ▪ Microsoft
    ▪ .NET Framework / C# / ASP.NET,
    ▪ Azure Mobile Services (Deployment and Notifications)
    ▪ Visual Studio Team Server
  ▪ Artificial Intelligence (AI)
  ▪ Machine Learning (ML)
  ▪ App Insights for Analytics
  ▪ SQL Server / DocumentDB
  ▪ Meijer Web Services

Grand Rapids, Michigan
Project Overview

Simplifying High Performance Computing

• Functionalities
  ▪ Make HPC Resources Simpler to Use
  ▪ Target Non-Programmer Researchers

• Features
  ▪ Build Responsive Web App
    o Create Job Scripts
    o Observe Job Progress
    o Observe Group Behavior
  ▪ Create Testing “Playground”
    o Test Job Scripts
    o Understand Resource Requirements
    o Tune Job Submissions
  ▪ Provide Dashboard for HPCC Administrators
  ▪ Mine Years of HPCC Data

• Technologies
  ▪ CSS / HTML / JavaScript / PHP
  ▪ JavaScript / AngularJS / JSON
  ▪ SLURM Workload Manager
  ▪ RESTful Web Services
  ▪ Machine Learning (ML)
  ▪ Data Mining
Team Michigan State University ITS

Project Overview

Group Project Organization and Scheduling

• Functionalities
  ▪ Facilitate Student Group Projects
  ▪ Automate Organizing and Scheduling
  ▪ Utilize Various Technologies

• Features
  ▪ Organize Groups Based on Calendars
  ▪ Find Available Meeting Times
  ▪ Support Various Messaging Platforms
  ▪ Provide Cloud Storage for Collaboration
  ▪ Build Infrastructure Using Amazon Web Services
  ▪ Deliver Production Ready System

• Technologies
  ▪ OAuth 2.0
  ▪ Calendars (O365, Google)
  ▪ Cloud Storage (OneDrive, Google, Dropbox)
  ▪ Messaging (Slack, Teams, Discord)
  ▪ Version Control (GitLab, GitHub)
  ▪ Amazon Web Services (AWS)
Optimizing Firefox Localization

• Functionalities
  ▪ Make Firefox Available in 98 Languages
  ▪ Optimize Localization
    o Streamline
    o Speed Up

• Features
  ▪ Convert Synchronous Code to Asynchronous Code
  ▪ Improve Tooling Around Fluent
  ▪ Investigate Use of Wasm and Rust
  ▪ Support Windows, macOS and Linux
  ▪ Deliver Production Code for Firefox

• Technologies
  ▪ Fluent
  ▪ DTD / .properties Files
  ▪ JavaScript / Wasm (Web Assembly)
  ▪ XUL / XBL / HTML
  ▪ Rust
  ▪ Mercurial
  ▪ IRCCloud (IRC)
  ▪ Bugzilla
  ▪ Phabricator
  ▪ Windows / macOS / Linux

Nota Bene:
• Team members are required to meet with the project sponsors for all day meetings on January 26 & 27.
• Team Members must agree to Open Source licensing.
AutoBudget Chatbot

- Functionalities
  - Provide Budgeting Assistance
  - Utilize Chatbot Technologies
- Features
  - Auto-Categorize Transactions
    - Predefined System Categories
    - User Defined Categories
  - Analyze Spending Patterns
  - Suggest Budget
  - Visualize Spending Habits
  - Provide Natural Language Interface
  - Support Various Devices
    - Smart Display (Amazon Spot, Amazon Show, Google Home Hub)
    - Mobile Devices (Apple iOS and Google Android)
- Technologies
  - CSS / HTML / JavaScript / PHP
  - Apple iOS / Swift
  - Google Android / Java
  - Amazon Alexa and Echo
  - Amazon Alexa Skills Kit
  - RESTful Web Services / JSON
  - MySQL
Team Principal

Project Overview

Integrated Analyst Ratings and Notes

- Functionalities
  - Create Robust Ratings and Notes Capabilities
  - Target Principal Analysts
  - Leverage Cloud Computing

- Features
  - Design and Develop Web App
    - Manage Ratings and Notes
    - Present Unified Software Platform and User Experience
    - Utilize Amazon Web Services
  - Handle Various Numerical Ratings
    - Companies
    - Industries
    - Products
    - Securities
    - Fund Managers
  - Create Prose Notes with Additional Media
    - Links to Web Pages
    - Attachments
    - Video
    - Audio
  - Customize User Experience Based on Analyst Context
    - Stock Analyst
    - Fund Manager Analyst
    - Etc.
  - Maintain Current and Historical Data

- Technologies
  - CSS / HTML / JavaScript / PHP
  - Amazon Web Services (AWS)
  - Microsoft Windows Authentication
  - PostgreSQL Database

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Prime
High grade
Upper medium grade
Lower medium grade
Non-investment grade speculative
Highly speculative
Substantial risks
Extremely speculative
Default imminent with little prospect for recovery
In default

Des Moines, Iowa
Team Proofpoint

Project Overview

Defeating Malware Payload Obfuscation

• Functionalities
  ▪ Identify Malware Payloads and Configuration Files
  ▪ Handle Large Scale at Reasonable Cost

• Features
  ▪ Utilize Existing Detonation Technologies
    o Reduce Run Times
    o Maintain High Efficacy
  ▪ Leverage Machine Learning and Heuristics
  ▪ Provide Dashboard
    o Monitor Processing
    o Drill Down
    o Reporting

• Technologies
  ▪ Cuckoo (Malware Sandboxing)
  ▪ Suricata (Intrusion Detection System)
  ▪ Steganography
  ▪ Malware Machine Learning
  ▪ Operating Systems and Compilers
  ▪ Reverse Engineering
  ▪ CSS / HTML / JavaScript / PHP
  ▪ Python
  ▪ MySQL
Team Spectrum Health

Project Overview

**Patient Training Tool**

- **Functionalities**
  - Improve Patient Experience
  - Educate Patient on Their Illness
  - Recommend Appropriate Spectrum Health Service
    - Video Chat with Doctor
    - Urgent Care
    - Emergency Room
- **Features**
  - Support Google Home
  - Ask Patient About Symptoms
    - Headache
    - Fever
    - Nausea
    - Etc.
  - Determine Best Matching Condition
  - Teach Patient About Condition
    - Easy to Understand
    - Suggest Appropriate Spectrum Health Service
- **Technologies**
  - Google Home SDK
  - Microsoft Azure DevOps
  - Natural Language Processing (NLP)
  - Machine Learning (ML)
Team Surge Solutions

Project Overview

xOS: Visualization of Automated Underwriting

- Functionalities
  - Make Loan Underwriting Process Fast and Accurate
  - Enable Lenders to Create and Visualize Financial Products

- Features
  - Design and Build Web App
    - Surge xOS Component
    - Displays Loan Decision Path Based on Product Policy
    - Enables Manipulation of Product Policy
    - Executes Monte Carlo Simulations
  - Create Surge xOS Embedded Decision Tree App
    - Embedded into Surge xOS Platform
    - Creates User-Friendly Decision Tree
    - Visualizes Underwriting Decision Paths
    - Assists Underwriter with Credit Risk Analysis
  - Leverage Salesforce

- Technologies
  - CSS / HTML / JavaScript
  - Salesforce (Lightning)
  - React / D3
  - Amazon Web Services (AWS)
  - Agile Software Delivery Methodology
Team Technology Services Group

Project Overview

Multi-Video Case Management

• Functionalities
  ▪ Manage Security Video
  ▪ Organize, Annotate and View Video

• Features
  ▪ Handle Security Camera and Mobile Phone Video
  ▪ View and Annotate Videos
    o By Timestamp
    o By Location
      ❖ Corporate Campus Map
      ❖ Building Map
  ▪ Aggregate Multi-Video View into Single Event
    o Based on Annotations, Timestamp and Location
    o Summarize an Incident
  ▪ Create OpenContent Management Suite Actions

• Technologies
  ▪ TSG OpenContent Management Suite (OCMS)
  ▪ TSG OpenAnnotate
  ▪ Amazon Web Services (AWS)
  ▪ DynamoDB / S3
Project Overview

Internal Telemetry for TechSmith Products

- Functionalities
  - Help TechSmith Developers Improve TechSmith Products
  - Create Telemetry Gathering System

- Features
  - Build Telemetry Framework
    - Integrate with Any Win32 App
    - Provide Simple API
  - Write Application Prototypes
    - Simulate Scenarios
    - Demonstrate Telemetry Framework
  - Provide Web Dashboard to View Telemetry
  - Integrate Into One TechSmith Product

- Technologies
  - Microsoft
    - Windows Presentation Foundation (WPF)
    - Windows Error Reporting APIs
    - Partner Center REST API
    - Visual Studio AppCenter
    - Azure
    - ASP .Net Core
  - C++ / C# / C++ / CLI
  - JavaScript
  - Docker
  - DirectX Diagnostic Tool (DxDiag)
Team Union Pacific

Project Overview

Railroad Arcade

• Functionalities
  ▪ Build Game Hosting System
  ▪ Target Railroad Training Games

• Features
  ▪ Create Three Sample Games
  ▪ Provide Reusable Components
    o Login and Settings
    o Administration
    o Quizzes and Scoring
    o Leader Boards
    o Integrate Adobe Captivate
  ▪ Support
    o Windows and WebGL
    o Mobile?
    o Virtual Reality (VR)?

• Technologies
  ▪ Unity
  ▪ Angular
  ▪ Java / Spring / Tomcat
  ▪ Adobe Captivate
Team United Airlines

Project Overview

Training Scheduling and Optimization System

• Functionalities
  ▪ Manage United Technical Operations Training
  ▪ Schedule Classes and Instructors Optimally

• Features
  ▪ Web and Apple iOS Apps
  ▪ Enable Course Request by Location
  ▪ Track
    o Instructor Times
    o Student Attendance
  ▪ Provide Class List of Students
  ▪ Optimize Course Scheduling
    o Number of Classes Per Location
    o Instructor Travel and Overtime
    o Fixed Courses
  ▪ Implement Various Roles
    (Student, Instructor, Scheduler)

• Technologies
  ▪ CSS / HTML / JavaScript / PHP
  ▪ Apple iOS / Swift
  ▪ Microsoft SQL Server
  ▪ Optimization Software
Team Urban Science

Project Overview

Dealer4U

• Functionalities
  ▪ Create Marketplace for Used Vehicle Leads
  ▪ Target Both Dealers and Customers

• Features
  ▪ Build Native Apps or Responsive Web App
  ▪ Provide
    o Customer User Interface
    o Dealer User Interface
    o Backend Data Storage and Processing
  ▪ Include Capabilities
    o To Create or Ingest Leads
    o For Dealers to Bid on Leads
    o To Match Dealers to Leads

• Technologies
  ▪ Apple iOS / Swift
  ▪ Google Android / Java
  ▪ Xamarin
  ▪ CSS / HTML / JavaScript / PHP
  ▪ Angular
  ▪ WebAPI
  ▪ Microsoft .NET Core
  ▪ Mongo DB

Detroit, Michigan

The Capstone Experience

Capstone Overview
Cognitive Enterprise Software Robots

• Functionalities
  ▪ Automate Manual Computer Tasks
  ▪ Utilize Software Robots (Soft Bots)

• Features
  ▪ Teach Soft Bot
    o Set of Business Rules
    o Process Flow
  ▪ Apply Deep Reinforcement Learning
    o Learn Human Behavior
    o Teach Soft Bot to Replicate Human Behavior
  ▪ Enable Soft Bot to Interact with Humans
    o Email
    o Natural Language Processing

• Technologies
  ▪ Python / NumPy / Matplotlib / PyAutoGUI
  ▪ TensorFlow / Keras
  ▪ Git
  ▪ Windows 10
  ▪ Graph Theory
  ▪ Machine Learning
Google Form

• www.capstone.cse.msu.edu
• + Other Links
• > Downloads
• > Team Member Survey: Google Form
First Assignments

• Read the Syllabus.

• Check out the Lab (3322EB, 3340EB, 3352EB, 3358EB).
  ▪ See if you can find it.
  ▪ See if you can get in.

• Check out the Web Site.

• Research your Project.
  ▪ Sponsor
  ▪ Technologies
What’s Next?

• Teams
  ▪ Assignments by Email Tomorrow Morning
  ▪ Meet Initially by Tomorrow Afternoon
  ▪ Lab Machine Assignments in Lab
  ▪ Start Researching Technologies
  ▪ Start Configuring Lab Machines
  ▪ Team Photos
    o After All-Hands Meeting
      ❖ Tu 01/10: Teams Amazon – Michigan State University HPCC
      ❖ Th 01/15: Teams Michigan State University ITS – Volkswagen
    o Dress Casual (But Appropriate)
    o Schedule for it. (~75 Minutes)

• Client
  ▪ Contact by Email by Tomorrow COB (Close of Business)
  ▪ Conference Call or On-Site Meeting by Friday
  ▪ Review Project Proposal
Capstone Overview

- Course Logistics

- Client Projects

- Course Logistics (Continued)
Urban Science Capstone Lab Machines

• Up to Four per Team
  ▪ Two 27” iMacs
  ▪ Dell Rack-Mounted Server (Optional)
    o Connected to Outside World
    o Keep Secure
  ▪ Mac Book Pro (Optional)

• Operating Systems on iMacs and MBPs
  ▪ Run macOS High Sierra
  ▪ Install VMware Fusion (from here)
  ▪ Create Virtual Machines
    o Windows 10 VM from TAs
    o Allocate Sufficient Cores and Memory
    o Others as Needed
  ▪ Don’t use Apple Boot Camp
Capstone Lab Miscellany

- **Security**
  - Keep lab doors closed.
  - Do not open doors for strangers
  - Do not give out door key code to others.
  - Do not invite non-capstone students to work in the lab with you.
  - Email Dr. D. if door becomes unlocked.

- **Wireless**
  - SSID: CSE498
  - Key: ??????
  - Only for Mobile Devices Requiring Lab Subnet

- **Coffee**
  - Some Provided by Dr. D.
  - Bed, Bath & Beyond (Get 20% Off Coupon)

- **Game Playing / Video Watching**
  - Not On Monitors Facing Hallway
  - Not If Other Team Members Need Machine
Capstone Lab Miscellany

- Do not “maniac” the wires and cables.
- Keep the lab neat and clean.
  - Lived In, Okay.
  - Messy, Not Okay.
- Respect...
  - ...other teams’ spaces.
  - ...shared spaces.
- Garbage Containers
  - Empty the small one by the coffee maker into a larger one.
  - Put larger ones out in the hall at night if near full.
  - Put back in the lab in the morning if empty.
- Turn the lights out if you’re the last one out.
- Close the windows if you open them.
- Be careful with cabinet drawers; don’t “maniac” them.
Mobile Devices Available

- For Capstone Project Use
- By Team for the Semester
- iOS
  - iPads
  - iPhones
  - iTouch
- Android
  - Tablet
  - Phone
- Surface Pro 3
Expectations & Workload

• Extremely High For Both
• Your MSU Career Capstone
• Addition to Your Personal Portfolio
• Experience Viewed Like an Internship
• Interview Talking Points
• Leverage Into a Job Offer
Schedules

- **Schedules > All-Hands Meeting**
- **Schedules > Major Milestones**
  - 01/17: Status Report Presentations
  - 01/29: Project Plan Presentations
  - 02/19: Alpha Presentations
  - 04/02: Beta Presentations
  - 04/23: Project Videos
  - 04/24: All Deliverables
  - 04/25: Design Day Setup
  - 04/26: Design Day
  - 05/02: Project Videos

  - Attendance is required.
  - No excuses are accepted.
  - Do not schedule anything including during these times interviews, travel home, etc.
  - Will coordinate with your interviews.
Meeting Attendance

• Required
  ▪ All-Hands (Class) Meetings
  ▪ Team Triage Meetings
  ▪ Team Meetings
  ▪ Team Conference Call Meetings
• 5% of Final Grade
• Late == Absent
  ▪ 1% of Final Grade for Each Unexcused Absence
  ▪ Attendance Grade Can Be Negative (See Syllabus)
  ▪ If > 5 Absences Team Contribution Grade Will Be Affected
• Almost No Excuses Accepted
  ▪ One or Two Excused Possible for Interviews
  ▪ Must Provide Information
    ○ Date, Company, Recruiter Name & Contact Info
    ○ In Advance
    ○ To Both Dr. D. and TAs
• Must Attend (No Excuses Accepted)
  ▪ Your Team Presentations
  ▪ All Project Video Viewing
  ▪ Design Day

Do NOT schedule interviews. Do NOT schedule ANYTHING. Do NOT buy plane tickets.
Team Organization

• Up to Each Team
• Organize into Roles
  ▪ Client Contact
  ▪ Program Manager
  ▪ Developer
  ▪ Tester
  ▪ Systems Administrator
  ▪ Etc...
• Everyone must make technical contributions.
Team Dynamics

• Key to Success
• Significant Component of Course Grade
• Address Problems Immediately
  ▪ Within Team
  ▪ With Dr. D. and/or TAs
• Be Ready to Discuss During Interviews
Grading

• Team (70%)
  ▪ Project Plan Document & Presentation  10
  ▪ Alpha Presentation  10
  ▪ Beta Presentation  10
  ▪ Project Video  10
  ▪ Project Software & Documentation  25
  ▪ Design Day  05
  ▪ Total  70

• Individual (30%)
  ▪ Technical Contribution  10
  ▪ Team Contribution  10
  ▪ Team Evaluation  05
  ▪ Meeting Attendance  05
  ▪ Total  30
Grading

• Final Grade Sum Of...
  ▪ Individual Total
  ▪ % of Team Total Based on Team Contribution

• Grand Total =
  (Individual Total)
  +
  (Team Total) * (Team Contribution) / 10.0

• Nota Bene: Your Team Contribution will have a very significant effect on your final grade.
## Effect of Team Contribution

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*Nota Bene: Assumes Perfect Score In Every Other Category*
Unacceptable Excuses for Not Contributing

- They never asked me to do anything.
- They never let me do anything.
- I wrote 1000’s of lines of code but they weren’t included in the project.
- My features were not included in the project.
- I work 40 hours per week at my job.
- I live 60 minutes from MSU.
- I didn’t want to work on this project team.
- I ranked this project 26 out of 26.
- I did a lot of research about stuff we never used.
- I was busy interviewing.
- Etc...
Grading

• We reserve the right to make changes with sufficient notice.
• No special consideration will be given for final grades including but not limited to
  ▪ status in any academic program including CSE,
  ▪ financial aid,
  ▪ rank in the armed forces,
  ▪ job while a student at MSU,
  ▪ job after anticipated graduation from MSU,
  ▪ commute to MSU,
  ▪ graduation,
  ▪ mortgage,
  ▪ wedding,
  ▪ visa status,
  ▪ ability to enroll in CSE498 next semester,
  ▪ or anything else.
Integrity of Scholarship

• MSU’s policies will be enforced.

• Individual and team work must be original.

• Violators...
  ▪ ...will be referred to the appropriate deans.
  ▪ ...may receive a grade of F in the course.
Using Resources

• Ok For “Help”
  ▪ People
    o Past Capstone Teams
    o Other Capstone Teams
    o Faculty Members
  ▪ Articles
  ▪ Sample Code
  ▪ Etc...

• Not Ok For “Entire” Project
• If Unsure, Ask Dr. D. and/or TAs
Using Existing Code

• Ok
  ▪ Examples
  ▪ Prototypes
  ▪ Open Source Code
    o Fragments
    o Libraries
    o Utilities

• Not Ok
  ▪ Vast Amounts of Your Project
  ▪ Not Open Source

• Ask Client in Advance
• Document and Report All Existing Code Used
• Be Careful!
• If Unsure, Ask Dr. D. and/or TAs and/or Your Client
Design Day

• College of Engineering Event
  ▪ Engineering Building
  ▪ Friday, April 26, 2018

• Displays (Booths) of Design Projects
  ▪ CSE Capstone
  ▪ ECE Capstone
  ▪ ME Capstone
  ▪ Etc...

• Presentations and Awards
  ▪ Panel of Judges
  ▪ CSE Team Project Videos
Travel to Client

• Reimburse for Mileage for Personal Car
• Travel Within Michigan (Outside of Lansing)
  ▪ Grand Rapids
  ▪ Jackson
  ▪ Midland
  ▪ St. Joseph
  ▪ Metro Detroit
• From East Lansing to Client and Back
• Two Cars Per Team Per Trip
• See Brenda in the CSE office in advance.
VISA

• Verified Individualized Services and Accommodations

• Let us know immediately.

• We will work with you.
Office Hours

• Any Time...
  ▪ Visit: 3149 EB
  ▪ Call: 353-5573
  ▪ Email: (dyksen@msu.edu)

• Make Appointment
Capstone Overview

✓ Course Logistics

✓ Client Projects

✓ Course Logistics (Continued)

Questions?