Leveraging Open Source e-Commerce Tools to Enable Joint Operations

Steve Rowe
Josh Band
Charles Cohen, Ph. D.

Cybernet Systems Corp.
Acknowledgements

• This work was funded by the Air Force Research Laboratory Human Effectiveness Directorate under contract FA8650-06-C-6619
The Need for Interoperability

• Joint Vision 2010/2020
  – The joint chiefs of staff called for a fusion of US military forces.

• US-JFCOM
  – Won an award last year for developing a framework to allow interoperability. Have you heard of it?

• Transformation to information-based warfare
  – Many computer systems will need to work together

• Future Combat Systems
  – APIs are defined, but what about the infrastructure?
Challenges

• Need interoperability among similar, but competing, organizations (Army, Navy, Air Force, Marines, Coast Guard, Coalition Partners)

• Massive amounts of data

• Need for wide-spread, real-time access

• Need maximum data security

• Mistakes cost lives
Challenges Faced By Banks

- Need interoperability of financial transactions
- Massive amounts of data
- Millions of Point-of-sale terminals that need to work in a few seconds
- Need maximum data security
- Mistakes cost money
How to get Interoperability

• Use a common standard
  – Everybody speaks the same language!
  – Who invented the standard? A rival company?
  – Does the standard meet all the needs of a particular application?
  – How does the common standard support legacy systems?
How to get Interoperability

• Create adapters
  – Translate from "yours" to "mine"
  – Such translations may not be possible
  – Although the individual development effort for an adapter is small, the number of adapters needed grows exponentially with the number of stove pipes you need to make interoperate.
Whence a Common Standard?

The "industry" model (C++)

Need

Committee

Consensus?

Standard!

The "government" model (Ada)

Need

Mandate

Standard!

Consensus?
Epiphany

• Why not use COTS software to distribute the data for a military application?
The 3-Tier Solution
Open Source Solutions

- Web Browser: Mozilla
- JavaScript Library: Dojo
- Application Server: jboss
- Web Server: Apache
- Servlet Server: Tomcat
- Database Server: postgresQL
Adapter for Legacy Systems
Performance

- Solved by multiple, parallel transaction servers.
- Distribute computation load over many thin (display) clients, many middle-tier logic processing servers, and multiple data servers.
- Distribute network load around congestion to alternative resources.
- Recent developments in browsers (particularly AJAX and COMET) make perceived performance better.
Reliability

• Fault tolerance through multiply redundant resources.
• Transaction management capability provides “all-or-nothing” data modification.
Accuracy

• Fault tolerance built into “business logic”
• Transaction protocol prevents partial answers.
• Transaction protocol notifies sender if message was not received.
• For Open Source Software, many inspectors are examining the code for defects.
Security

• Authentication
• Encryption
• Multi-Layer Architecture
• For Open Source Software, many inspectors are examining the code for defects.
Will the Government Accept Open Source?

• Yes:
  – In 2003, Defense Department CIO John P. Stenbit, freed DOD agencies to use open-source software (OSS) provided security and validation requirements are met
  – Numerous Small Business Innovative Research (SBIR) solicitations from the DOD call for Open Source solutions.
  – “OSS components should be leveraged rather than funding the development of equivalent proprietary components for specific programs.” – recommendation to the undersecretary of defense, April 2006.
MITRE says

OSS is a viable long-term solution that merits careful consideration because of the potential for significant cost, reliability, and support advantages. However, these potential benefits must also be carefully balanced with a number of risks associated with OSS approaches and products.

… It typically compares favorably for server and embedded system implementations that may require some customization, but fares no better than traditional COTS for typical desktop applications.

Will Open Source Accept Military?

- Open source project adds "no military use" clause to the GPL
- Monday August 14, 2006 (04:01 PM GMT)
- By: Tina Gasperson

Tiziano Mengotti and Rene Tegel are the lead developers on the GPU project. Mengotti is the driving force behind the license "patch," which says "the program and its derivative work will neither be modified or executed to harm any human being nor through inaction permit any human being to be harmed." Mengotti says the clause is specifically intended to prevent military use. "We are software developers who dedicate part of our free time to open source development. The fact is that open source is used by the military industry. Open source operating systems can steer warplanes and rockets. [This] patch should make clear to users of the software that this is definitely not allowed by the licenser."
Results

• Cybernet used the Open Source tools listed herein to create a web-based situation awareness application for joint air strike missions.
  – Easier to make changes to the presentation without invalidating the business logic.
  – Cost to implement was small due to configuration rather than development.
Results
Future Directions

• Service-Oriented Architectures
  – Will simplify the creation of adapters
• More integration with industry-based standards committees
• More adoption of Open-Source Software
Conclusions

• Industry has similar needs but leaner processes to get those needs met.
• To get interoperability, you need to create new systems that conform to an existing standard, using adapters to reach back to legacy systems.
• Industry has a number of existing standards for data exchange that meet the needs of military, and have widely-used Open Source implementations.
Questions?

• Please address questions to Steve Rowe, srowe@cybernet.com