01/07: Capstone Overview

The Capstone Experience

Dr. Wayne Dyksen
Department of Computer Science and Engineering
Michigan State University
Spring 2013
Capstone Overview

Course Logistics

- Client Projects

- Course Logistics (Continued)
CSE 498, Collaborative Design

• “The Capstone Experience”
• Instructors
  ▪ Dr. Wayne Dyksen ("Dr. D.")
  ▪ Meredith Schmidt
• Class Meetings
  MW, 3:00-3:50pm, 1225 EB
• Syllabus
• Web Site
  ▪ capstone.cse.msu.edu
  ▪ Check it often.
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
• Etc...
Course Goals

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

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

See Major Milestones.
All-Hands Meetings

- Presentations By
  - Dr. D.
- Teams
  - Status Reports
  - Formal Presentations
    - Project Plan
    - Beta
  - Project Videos
- Guest Speakers
All-Hands Meeting Agendas

- 01/07: Course Overview
- 01/09: Project Plan
- 01/14: Risks and Prototypes
- 01/16: Schedule and Teamwork
- 01/21: (Martin Luther King Day, No Meeting)
- 01/23: Team Status Report Presentations
- 01/28: Team Project Plan Presentations
- 01/30: Team Project Plan Presentations
- 02/04: Team Project Plan Presentations
- 02/06: Team Project Plan Presentations
- 02/11: Resume Writing and Interviewing
- 02/13: Creating and Giving Presentations
- 02/18: Team Alpha Presentations
- 02/20: Team Alpha Presentations
- 02/25: Team Alpha Presentations
- 02/27: Team Alpha Presentations
- 03/04: (Spring Break, No Meeting)
- 03/06: (Spring Break, No Meeting)
- 03/11: Design Day and the Project Videos
- 03/13: Camtasia Demo
- 03/18: Team Status Reports
- 03/20: Team Status Reports
- 03/25: Team Status Reports
- 03/27: Team Status Reports
- 04/01: Team Beta Presentations
- 04/03: Team Beta Presentations
- 04/08: Team Beta Presentations
- 04/10: Team Beta Presentations
- 04/15: Ethics and Professionalism
- 04/17: Intellectual Property
- 04/22: Project Videos
- 04/24: Project Videos and All Deliverables
- 04/25: Design Day Setup
- 04/26: Design Day
- 05/01: Project Videos
Urban Science Capstone Lab

- **3352 EB**
- **Door Lock**
  - Electronic Keypad
  - Code = ########
- **Systems**
  - Three PC’s per Team
    - Dell Rack-Mounted Server
    - Two Development Machines
      - 27” iMac
      - 13” MacBook Pro
  - Team 100% Responsible
    - Building
    - Maintaining
    - Securing
    - Backing Up
- **Books**

- **WiFi**
  - SSID: CSE498
  - Key: ???????
- **Conference Area**
  - Team Meetings
  - Client Conference Calls
  - Google Conference Calendar
- ** Appliances**
  - Water Cooler/Heater
  - Refrigerator
  - Microwave
  - Keurig Coffee Maker
- **Lockable Storage**
  - One Drawer Per Team
  - Assigned and Labeled
  - Obtain Keys from CSE Office
Scheduled Lab Times

• No Formal Lab Sessions
• “Credit” for Scheduled Weekly Meetings
  ▪ Team Meeting
  ▪ Client Conference Call
  ▪ Triage Meeting with Meredith
• Meeting Times TBA With
  ▪ Team
  ▪ Client
  ▪ Meredith
• Students must be available to meet.
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 Three 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
Project Teams/Clients

• Team Auto-Owners
• Team Boeing
• Team Dow
• Team EA
• Team GM
• Team Meijer
• Team Mozilla
• Team MSUFCU
• Team Spectrum Health
• Team TechSmith
• Team Urban Science
• Team Whirlpool
Team Auto-Owners

Project Overview

Events Planning Mobile App

• Functionalities
  ▪ Create, Edit and Track Events
    ▪ Seminars and Classes
    ▪ Social Events
      ▸ Golf Outings
      ▸ Tailgates
  ▪ Register Event Attendees
    ▪ Open Events by Web
    ▪ Restricted Events by Email Invitation and Web

• Features
  ▪ Web and Mobile
    ▪ Display Event Information
    ▪ Register for Open Events
    ▪ Respond to Invitations to Restricted Events
    ▪ Provide Mapping and Directions
  ▪ Administrative
    ▪ Create New Event Types
    ▪ Generate Reports
    ▪ Print Name Tags and Table Tents

• Technologies
  ▪ Java
  ▪ JQuery Mobile
  ▪ IBM DB2 Database

Lansing, Michigan
Team Boeing

Project Overview

Airplane Building Game Simulator

• Functionalities
  ▪ Factory Simulation Game
  ▪ Build Paper and Model Airplanes
  ▪ By Team of Humans and Robots
  ▪ Player is Factory “Floor Captain”

• Features
  ▪ Networked
  ▪ Humans and Robots with Moveable Parts
    o Arms
    o Hands
    o Wheels
    o Etc.
  ▪ Airplane Assemblies
    o Paper Planes with 5 Degrees of Difficulty
    o Model Planes with 3 Degrees of Difficulty
  ▪ Assignment of Tasks to Humans and Robots

• Technologies
  ▪ C++
  ▪ 3-D Game Modeling
  ▪ Game Engines
  ▪ Robotics Simulation
  ▪ Physics Modeling

St. Louis, Missouri
Team Dow

Project Overview

Personalized Intranet Portal

• Functionalities
  ▪ Customizable Dashboard
  ▪ Presents Internal Dow Information
  ▪ Based on User’s Attributes
  ▪ From SharePoint MySite Profile

• Features
  ▪ Display Corporate News
  ▪ Add and Modify Links
  ▪ Share Document Library
  ▪ Integrate Outlook Tasks or MySite Tasks
  ▪ Display RSS Feeds
  ▪ Information Based on 13 Core Businesses and 5 Functions

• Technologies
  ▪ Microsoft SharePoint 2013
  ▪ Microsoft SQL Server 2012
  ▪ Microsoft Office (Outlook)
  ▪ Visual Studio 2010
Team EA

Project Overview

Android Emulator for EA Games

• Functionalities
  ▪ Android Emulator
  ▪ Streams Mobile Games

• Features
  ▪ Emulator Runs on a PC
  ▪ Communication System and Controller Interface
    □ Allows Android Devices to Control Game on PC
    □ Interface Based on HTML5
    □ Connects Over WiFi
  ▪ Interprets Gestures and Device Tilt Movements
  ▪ Stream Video from Emulator to HTML5 Webpage

• Technologies
  ▪ C++ and C#
  ▪ Android SDK
  ▪ HTML5
  ▪ JavaScript
  ▪ PHP
  ▪ webRTC
Team GM

Project Overview

My Conference Room

• Functionalities
  ▪ Enable Impromptu Meetings
  ▪ In Empty Conference Rooms
    o Find or Check Status
    o Book
  ▪ Using Mobile Devices

• Features
  ▪ Based on GM Microsoft Exchange Server
    o Includes all Conference Rooms
    o Cataloged for Searching and Scheduling
    o Accessible Via Exchange APIs
  ▪ Displays All Relevant Room Information
    o Name, Location and Capacity
    o Amenities (Whiteboards, Projector, Etc.)
    o Schedule
  ▪ Supports Room QR Codes

• Technologies
  ▪ CSS, HTML5
  ▪ JavaScript, AJAX
  ▪ Microsoft Exchange 2013
  ▪ Microsoft Outlook 2013 APIs (EWS, etc.)
  ▪ Application Tier (.NET Recommended)
Team Meijer

Project Overview

IT Metrics Repository

• Functionalities
  ▪ Dashboard
  ▪ Visualizes IT Metrics
    ○ Over Time
    ○ Possibly with Goals

• Features
  ▪ Create, Enter and Edit
    ○ Metrics
    ○ Time Dimensions
    ○ Goals
  ▪ Create Metric as Function of Other Metrics
  ▪ Enter or Calculate Historical Values
  ▪ Automatically Propagate Unchanged Values
  ▪ Support Various Graphing Capabilities

• Technologies
  ▪ CSS, HTML5
  ▪ JavaScript, jQuery, jQuery UI
  ▪ Microsoft .NET, ASP.NET, C#
  ▪ Microsoft Communication Foundation (WCF)
  ▪ Microsoft Internet Information Services (IIS)
  ▪ SQL Server

The Capstone Experience
Team Mozilla

Project Overview

Multi-Touch Gestures for Mac OS X Firefox

• Functionalities
  ▪ Multi-Touch Gestures for Mac OS X Firefox
  ▪ Implement New Gestures
  ▪ Improve Existing Gestures

• Features
  ▪ Rotating Images
  ▪ Tab Switching
  ▪ Tap to Zoom
  ▪ Pinch to Zoom
  ▪ History Listing

• Technologies
  ▪ CSS
  ▪ Objective-C
  ▪ C++
  ▪ JavaScript

Mountain View, California
Team MSUFCU

Project Overview

Mobile Information App for Staff

• Functionalities
  ▪ Provides Information About MSUFCU...
    ○ Events
    ○ News
    ○ Announcements
  ▪ To MSUFCU Employees
  ▪ On iPhone, iPad and Android

• Features
  ▪ User Experience (UX)
    ○ Easy-to-Use
    ○ Useable by Wide Variety of Users
  ▪ Includes a Calendaring Tool
    ○ Sign Up
    ○ Send Text Message Reminders
  ▪ Data Housed on Internal Servers
  ▪ Utilizes SSL Encryption

• Technologies
  ▪ Apple iPhone and iPad (iOS)
  ▪ Google Android
  ▪ Objective-C, Xcode
  ▪ C#
  ▪ Java
  ▪ HTML, PHP, JavaScript
  ▪ Microsoft SQL Server
Team Spectrum Health

Project Overview

SLA Management and Metric Reporting System

• Functionalities
  ▪ Information Services Metrics Dashboard
  ▪ Shows Progress on Internal Projects
  ▪ Via Monthly Scorecards
  ▪ Assists in Evaluation and Decision Making

• Features
  ▪ Create, Edit and Delete Metrics
  ▪ Track Metrics with Approvals
  ▪ Visualize Monthly Scorecards
  ▪ Manage Metrics Issues Log
  ▪ Control and Link All Information Related to a Metric
  ▪ Perform Calculations Based on Metrics
  ▪ Format Data Based on a Set of Parameters

• Technologies
  ▪ Database Technologies
  ▪ Dynamic Web Programming
  ▪ Web Services
  ▪ Data Aggregating and Warehousing

---

The Capstone Experience Capstone Overview

SLA Management and Metric Reporting System Table

<table>
<thead>
<tr>
<th>Project</th>
<th>Current Milestone</th>
<th>Issues</th>
<th>Spend To Date</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aphrodite</td>
<td>Project Plan</td>
<td>7</td>
<td>1.1</td>
<td>Q1 2018</td>
</tr>
<tr>
<td>Apollo</td>
<td>Development</td>
<td>2</td>
<td>12.9</td>
<td>Q2 2018</td>
</tr>
<tr>
<td>Ares</td>
<td>Data Migration</td>
<td>2</td>
<td>19.1</td>
<td>Q1 2018</td>
</tr>
<tr>
<td>Artemis</td>
<td>Launch</td>
<td>0</td>
<td>3.4</td>
<td>Q2 2018</td>
</tr>
<tr>
<td>Athena</td>
<td>Development</td>
<td>0</td>
<td>0.2</td>
<td>Q3 2018</td>
</tr>
<tr>
<td>Demeter</td>
<td>Testing</td>
<td>11</td>
<td>16.2</td>
<td>Q1 2018</td>
</tr>
<tr>
<td>Dionysus</td>
<td>Testing</td>
<td>13</td>
<td>19.7</td>
<td>Q4 2018</td>
</tr>
<tr>
<td>Hades</td>
<td>Security Testing</td>
<td>10</td>
<td>3.2</td>
<td>Q1 2018</td>
</tr>
<tr>
<td>Hephaestus</td>
<td>Testing</td>
<td>6</td>
<td>0.9</td>
<td>Q3 2018</td>
</tr>
<tr>
<td>Hera</td>
<td>Development</td>
<td>0</td>
<td>0.2</td>
<td>Q4 2018</td>
</tr>
</tbody>
</table>
Team TechSmith

Project Overview

American Sign Language Learning App

• Functionalities
  ▪ Learn and Teach American Sign Language
  ▪ Using Microsoft Surface Tablet App
  ▪ Learner
    o Watches YouTube Videos
    o Records Themselves Signing
  ▪ Teacher
    o Watches Learner’s Video
    o Responds with a Critique

• Features
  ▪ Create Lesson Plans
    o From YouTube Videos
    o By Teacher and Automatically
  ▪ YouTube Video Tagging (Beginner, Intermediate, Advanced)
  ▪ Teacher Critiquing
    o Quick Ratings
    o Choosing Frames From Learner Video
    o Create New Video with Voice Narration
    o Text and Drawing Annotation
  ▪ Interaction Both Remote and In-Person

• Technologies
  ▪ Window 8, WinRT
  ▪ YouTube API
  ▪ Windows Azure or Ruby on Rails
  ▪ Urban Airship
  ▪ RESTful Web Services

Okemos, Michigan
Team Urban Science

Project Overview

Dealership Consultant Mobile App

• Functionalities
  ▪ Support Urban Science Consultants
  ▪ Meetings with Automobile Dealers
  ▪ Provide and Collect Information
    o Before Meeting
    o During Meeting
    o After Meeting
  ▪ On iPad

• Features
  ▪ Useable During Meeting
  ▪ Provide and Collect
    o Specific Action Plan
    o Dealer’s Reaction
    o Meeting Atmosphere
    o Specific Process to be Utilized
    o Dealer Agreements
  ▪ All Information Stored in SQL Database

• Technologies
  ▪ CSS, HTML5
  ▪ PhoneGap
  ▪ Microsoft Bing Maps
  ▪ Web Services
  ▪ SQL Server
  ▪ Mobile Geography Management, Fall 2012

Detroit, Michigan
Guided Cooking and Recipe App

• Functionalities
  ▪ Cooking and Recipe Guide
  ▪ For Web and Mobile Devices
  ▪ Replicates UX (User Experience) of Oven LCD

• Features
  ▪ Cloud-Based SQL Database
  ▪ Import Recipes
    ▪ From Select Websites
    ▪ Map to Whirlpool Database Schema
  ▪ Administrative Interface
    ▪ Edit Database
    ▪ Import Recipes

• Technologies
  ▪ Java
  ▪ JavaScript
  ▪ SQLite and MySQL
  ▪ HTML5, CSS3
  ▪ PHP or Ruby
  ▪ RESTful Web Services
First Assignments

• Read the **Syllabus**.

• Check out the Lab (**3352 EB**).
  - See if you can find it.
  - See if you can get in.

• Check out the **Web Site**.

• Research Your **Project**.
  - Client
  - Technologies
What’s Next?

• Teams
  ▪ Assignments by Email Tonight or Tomorrow Morning
  ▪ Meet Initially by Tuesday Afternoon
  ▪ Lab Machine Assignments in Lab
  ▪ Start Configuring Lab Machines
  ▪ Team Photos
    o Wednesday 01/09, After All-Hands Meeting
    o Dress Casual (But Appropriate)

• Client
  ▪ Contact by Email by Tuesday COB
  ▪ Conference Call by Phone Wednesday or Thursday
  ▪ Review Project Proposal
Capstone Overview

✓ Course Logistics

✓ Client Projects

➤ Course Logistics (Continued)
Urban Science Capstone Lab Machines

• Three Per Team
  ▪ Rack-Mounted Dell Server
    o Connected to the Outside World
    o Keep Secure
  ▪ 27” iMac
  ▪ 13” MacBook Pro

• Operating Systems
  ▪ Run OSX
  ▪ Install VMware Fusion (from here)
  ▪ Create Virtual Machines
    o Windows XP, Vista, 7
    o Linux
Urban Science Capstone Lab Miscellany

• Security
  ▪ Keep Lab Doors Closed
  ▪ Do Not Open Doors For Strangers
  ▪ Email Dr. D. if Door Becomes Unlocked

• Wireless
  ▪ SSID: CSE498
  ▪ Key: ??????

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

• Game Playing
  ▪ Not On Monitors Facing Hallway
  ▪ Not If Other Team Members Need Machine
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
Major Milestones

- 01/23: Status Report Presentations
- 01/28: Project Plan Presentations
- 02/18: Alpha Presentations
- 04/01: Beta Presentations
- 04/22: Project Videos
- 04/24: All Deliverables
- 04/25: Design Day Setup
- 04/26: Design Day
Meeting Attendance

• Required
  ▪ All-Hands (Class) Meetings
  ▪ Team Triage Meetings
• 5% of Final Grade
• Late == Absent
• Almost No Excuses Accepted
  ▪ One or Two Excused Possible for Interviews
  ▪ Must Provide Information In Advance
    (Date, Company, Recruiter Name & Contact Info)
• Must Attend (No Excuses Accepted)
  ▪ Your Team Presentations
  ▪ All Project Video Viewing
  ▪ Design Day

Do NOT Schedule Interviews
Do NOT Schedule ANYTHING
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 Meredith
• 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 =
  \[
  \text{(Individual Total)} \quad + \quad \text{(Team Total)} \times \text{(Team Contribution)} / 10.0
  \]
- *Nota Bene*: Your Team Contribution will have a very significant effect on your final grade.
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,
  ▪ graduation,
  ▪ mortgage,
  ▪ wedding,
  ▪ visa status,
  ▪ 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.
IP & NDA’s

• IP: Intellectual Property
  ▪ By Default, Owned by You
  ▪ Client May Request
    o Right to Use
    o Assignment of Ownership
    o Etc.

• NDA: Non-Disclosure Agreement
  ▪ May Be Required by Client
  ▪ You will...
    o ...respect/protect intellectual property.
    o ...respect/protect source code.
    o ...etc.

• Normally Not an Issue
• Always Contact Dr. D. Before Signing Anything
Using Resources

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

• Not Ok For “Entire” Project

• If Unsure, Ask Dr. D. and/or Meredith
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

• Document and Report All Existing Code Used
• Be Careful!
• If Unsure, Ask Dr. D. and/or Meredith
Design Day

• College of Engineering Event
  ▪ Engineering Building
  ▪ Friday, April 26, 2013

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

• Presentations and Awards
  ▪ Panel of Judges
  ▪ CSE Team Project Videos
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@cse.msu.edu)

• Make Appointment
Capstone Overview

- Course Logistics
- Client Projects
- Course Logistics (Continued)

Questions?
01/09: Project Plan

The Capstone Experience

Dr. Wayne Dyksen
Department of Computer Science and Engineering
Michigan State University
Spring 2013