MICHIGAN STATE UNIVERSITY

The Capstone Experience

From Students...to Professionals

COMPUTER SCIENCE AND ENGINEERING 2010-2011

The Capstone Experience

CSE498
Collaborative Design

Dr. Wayne Dyksen
Professor of Computer Science and Engineering

The Capstone Experience provides the educational capstone for all students majoring in computer science at Michigan State University. Teams of students build software projects for corporate clients.

During the Capstone Experience, students

- design, develop, debug, document, and deliver a software project for a corporate client,
- work in a team environment,
- develop written and oral communication skills,
- become proficient with software development tools and environments,
- consider issues of professionalism and ethics.

Corporate clients are local, regional, and national including Auto-Owners Insurance, Boeing, Chrysler, Dow Chemical, Ford, GE Aviation, GM, IBM, Medtronic, Meijer, Microsoft, Motorola Mobility, Raytheon, Sparrow Health System, TechSmith, Terex, Toro, the Union Pacific Railroad, and Urban Science.

At the end of each semester, the College of Engineering sponsors Design Day, at which student teams from throughout the college showcase their Capstone projects in the MSU Union.

Computer science capstone teams demonstrate the software projects that they have designed, developed, and delivered for their corporate client. Teams compete for four awards, which are conferred by a panel of corporate judges.

We thank Auto-Owners Insurance of Lansing, Michigan for their continued support of Michigan State University and the Capstone Experience, including the printing of this Capstone Experience booklet.

Check out the Capstone Experience web site at www.capstone.cse.msu.edu.

For more information about the capstone experience or becoming a capstone project sponsor, contact Dr. Wayne Dyksen by email (dyksen@msu.edu) or by phone (517-353-5573).

The Capstone Experience, 2010-2011

Department of Computer Science and Engineering

Michigan State University

Corporate Sponsors

Jeremy Briggs

University Staffing Manager
Microsoft
Redmond, Washington

Microsoft *"Michigan State University's program in computer science has been a focal point for Microsoft for many years. We continue to recruit and hire outstanding graduates including 22 permanent hires and 23 summer interns in just the last five years."*

Bob Buchanan

Senior Vice President, Information Systems and Technology
Auto-Owners Insurance
Lansing, Michigan

Auto-Owners Insurance Life Home Car Business *"Auto-Owners Insurance is proud to be a long term capstone project sponsor. The business-like environment of the capstone experience provides a unique opportunity for students to develop into professionals. Our strategic partnership has enabled us to identify and recruit many outstanding MSU graduates."*

Robert Feldmann

Vice President and General Manager
The Boeing Company
Seattle, Washington

BOEING *"Michigan State's capstone course provides students with real-world experiences within the aviation and aerospace industries. The Boeing capstone teams continue to produce outstanding projects including a flight visualization system for the Navy's Blue Angels as well as complex scene rendering software for our simulation environments."*

Louise Hemond-Wilson

Executive Consultant
IBM, Somers, New York

IBM *"At the beginning of the semester, each MSU capstone team receives a challenging business problem from their sponsor. These are not hypothetical or artificial problems. They very much resemble problems I see when working with client and IBM teams in my role as a consultant for IBM. I have had the honor and pleasure of judging capstone teams' software solutions, examining their design, development and delivery. Repeatedly and consistently, the students, their projects, and their presentations impress me with their high degree of innovation, creativity and professionalism."*

Capstone Alumni

Gina Chernoby

Software Development Engineer in Test
Microsoft
Redmond, Washington

Microsoft *"Learning how to give and defend technical presentations is a key feature of the capstone experience, which I use often in my work at Microsoft."*

BS, CSE: May 2009
Hometown: Wyoming, Michigan

Josh Kitchens

Associate Microsoft Web Developer

Ford
Dearborn, Michigan

Ford *"The capstone course is an invaluable asset to any CSE graduate. My capstone project with Ford gave me a great understanding of what professional software development is, and gave me industry connections, which helped me start my career after graduation."*

BS, CSE: December, 2010
Hometown: Ann Arbor, Michigan

Jayson Vincent

Modeling & Simulation Software Engineer
The Boeing Company
St. Louis, Missouri

BOEING *"My capstone project with Boeing was technically challenging, team-oriented, and concluded with a result that was rewarding to observe. Alongside summer internships and mentors who continually believed in me, my capstone project inspired me to pursue an exciting career in aviation and aerospace."*

BS, CSE: May 2005
Hometown: Mason, Michigan

Ben Pedersen

Software Test Engineer
TechSmith
Okemos, Michigan

TechSmith *"As a Michigan native, I wanted to pursue my career within the state. The capstone course project sponsors include companies of various sizes from throughout Michigan, including my company, TechSmith of Okemos, Michigan."*

BS, CSE: May 2010
Hometown: Lansing, Michigan

Fall 2010

Project Sponsors

We thank the following companies for their generous support of the computer science capstone course.

Auto-Owners Insurance
Lansing, Michigan

The Boeing Company
St. Louis, Missouri

Ford Motor Company
Dearborn, Michigan

GE Aviation
Grand Rapids, Michigan

Medtronic, Inc.
Mounds View, Minnesota

Meijer
Grand Rapids, Michigan

Motorola
Libertyville, Illinois

TechSmith
Okemos, Michigan

Urban Science
Detroit, Michigan

Auto-Owners Insurance
Agent Multimedia Ad Builder

Auto-Owners Insurance provides many different advertising resources to their independent agents. A significant part of this service involves a set of templates of ads, which are available to their agents via their web-based Media Center.

In order to make this process easier for both parties, we have created a web application, the Agent Multimedia Ad Builder, that allows agents to create print, TV, and radio ads that are specific to their agency.

The web application allows agents to create profiles with basic information such as agency name and location, which is then automatically incorporated into one of the ad templates. This process makes customization much more convenient since agents simply need to pick a template they like and all their agency information will be used to create the corresponding ad.

For agents who want to include their own touch of editing into the ads, we have created a basic web editor for print ads that lets them drag and drop different pictures into the template. The editor also allows them to edit the written content in place on the ad.

All of the created ads are able to be previewed and saved for later visits through the application. Ads that are complete and ready for submission will be able to be sent for approval by Auto-Owners Insurance to ensure that the ads are cleared for publication.

Michigan State University
Team Members (left to right)

Jeff Chapman
Plymouth, Michigan

Michael Kerwin
Howell, Michigan

Marie Buckner
New Baltimore, Michigan

Auto-Owners
Corporate Sponsors

Bob Buchanan
Lansing, Michigan

Megan Collins
Lansing, Michigan

Scott Lake
Lansing, Michigan

The Boeing Company
O-Show for Simulation Software

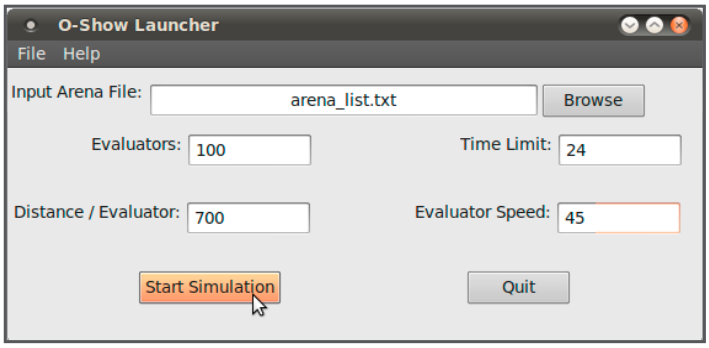
The Boeing O-Show project is a joint effort between Michigan State University and The Boeing Company to develop specialized software to find and simulate an optimized path for multiple units traveling to a large number of destinations. O-Show stands for "Optimize and Show."

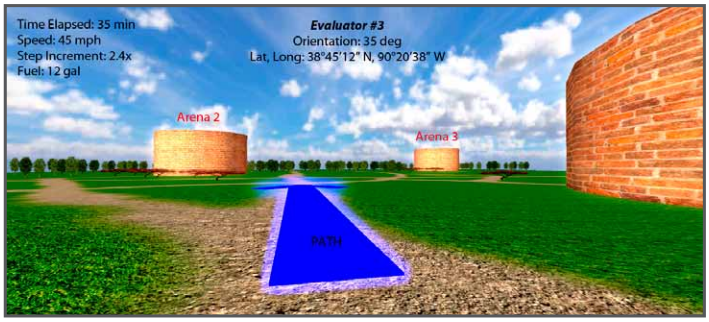
O-Show is best understood with an illustrative example of how it might be used. Imagine that there are many evaluators who are tasked to evaluate certain properties of basketball arenas in a given state within a given timeframe.

In this scenario, our software allows the user to configure evaluator travel speed, number of evaluators, a starting point, maximum allowed evaluator travel distance, and a list of arenas to visit. The main goal is to optimize the routes of the evaluators in a way that minimizes the number of them needed to accomplish the mission.

The software comprises two parts. First, a launcher takes the inputs for the desired problem. The launcher then feeds the inputs to lp_solve, which is a software library used for solving linear programming models. The launcher then receives the results of lp_solve's calculations, completing the "Optimize" part of our simulation. After that, our "Show" aspect of the simulation takes over.

"Show"—the visualization—is written in a graphics library called OpenSceneGraph and is used to render a graphical representation of the people, places, and paths of our simulation.





Michigan State University
Team Members (left to right)

Matthew France
Jackson, Michigan

Scott Buffa
Oakland, Michigan

Bryan Askins
Farmington Hills, Michigan

Boeing
Corporate Sponsors

Pete Clive
Saint Louis, Missouri

Matt Daniels
Saint Louis, Missouri

Jayson Vincent
Saint Louis, Missouri

Steve Yallaly
Saint Louis, Missouri

Ford Motor Company
Ford Idea Place Mobile Edition

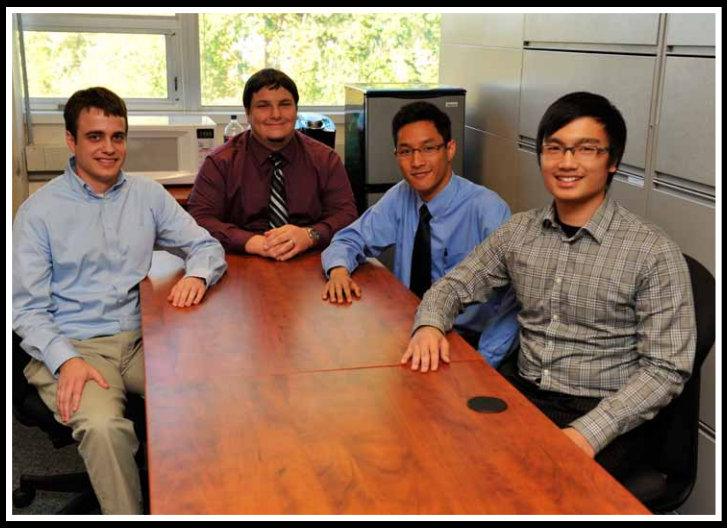
A company's most important assets are its employees and their ideas. In order for employees to document and share these ideas, Ford has developed an online application called Ford Idea Place.

Ford employees work at many locations, including at manufacturing plants and at supplier facilities. When someone gets an idea at such a location, say on a plant floor, they may not have access to Ford Idea Place. By the time access is available, the idea may be lost.

To address this issue, Ford partnered with Michigan State University, tasking a team of students with developing a mobile solution that is built on Ford Idea Place. The result is Ford Idea Place Mobile Edition.

Ford Idea Place Mobile Edition consists of two custom apps, one for the iPhone and one for the Android, which allow users to share ideas anytime, anywhere. It features the ability to post, view, rate and comment on ideas. Users can even subscribe to authors and categories to keep them updated with ideas that could impact their work stream. As added incentive, users are also awarded achievements for various milestones like posting their first idea.

Further expanding its capabilities, the application can use the device's physical resources to attach photos, audio or video to ideas. Such functionality allows users to capture an idea fully while the platform's mobility allows these features to be accessed from anywhere, any time.



Michigan State University
Team Members (left to right)

Derek Ulch
Holt, Michigan

Josh Kitchens
Ann Arbor, Michigan

Victor Kupatavetin
Bangkok, Thailand

Sam Djap
Jakarta, Indonesia

Ford
Corporate Sponsors

Adam Haas
Dearborn, Michigan

Michael Seneski
Dearborn, Michigan

Michael Volk
Dearborn, Michigan

GE Aviation
Super Synoptics

Trying to decipher the vast array of dials, gauges, switches, and indicators on a modern aircraft flight deck is a challenging task even in ideal conditions. Compound the problem with flashing lights and warning buzzers from an emergency situation, and it's easy to see why in-flight problems present difficult and potentially serious challenges for pilots.

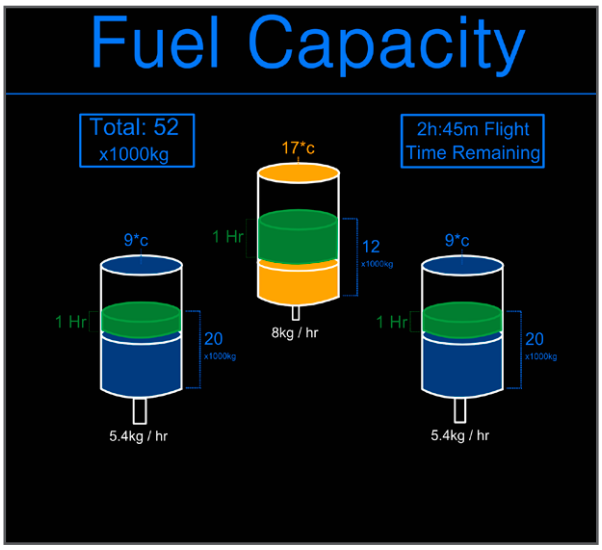
Working with GE Aviation, we have designed and built Super Synoptics, a new display which will help pilots better manage an aircraft, particularly during emergency situations.

Super Synoptics provides superior, intuitive instrumentation displays, along with summaries and solutions to current, emerging, and potential aircraft system failures.

Our design streamlines the flight crew's decision making process, by presenting them with situation-applicable information without overwhelming them with system information that is not currently relevant.

Super Synoptics is designed with a simple, clean, cursor-free screen navigation scheme, which is important in turbulent and emergency situations where cursors, whether via mouse or touch-pad, are unreliable and impractical.

The Super Synoptics system is comprised of the Super Synoptics Display, built with OpenGL, and is interfaced with the X-Plane flight simulator, which is used to simulate an aircraft and demonstrate the use of our system. The two applications communicate via a data plugin and TCP sockets.



Michigan State University
Team Members (left to right)

Shawn Henry Adams
Brighton, Michigan

Adam Breece
Pinckney, Michigan

Nick Rafalski
Troy, Michigan

GE Aviation
Corporate Sponsors

Timothy Burns
Grand Rapids, Michigan

Aaron Gannon
Grand Rapids, Michigan

Dashiell Kolbe
Grand Rapids, Michigan

Medtronic, Inc.
Medtronic Wellness Portal

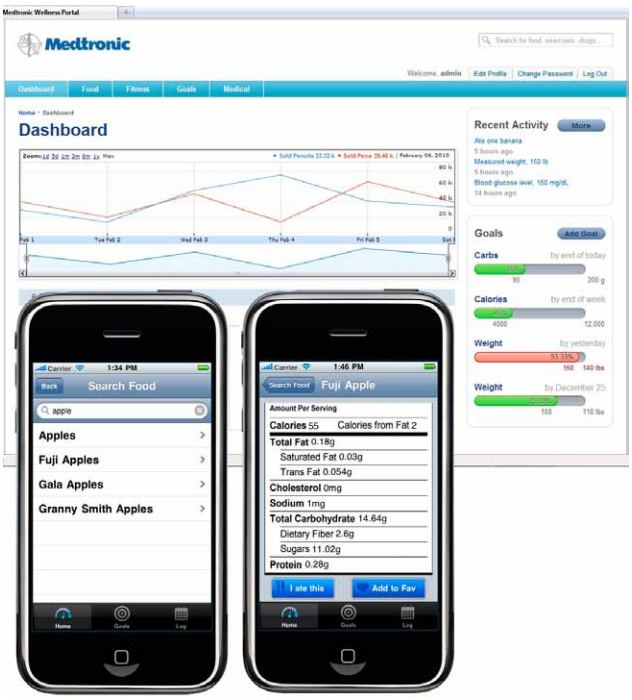
For over 50 years, Medtronic's mission has been to alleviate pain, restore health, and transform the way the world treats chronic diseases so patients can live a fuller life. To this end, the Medtronic Wellness Portal enables patients to manage their diet, health, and activity levels in a streamlined, more convenient way.

The heart of the Wellness Portal is to help a patient understand the impact of their food and exercise choices on their overall wellness. Patients can track a wide range of goals such as weight, activity levels, blood sugar, or daily calorie intake, with a goal to reinforce healthy choices.

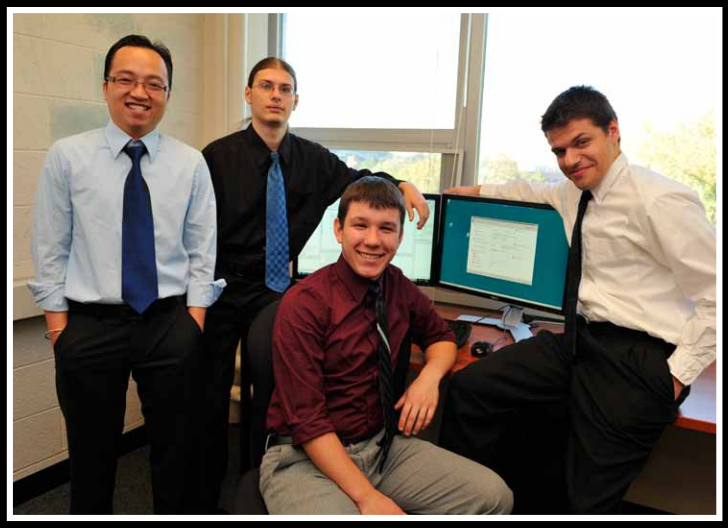
The Wellness Portal is comprised of web and iPhone applications that allow users to quickly input data. If, for example, the user wishes to track a daily caloric input, the application has a fast and easy way to input food eaten at any time of the day. The user can see at a glance the total calories consumed compared to the daily goal.

Along with user input, the portal also automatically inputs and tracks data from the patient's Medtronic devices, such as insulin pumps or a continuous glucose monitor, as well as from the user's Google Health account. Graphs are used to show data correlation and, by using analytics, appropriate observations and recommendations are made.

The web application is written in Grails, a web framework for Groovy. The iPhone app is written in Objective-C.



Medtronic



Michigan State University
Team Members (left to right)

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Zach Riggle
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Chris Van Wiemeersch
Novi, Michigan

Medtronic
Corporate Sponsors

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Mounds View, Minnesota

Vandy Johnson
Mounds View, Minnesota

Scott Mark
Mounds View, Minnesota

Javaid Masoud
Mounds View, Minnesota

Karin Petty
Mounds View, Minnesota

Michael Stuedemann
Mounds View, Minnesota

Meijer
ITS Products and Services Request System

Meijer ITS—Information Technology Services—provides products and services to all divisions within the company. Currently, there is no single web site where ITS products and services can be found and requested by Meijer employees.

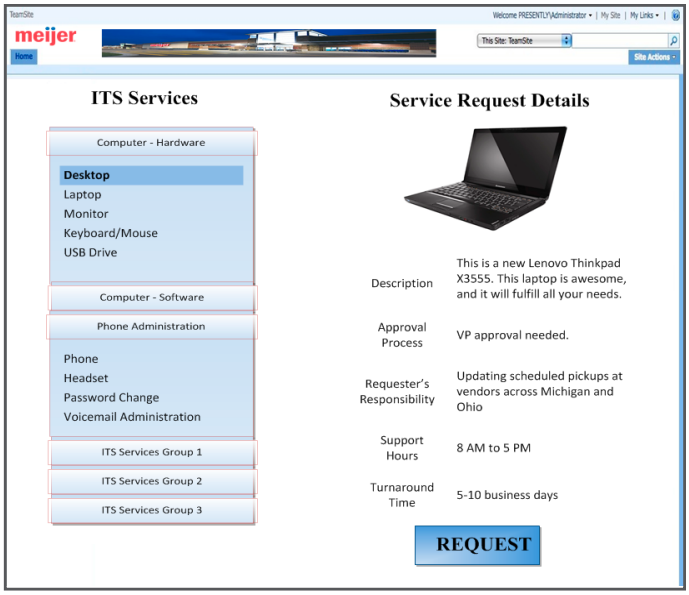
We have developed a web portal built upon SharePoint, which consolidates all ITS products and services. In addition, our portal includes a standardized form for all requests.

The portal directs customers to the ITS Service Request Catalog. Customers are then able to view the available products and services via an expandable menu. When a service is selected from the menu, a detailed description of the service is displayed. Once the desired service is found, the user is directed to the corresponding form to request it.

After a form is filled out and submitted, a copy of the form is stored within SharePoint and an email is sent to the existing ticketing system, which handles such requests.

The goal of our web portal is to make it easier for Meijer employees to find and request the desired ITS products and services and to provide the ability to view the status of their request, thereby allowing ITS to provide quicker request turnaround rates. By using our web portal, the user and ITS will save valuable time, thus increasing productivity.

The site is developed in ASP.NET and C#. The forms are created with Microsoft InfoPath. The database is created with Microsoft SQL Server 2008.



Michigan State University
Team Members (left to right)

Andrew Thielking
Kalamazoo, Michigan

Austin McCarty
Clinton Township, Michigan

Matt Packowski
Charlotte, Michigan

Meijer
Corporate Sponsors

Randy Brower
Grand Rapids, Michigan

Jim Poll
Grand Rapids, Michigan

David Rodgers
Grand Rapids, Michigan

Motorola
Enhanced Program Guides for Mobile Devices

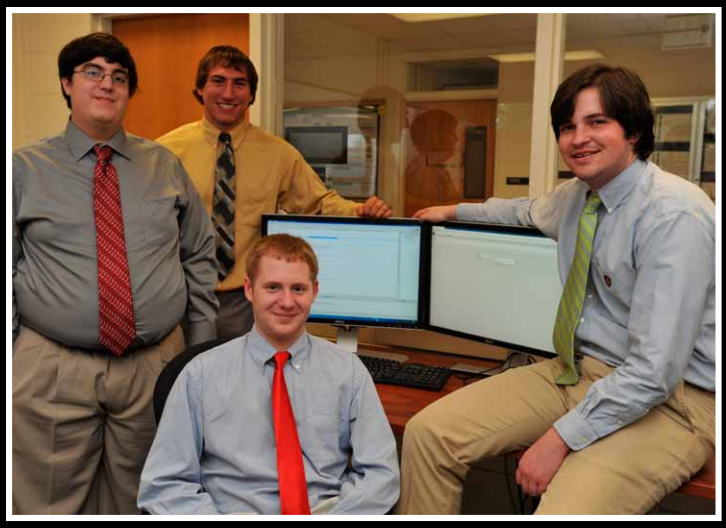
Television has become more intertwined with the World Wide Web than ever before. With the emergence of smart devices, consumers are connected wherever they go. Motorola aims to leverage these platforms and give consumers the ability to follow their favorite programs wherever they may be, while providing a television viewing experience unlike any other.

Our Enhanced Electronic Program Guide (EEPG) allows a content provider to create and manage supplementary content through an easy to use web interface. The provider can associate this content with a TV program and choose a specified time when it should appear on a synced mobile device during the viewing of a show. This content can be used to enhance the television experience by providing new and exciting information to the viewer as a show airs.

The EEPG allows consumers to receive this supplementary content on their mobile device as they watch their favorite shows. The EEPG is presented in an intuitive interface that alerts the user when new content is available. It displays the content in a non-intrusive manner and in user selectable layers.

The EEPG service is written in Java with a RESTful architecture and deployed on a Glassfish server. Our persistent data is stored on a MySQL database and accessed through an iBatis persistence layer. The Secondary Content Creation Tool is written in Java using Google Web Toolkit and the iPad mobile application is written in Objective C.

MOTOROLA



Michigan State University
Team Members (left to right)

Tim Aubel
Essex, Vermont

Andrew Rossow
Canton, Michigan

Brian Cripe
Medfield, Massachusetts

Drew Hanlon
Grosse Pointe Shores, Michigan

Motorola
Corporate Sponsor

Kabe Vanderbaan
Libertyville, Illinois

TechSmith
Extending Apps with Cloud Asset Sharing

TechSmith is harnessing the power of the cloud to create a new resource for sharing and acquiring assets for two of their most popular programs, Snagit and Camtasia Studio. Using Microsoft's Windows Azure cloud platform, this program enables users to easily browse and download shared assets or to upload and share assets with friends, groups, or the whole world. Sharable assets include things like images and video clips created by users, as well as other graphical elements such as callouts and title screens.

Once a user has downloaded a new asset, it is automatically installed into the correct location for each program for immediate access. Additionally, a special plug-in for Snagit allows users to instantly save their images to the cloud.

Users will enjoy a more efficient and richer experience as we make it easier for them to share and find these assets.

Snagit is a screenshot program that replaces the native Print Screen function with additional features, such as the ability to take shots of entire web pages or shots of the contents of a program window. It also contains a built in editor that automatically opens after taking a shot.

Camtasia is a screen video capture program that allows users to capture what is happening on their screen in video. The user may define the area of the screen or the window that is to be captured or the whole screen can be recorded instead.

TechSmith

Michigan State University
Team Members (left to right)

Seungmin Kim
Jeju, South Korea

Timothy Miller
Owosso, Michigan

Alex Nolley
Fenton, Michigan

Chris Dasbach
Lake Orion, Michigan

Techsmith
Corporate Sponsors

Randall Brown
Okemos, Michigan

Dean Craven
Okemos, Michigan

William Hamilton
Okemos, Michigan

Larry LaHaie
Okemos, Michigan

Urban Science
Modern Online Analytical Processing Cube

As one of the most trusted sources of analytical data in the industry, Urban Science helps their automotive and retail clients plan effectively, define and measure performance, and develop sales and marketing programs that deliver results.

In order to produce these results, very large amounts of data need to be analyzed very quickly and efficiently. A special kind of database structure—OLAP (OnLine Analytical Processing) cube—is used as a querying tool with a user-friendly interface.

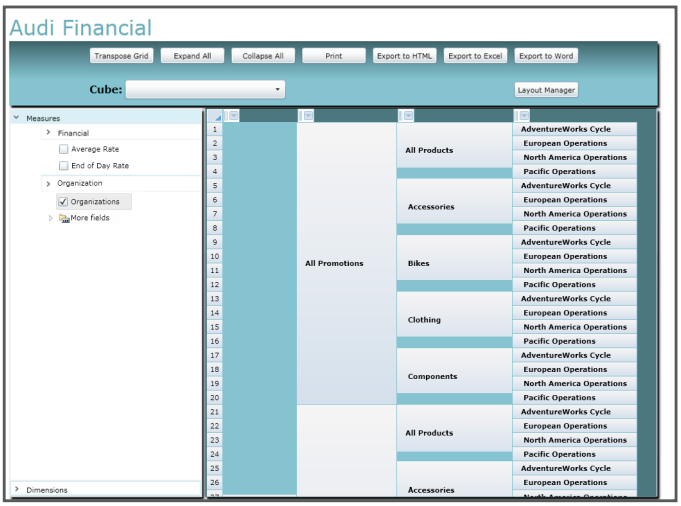
The figure at the right shows our OLAP cube dashboard interface and functionality.

Our dashboard is accessible from the internet, while the database is stored at a remote location off-site. Customers need not install any additional software, thus giving our program a zero-footprint for our end-users.

Users can manipulate the various dimensions available to them based on a given set of data and view it in a pivot. The PivotViewer enables the user to present extensive data so it can be manipulated for sorting and saving for later use.

A widely requested functionality for this program is the ability to print data, which is provided by a one-click PDF link.

The program uses Microsoft Silverlight and XAML for the interface, ASP.NET and C# for the processing, and Microsoft SQL Server and MDX for database manipulation.



URBAN SCIENCE™

Michigan State University
Team Members (left to right)

Nathan Goodrich
Haslett, Michigan

Dinesh Banda
Troy, Michigan

Ryan Kelly
Farmington Hills, Michigan

Urban Science
Corporate Sponsors

Matt Bejin
Detroit, Michigan

Randy Berlin
Detroit, Michigan

Mark Colosimo
Detroit, Michigan

Suzanne Dubois
Detroit, Michigan

Design Day Awards

CSE 498, Collaborative Design, is the senior capstone course for students majoring in computer science. Teams of students design, develop, and deliver a significant software system for corporate clients. The CSE capstone teams compete for four prestigious awards. The winners are selected on Design Day by a panel of distinguished judges.

Auto-Owners Exposition Award

Auto-Owners Insurance
Life Home Car Business
The "No Problem" People®

CSE 498 capstone teams present their projects on Design Day in a variety of ways. Teams create and set up an exhibit where they demonstrate their software systems and answer questions to Design Day attendees. Each team plays their project videos and answer questions for a panel of judges.

The CSE capstone team with the best overall Design Day performance is honored with the Auto-Owners Exposition Award, which is sponsored by Auto-Owners Insurance Company of Lansing, Michigan.

Team Meijer
ITS Products and Services Request System

Matt Packowski, Austin McCarty, Andrew Thielking
Presented by Scott Lake and Bob Buchanan of Auto-Owners Insurance

Chrysler Praxis Award

CHRYSLER

One of the hallmarks of CSE 498 capstone projects is that of praxis, the process of putting theoretical knowledge into practice. Teams apply a wide variety of information technologies to produce solutions to complex problems in areas such as business, engineering, computing, and science.

The CSE capstone team that engineers the software system that is the most technically challenging is recognized with the Chrysler Praxis Award, which is sponsored by Chrysler LLC of Auburn Hills, Michigan.

Team Motorola
Enhanced Program Guides for Mobile Devices

Andrew Rossow, Drew Hanlon, Tim Aubel, Brian Cripe
Presented by Karen Wrobel of Chrysler

Design Day Judges

Scott Carney *Sparrow*	**Richard Enbody** *Michigan State University*	**Louise Hemond-Wilson** *IBM*	**Kevin Ohl** *Michigan State University*	**Damian Winslow** *Dow*
David Della Vedova *GE Energy*	**Adam Haas** *Ford*	**Vandy Johnson** *Medtronic*	**Marty Strickler** *Rose Packing*	**Karen Wrobel** *Chrysler*

TechSmith Screencast Award

TechSmith

Each CSE 498 capstone team produces a video that describes and demonstrates their software product. Starting with a storyboard and a script, teams use Camtasia Studio 5 to synthesize screen recordings, video, audio and other multimedia to produce their project videos.

And the TechSmith Screencast Award goes to...the CSE capstone team with the best project video. The award is sponsored by the creators of Camtasia Studio, TechSmith of Okemos, Michigan.

Team Medtronic
Medtronic Wellness Portal

Zach Riggle, Joe Heldt, Chris Van Wiemeersch, Vu Bui
Presented by Dean Craven of TechSmith

Urban Science Sigma Award

URBAN SCIENCE

The CSE 498 experience represents the capstone of the educational career of each computer science major. An intense semester of teamwork produces impressive deliverables that include a formal technical specification, software, documentation, user manuals, a video, a team web site, and Design Day participation. The resulting sum, the capstone experience, is much greater than the parts.

The capstone team that delivers the best overall capstone experience is recognized with the Urban Science Sigma Award, which is sponsored by Urban Science of Detroit, Michigan.

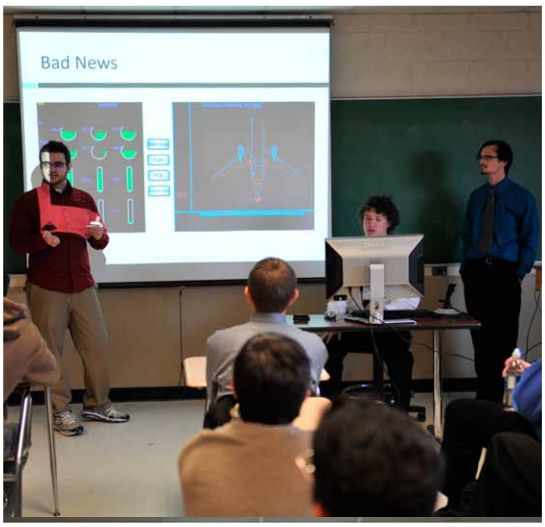
Team GE Aviation
Super Synoptics

Adam Breece, Shawn Henry Adams, Nick Rafalski
Presented by Randy Berlin of Urban Science

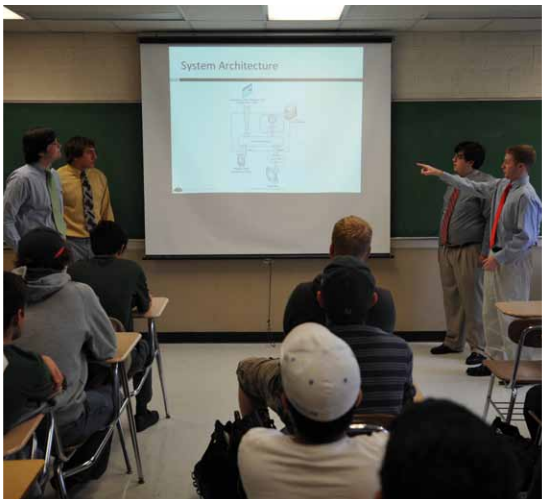

Screen Mockups


O-Show Launcher


System Architecture

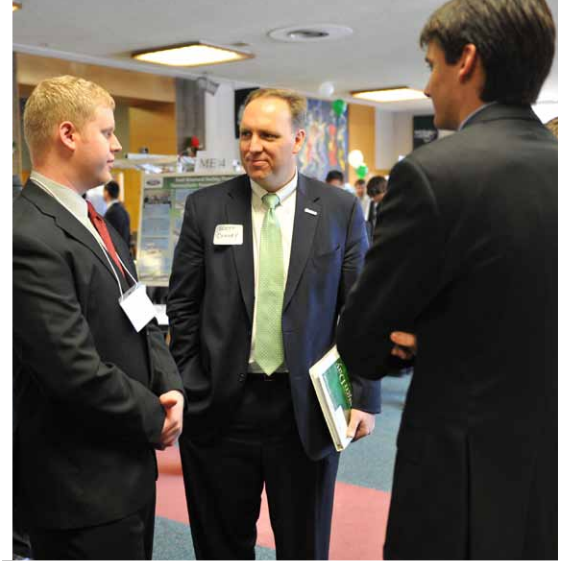

Bad News


iPhone App Screen Shots


System Architecture


Communication Diagram


Screen Shot







Corporate Sponsors

Dean Craven

Chief Technology Officer
TechSmith
Okemos, Michigan

TechSmith

"TechSmith capstone projects give students experiences with some of the latest computing trends including multi-media technologies, cloud computing, and Facebook applications, all of which makes them very marketable. Located a few miles from MSU in Okemos, Michigan, TechSmith continues to recruit and hire capstone graduates as our software developers."

Michael Drazan

Vice President,
Contractor Business
and CIO
The Toro Company
Minneapolis, Minnesota

TORO.

"As a Design Day judge, I have evaluated capstone projects from many of the corporate sponsors. The software systems produced by the MSU students rival that of professional developers. The Toro sponsored capstone teams have delivered software that has been incorporated into our commercial products."

Dave Rodgers

Vice President,
Chief Information Officer

Meijer
Grand Rapids, Michigan

meijer

"Meijer is proud to have sponsored MSU capstone projects over the past two years. We have been impressed with both the capabilities of the students and the quality of the solutions they have developed. The latest project will be used by Meijer to improve the analytics within our check cashing system."

Karen Wrobel

Head of Assembly
& Stamping Systems
Chrysler, LLC
Auburn Hills, Michigan

CHRYSLER

"When Chrysler recruits summer interns and permanent hires from MSU, the computer science capstone experience is an important factor on a student's resume. As both a project sponsor and a Design Day judge, I continue to be impressed by the quality of the software produced by capstone teams. The latest Chrysler capstone project will help us track key performance indicators at our Warren stamping plant."

Capstone Alumni

Bill Zajac

PDP Associate

Compuware
Detroit, Michigan

Compuware
THE TECHNOLOGY PERFORMANCE COMPANY

"The capstone course provided me with a challenging real-world experience working on a next generation flight deck for a commercial airliner with GE Aviation, which has given me a strong foundation for an exciting and successful career at Compuware."

BS, CSE: May 2011
Hometown: Shelby Township, Michigan

Caitlin Nelson

Software Developer/ Consultant
Crowe Horwath
Nashville, Tennessee

Crowe Horwath

"Working directly with a business client was a very valuable aspect of my capstone experience at MSU, particularly since it's now a very important part of my job at Crowe Horwath."

BS, CSE: December, 2008
Hometown: East Lansing, Michigan

Rob Palmer

Software Developer
Auto-Owners Insurance
Lansing, Michigan

Auto-Owners Insurance
Life Home Car Business

"The entire capstone course is designed to be a real-world, professional experience, which helps graduates transition from being students to professionals. Auto-Owners Insurance has a long history of capstone project sponsorship, which made me aware of the career opportunities here and inspired me to apply."

BS, CSE: December 2009
Hometown: Livonia, Michigan

Andy Kreling

Software Engineer
Google
Mountain View, California

Google

"The capstone experience at MSU challenges students to build innovative software solutions to complex technical problems, which was great preparation for my job at Google."

BS, CSE: May 2008
Hometown: Kalamazoo, Michigan

Spring 2011

Project Sponsors

We thank the following companies for their generous support of the computer science capstone course.

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Fort Wayne, Indiana

Sparrow Health System
Lansing, Michigan

TechSmith
Okemos, Michigan

Urban Science
Detroit, Michigan

Auto-Owners Insurance
Agent Multimedia Advertisment Builder

Auto-Owners Insurance operates solely through over 6,700 independent agents in twenty-six states to provide insurance that is "Safe, Sound and Secure"®. To help these agents advertise in their local communities quickly and easily, we have created Agent Multimedia Advertisement Builder.

Using this web application, independent agents can fulfill all of their print, television and radio advertising needs. Starting with standard templates provided by Auto-Owners, agents can produce customized, professional ads in minutes.

Each agency has a system account that includes an agency profile, which contains contact information along with an uploaded logo and uploaded images that may be used to customize ads. After an agent selects a template ad, the system automatically populates it with all of the agency-specific information, making it very easy for agents to build and preview potential advertisements.

Once created, customized ads are automatically submitted to Auto-Owners for review. Agents are then notified by email that their proposed ad has been accepted or are given suggested changes for editing and resubmission.

For users at Auto-Owners, the system supports other features including the ability to view a history of ads submitted as well as statistical reports, such as the use of particular templates.

The 6,700 independent Auto-Owners Insurance agents now have a quick and easy way of creating and customizing their own advertisements.

Auto-Owners Insurance
Life Home Car Business
The "No Problem" People®

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Amy Watson
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The Boeing Company
BAPS: Battle Aircraft Position Share

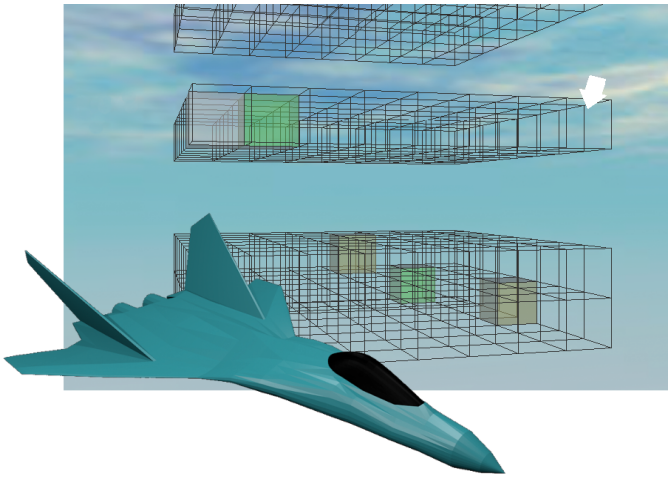
Battle Aircraft Position Share, or BAPS, combines strategy and quick thinking as players compete to seek and destroy each other's targets in a 3D battle arena. BAPS mixes both turn-based and real-time game play. Players have a limited amount of time in which to fire but can always command their fleet.

Opposing players utilize a fleet of radar transmitter and radar receiver planes to reveal the location of enemy targets within the environment. Effective scanning provides a higher probability of hitting enemy targets when firing. Radar is simulated by a simple algorithm determined by unit positions and the angle of reflection. Aircraft are constantly in motion and consume fuel based on pitch and speed.

In order to win a game, a player needs to deal with information overload and respond to feedback resulting from game events. It is the player's choice whether to micromanage their units or focus their efforts on alternate strategies.

Since BAPS is controlled by a network-based game manager, opposing players can be at different locations. All network communication between the game manager and clients is encrypted. The game manager keeps the game information in sync for both players. The manager also provides a statistical and graphical overview of the current state of the game.

BAPS is compatible with Microsoft Windows XP/Vista/7. OpenSceneGraph is used to render the game environment and handles the game engine. WinSock handles the network connectivity. All models are created with Blender.



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Chrysler Group, LLC
Fleet Auction Distribution and Sale Optimizer

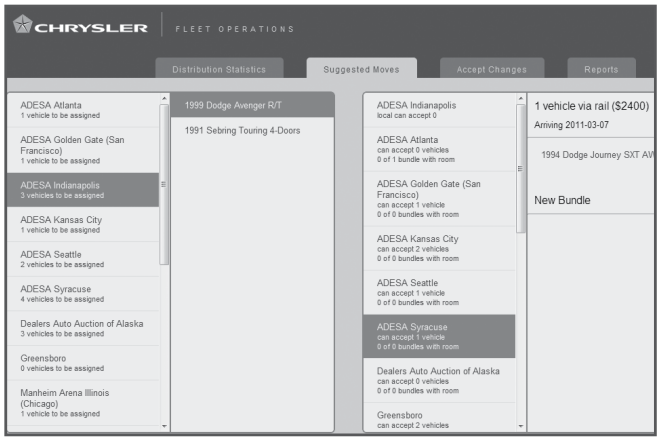
Chrysler Group, LLC fleet customers return vehicles to marshaling yards at various locations throughout the nation. The objective is to distribute each vehicle to the auction that will sell it at the highest price.

The Chrysler distribution manager will be using our application to determine the optimal auction location around the country to send and subsequently sell the returned vehicle. There are eighteen auction sites to consider, and a vehicle may sell for a different price at each, depending on the local dealer demand for that type of vehicle.

Our application automates the process of predicting approximately how much a vehicle will sell for at each auction and shows which auction has the highest demand for a specific vehicle based on past sales and inventory data. The system allows the manager to target a specific vehicle body model and automatically distribute vehicles throughout the country.

In the screenshot shown to the right, the distribution manager can view a summary of how vehicles are selling, and how the current distribution compares to the target distribution. Our system determines the optimal auction site for each vehicle. The distribution manager is then able to make adjustments to the stock of vehicles at each auction site as they deem necessary.

Our system automates most of the decision making, but also focuses on providing the distribution manager with the information required to make the best possible decisions, overriding our system's decisions when necessary.



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Art Magri
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Rick Rose
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Bill Whedon
Auburn Hills, Michgan

Karen Wrobel
Auburn Hills, Michigan

The Dow Chemical Company
Business Approval System

Money is the lifeblood of every company. Every corporate officer and board member has an obligation to the stockholders to ensure that money is being used responsibly.

The Dow Chemical Company currently has a process in place to approve or reject spending requests. For every department in the company, there is a clearly defined chain of approval through which all material spending requests must be routed. Once every person in the chain approves the request, the funding is provided.

One of the purposes of technology is to improve the quality of our lives by making certain tasks easier. With that idea in mind, we set out to build a system to handle the existing approval process automatically. Our software notifies the people involved in the approval process by email when a new request is created. It also routes the request to each individual in the appropriate order.

Our Business Approval System also allows each approver in the chain to enter comments, and all of the people in the process can review them and add their own. A historical record of all requests is maintained.

In the fast-paced modern business environment, people need to be able to access the software from a variety of devices, from a PC or laptop to an iPad or smartphone. Our software is able to be used from any of those devices to facilitate that lifestyle.

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Dow
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Martin Brennan
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Jeremy Preston
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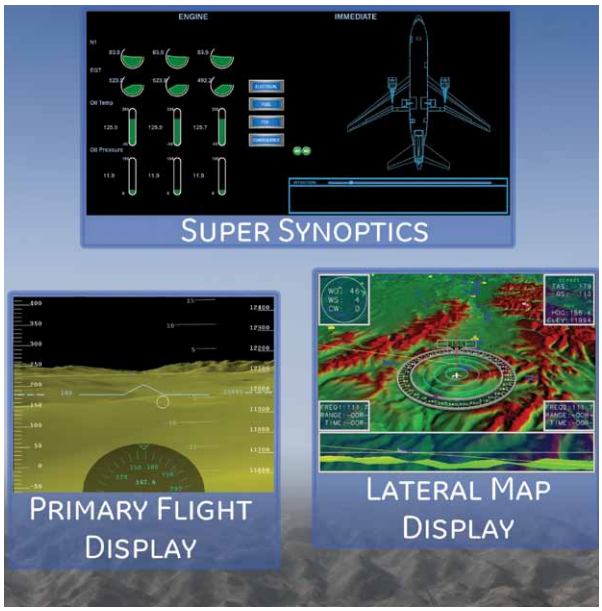
GE Aviation
MSU Next Generation Flight Deck

You are flying a Boeing 747 headed from Paris to L.A. with 400 exhausted passengers on board. Air Traffic Control has just alerted you to a massive storm system dead ahead. Neither your customers nor your boss want to hear that you needed to divert to Nebraska. This has been a long and exhausting flight, and weaving through a storm will not be a simple task. Now what do you do?

With the GE MSU Next Generation Flight Deck, the answer is simple: ask the Lateral Map for a new course, accept the new plan, and follow the intuitive guidance cues provided on the Primary Flight Display. Thanks to the Next Generation Flight Deck's revolution in flight deck design, flight crews are now better equipped than ever to fly aircraft safely and reliably, even in the direst of situations.

The culmination of two years' work by four MSU-borne teams, the Next Generation Flight Deck is more than the sum of its parts. At first glance, the flight crew notices the sleek modern graphics and intuitive design of each individual display. But the real revolution is acting out behind the scenes, where each system is working in harmony with the others to provide the flight crew with the right information in the right format at the right time. This cross-functional integration, inclement weather avoidance being just one example, represents a major departure from the federated days of yore.

Nothing can replace the skills and ingenuity of an experienced flight crew. But with the Next Generation Flight Deck by GE and MSU, we can harness these resources to their fullest, guaranteeing everyone a safe and enjoyable journey.



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Medtronic, Inc.
Cloud-Based Athletics Operations Center

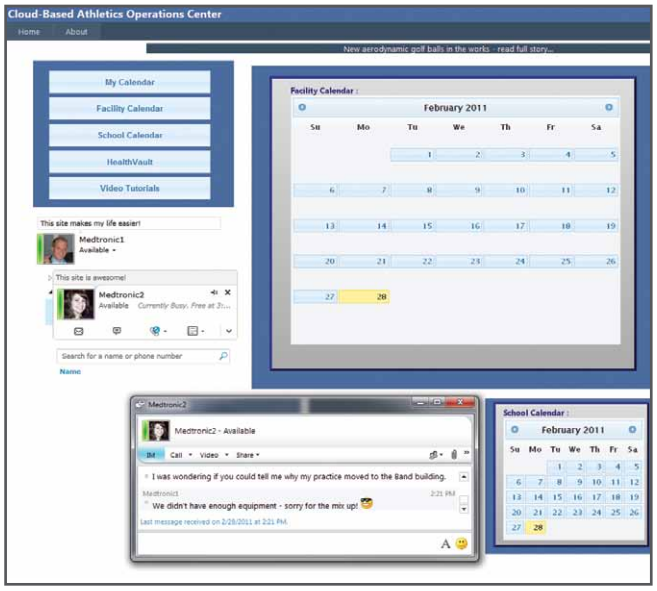
For over 50 years, Medtronic's mission has been to alleviate pain, restore health, and extend life. As an ongoing effort to extend services, a sample service offering hosted by Microsoft Azure Cloud Services was designed and developed.

The objective of our software system is to put coaches, student athletes, and a facilities administrator into one toolset to provide information and collaborate on improving the overall health of the student athlete to ensure playing status. With many teams and facilities to manage, proper allocation of resources and equipment becomes an important issue.

Our team has created a cloud-based Athletics Operations Center to enable coaches and student athletes ease of access to robust utilities such as People Presence, Calendaring, and Instant Messaging. The users of the system also have access to Health Records, Videos, and relevant RSS Feeds.

The key focus of the Athletics Operations Center is to provide coaches and student athletes a cohesive environment in which to access valuable information. Instant Messaging enables coaches to easily communicate with others using the system. The Calendaring feature allows for quick recognition of event conflicts, or insufficient resources.

The Athletics Operations Center is accessible via any modern web browser, and is primarily intended to be viewed on large kiosk-like systems. The web application is written in ASP.NET and C# with a Windows Azure cloud-based back-end.



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Meijer
Consumer Payroll Check Cashing Analytics

In order to help customers save time and also provide convenience, Meijer has set up a system to allow customers to cash their payroll checks at the store.

While there are many benefits to providing this service, it also creates problems when people begin to cash fraudulent checks and therefore steal from Meijer.

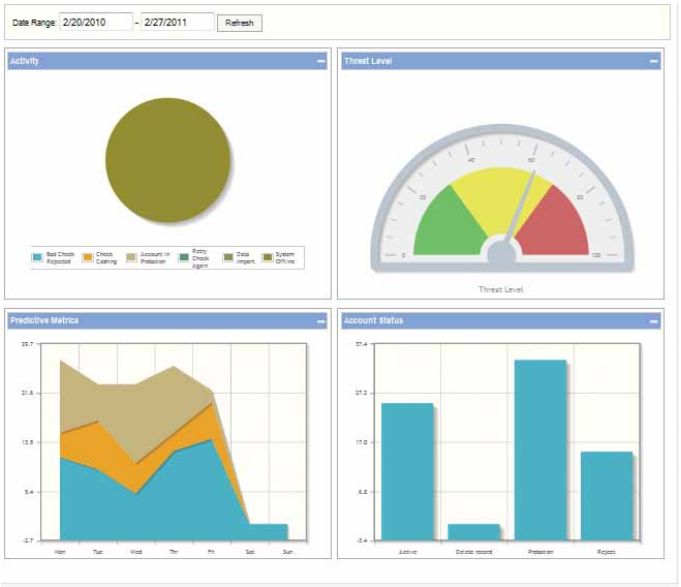
In an effort to prevent or detect these fraudulent activities, we developed web-based software called the Consumer Payroll Check Cashing Analytics that can be used to track the number of fraudulent checks cashed and to predict future fraud.

Working with Meijer, we were able to create an easy-to-use web page that they can use to search for customers that have cashed a payroll check to see if they are passing bad checks.

To help visualize the different kinds of activities that a customer is doing, graphs and charts were put into our program as shown on the right. A report of recent activity can be created against the entire Meijer chain, or a group of particular stores to help identify trends.

The Consumer Payroll Check Cashing Analytics system can be accessed with both Internet Explorer and Firefox using Windows XP, Vista, and Windows 7.

The software is written in C# using jQuery for the graphical user interface. The graphs and charts are implemented using jqPlot.



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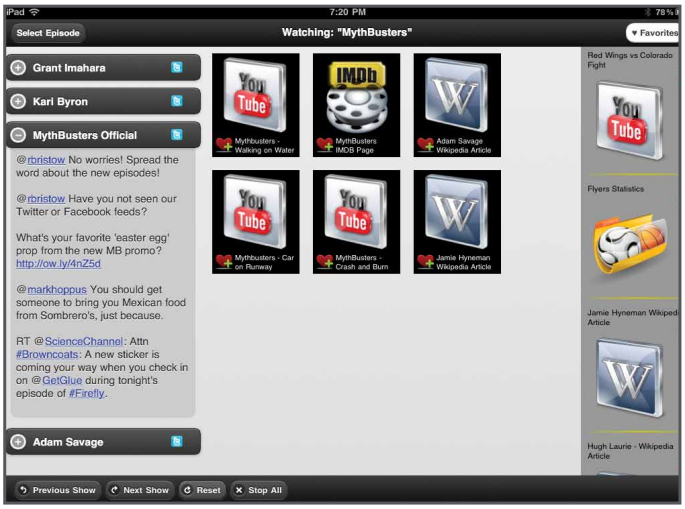
Motorola Mobility
Enhanced Content Authoring Services

Today's world is an increasingly interactive one, from the ubiquity of social media to the increasing growth of mobile devices. While traditional content providers struggle with how to utilize these growing social and technological platforms, users demand a much more rich and interactive experience than television currently offers.

Motorola Mobility aims to solve this problem with services that allow content providers to tailor a unique multimedia experience for users and present secondary content to users to enhance their experience.

In the cloud, the Content Authoring Tool (CAT) allows content providers to associate secondary content, such as videos, Twitter feeds, sports statistics, etc., with primary content viewed on the television. With this tool, content providers can easily choose what secondary content to show and the exact point at which it will appear. It allows great flexibility, so that a user viewing the same program multiple times may have a unique experience with each viewing.

On a mobile device, the CompleteTV App presents this secondary content to users, allowing them to interact with what they're viewing in new ways. With either their Apple or Android devices, users will be immersed in secondary content aimed at improving their viewing experience. Whether it's actor biographies, information on a product they have seen, or a video of the best plays of the game, users will be engaged with their televisions rather than just as passive observers.



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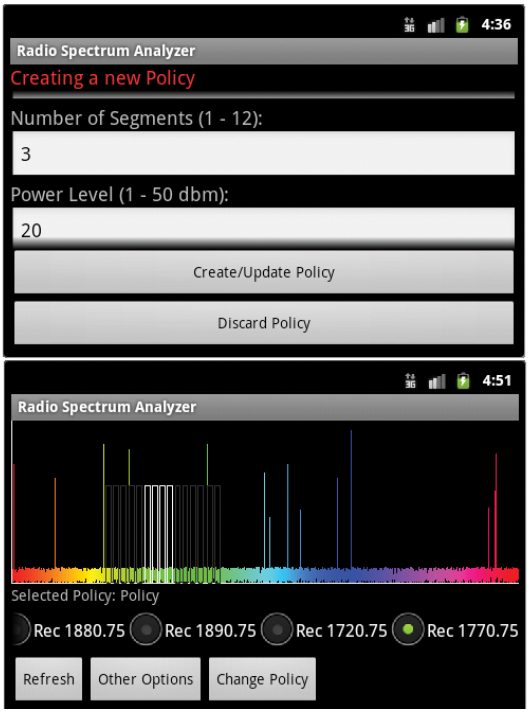
Raytheon
Dynamic Spectrum Access for Network Radios

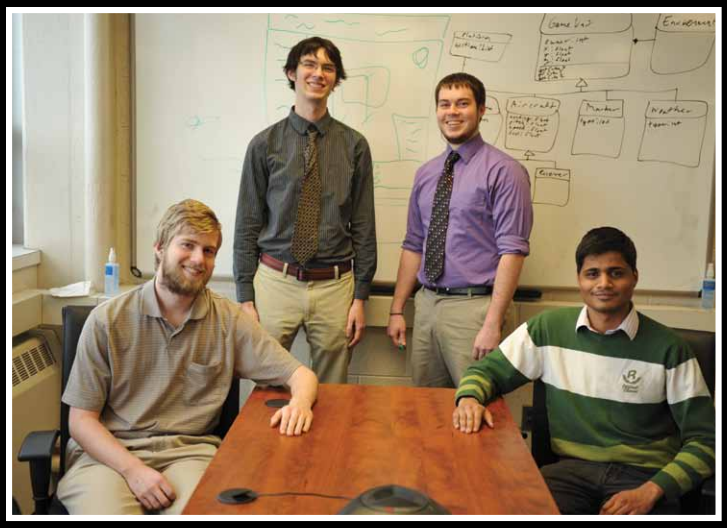
Within militarized regions, reliable radio communication is crucial for coordinating maneuvers between military units. As more radios are used, the radio frequency spectrum becomes crowded with interfering signals. Currently, radio broadcast frequencies have to be manually configured. We have created a program which automates and optimizes this process. This will ensure clear communication in otherwise unusable environments. Our program runs on an Android smart phone which can be connected to a military radio, allowing the entire process to be executed on portable devices.

Our software pulls radio spectra from a military radio. With this data, a decision is made as to what radio frequencies are suitable for transmission. Friendly transmissions which are already in place on the air are detected, allowing the operator to tune into an existing radio network. If the radio operator wants to set up a new transmission on unused airspace, our program recommends a set of radio frequencies over which to broadcast, conforming to some minimal requirements specified by the user. The user can scroll through all available broadcasting recommendations and select one of these recommended frequencies on which to broadcast. Once the new broadcast is set up, other friendly radio operators can identify and tune to this same set of frequencies.

The algorithm used to generate broadcasting recommendations was coded separately from the Android user interface. Raytheon can easily reuse the algorithm's code, allowing for future development of non-Android dependent versions.



Raytheon



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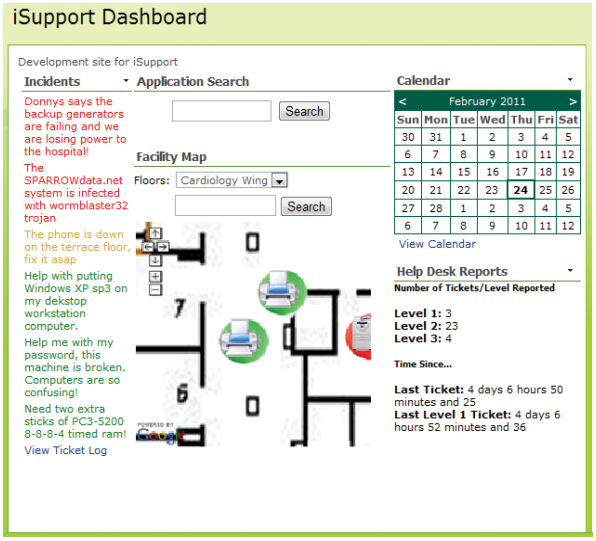
Sparrow Health System
iSupport Center

There are few places in the world where work is a matter of life or death. Sparrow Hospital is one of those few, as mid-Michigan's premier healthcare provider. Working at a hospital requires quick decision making. With the medical world's ever increasing dependence on technology, Sparrow's IT personnel must resolve technical issues as soon as possible. To complete tasks quicker for Sparrow's IT department, we developed an innovative web system called iSupport Center. This integrated dashboard contains tools that employees use to their advantage.

One tool of iSupport Center is to notify employees of incidents. The dashboard screen organizes these open incidents by level of urgency. More details on each assignment can be viewed with one click. Sparrow employees contacted the IT Helpdesk over 60,000 times last year. Finding the necessary information to support one of Sparrow's 400 applications can be overwhelming. iSupport Center includes a search bar to quickly find the application support page. An alert notification can then immediately be sent to the on-call team from the tool.

To show available hardware such as printers and fax machines, iSupport Center includes a dynamic floor plan and hardware map. If any hardware fails, it is indicated on the map with a red marker as opposed to a green marker. Helpdesk support can then redirect employees to the nearest working machine.

The iSupport Center is accessed via any web browser, developed in Microsoft SharePoint 2010 and ASP.NET/C#, with data management in Microsoft SQL Server 2008.



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TechSmith
WhiteCaps: Mobile Whiteboard Capture Solution

Software developers often use whiteboards to collaborate and document valuable drawings and ideas. These ideas usually end up getting erased or lost. TechSmith came up with a Mobile Whiteboard Capture Solution in which a person can snap a picture of a whiteboard and have that picture automatically saved and organized in the cloud to be easily located later. The goal of this project is to allow TechSmith employees, as well as the general public, to use whiteboards to collaborate and share information more easily.

This project includes a web application as well as mobile applications for the iPhone and Android devices. Users of the mobile app have the ability to take pictures which will automatically be uploaded to the cloud. Users are able to add metadata such as locations, group names, and notes to whiteboard captures. They can organize and share these captures with other users or groups of users. All whiteboard captures and user profiles can be accessed on the web application from either the mobile phone or computer where users can add metadata, annotate captures, search or browse through captures, and manage user groups and profiles.

The web application is developed in C# using the .NET 4.0 framework and Windows Azure SDK. The iPhone application is developed in Objective-C using the iOS SDK, and the Android application is developed in Java using the Android SDK. The application uses Azure Cloud Services for web hosting and data storage.

TechSmith

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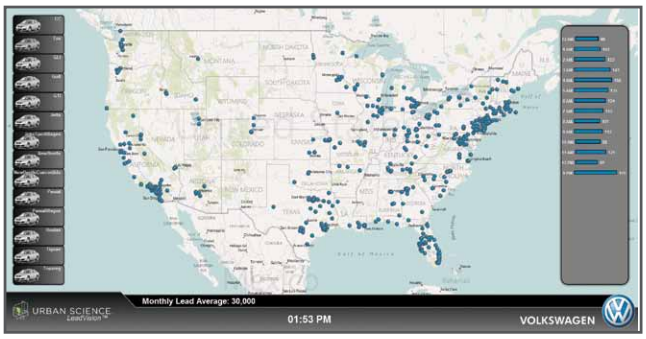
Urban Science
Bringing LeadVision to the Web

Every day thousands of people go online to shop for a car that suits their lifestyle. For example, two upper class parents might need an SUV to fit themselves and their two children comfortably. They navigate to an automotive manufacturer's website such as AudiUSA.com and request a quote from a local dealership. The dealer responds and starts the sales process with the customer just as if they had walked in the door of the showroom.

Requests such as these leads are routed through Urban Science, an automotive consulting company that enriches customer leads with additional useful data and scores them in an effort to help dealers target the right customers. With so many customer leads, it can be difficult for an automotive company to visualize geographically the locations from where their leads are originating. LeadVision solves this problem by taking those leads and plotting them on a map.

While LeadVision currently only plots leads, the web version will also give the user the option of interacting with the map. Clicking on a vehicle model will filter the map to only show leads for that particular model. Clicking on a geographic area will zoom LeadVision to that particular geography.

The introduction of the new LeadVision system to the web with its manufacturer-agnostic platform provides benefits to corporate employees as well as enabling field representatives and dealerships to create a better connection between any brand and its respective customers.



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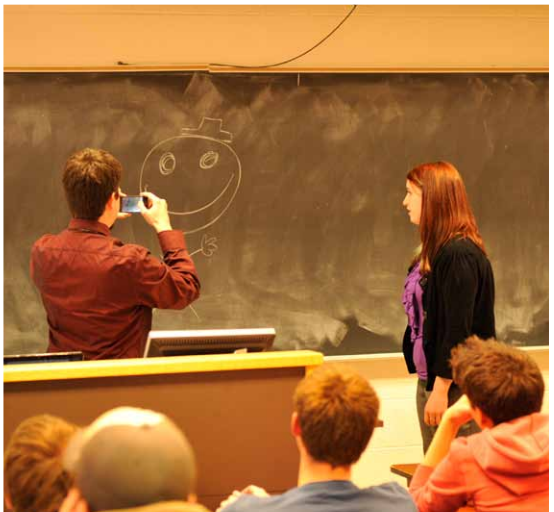
Screen Mockups

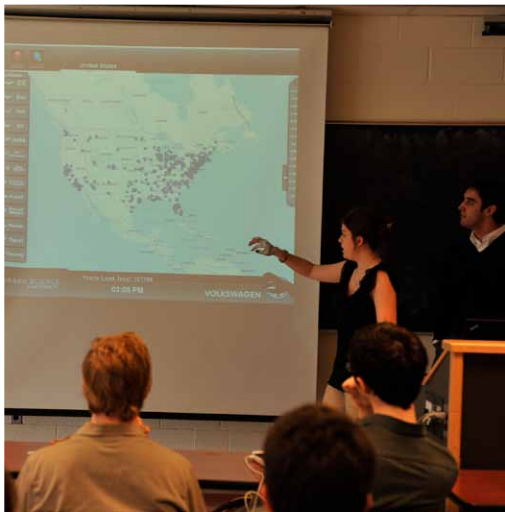

System Architecture


meijer


Screen Mockups


Policy Create/Edit




VOLKSWAGEN

Design Day Awards

CSE 498, Collaborative Design, is the senior capstone course for students majoring in computer science. Teams of students design, develop, and deliver a significant software system for corporate clients. The CSE capstone teams compete for four prestigious awards. The winners are selected on Design Day by a panel of distinguished judges.

Auto-Owners Exposition Award

Auto-Owners Insurance
Life Home Car Business
The "No Problem" People®

CSE 498 capstone teams present their projects on Design Day in a variety of ways. Teams create and set up an exhibit where they demonstrate their software systems and answer questions to Design Day attendees. Each team plays their project videos and answer questions for a panel of judges.

The CSE capstone team with the best overall Design Day performance is honored with the Auto-Owners Exposition Award, which is sponsored by Auto-Owners Insurance Company of Lansing, Michigan.

Team Raytheon
Dynamic Spectrum Access for Network Radios

Matt Bowser, James R. Voss, William Bonner, Srinivasa Settaluri
Presented by Scott Lake and Bob Buchanan of Auto-Owners Insurance

Chrysler Praxis Award

CHRYSLER

One of the hallmarks of CSE 498 capstone projects is that of praxis, the process of putting theoretical knowledge into practice. Teams apply a wide variety of information technologies to produce solutions to complex problems in areas such as business, engineering, computing, and science.

The CSE capstone team that engineers the software system that is the most technically challenging is recognized with the Chrysler Praxis Award, which is sponsored by Chrysler LLC of Auburn Hills, Michigan.

Team Boeing
BAPS: Battle Aircraft Position Share

Andrew Kos, Eric Muller, Steven Garske, Adam Cook
Presented by Karen Wrobel of Chrysler

Spring 2011

Design Day Judges

Mike Drazan
Toro

Bob Feldmann
Boeing

Louise Hemond-Wilson
IBM

Brian Loomis
Microsoft

Marty Strickler
Rose Packing

Richard Enbody
Michigan State University

Adam Haas
Ford

Keith Landau
GENBAND

Kevin Ohl
Michigan State University

Karen Wrobel
Chrysler

TechSmith Screencast Award

TechSmith

Each CSE 498 capstone team produces a video that describes and demonstrates their software product. Starting with a storyboard and a script, teams use Camtasia Studio 5 to synthesize screen recordings, video, audio and other multimedia to produce their project videos.

And the TechSmith Screencast Award goes to...the CSE capstone team with the best project video. The award is sponsored by the creators of Camtasia Studio, TechSmith of Okemos, Michigan.

Team Medtronic
Cloud-Based Athletics Operations Center

Michael Holp, Evan Francis, Christopher Paterson, Caitlin Russ
Presented by Dean Craven of TechSmith

Urban Science Sigma Award

URBAN SCIENCE

The CSE 498 experience represents the capstone of the educational career of each computer science major. An intense semester of teamwork produces impressive deliverables that include a formal technical specification, software, documentation, user manuals, a video, a team web site, and Design Day participation. The resulting sum, the capstone experience, is much greater than the parts.

The capstone team that delivers the best overall capstone experience is recognized with the Urban Science Sigma Award, which is sponsored by Urban Science of Detroit, Michigan.

Team Sparrow
iSupport Center

Ryan Hewitt, Dianna Kay, Brett McMillen, Maurice B. Wong
Presented by Mark Colosimo and Randy Berlin of Urban Science


MSU
UNION

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