Project Plan
MSU Next Generation Flight Deck

The Capstone Experience

Team GE Aviation
Daniel Alexander
Steven Cornfield
Alex Delgado
Bill Zajac

Department of Computer Science and Engineering
Michigan State University
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Project Overview

• Create the MSU Next-Generation Flight Deck
• Make flying:
  ▪ Easier
  ▪ Safer
  ▪ Ready to meet the demands of the future
Fact

- Regardless of how advanced a flight deck is, the human pilot is still its most vital asset.
- Pilots need to make decisions:
  - Quickly
  - Informatively
  - Correctly
Functional Specifications

• Integrate previous capstone projects
• Each display can run on its own computer
• The pilot/end-user interacts with the display
• Intercommunication and Cross Functionality
  ▪ Industry research
  ▪ Limited by functional capabilities
• Simulated Environment
Design Specifications

• X-Plane 9 transmits data
  ▪ Plug-in System
  ▪ Network
  ▪ Real-Time

• Separate applications simulate each display
  ▪ Receive Data via network
  ▪ Render data graphically in real time
  ▪ Communicate within each other

• Configurable
  ▪ All applications may run on a single computer
    — OR—
  ▪ Each application may run on its own system
Screen Shot - Primary Flight Display
Screen Shot - Lateral Map Display
Screen Shot - Super Synoptics

ENGINE

N1
4.0

EGT
418.0

Oil Temp
128.6

Oil Pressure
8.6

IMMEDIATE

SITUATION:
Right Engine Failure:
Throttle down opposite engine and throttle up Engine 2
Technical Specifications

• Plugins
  ▪ C and/or C++
  ▪ X-Plane SDK
• Displays
  ▪ C and C++
  ▪ OpenGL
  ▪ Boost, Xtools, nui, and other libraries
• Communication
  ▪ TCP/UDP
• Project
  ▪ Visual Studio 2008
System Architecture

- X-Plane Flight Synoptics Data Plug-in
- PFD Flight Data Plug-in
- PFD Terrain Plug-in
- LMD Flight Data Plug-in
- LMD Terrain Plug-in

- Super Synoptics
- Primary Flight Display
- Lateral Map Display

Nodes with TCP and UDP connections, with some connections undecided.

Cross Functionality

TCP
UDP
Undecided
Hardware Setup

![Diagram of hardware setup including a projector for X-Plane, a large screen, a lateral map display, super synoptics, and a primary flight display.]
System Components

• Hardware Platforms
  ▪ Windows 7
  ▪ One or more machines running avionics instruments
  ▪ Machines networked to stream data

• Software Platforms / Technologies
  ▪ X-Plane SDK
  ▪ Visual Studio 2008
  ▪ OpenGL, GLUT, XTools, Boost, nui
Testing

• Lots of research and prototyping
  ▪ When will this functionality be useful?
  ▪ Will this interfere with a display’s existing functionality?
  ▪ Can we make it better?

• Data Display
  ▪ Synchronized with X-Plane, other displays
  ▪ Data displayed is realistic

• Edge-Case Testing
  ▪ Fault-tolerance between displays
Risks

• General avionics knowledge
  ▪ Team members will research field via client suggested information
• Some ideas may have to be killed
  ▪ Not completely avoidable
  ▪ Risk reduced by research, visual prototyping
  ▪ “1000 ways not to make a light bulb”
• Must rely on and utilize previous projects
  ▪ Must heavily debug and optimize code
  ▪ Adding cross functionality will prove difficult
• Networking conflicts within instrumental communication
  ▪ Primary network specialist