MICHIGAN STATE
U N I V E R S I T Y

01/10: 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

➢ Course Logistics

• Client Projects

• Course Logistics (Continued)

CSE 498, Collaborative Design

• "The Capstone Experience"
• Instructors
  ▪ Dr. Wayne Dyksen ("Dr. D.")
  ▪ Stephen Paslaski
• Class Meetings
  MW, 3:00-3:50pm, 2400 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
  ▪ 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
- Professor
- Teams
  - Status Reports
  - Formal Presentations
    - Project Plan
    - Alpha
    - Beta
  - Project Videos
- Guest Speakers

All-Hands Meeting Agendas

- 01/10: Course Overview
- 01/12: Project Plan
- 01/17: (Martin Luther King Day, No Meeting)
- 01/19: Project Schedule and Risk
- 01/24: Team Status Reports
- 01/26: Prototyping
- 01/31: Team Project Plan Presentations
- 02/02: Team Project Plan Presentations
- 02/07: Team Project Plan Presentations
- 02/09: Team Project Plan Presentations
- 02/14: Resume Writing and Interviewing
- 02/16: Creating and Giving Presentations
- 02/21: Team Alpha Presentations
- 02/23: Team Alpha Presentations
- 02/28: Team Alpha Presentations
- 03/02: Team Alpha Presentations
- 03/07: (Spring Break, No Meeting)
- 03/09: (Spring Break, No Meeting)
- 03/14: Design Day and the Project Videos
- 03/16: Camtasia Demo
- 03/21: Team Status Reports
- 03/23: Team Status Reports
- 03/28: Team Status Reports
- 03/30: Team Status Reports
- 04/04: Team Beta Presentations
- 04/06: Team Beta Presentations
- 04/11: Team Beta Presentations
- 04/13: Team Beta Presentations
- 04/18: Ethics and Professionalism
- 04/20: Intellectual Property and Copyright
- 04/25: Team Project Videos
- 04/27: Team Project Videos and All Deliverables
- 04/28: Design Day Setup
- 04/29: Design Day
- 05/03: Team Project Videos

CSE498 Lab

- 3352 EB
- Door Lock
  - Electronic Keypad
  - Code = ####
- Systems
  - Two PC's per Team
    - Server
    - Development Machine
  - Team 100% Responsible
    - Building
    - Maintaining
    - Securing
    - Backing Up
- Books

- Conference Area
  - Team Meetings
  - Client Conference Calls
  - Google Conference Calendar
- Appliances
  - Refrigerator
  - Microwave
  - Coffee Maker
- Lockable Storage

Scheduled Lab Times

- No Formal Lab Sessions
- "Credit" for Scheduled Weekly Meetings
  - Team Meeting
  - Client Conference Call
  - Triage Meeting with Stephen
- Meeting Times TBA With
  - Team
  - Client
  - Stephen
- 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 Level of Difficulty
  - Hard Enough
  - But Not too Hard
- Deliverable
  - To the Client
  - By the Due Date
- Documentation
  - System Administrator Manual
  - User Manual

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

- 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 Chrysler
- Team Dow
- Team GE Aviation
- Team Medtronic
- Team Meijer
- Team Motorola Mobility
- Team Raytheon
- Team Sparrow
- Team TechSmith
- Team Urban Science

Team Auto-Owners Insurance
Project Overview

Agent Multimedia Advertisement Builder
- Build Auto-Owners Advertisements
  - Customized by and for Independent Agents
  - Utilize Corporate Templates
- User Features
  - Upload Text, Photos, Images, Audio, and Video
  - Save , Open , Edit, Produce, and Submit
  - Shopping Cart
- Administrative Features
  - Manage User Profiles
  - Manage Ad Templates
  - Review, Approve , and Track Ads
- Technologies
  - Java / Eclipse
  - Struts 2
  - DB2 (Relational Database)

Team Boeing
Project Overview

BAPS: Battle Aircraft Position Share
- 3D Game
  - Two Teams
  - Destroy Targets of Opposing Team
  - Use Aircraft with Various Capabilities
- Features
  - Similar to Chess and Battleship
  - Variety of Targets, Radars, and Weapons
  - Weather
  - Network-Based with Encryption
- Technologies
  - C++ and Python
  - OpenSceneGraph (OSG)
  - Blender (3D Modeling)
  - Internetworking
  - Windows XP, Windows 7

Dr. Wayne Dyksen
Professor of Computer Science and Engineering

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Michigan State University
East Lansing, Michigan 48824

Team Chrysler
Project Overview

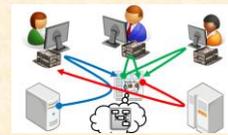**Fleet Auction Distribution and Sale Optimizer**
- Fleet
  - Vehicles
    - Group of Vehicles Cars, Trucks, Etc.
    - Owned by Company, Dealers, or Daily Rental Companies
  - Marshaling Yards
    - Returned Fleet Vehicles
    - Assigned to Auction by Chrysler
- Optimize Fleet Auction Sales Net Revenue
  - Distribute Vehicles Geographically
  - Maximize Net Sales Revenue Based On
    - Current Vehicle Location
    - Historical Sales Data
    - Transportation Costs
- Features
  - Web Application
  - Form and Map Interface
  - Drag-and-Drop Vehicle from Site to Site
  - Revenue Models and Forecast Reports
- Technologies
  - Java (or JavaScript)
  - SQL (Database Structured Query Language)
  - Google Maps

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Team Dow
Project Overview

Business Approval System
- Business Workflow Approval
  - Sequence of Connected Steps
  - Used to Approve Business Requests
- Spending Delegation of Authority
  - Authorization to Spend Money
  - Based On
    - Requester
    - Sequence of Authorized Approvers
- Features
  - Administrative and User Interfaces
  - Device Agnostic
    - Web Browsers
    - Mobile Devices
  - Microsoft SharePoint Farm Solution
- Technologies
  - Microsoft SharePoint 2010
  - Web Application Programming
  - Blackberry (Java)
  - iPhone and iPad (Objective-C)

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Team GE Aviation
Project Overview

MSU Next Generation Flight Deck
- Pilot Tasks
  - Aviate
  - Navigate
  - Communicate
  - Manage Systems
- MSU Capstone Flight Deck, V1
  - Integrate Previous Capstone Projects
  - Add New Features and Functionality
  - Integrate with X-Plane
- Aviation Use Case
  - Real Life
  - Demonstrate Improved
    - Efficiency
    - Safety
- Technologies
  - X-Plane
  - Previous Capstone Projects
    - Synthetic Vision Display, Fall 2009
    - Lateral Map Display, Spring 2010
    - Super Synoptics, Fall 2010
  - Open GL, GL Studio, GLUT, GLEW

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Team Medtronic
Project Overview

Cloud-Based Athletics Operations Center
- University Athletics Information Portal
  - Resources
    - People (Coaches, Athletes, Managers, Trainers, Etc.)
    - Facilities (Practice, Training, Meeting, Etc.)
    - Etc.
  - Information
    - Schedules (People, Facilities, Teams, Etc.)
    - Athlete Health Records
    - Videos (Scouting, Training, Etc.)
    - News Feeds
    - Weather and Travel Conditions
    - Etc.
- User Features
  - People Presence
  - Calendaring, Emailing, Instant Messaging
  - Video Conferencing
  - Etc.
- Technologies
  - ASP.net, C#.net
  - Microsoft Office 365 Cloud Services
  - Microsoft Azure Cloud Services
  - Microsoft HealthVault

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Team Meijer
Project Overview

Consumer Payroll Check Cashing Analytics
- Consumer Payroll Check Cashing Service
  - In Store At Service Desk
  - Users Must Enroll 7 Days in Advance
  - Uses Third Party Authentication Service (Certegy)
- Design and Implement Reporting Features
  - Ad Hoc Reports by Customer, Store, Date, Etc.
  - Fraud Analysis
    - Reports by Store, Groups of Stores, and All Stores
    - Upload and Store Images of Returned Checks
    - Print Automated Prosecution Package for Law Enforcement
  - Predictive Alerts Engine
  - Transaction Trending
- Technologies
  - Microsoft Visual Studio 2010
  - Microsoft Office 2007, 2010
  - Microsoft SQL Server 2008
  - Microsoft SQL Server Reporting Services (SSRS)

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Team Motorola Mobility
Project Overview

Companion Authoring System
- Enhanced Program Guides for Mobile Devices, Fall 2010
  - Provide Enhanced Information
    - Actor Biographies
    - Merchandise Seen on Show
    - Etc.
  - Pushed to Mobile Devices
    - While Consumer Watches Content
    - Non-Intrusive Manner
- Project Extensions
  - Life Cycle Management System
    - Network Operators (e.g., Comcast)
    - Content Providers (e.g., NBC Universal, Disney)
  - Secondary Metadata
    - Triggers
    - Synchronization
    - Display in Selectable Layers
  - Consumer Interactivity with Metadata
- Technologies
  - Java (Servlets, JEE, JSE)
  - Web Services (RESTful)
  - Web Development (XML, JSON, JavaScript, GWT)
  - iPhone, iPad Development (Objective-C)
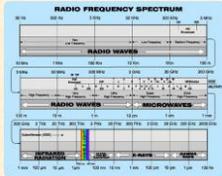 - Android Development (Java)

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Team Raytheon
Project Overview

Radio Spectrum Analyzer for Mobile Platforms
- Optimize Use of Radio Frequency Spectrum
  - Identify and Analyze Used Frequency Ranges
  - Recommend Frequency Range to Use
    - To Maximize Bandwidth and Minimize Noise
    - For Tuning and Controlling Military Radios
    - Based on Spectrum Allocation Policies
- Design Features
  - User Interface
    - Manage Spectrum Allocation Policies
    - Display Frequency Usage and Assignments
  - Platform Independent
    - Embedded Platforms (e.g., Radios)
    - Android Smartphones
    - Laptops and iPad-Like Devices
  - Web Service to Manage Spectrum
    - Usage and Assignments
    - Allocation Policies
  - Interoperable with C
- Technologies
  - C, C++
  - Web Application Programming
  - Web Services
  - Raytheon TacLink® EZConnect™

Raytheon

Team Sparrow
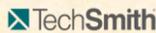## Project Overview

iSupport Center
- Medical Informatics at Sparrow
  - 400+ Applications and Systems
    - Patient Medical Information
    - Schedules (Doctors, Patients, Operating Rooms)
    - Etc.
  - Delivery Critical (Matter of Life and Death)
    - Accurately, Timely, and Securely
    - Anytime and Anywhere
- iSupport Center
  - Manage IT Systems and Services
  - Improve Reliability and Response Time
  - Features
    - Catalogue
    - Maintain Licensing and Updates
    - Report, Assign, Track, and Resolve Problems
    - Etc.
- Technologies
  - Microsoft .NET
  - Microsoft SharePoint
  - Microsoft SQL Server
  - Symantec Altris Management Suites

Sparrow

Team TechSmith
Project Overview

WhiteCaps: Mobile Whiteboard Capture Solution
- TechSmith Screen Capture Solutions
  - Jing
  - Snagit
  - Camtasia
- Whiteboard Capture Solution
  - Capture, Annotate and Share
  - Via Mobile Phone and the Cloud
- Features
  - User Accounts
  - Upload, Share, Annotate, and View
  - Contextual Metadata
    - Location, Date, and Time
    - QR (Quick Response) Codes
  - Content History and Notifications
  - Photo Deskewing and Stitching
- Technologies
  - Apple iOS iPhone SDK, C, Objective-C
  - Google Android SDK, Java
  - Microsoft .NET, C#, WPF
  - Microsoft Azure Cloud Computing and Web Services

TechSmith

Team Urban Science
Project Overview

Bringing LeadVision to the Web
- LeadTV
  - Visualization of Automotive Sales Leads
  - "TV" Model
    - Client-Based Application
    - Displayed on Dedicated Monitor
    - Little or No Interaction
- Web LeadTV
  - Browser-Based
  - Enhanced Capabilities and Usability
- Features
  - Customize Leads Visualized
    - By Brands and/or Models
    - By Top 5
    - Etc.
  - Zoom and Pan
  - Time Shifting
  - Etc.
- Technologies
  - Web Application Programming
  - Java and/or Silverlight
  - SQL Databases

URBAN SCIENCE

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 Wednesday or Thursday
  - Review Project Proposal

Capstone Overview

✓ Course Logistics

✓ Client Projects

➢ Course Logistics (Continued)

Lab Stuff

- Security
  - Cabinets
  - Doors
- Food Stuff
  - Coffee Maker
  - Refrigerator
  - Microwave
- Machines
  - Desktops
    - Running
    - Screen Saver
  - Rack-Mounted
    - 1 Per Team
    - Talk with Stephen

Course Environment

- Business-Like
- Team
  - External Software Development Company
  - Internal Software Development Team
- Dr. D. & Stephen
  - Are Your
    - External Paying Clients
    - Internal Managers
  - Expect Results
    - On Time
    - No Excuses

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

- 01/24: Status Reports
- 01/31: Project Plan Presentations
- 02/21: Alpha Presentations
- 03/21: Beta Presentations
- 04/25: Project Videos
- 04/27: All Deliverables
- 04/28: Design Day Setup
- 04/29: 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   ⎤— Do NOT Schedule Interviews
  - Design Day ⎦

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 Stephen
- 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	05
Total	70

- Individual (30%)

Technical Contribution	10
Team Contribution	10
Team Evaluation	05
Meeting Attendance	05
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, or
  - visa status.

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
    - 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

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 Stephen

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 Stephen

Design Day

- College of Engineering Event
  - MSU Union
  - Friday Morning, April 29, 2011
- 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
    - 411 Nat Sci
  - Call
    - EB: 353-5573
    - Nat Sci: 884-2469
  - Send Email (dyksen@cse.msu.edu)
- Make Appointment

Capstone Overview

✓ Course Logistics

✓ Client Projects   Questions?

✓ Course Logistics (Continued)

MICHIGAN STATE
UNIVERSITY

01/12: Project Plan

The Capstone Experience

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Department of Computer Science and Engineering
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