Course Objectives

- Complete a Large Software Project
  - Architect
  - Implement
  - Test
  - Document
  - Deliver
- For a Client
- From “Scratch”
- In 15 (Short) Weeks
Course Objectives

- Build and Administer Systems
- Use Advanced Tools And Environments
- Integrate Computer Science Knowledge
Course Objectives

- Work In A Team Environment
- Develop Communication Skills
- Develop Some Interview Talking Points
All-Hands Meetings

- MW, 3:00-3:50pm, 2243 EB
- Presentations By
  - Professor
  - Teams
    - Status Reports
    - Demonstrations
    - Formal Presentations
    - Project Videos
  - Guest Speakers
All-Hands Meeting Agendas

01-07: Course Overview / Skills Inventory
01-09: Technical Specifications / Team Assignments
01-14: Project Schedule & Risk
01-16: Teams: Status Reports
01-21: Martin Luther King Day, No Meeting
01-23: Prototyping
01-28: Teams: Technical Specifications / Schedule
01-30: Teams: Technical Specifications / Schedule
02-04: Teams: Technical Specifications / Schedule
02-06: Teams: Technical Specifications / Schedule
02-11: Resume Writing & Interviewing
02-13: Creating & Giving Presentations
02-18: Teams: Alpha Demonstrations
02-20: Teams: Alpha Demonstrations
02-25: Teams: Alpha Demonstrations
02-27: Teams: Alpha Demonstrations
03-03: Spring Break, No Meeting
03-05: Spring Break, No Meeting
03-10: Ethics
03-12: Intellectual Property and Copyright
03-17: Teams: Beta Demonstrations
03-19: Teams: Beta Demonstrations
03-24: Teams: Beta Demonstrations
03-26: Teams: Beta Demonstrations
03-31: The Project Video
04-02: Camtasia Demo
04-07: Teams: Progress Reports &/Or Demos
04-09: Teams: Progress Reports &/Or Demos
04-14: Teams: Progress Reports &/Or Demos
04-16: Teams: Progress Reports &/Or Demos
04-21: Teams: Project Videos
04-23: Teams: Project Videos
04-24: Design Day Setup
04-25: Design Day
04-30: Teams: Project Videos
The Computer Science Senior Capstone Experience

CSE498 Collaborative Design
Department of Computer Science and Engineering
Michigan State University
Spring 2008
Professor Wayne Dyksen
<table>
<thead>
<tr>
<th>Products</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life</td>
<td>Protecting your family</td>
</tr>
<tr>
<td>Home</td>
<td>Property &amp; Liability</td>
</tr>
<tr>
<td>Car</td>
<td>Security while on the road</td>
</tr>
<tr>
<td>Business</td>
<td>Guarding your investment</td>
</tr>
</tbody>
</table>

Auto-Owners Insurance

Customer Center | Career Center | Media Center

Our Products | Find an Agency | Corporate Information | Customer Claims

The "No Problem" People®

Have questions? Want coverage? See why thousands of customers nationwide rely on Auto-Owners for "No Problem" service in life, home, car, or business insurance.
Project Overview

Vendor Tracking System

- Security System to Track Vendors Visiting Auto-Owners
  - Application Runs on Lobby Desktop
  - Vendor Signs In
    - Vendor Name
    - Vendor Company
    - Auto-Owners Person Visiting
    - Etc
  - System Prints Badge with Barcode
  - Visitor Signs Out by Scanning Badge Barcode

- Technologies
  - .NET
  - C#
  - SQL Server
  - Etc...
Team 1 Auto-Owners Insurance Technical Specifications Presentation
Team 1 Auto-Owners Insurance

Database Schema
Team 1 Auto-Owners Insurance

Web Page Flow

- Login
  - Secretary
  - Admin
  - Manager

- NMA
  - Access Page
  - Edit Page Access

- Reports
  - Check-in/Checkout
  - Visitor Data
  - Appointment Detail

- Register
  - Self
  - Others
  - Others Visits

- Calendar View
  - View/Edit Your Visits
  - View and Edit Others Visits

- Print Barcodes
  - Assign Barcode
  - Release Barcode
  - Edit/Update Data
  - View/Edit Your Visits
  - Register Self
  - View/Edit Others Visits

- Access
  - View Your Visits
  - View All Visits

- Admin
  - View and Edit Your Visits

- Secretary
  - Assign Barcode

- Manager
  - View/Edit Others Visits
  - Register Others

- View
  - Edit
  - Update

- View
  - Edit

- The CSE Senior Capstone Experience
Team 1 Auto-Owners Insurance
Homepage Mockup
Team 1 Auto-Owners Insurance Beta Demonstration
Team 2 Boeing

Project Overview

Poseidon Executor 2008

- Visualize Flight of P-8A Poseidon Submarine Hunter
- Poseidon Aircraft CIGI Integration (PACI)
  - Create Graphical Models
    - P-8A Poseidon Aircraft
    - Submarines
  - Display Aircraft In Flight
    - Automated: Input from Data File
    - Operator: Input from User (Keyboard or Joystick)
- IOS Execution Tool (IOSET)
  - Process Management
  - Isolated Process Launcher
  - Visual Studio Solution Builder
- Technologies
  - C/C++
  - CIGI (Common Image Generator Interface)
  - DIS (Distributed Interactive Simulation)
  - Etc...
Team 2 Boeing
Technical Specifications Presentation
Team 2 Boeing

Functional Specifications

PACI
- IG – Visualization of the Flight Simulator
- Host – Configuration/Control of Simulator
- Communication through CIGI

IOS Execution Tool
- End User Interface
- Open/Kill Processes
- Manages Shared Memory
Risks

- Shared Memory
  - We need to set up File Mapping to share data and communicate between processes.
  - This is the main objective of the IOS team right now. We are in the process of experimenting with this by making simple applications that share memory and figuring out how to implement that into our simulator.

- Process Management
  - Making the IOS capable of launching any process and taking that processes console output and printing it within a tab.
  - We can currently retrieve a console applications output and print it within a tab but we need to make this update immediately and the main focus now is on making this capability dynamic.
Team 2 Boeing
Architecture Illustrated

The CSE Senior Capstone Experience
Team 2 Boeing
Beta Demonstration
Team 2 Boeing
Beta Demonstration
Team 2 Boeing
Beta Demonstration
Team 3 Ford Team Photo

Nathan Crosty
Austin Drouare
Colin Nemchik
Devin Schnepp
Team 3 Ford

Project Overview

Ford Sensor Showroom

- Automatically Measure Interest in Vehicles
  - Auto Shows
  - Car Dealerships
- Use Wireless Sensors
  - Count
    - Door Opened
    - Hood Popped
    - Trunk Unlatched
    - Etc...
  - Time
    - Standing by Vehicle
    - Sitting in Seat
    - Looking at Engine
    - Etc...
- Technologies
  - Crossbow iMote2 Wireless Sensors
    - Temperature, Humidity, Light
    - Motion (By 3-Axis Accelerometer)
  - .NET Micro Framework
  - Etc...
System Components

- Hardware Platforms
  - iMote2 wireless sensors / receiver
  - Web/Database server
  - Sensor hub PC

- Software Platforms / Technologies
  - .Net Micro / C#
  - MySQL database
  - Apache web server

Team 3 Ford
Technical Specifications Presentation
System Components

- Hardware Platforms
  - iMote2 wireless sensors / receiver
  - Web/Database server

- Software Platforms / Technologies
  - .Net Micro / C#
  - MySQL database
  - Apache web server
Team 3 Ford
Technical Specifications Presentation
Team 3 Ford

Architecture Illustrated
Team 3 Ford
Beta Demonstration
Team 3 Ford
Beta Demonstration
Team 3 Ford
Beta Demonstration
For two weeks each year the world watches the US Open
From real-time stats to SlamTracker, IBM serves up the action
Take a look
Project Overview

POWER Hypervisor hcall Testing Tools

- IBM POWER Hypervisor
  - Virtual Machine Environment
  - Supports Multiple Processors
    - Partition Processors
    - Assign Particular Processor to Particular Virtual Machine

- hcall Testing Tools
  - 100’s of Hypervisor hcall System Calls
  - Testing Tools
    - Make hcall Calls
    - Test Return Values Against Known Return Values
    - Automate

- Technologies
  - Hypervisor
  - Linux Kernel
  - C/C++
  - Perl Scripting
  - X Window System
Team 4 IBM
Technical Specifications Presentation
Team 4 IBM

Test Harness Design
Team 4 IBM

Hardware Interconnections

- Machines here at MSU
- AIX Machine at IBM
- HMC Linux Machine
- Multiple OS Images on Partitions
  - Hypervisor
  - Hardware
Team 4 IBM

Proposed Graphical User Interface
Team 4 IBM

Proposed Graphical User Interface

<table>
<thead>
<tr>
<th>HCall Test Suite</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>File</strong></td>
</tr>
<tr>
<td><strong>Control</strong></td>
</tr>
<tr>
<td>HCalls Samples</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Name:**

HCall Sample 1

**Description:**

A test that will connect to a partition allocate memory and run an H-call

---

**Standard Out**

Fri Jan 25 18:49:50 EST 2008: Unable to access jarfile randomoutput.jar
Team 4 IBM
Beta Demonstration
<table>
<thead>
<tr>
<th>Control</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module</td>
<td>OS PHYP HCall Test Module</td>
</tr>
<tr>
<td>Module Description</td>
<td></td>
</tr>
<tr>
<td>Run this module’s tests</td>
<td>2 times</td>
</tr>
<tr>
<td>Test Case</td>
<td>Page Init</td>
</tr>
<tr>
<td>Testcase Description</td>
<td>in real mode either to zero or to the copied contents of another page.</td>
</tr>
<tr>
<td>Run this test</td>
<td>1 times</td>
</tr>
<tr>
<td>Argument</td>
<td>Partition Name</td>
</tr>
<tr>
<td>Argument Value</td>
<td></td>
</tr>
<tr>
<td>Standard Out</td>
<td>Standard Err</td>
</tr>
<tr>
<td>11:53:20 AM</td>
<td>Successfully created session with name BetaDemo</td>
</tr>
<tr>
<td>11:54:34 AM</td>
<td>Module OS PHYP HCall Test Module will run 2 times</td>
</tr>
<tr>
<td>11:54:52 AM</td>
<td>Test case Page Init will run 1 times</td>
</tr>
</tbody>
</table>

Team 4 IBM
Beta Demonstration
Projects

A Note about MATRIX’s Approach to Developing & Designing Internet Projects: MATRIX uses its unique position in the communications revolution to pioneer ideas and innovations, as the heirs of the Internet develop into the 21st century. While we have a cautious view of the value of the communications revolution for teaching, we support experimentation and innovation in the classroom. In addition to developing a wide range of teaching tools, we are focusing at the present on two main challenges: the digitation of sound files so that they can best be utilized by teachers, students, and researchers, and the development of large-scale integrated research tools that can be developed by widely disparate repositories and freely accessed worldwide.
Dustin Manning
Chung-Hi Kim
Chris Samiadjji-Benthin
Jared Wein

Team 5 MATRIX Team Photo
Team 5 MATRIX

Project Overview

Event Logging System for KORA

- KORA
  - Digital Archiving Platform
  - Content Management Capabilities
- Provide Archival Data Integrity via Event Logging
  - On Ingestion Computes and Stores Checksum
  - Intermittently
    - Checks Checksum
    - Add Record to Datastore
  - Provide Searching Over Logs
- Scale Challenges
  - Hundreds of Thousands of Files
  - Hundreds of Gigabytes of Information
- Technologies
  - Open Source
  - Platform Independent
  - Handle Multiple Database Backends Including MySQL
  - Standard Messaging Protocol
  - Support Multiple Checksum Methodologies
  - Etc...
Team 5 MATRIX
Technical Specifications Presentation
System Components

• Hardware Platforms
  – Standard Personal Computer
  – Server
  – Ethernet Connection

• Software Platforms / Technologies
  – Python 2.5.1
  – Python Libraries (ADOdb, SimpleXMLRPCServer, Hashlib)
  – OS/ Database Independent
Manager Database Schema

Team 5 MATRIX

Technical Specifications Presentation
Team 5 MATRIX

Architecture Illustrated

1. Manager sends file paths to Worker
2. Worker requests files
3. Worker receives file from disk array
4. Worker replies with checksums
Test 1

Setup:
- 12 Gbyte of randomly generated files (sized: 295 Kbyte to 60 Mbyte)
- 1 server, ~15 Mbyte/sec typical bandwidth
- from 3 to 11 machines, (2 workers/machine)

Test Results for 12 Gb of Data and 1 Server
Future Work

- Improved event reporting: job history
- API
- User’s manual or man. page
- Tests with larger data sets
how much we’re sending now:

Team 5 MATRIX
Beta Demonstration
Team 6 Microsoft

Project Overview

LiveSketch

- Whiteboard
  - Web-Based
  - Users
    - Multiple
    - Simultaneous

- Client/Server
  - Client
    - Runs on Local Machine
    - User Drawing Surface
    - Silverlight/C# Based
  - Server
    - Runs on Remote Machine
    - Maintains State of the Whiteboard
    - Resolves Potential Conflicts from Multiple, Simultaneous Use
    - C# Based

- Technologies
  - .NET
  - C#
  - Silverlight
  - Etc...
Project Overview

- Online Virtual Whiteboard
- Multiple Users Concurrently
- Internet based, physical location irrelevant
- Targeted towards technical users
  - Work-related brainstorming
- Designed with usability in mind

Team 6 Microsoft
Technical Specifications Presentation
Team 6 Microsoft

Proposed Graphical User Interface
Team 6 Microsoft
Architecture Illustrated

Client

HTTP Web Response

Server

Client

HTTP Web Request

Client

Client
Project Schedule

1. Exploration
   a) Goal: Understanding Silverlight; working class diag.
   b) Date: January 26
2. Foundations
   a) Goal: start coding; well into basics by end of week
   b) Date: February 2
3. Foundations cont.
   a) Goal: Finish basic components and base classes
   b) Date: February 9
4. Prepare for Alpha
   a) Goal: Polish UI appearance and user interaction
   b) Date: February 16
Team 6 Microsoft Beta Demonstration
Team 6 Microsoft Beta Demonstration
Team 6 Microsoft Beta Demonstration
Matt Filipiak
Kyle Shumaker
Dan Savoie
Tamy Liang
Team 7 Motorola Team Photo
Project Overview

Advanced Network Fault Management

- Network Fault Management
  - Devices Report Faults
  - Manage Network Based on Faults
- Motorola INFM System
  - Manages Faults
    - Records
    - Correlates
    - Reports
  - Stand-Alone Application
- Create Distributed INFM System
  - Migrate Stand-Alone Tool to Distributed
    - Resuse Existing Code
    - Create Deployable Services
  - Communicate via Services Infrastructure
  - AJAX User Interface
- Technologies
  - Java
  - Javascript
  - XML
  - AJAX
  - JBoss
  - Eclipse
  - Etc...
  - Etc...
Team 7 Motorola

Existing INMF Application
Team 7 Motorola
Proposed Graphical User Interface
Team 7 Motorola
Technical Specifications Presentation
Team 7 Motorola
Architecture Illustrated
Team 7 Motorola Beta Demonstration
Team 8 Sircon

Project Overview

Workflow Editor for AutoPilot

- Sircon’s AutoPilot
  - Automated Workflow Technology
  - Based On Open Source OSWorkflow Project
- Workflow Editor
  - Create and Edit AutoPilot Workflows
  - Represent Workflows as Flowcharts
  - Reduce Time and Training Required to Use AutoPilot
- Technologies
  - Java
  - Swing
  - Etc...
Team 8 Sircon
Technical Specifications Presentation
Team 8 Sircon

System Components

- Software Platforms / Technologies
  - Java
  - NetBeans IDE
  - SWING UI
  - XMLBeans Parser Library
Prototype – Cont.

- Autopilot Workflow Editor: Prototype Part 2
Team 8 Sircon

Functional Overview

Current Workflow Editing Process

PSO Analyst

Manually Code XML Files

Provide backend function configuration for

Interviews With

New Sircon Customer (Wishes to sell insurance)

Becomes

Producer Express (New Client Interview Web Application)

Registered Customer

New Workflow Editing Process

PSO Analyst

Auto-Generates XML Files

Auto-Generates

Interacts With

Autopilot Workflow Editor (AWE)

Becomes

Producer Express (New Client Interview Web Application)

Interviews With

New Sircon Customer (Wishes to sell insurance)
Team 8 Sircon
Beta Demonstration
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Team 9 TechSmith Team Photo

Ian Taylor
Mike Ezzo
Mike Harriman
Keith Barnes
Team 9 TechSmith

Project Overview

Screen Recorder for Linux

- Camtasia Relay Server
  - Beta 1.0.0 Release
  - Video Recording Server
    - Receives
    - Transcodes
    - Publishes to Remote Locations for Viewing

- Linux Relay Recorder
  - X Window System Based
  - Records Screen Activity Plus Audio
  - Uploads to Camtasia Relay Server
  - Must Have Look-and-Feel of Existing Windows and Mac Relay Recorders

- Three Components
  - Recorder
  - Uploader
  - Screen Recording SDK

- Technologies
  - C++
  - Open Source Tools
  - QT Cross Platform GUI Toolkit
  - Etc...
Team 9 TechSmith

System Components

- **Hardware Platforms**
  - Recorder Client runs on Linux
  - Server runs on Windows Server 2003 or Windows XP
  - Microphone Present for audio
  - Network Connection

- **Software Platforms / Technologies**
  - X11 for video display
  - QT libraries
  - Eclipse for Development
Team 9 TechSmith

Network Architecture

1. Login / Profile
2. Upload
3. Load Balance
4. Publish
Team 9 TechSmith

System Architecture Illustrated
FFMPEG Screen Recording

- **Alpha**
  - GUI application with socket control interface (separate recorder program)
  - Socket-controlled recorder cannot pause/resume

- **Beta**
  - Cleaner, intuitive, SDK-style screencast class
  - No more sockets, controlled by “QProcess”
  - Pause/resume enabled!

- **The Future**
  - Encoding to QT RLE
  - True integration of FFMPEG API
Team 10 Toro

Project Overview

WPF-Based User Interface for Irritrol

- Toro Wireless Sprinkler System
  - Partitioned Into Zones
  - Wireless Controller
    - Connected Via Wires to Zones
    - Turns Zones On and Off
    - Programmed with Watering Schedule
      - Uploaded From PC
      - Through Wireless Hand-Held Remote

- Existing Irritrol
  - PC-Based Controller Watering Schedule Software
  - Create, Edit, & Upload
  - Front-End Written in Macromedia Flash

- Proposed Irritrol
  - Re-write Front-End in Windows Presentation Foundation
  - Re-Use as Much of Backend as Possible

- Technologies
  - C++
  - Windows Presentation Foundation
  - Etc...
Team 10 Toro
Technical Specifications Presentation
Architecture Illustrated
Team 10 Toro

Technical Specifications Presentation
Team 10 Toro

Proposed Graphical User Interface
Team 10 Toro
Architecture Illustrated

Scheduling Advisor
Team 10 Toro

Architecture Illustrated

USB Communication
Team 10 Toro
Beta Demonstration
Team 10 Toro
Beta Demonstration
Team 10 Toro
Beta Demonstration
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Welcome to the home of Ford Motor Company and our family of brands

Vehicles & Services  Heritage  Innovation  Good Works  Company

Put the Pedal to Our Medals
LEARN MORE

2007 Lincoln Mark-T  2007 Mercury Milan
2007 Ford Mustang  2007 Mazda MX-5 Miata

Better World
High Standards for High Achievement
VALUES FOR A STRONG BUSINESS

Driving Thrills
Vehicle Quality Soars
RACING, AUTO SHOWS, PERFORMANCE VEHICLES

Great Products  Our family of brands

Ford  LINCOLN  MERCURY  Mazda  VOLVO  JAGUAR  LAND ROVER
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CSE498 Collaborative Design
Department of Computer Science and Engineering
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Professor Wayne Dyksen
View of Spartan Stadium
From the Capstone Lab
Team 6 Microsoft
Triage Meeting with TA Matt Luciw
Team 6 Microsoft Reports Progress to Matt
Team 6 Microsoft
Matt Needs More Convincing
Team 5 MATRIX
Jared Wein
Team 10 Toro
Matt Grabow
Team 4
Jordan Fish
View of Spartan Stadium From the Capstone Lab During a Snowstorm
Team 5 MATRIX
Working in the Capstone Lab
The Capstone Lab at Work
Bob Buchanan of Auto-Owners Insurance Presents at a Capstone All-Hands Meeting
Auto-Owners Exhibition Award
Team TechSmith, Fall 2007
Chrysler Praxis Award
Team IBM, Fall 2007
TechSmith Screencast Award Team Sircon, Fall 2007
Crowe Sigma Award
Team Motorola, Fall 2007
MSU Trustee Melanie Foster
With Team Sircon, Fall 2007
MSU Trustee Melanie Foster
With Team Auto-Owners, Fall 2007
MSU Trustee Melanie Foster
With Team TechSmith, Fall 2007