08/28: Capstone Overview

The Capstone Experience

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

Course Logistics

• Client Projects

• Course Logistics (Continued)
CSE 498, Collaborative Design

• “The Capstone Experience”

• Instructors
  ▪ Dr. Wayne Dyksen (“Dr. D.”)
  ▪ Malcolm Doering

• Class Meetings
  MW, 3:00-3:50pm, 1225 EB

• Syllabus

• Web Site
  ▪ capstone.cse.msu.edu
  ▪ Check it often.
Course Goals

• Give You Experience
  ▪ Real World (As Possible)
  ▪ In Corporate Setting

• Help You 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
• Etc...
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
    o Project Plan
    o Alpha
    o Beta
  ▪ Project Videos
• Guest Speaker(s)
<table>
<thead>
<tr>
<th>Date</th>
<th>Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/28</td>
<td>Capstone Overview</td>
</tr>
<tr>
<td>09/02</td>
<td>(Labor Day, No Meeting)</td>
</tr>
<tr>
<td>09/04</td>
<td>Project Plan</td>
</tr>
<tr>
<td>09/09</td>
<td>Risks and Prototypes</td>
</tr>
<tr>
<td>09/11</td>
<td>Team Status Report Presentations</td>
</tr>
<tr>
<td>09/16</td>
<td>Team Project Plan Presentations</td>
</tr>
<tr>
<td>09/18</td>
<td>Team Project Plan Presentations</td>
</tr>
<tr>
<td>09/23</td>
<td>Team Project Plan Presentations</td>
</tr>
<tr>
<td>09/25</td>
<td>Team Project Plan Presentations</td>
</tr>
<tr>
<td>09/30</td>
<td>Resume Writing and Interviewing</td>
</tr>
<tr>
<td>10/02</td>
<td>Career Gallery</td>
</tr>
<tr>
<td>10/07</td>
<td>Schedule and Teamwork</td>
</tr>
<tr>
<td>10/09</td>
<td>Creating and Giving Presentations</td>
</tr>
<tr>
<td>10/14</td>
<td>Team Alpha Presentations</td>
</tr>
<tr>
<td>10/16</td>
<td>Team Alpha Presentations</td>
</tr>
<tr>
<td>10/21</td>
<td>Team Alpha Presentations</td>
</tr>
<tr>
<td>10/23</td>
<td>Team Alpha Presentations</td>
</tr>
<tr>
<td>10/28</td>
<td>Design Day and the Project Videos</td>
</tr>
<tr>
<td>10/30</td>
<td>Camtasia Demo</td>
</tr>
<tr>
<td>11/04</td>
<td>Team Beta Presentations</td>
</tr>
<tr>
<td>11/06</td>
<td>Team Beta Presentations</td>
</tr>
<tr>
<td>11/11</td>
<td>Team Beta Presentations</td>
</tr>
<tr>
<td>11/13</td>
<td>Team Beta Presentations</td>
</tr>
<tr>
<td>11/18</td>
<td>Team Status Reports</td>
</tr>
<tr>
<td>11/20</td>
<td>Team Status Reports</td>
</tr>
<tr>
<td>11/25</td>
<td>Team Status Reports</td>
</tr>
<tr>
<td>11/27</td>
<td>Team Status Reports</td>
</tr>
<tr>
<td>12/02</td>
<td>Project Videos</td>
</tr>
<tr>
<td>12/04</td>
<td>Project Videos and All Deliverables</td>
</tr>
<tr>
<td>12/05</td>
<td>Design Day Setup</td>
</tr>
<tr>
<td>12/06</td>
<td>Design Day</td>
</tr>
<tr>
<td>12/12</td>
<td>Project Videos</td>
</tr>
</tbody>
</table>

The Capstone Experience

Capstone Overview
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
  - Whirlpool 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 Meetings
  ▪ Client Conference Calls
  ▪ Triage Meetings with Malcolm
• Meeting Times TBA With
  ▪ Team
  ▪ Client
  ▪ Malcolm
• 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 GM
- Team IBM
- Team Meijer
- Team Mozilla
- Team MSUFCU
- Team Quicken Loans
- Team Spectrum Health
- Team TechSmith
- Team Urban Science
- Team Whirlpool
Team Auto-Owners

Project Overview

Catastrophe Insurance Adjuster App

• Functionalities
  ▪ Manage Independent Insurance Adjusters
  ▪ Handling Claims Resulting from Catastrophes
    o Hurricanes
    o Tornados
    o Earthquakes
  ▪ Remotely, At Site of Catastrophe

• Features
  ▪ Handle Large Groups (Hundreds) of Adjusters
  ▪ Assign Individual Adjuster to Claims
  ▪ Map Locations of Adjusters and Claims
  ▪ Show Historical Weather Data
  ▪ Facilitate Two-Way Communications

• Technologies
  ▪ CSS, HTML5
  ▪ JavaScript, jQuery
  ▪ Java
  ▪ Microsoft SQL Server, DB2 or MySQL
  ▪ Web Services
  ▪ National Weather Service Storm Prediction Center
  ▪ Capstone Weather Incident Verification System, Spring 2010

Lansing, Michigan
Team Boeing

Project Overview

Optimization of Boeing Assembly Lines

• Functionalities
  ▪ Simulate Aircraft Assembly Line
  ▪ Teams of Humans and Robots
  ▪ Optimize Assembly Line Layout

• Features
  ▪ 3-D Graphical Visualization
  ▪ First Person View of Assembly Workers
  ▪ Inverse Kinematic Algorithms
  ▪ Quality Metrics

• Technologies
  ▪ C++, Python
  ▪ Gazebo
  ▪ Pathfinding
  ▪ Simulation (First Person View)
  ▪ Networking
  ▪ QT Application Framework
  ▪ Optimization
  ▪ 3-D Modeling
  ▪ Capstone Paper Airplane Builder Game Simulator, Spring 2013

The Capstone Experience

St. Louis, Missouri
Project Overview

Augmented Reality Auto Mobile Guide App

- **Functionalities**
  - Provide Information About a Particular Car
    - Make and Model
    - Manufacturer’s Suggested Retail Price
    - Available Options
    - Location of Nearest Dealer
  - By Pointing Mobile Phone or Tablet Camera

- **Features**
  - Information Overlaid Over Car Image
  - Integrated with Social Media
  - Support both Apple iOS and Google Android
  - May Be Positioned as a Game

- **Technologies**
  - Apple iOS (iPhone and iPad)
  - Google Android (Phones and Tablets)
  - Argon Web Browser
  - ARToolKit
  - ATOMIC Authoring Tool
  - ArUco
  - IQ Engines
  - PAR Works

Detroit, Michigan
Team IBM

Project Overview

Information Technology Assessment Toolkit

• Functionalities
  ▪ Toolkit for IBM Executive Consulting Services
  ▪ Gather and Synthesize Client IT Information
  ▪ Identify Potential Gaps
  ▪ Prioritize Projects

• Features
  ▪ Replace Existing Limited Spreadsheet Tools
  ▪ Windows 7/8 Native Application
  ▪ Consolidated Remote Database
  ▪ Support Cross Client Analysis

• Technologies
  ▪ Java, XML
  ▪ IBM DB2 Database
  ▪ Microsoft Windows Application Development
Team Meijer

Project Overview

Chief Information Officer Dashboard

• Functionalities
  ▪ Dashboard of Information Technology Services (ITS) Key Performance Indicators (KPIs)
  ▪ Targeted for Chief Information Officer (CIO) and ITS Leadership
  ▪ Supports Desktop and Mobile Browsers

• Features
  ▪ Spotlighting (Red/Green) of Actual vs. Goal
  ▪ Trending: Up, Down and Rolling
  ▪ Drill-down
  ▪ Alerts and Notifications
  ▪ Consistency of Delivery and Format
  ▪ Extensible Architecture

• Technologies
  ▪ C#, JavaScript
  ▪ Microsoft Internet Information Services (IIS)
  ▪ Microsoft SharePoint 2010
  ▪ Microsoft SQL Server
  ▪ Microsoft .NET
  ▪ Capstone ITS Scorecard Dashboard, Fall 2009
  ▪ Capstone Chief Information Officer Dashboard, Spring 2010

Grand Rapids, Michigan
Team Mozilla

Project Overview

Australis-Styled Widgets for Mozilla Firefox

• Functionalities
  ▪ User Installable Widgets
  ▪ For Completely Restyled Firefox
  ▪ To Be Released End of 2013

• Features
  ▪ Bugzilla
  ▪ Weather
  ▪ Music

• Technologies
  ▪ CSS, HTML, JavaScript
  ▪ XUL (XML User Interface Language)
  ▪ Mozilla Firefox Add-On SDK
  ▪ Web APIs for Bugzilla, Weather and Music
  ▪ IRC (Internet Relay Chat)
Team MSUFCU

Project Overview

In-School Banking Program

• Functionalities
  ▪ Enable Mini MSUFCU Branch
  ▪ At Local Elementary and Middle Schools
  ▪ Accept Deposits from Students
  ▪ Run by Parent Volunteers

• Features
  ▪ iPad App
  ▪ Intuitive User Experience
  ▪ Create and Manage Student Accounts
  ▪ Transfer Information to MSUFCU
  ▪ Secure

• Technologies
  ▪ Apple iPad iOS
  ▪ Objective C, Xcode, C#
  ▪ CSS, HTML, PHP, JavaScript
  ▪ Microsoft SQL Server, MySQL
  ▪ Encryption Based on SQL Standards

The Capstone Experience

Capstone Overview

East Lansing, Michigan
Team Quicken Loans

Project Overview

Survey and Voting Web Apps

• Functionalities
  ▪ Collect Opinions and Feedback
  ▪ Of Quicken Loan’s Team Members
  ▪ Via Online Surveys and Votes

• Features
  ▪ Responsive Web App
  ▪ Manage Surveys and Votes
    o Create and Send
    o Collect Results
  ▪ Support Live Voting
  ▪ Display Results Graphically

• Technologies
  ▪ CSS, HTML5
  ▪ Microsoft .NET
  ▪ Microsoft Internet Information Services (IIS)
  ▪ Microsoft Active Directory
  ▪ Web Browser Plug-Ins
Team Spectrum Health

Project Overview

Talent Connections Careers Mobile Site

• Functionalities
  ▪ Apply for Spectrum Health Position
  ▪ Via Mobile Devices
  ▪ Including Phones and Tablets

• Features
  ▪ Simple and Easy Process
  ▪ Web App, Consistent with Non-Mobile Site
  ▪ Useable by Both Internal and External Candidates
  ▪ Support for High Resolution Displays

• Technologies
  ▪ CSS, HTML5
  ▪ JavaScript, Ajax
  ▪ jQuery, jQuery Mobile
  ▪ Microsoft C#, ASP.NET MVC 4.0
  ▪ Microsoft Internet Information Services (IIS) 7.0
  ▪ RESTful Web Services
Team TechSmith

Project Overview

Learning Activity Capture

• Functionalities
  ▪ Collect User Learning Activity Information
    o “Read an Article”
    o “Watched a Video”
    o “Took a Quiz”
    o Etc.
  ▪ Summarize Information for User

• Features
  ▪ Collect Information Via
    o TechSmith Smart Player
    o Web Browser Add-On
    o Microsoft User Interface Automation
  ▪ User Provided Activity Hints
  ▪ Shareable Activity Lists
  ▪ Learning Activity Reporting Web Site

• Technologies
  ▪ CSS, HTML5, JavaScript
  ▪ Python, C#/.NET
  ▪ Microsoft Windows and Ubuntu (Unix)
  ▪ Advanced Distributed Learning, Learning Records Store
  ▪ Tin Can API
  ▪ RESTful Web Services
  ▪ Microsoft Windows User Interface Automation

Okemos, Michigan
Team Urban Science

Project Overview

Dealership Consultant Mobile Apps

- Functionalities
  - Support Urban Science Consultants
  - Meetings with Automobile Dealers
  - Provide and Collect Information
    - Before Meeting
    - During Meeting
    - After Meeting
  - Natively on iPad and Android Tablet
- Features
  - Useable During Meeting
  - Provide and Collect
    - Specific Action Plan
    - Dealer’s Reaction
    - Meeting Atmosphere
    - Specific Process to be Utilized
    - Dealer Agreements
  - All Information Stored in SQL Database
- Technologies
  - Apple iOS iPad
  - Google Android Tablet
  - Microsoft Bing Maps or Google Maps
  - Web Services
  - SQL Server
  - Capstone [Mobile Geography Management](#), Fall 2012
  - Capstone [Dealership Consultant Mobile App](#), Spring 2013

Detroit, Michigan
Team Whirlpool

Project Overview

Connected Appliance SmartZones

- **Functionalities**
  - Extend Whirlpool Connected Appliance Feature
  - Enable Consumer Interaction Using SmartZones
  - Mobile Apps

- **Features**
  - Native Apple iPad and Google Android Tablet Apps
  - Use Geolocation and Geofencing
  - Support Various SmartZones
    - Vacation
    - Comfort
    - AlertMe
    - RemindMe

- **Technologies**
  - Apple iOS 6.x or Higher
  - Android Jelly Bean 4.2 or Higher
  - PhoneGap (Optional)
  - Mapping APIs (for Showing Locations of Geofenced SmartZones)
  - Whirlpool Connected Appliance APIs
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
  ▪ Meet Initially by Tomorrow Afternoon
  ▪ Lab Machine Assignments in Lab
  ▪ Start Configuring Lab Machines
  ▪ Team Photos
    o Wednesday 09/04, After All-Hands Meeting
    o Dress Casual (But Appropriate)

• Client
  ▪ Contact by Email by Tomorrow COB
  ▪ Conference Call by Phone by Friday or Tuesday
  ▪ 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 on iMacs and MBPs
  ▪ Run OSX
  ▪ Install VMware Fusion (from here)
  ▪ Create Virtual Machines As Needed
    o Windows XP, Vista, 7, 8
    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

• 09/11: Status Report Presentations
• 09/16: Project Plan Presentations
• 10/14: Alpha Presentations
• 11/11: Beta Presentations
• 12/02: Project Videos
• 12/04: All Deliverables
• 12/05: Design Day Setup
• 12/06: 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
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 Malcolm
• 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 =
  \[(\text{Individual Total}) + (\text{Team Total}) \times (\text{Team Contribution}) / 10.0\]

• 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
    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 Malcolm
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 Malcolm

The Capstone Experience

Capstone Overview
Design Day

• College of Engineering Event
  ▪ Engineering Building
  ▪ Friday, December 6, 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?