

MICHIGAN STATE  
UNIVERSITY

# 01/09: Capstone Overview

## The Capstone Experience

Dr. Wayne Dyksen

Department of Computer Science and Engineering  
Michigan State University

Spring 2011



*From Students...  
...to Professionals*

# Capstone Overview

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## ➤ 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](http://capstone.cse.msu.edu)
  - Check it often.



# Course Goals

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- 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

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



# Project Deliverables

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

See [Major Milestones](#).



# All-Hands Meetings

- Presentations By
- Professor
- Teams
  - Status Reports
  - Formal Presentations
    - Project Plan
    - Alpha
    - Beta
  - Project Videos
- Guest Speakers



# All-Hands Meeting Agendas

- 01/09: Course Overview
- 01/11: Project Plan
- 01/16: (Martin Luther King Day, No Meeting)
- 01/18: Project Schedule and Risk
- 01/23: Team Status Report Presentations
- 01/25: Prototyping
- 01/30: Team Project Plan Presentations
- 02/01: Team Project Plan Presentations
- 02/06: Team Project Plan Presentations
- 02/08: Team Project Plan Presentations
- 02/13: Resume Writing and Interviewing
- 02/15: Creating and Giving Presentations
- 02/20: Team Alpha Presentations
- 02/22: Team Alpha Presentations
- 02/27: Team Alpha Presentations
- 02/29: Team Alpha Presentations
- 03/05: (Spring Break, No Meeting)
- 03/07: (Spring Break, No Meeting)
- 03/12: Design Day and the Project Videos
- 03/14: Camtasia Demo
- 03/19: Team Status Reports
- 03/21: Team Status Reports
- 03/26: Team Status Reports
- 03/28: Team Status Reports
- 04/02: Team Beta Presentations
- 04/04: Team Beta Presentations
- 04/09: Team Beta Presentations
- 04/11: Team Beta Presentations
- 04/16: Ethics and Professionalism
- 04/18: Intellectual Property
- 04/23: Project Videos
- 04/25: Project Videos and All Deliverables
- 04/26: Design Day Setup
- 04/27: Design Day
- 05/01: Project Videos





# CSE498 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
- 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

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✓ Course Logistics

➤ Client Projects

• Course Logistics (Continued)



# Team / Project Generalities

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- 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

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- 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...
    - Languages
    - Environments
    - API's
    - SDK's
    - Processes
    - Protocols
    - Etc.
  - Project Management
  - Etc...



# Project Specifics

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- Vary
  - Type
  - Current State of Specificity
- Challenge
  - Connect with Client
  - “Nail Down” the Project
    - Hard Enough
    - Not too Hard
    - Avoid Feature Creep
  - Course Feature, Not Bug



# Project Teams/Clients

- Team Auto-Owners
- Team Boeing
- Team Dow
- Team GE Aviation
- Team Meijer
- Team Motorola Mobility
- Team Mozilla
- Team Plex Systems
- Team Raytheon
- Team Spectrum Health
- Team TechSmith
- Team Urban Science





# Team Auto-Owners

## Project Overview

### Enterprise Learning Management System

- Functionalities
  - Manage Continuing Education and Certification
  - For Auto-Owners Associates Throughout the Enterprise
  - Customize and Extend Moodle LMS
- Features
  - Show Complete Catalog of Courses
  - View Transcripts by Associate
  - Support Registration with Waiting Lists
  - Suggest Courses and Certifications
  - Support Various User Roles
  - Track Resources Checked Out to Associates
  - Integrate with External Vendors (Kaplan, AICPCU)
- Technologies
  - Moodle Learning Management System
  - PHP 5, JavaScript
  - Microsoft SQL Server or MySQL
  - Microsoft Access



Lansing, Michigan



# Team Boeing

## Project Overview

### Design, Fly and Battle Flight Simulator

- Functionalities
  - Flight Simulator Game
  - Players Compete on Obstacle Courses
  - With Airplanes Designed by Players
- Features
  - Allow 2 to 5 Players Per Team
  - Ability to Trade Off Various Airplane Features
  - Support Joystick, Keyboard and Mouse
  - Accurate Aerodynamic Physics of Flight
  - Ability to Shoot Paintballs and See Damage
  - Secure with Encrypted Networking
- Technologies
  - C++, Python
  - Jenkins, QT Creator
  - Open Scene Graph (OSG)
  - Blender (3D Modeling)
  - Secure Internetworking, Encryption



# Team Dow

## Project Overview

### Global Emissions Inventory Water Dashboard

- Functionalities
  - Visualize Global Emissions Inventory Water Data
  - Interactive World Map
  - Dual Display
    - Tabular Data
    - Graphical Mapping
- Features
  - Web-Based Dashboard
  - Display Water Data, Basin Names and Stressed Areas
  - View by Sites or Geographical Regions
  - Filter by Water Stressed Basins
  - Drill Down by Water Intake Type
- Technologies
  - Microsoft Visual Studio 2010
  - Microsoft SharePoint 2010
  - SQL Server Reporting Services



Midland, Michigan

# Team GE Aviation Project Overview

## Mobile Avionics Weather

- Functionalities
  - Display Weather Maps
  - For Aviation Industry
  - On Mobile Devices
    - Apple iPad
    - Google Android Tablets
- Features
  - Intuitive, Easy to Use Interface
  - Visualize Complex Weather Data
  - Support Multiple Users
    - Pilots
    - Air Traffic Controllers
    - Ground Controllers
- Technologies
  - Apple iOS iPhone/iPad SDK, C, Objective-C
  - Google Android SDK, Java



Grand Rapids, Michigan



# Team Meijer

## Project Overview

### Food Safety Audits and Reports

- Functionalities
  - Food Safety Inspection System
  - Used by Meijer Team Members
  - For Meijer Stores
- Features
  - HTML5-Based Web App
  - Support Touchscreen Tablets
    - iPad
    - Android
  - Various User Levels
    - Store Director Audit
    - Store Assessment
    - Store Audit
- Technologies
  - Microsoft SQL Server 2008 R2, SQL Server Reporting Services
  - Microsoft C#/.NET
  - CSS, HTML 5
  - XML (Extensible Markup Language)
  - SOAP (Simple Object Access Protocol)



**meijer**<sup>®</sup>

Grand Rapids, Michigan

# Team Motorola Mobility

## Project Overview

### Context Driven Content Delivery

- Functionalities
  - Provide Enhanced Television Program Information
    - Actor Biographies
    - Upcoming Actor Appearances on Talk Shows
    - Merchandise Seen on Show
  - Pushed to Mobile Devices
    - While Consumer Watches Content
    - Presented in Non-Intrusive Manner
- Features
  - End-to-End Framework
  - Extend Existing Sync Framework
    - Collect and Persist Contextual Data
    - Collect and Resolve Location Context and Content
    - Present Secondary Content to End User
    - Permit Authoring of Rules
    - Collect and Persist Application Usage
- Technologies
  - Android Development (Java)
  - Java (Servlets, JEE, JSE)
  - Web Development (RESTful, XML, JSON, JavaScript, jQuery)
  - Database (iBatis, Hibernate, MySQL)
  - Messaging using Active MQ
  - Hbase, Hadoop
  - Synchronized Program Content Delivery, Fall 2011



**MOTOROLA**

Libertyville, Illinois

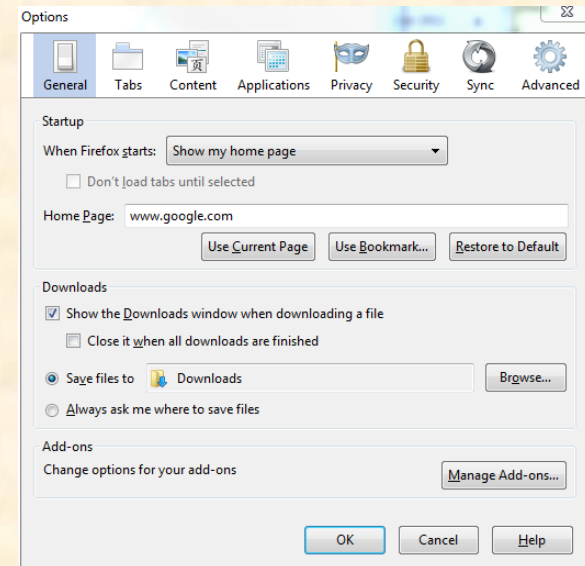


# Team Mozilla

## Project Overview

### In-Content Preferences for Firefox

- Functionalities
  - Set Firefox Preferences
  - Within Firefox Tab
    - Eliminate Popup Window
    - Use Content Area
- Features
  - Seamless User Experience Across Devices
  - Improve User Interface
  - Integration of all Customizations into Preferences
    - Add-On Manager
    - Toolbar Layout
- Technologies
  - CSS, HTML
  - XML User Interface Language (XUL)
  - JavaScript (Including New Language Features)
  - Mercurial
  - Bugzilla

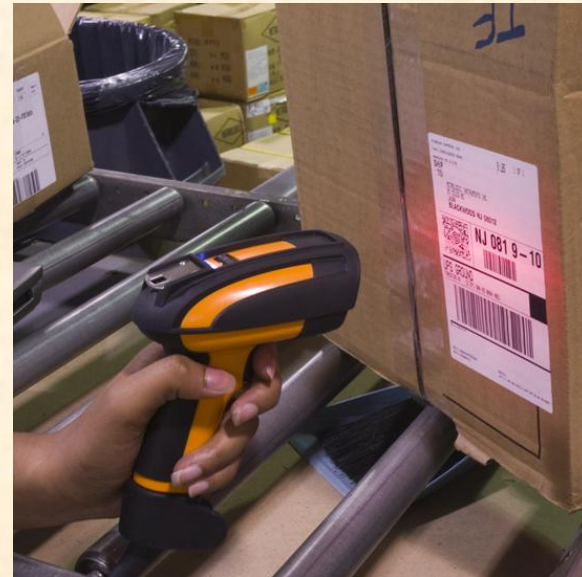


# Team Plex Systems

## Project Overview

### HTML5-Based WYSIWYG Label Designer

- Functionalities
  - Design Labels
  - For Manufacturing Companies
  - To Label Products For End-Customers
- Features
  - What You See Is What You Get (WYSIWYG)
  - Web and Cloud-Based
  - Support
    - Text Labels and Data
    - Barcoded Data
      - ❖ 3 of 9
      - ❖ 2D
      - ❖ Code-128
    - Lines and Images
- Technologies
  - CSS, HTML5 JavaScript, AJAX
  - JQuery
  - Microsoft SQL Server 2008
  - Microsoft C#/.NET, ASP.NET





# Team Raytheon

## Project Overview

### Android Secure VOIP Communications System

- Functionalities
  - Command and Control Communications
  - Group Voice Collaboration
  - On Android-Based Handheld Devices
  - Via Secure Voice Over Internet Protocol (VOIP)
- Features
  - Select Users or Groups
  - Capture Recordings in Case Folder
  - Integrate with Total Battle Space Awareness (TBSA)
  - Configure MX4025 Radios with Voice Commands
  - Secure with AES 256 Encryption
- Technologies
  - Voice over Internet Protocol (VOIP)
  - Google Android SDK, Java
  - Voice XML, Adobe Flex
  - Speech Recognition
  - Secure Internetworking, Encryption
  - Bluetooth Interface Control



# Raytheon

Fort Wayne, Indiana



# Team Spectrum Health Project Overview

## Web Applications for Healthier Communities

- Functionalities
  - Web-Based Mobile Evaluation System
  - For Spectrum's Healthier Communities Program
    - Provides Health Care to Under-Served People
    - Throughout Western Michigan
  - Collect and Analyze Client Information
- Features
  - Support for Mobile Tablets (iPad and Android)
  - Adherence to HIPPA Guidelines
  - Encryption of Protected Health Information System
  - Integration with Spectrum's Existing Systems
    - C-Trac
    - Enterprise Data Warehouse
- Technologies
  - Microsoft IIS, SharePoint, Active Directory
  - CSS, HTML, jQuery
  - Microsoft C#/.NET, ASP.NET MVC 3.0
  - Microsoft SQL Server, SQLMetal, LNQ



# Team TechSmith

## Project Overview

### Mobile Smart Video Player

- Functionalities
  - Video Player for iPhone and iPad
  - Rich Playback Experience
    - Enhanced Navigation
    - Leverage Metadata
- Features
  - Table of Contents and Hotspots
  - User Settable Bookmarks
  - Timed Text Captions Displayed During Playback
  - Support For Panning and Zooming
  - Varied Playback Speeds with Audio Pitch Adjustments
  - Aggregation of Metadata from Multiple Viewers
- Technologies
  - Apple iOS iPhone /iPad SDK, C, Objective-C
  - TechSmith Camtasia Studio
  - Microsoft C#/.NET, ASP.NET
  - Web Services (RESTful)



# Team Urban Science

## Project Overview

### Infographic Generator

- Functionalities
  - Visualize Data and Information
    - Graphically
    - Compactly
    - Creatively
  - Based on Key Performance Indicators (KPIs)
- Features
  - Dynamic User Selections
    - Key Performance Indicators
    - Timeframes
  - Display Engaging Graphics
    - Scalable
    - Varied
  - Support Drill Down into KPIs
- Technologies
  - Microsoft C#/.NET, ASP.NET
  - JavaScript
  - CSS, HTML5
  - SQL Server



URBAN SCIENCE.  
Detroit, Michigan



# First Assignments

- Read the Syllabus
- Check out the Lab
  - 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 Tuesday Afternoon
  - Lab Machine Assignments in Lab
  - Start Configuring Lab Machines
  - Team Photos Wednesday After All-Hands Meeting
- Client
  - Contact by Email by Tuesday COB
  - Conference Call by Phone Tuesday or Wednesday
  - Review Project Proposal



# Capstone Overview

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✓ Course Logistics

✓ Client Projects

➤ **Course Logistics (Continued)**



# Lab Machines

- Three Per Team
  - Rack-Mounted Dell Server
  - 27" iMac
  - 13" MacBook Pro
- Operating Systems
  - Run OSX
  - Install VMware Fusion (from [here](#))
  - Create Virtual Machines
    - Windows XP, Vista, 7  
(Windows 7 Professional SP1 DVDs in Lab)
    - Linux





# 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
  - Bed, Bath & Beyond
  - Get 20% Off Coupon
- Game Playing
  - Not On Monitors Facing Hallway
  - Not If Other Team Members Need Machine



# Expectations & Workload

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- 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
- 01/30: Project Plan Presentations
- 02/20: Alpha Presentations
- 04/02: Beta Presentations
- 04/23: Project Videos
- 04/25: All Deliverables
- 04/26: Design Day Setup
- 04/27: 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 Final Project Video Viewing
    - Design Day
- Do NOT Schedule Interviews  
Do NOT Schedule ANYTHING



# Team Organization

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- Up to Each Team
- Organize into Roles
  - Client Contact
  - Program Manager
  - Developer
  - Tester
  - Systems Administrator
  - Etc...
- Everyone Must Make Technical Contributions



# Team Dynamics

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- 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

(1 of 3)

• Team (70%)	
▪ Project Plan Document & Presentation	10
▪ Alpha Presentation	10
▪ Beta Presentation	10
▪ Project Video	10
▪ Project Software & Documentation	25
▪ Design Day	<u>05</u>
▪ Total	70
• Individual (30%)	
▪ Technical Contribution	10
▪ Team Contribution	10
▪ Team Evaluation	05
▪ Meeting Attendance	<u>05</u>
▪ Total	30



# Grading

(2 of 3)

- 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.





# Grading

(3 of 3)

- 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

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- 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 MSU
  - Client May Request
    - Right to Use
    - Assignment of Ownership
    - Etc.
- NDA: Non-Disclosure Agreement
  - May Be Required by Client
  - You will...
    - ...respect/protect intellectual property.
    - ...respect/protect source code.
    - ...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
    - Fragments
    - Libraries
    - 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
  - MSU Union
  - Friday Morning, April 27, 2011
- Displays (Booths) of Design Projects
  - CSE Capstone
  - ECE Capstone
  - ME Capstone
  - Etc...
- Presentations and Awards
  - Panel of Judges
  - CSE Team Project Videos





# VISA

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- Verified Individualized Services and Accommodations
- Let us know immediately.
- We will work with you.

# Office Hours

- Any Time...
  - Visit
    - 3149 EB
    - 411 Nat Sci
  - Call
    - EB: 353-5573
    - Nat Sci: 884-2469
  - Send Email ([dyksen@cse.msu.edu](mailto:dyksen@cse.msu.edu))
- Make Appointment



# Capstone Overview

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✓ Course Logistics

✓ Client Projects

✓ Course Logistics (Continued)

Questions?



**MICHIGAN STATE**  
UNIVERSITY

# 01/11: Project Plan

## The Capstone Experience

Dr. Wayne Dyksen

Department of Computer Science and Engineering  
Michigan State University

Spring 2012



*From Students...  
...to Professionals*