Java Based Simulation Content in E-Learning
Development & Deployment Issues and Options

Presenter
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Presentation Outline

• E-Learning Overview
• E-Learning Content Assets
  – Issues
  – Options
• Available Technology
• Java – A Viable Option
• Conclusion
Presenter Background Information

• Christopher P. Giordano
  – DiSTI, Orlando, FL U.S.A.
    • Worldwide Director of Software Support
    • Product Manager and Instructor
  – Worked in Simulation Industry since 1997
  – Program Manager & Lead Software Engineer for Visual Development on 42 Unique Airframes
    • Courseware (CBT), Visual Simulations, HMI Development and Prototyping, Virtual Maintenance Training
  – Class Designer and Instructor
    • PHP, MySQL and Apache Architecture
    • GL Studio HMI Toolkit
E-Learning Overview

• Computer Based Training for the Enhancement, Retention or Utilization of a Required Skill Set
  – Courseware
  – Maintenance Training
  – Operational / Procedural Training

• Types of E-Learning
  – Classroom
  – Web Based
  – Portable (Mobile)

• Automated or Instructor Assisted
E-Learning Overview

- Anatomy of a Learning System Architecture

![Diagram of E-Learning System Architecture]

- Development
  - LCMS
    - SCO(s)
    - Assets
    - Model Behavior
  - Behavior Server

- Deployment
  - LMS
    - Server
    - Lessons
    - SCO(s)
    - Assets
    - Model Behavior
    - MySQL Database

- Utilization
  - Client System
    - Web Browser
    - Active Lessons

Behavioral Serving Option
E-Learning Overview

• U.S. DoD’s Drive for Higher Fidelity
  – Simulation Content vs. Animations
• Deeper Immersion into Lesson Assets
  – Fully Interactive 3D Content
  – Reuse Existing Source Data
• Natural Navigation
  – Free Play Environment
  – Realistic Movement
E-Learning Overview

- Reusable Software Objects (RSOs)
  - Easily Maintainable Human Machine Interfaces (HMI)
  - Vertical Reuse
  - Horizontal Reuse
E-Learning Content Assets

• Development Issues
  – Hardware Concerns
  – Object Size Constraints
  – Learning New Proprietary Coding Solutions
  – Proprietary Players in Secure Environments
  – “Sunset Technology” Active-X®
E-Learning Content Assets

• Deployment Issues
  – Bandwidth Constraints
  – Security Constraints
    • Code Signing & Trusted Servers
    • Proprietary Web Players
  – Rendering Performance
  – LMS Integration Inconsistencies
E-Learning Content Assets

• Development Options
  – Hardware Smaller Faster and Less Expensive
  – Smaller HMI RSOs with More Detail
  – Non Proprietary Development
  – Use Industry Standard Content Player
  – Use Cross Platform Graphics Layer
E-Learning Content Assets

- Deployment Options
  - Separate & Centralize Model Behavior from Asset

![Diagram of simulation behavior server, client system, and LMS interaction]

- RSO Initial Parameters sent to Simulation Server & Visual Representation Data sent back to Client HMI
- Scenario Initialization Parameters sent to Radio RSO & Sends Student Evaluation Back to LMS
- Administration & Scheduling of Simulation Server Time
- LMS
E-Learning Content Assets

- Deployment Options
  - Deploy Safe Interpreted Byte Code
  - Let GPU do the Processing with OpenGL
  - LMS Independent Integration

Ex: Java Based PFD Applet with Behavior Model Separate from RSO, Running at 60 Hz via web
Available Technology

• COTS Development Tools
  – Non-Proprietary Format
  – Cross Platform (OpenGL)

• Superior Hardware Available Today
  – Smaller, Faster, Less Expensive

• Today’s Software Does More
  – Non-proprietary, Human Readable, Object Oriented Code Generator
  – Java OpenGL Bindings (JOGL)
Java – A Viable Option

• What is JOGL?
  – Java OpenGL Binding
    • OpenGL Rendering
    • OpenGL API (JSR-231)
  – Superb performance

• Historical Concerns of Java
  – Versions Control by Sun
  – Performance Limitations
  – Hardware Demands
  – Ease of Integration

Ex: Commercial Diesel Engine Trainer in Java
Java – A Viable Option

• Benefits of Java with JOGL
  – No Proprietary Web Player
  – No ActiveX
  – No Code Signing Required
  – Reuse Existing Content
  – Flexibility to write Model Behavior as a separate RSO
    • C / C++ / or existing legacy code
    • On server for common access
    • Make HMI RSO Smaller
  – Superior Performance
Conclusion

• Secure Deployment
• Simulation Content vs. Animations
• Easy Integration and Maintenance
• Great Performance through Java
• Reusable, Non-Proprietary Content Development
• Allows More Effective Blended Solutions
  – MT CBT Crossover E-Learning