URBAN TERRAIN TRAINING

Military Operations on Urban Terrain (MOUT) are one example of the many types of training systems in the Army's Live Training Transformation (LT2) Product Line. The development of a Mobile Product Line Architectural Framework will involve synchronization with the emerging second generation of LT2 products and the Common Training Instrumentation Architecture. Here, Soldiers with 3rd Brigade Support Battalion, 1st Heavy Brigade Combat Team, Third Infantry Division (1HBCT, 3ID) enter a shoot house during MOUT training at Fort Stewart, GA, June 21. (Photo by SSG Christopher Blakeslee, 1HBCT, 3ID)

LIVE TRAINING *Goes* MOBILE

PEO STRI advances Army vision for handheld applications with common architecture, data, standards, processes, and components

by Andrea Morback, James Todd, and Dr. Jeremy T. Lanman

In May 2010, the U.S. Army Deputy Chief of Staff, G-3/5/7 stated that the vision for the Common Operating Environment (COE) is to establish "an approved set of standards that enable secure and interoperable applications to be rapidly developed and executed across a variety of computing environments."

This vision includes the mission to "provide Soldiers with a position of advantage using mobile or handheld devices to access relevant, trusted information required to make timely decisions." To make this a reality, the Army has established a set of goals to be achieved over five years. The first goal, critical to the success of this mission, is the development of a Mobile Product Line Architectural Framework (MPLAF).

The Army is just beginning to pursue the use of mobile devices and applications in its live training domain. The migration to and reliance on these devices is likely to grow significantly over the next few years. As the Army looks into the application of mobile devices for many of its systems, there is an opportunity to apply product-line architectural techniques and lessons learned. The adoption of standards, frameworks, and style guides will ensure 1) early realization of cost avoidances; and 2) early return on investment from systematic reuse.

Currently, live training mobile applications range from maintenance roles, through command and control systems, to after-action reviews. These applications will be operated in stand-alone or connected configurations, or as service providers or consumers deployed into a cloud-based COE environment, allowing Soldiers on-demand training capability. However, just as there are many potential benefits, there also are many challenges, including security and information assurance, technical performance, and the current acquisition business model. To ensure success, an underlying mobile architectural framework that promotes product-line guidance and standardization must be established and maintained.

HANDHELD TARGET CONTROL
The TRACR Ültra Lite handheld target control system is a mobile application supporting the Targetry Range Automated Control and Recording control system. It is ready for transition to operational use. (Image courtesy of Dignitas Technologies LLC)

This article will explain the benefits of applying an MPLAF, a set of standards, and a style guide to live training, and will describe lessons learned and implementation considerations for developing mobile applications. Furthermore, it will discuss synchronization of the live training MPLAF with the emerging second generation of the Army's Live Training Transformation (LT2) Product Line and the Common Training Instrumentation Architecture (CTIA), and the Program Executive Office Simulation, Training, and Instrumentation's (PEO STRI's) overall enterprise mobile architecture approach.

MOBILE PRODUCT LINE CONCEPT

LT2 has long been a true software product line. The LT2 Family of Training Systems is based on the Army's CTIA. The CTIA is the technical framework that provides commonality across training instrumentation systems, and is the live training instrumentation interface to the Live – Virtual – Constructive Integrated Training Environment, a common instrumentation platform for training systems. The CTIA consists of standards, protocols, infrastructure services, and common software components to be used by system developers. It is the core software infrastructure of training instrumentation systems.

LT2 core assets include open architectures, common software components, standards, processes, policies, governance, documentation, and more, all leading to a common approach and framework for developing live training systems. Examples of the many types of training systems in the LT2 family include Military Operations on Urban Terrain, Maneuver Combat Training Center, instrumented live-fire range training, and various Joint training systems.

Similar to the LT2 Product-Line Architectural Framework, the MPLAF vision is to create a family of mobile applications using a common architecture with common data, standards, processes, and components. This commonality facilitates the rapid development of new applications, and ensures that applications across the LT2 product line can communicate and interoperate with one another. This is important because large training exercises need to employ different training systems working together.

The LT2 product line makes use of plug-and-play components and applications that are common between products and applications, allowing for changes, upgrades, and fixes developed for one application to be applied

to others. This concept provides the inherent logistical support benefits that derive from commonality, standardization, and interoperability, reducing total life-cycle costs.

Specifically, as defined by the Army's COE, the MPLAF should include a common software development infrastructure (CSDI) comprising operating and run-time systems, native and common applications and services, software development kits, and standards and technologies for handheld and wearable devices, with an initial focus on implementation of live training capabilities. Additionally, the MPLAF will provide guidance for hardware specifications to support integration of compliant capability solutions on the Soldier.

As a proof of concept, the Target Modernization program within PEO STRI's Project Manager Training Devices (PM TRADE), in conjunction with the U.S. Army Simulation and Training Technology Center, developed a mobile device application to support the Targetry Range Automated Control and Recording (TRACR) control system. The TRACR Ültra Lite (TÜL) handheld target control system, implemented quickly and efficiently by leveraging and defining mobile application standards, is ready for transition to operational use. TÜL is the next-generation handheld target controller for use on the Army's live-fire training ranges. TÜL provides a suite of graphical user interface-based controls for the individual or scenario control of targets in either operational or maintenance mode. TÜL communicates with the tower TRACR computer via a rest state interface to ensure timeliness of performance and safety of control.

Based on level of maturity, PM TRADE's TÜL currently focuses on adequately defining the description of functional characteristics and identification of common standards and practices for the MPLAF. Design considerations for the CSDI and associated hardware specification and network interfaces are preliminary. However, synchronization with the current LT2 Product Line construct and next-generation CTIA Service-Oriented Architecture (SOA), and systematic reuse has begun, with similar mobile initiatives in PM TRADE using MPLAF.

CHALLENGES AND LESSONS LEARNED

The emergence of mobile technology in the training environment introduces a number of challenges, including information assurance, ruggedization, reusability, integration into existing training systems, and life-cycle support.

One of the greatest challenges with the emergence of mobile architecture is ensuring the continued protection of data and adhering to evolving security regulations. Information assurance requirements need to keep up with the pace of mobile innovation. In addition to threats presented by a standard "non-mobile" system, mobile devices present their own unique security challenges.

Because of these constantly evolving threats, it is imperative that mobile systems go through the DOD Information Assurance Certification and Accreditation Process to successfully achieve an Authorization to Operate. The security risk for mobile architectures needs to be reduced to an acceptable level, while allowing innovation in this area to continue.

Second, mobile devices need to be ruggedized for use by Soldiers in a variety of environmental and physical conditions to ensure survivability in the field. These conditions include temperature extremes, wind gusts, humidity, sand, dust, and wear and tear by the operator. Also, Soldiers may need to wear gloves while using the mobile devices; therefore, the cases for the device's screen must be considered.

In keeping with PEO STRI's goal of reusability, mobile applications need to follow suit. A challenge to be overcome is

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to ensure that mobile applications are not stovepiped. The question of how to reuse part of an application needs to be studied. Mobile applications need to have reusable components built into them.

For example, TÜL has a component that allows the user to draw around targets with a finger in order to control multiple targets simultaneously. That same component, with very little modification, has the potential to be reused in another mobile application's capability to select and control multiple improvised explosive device simulators simultaneously. As a result, Army programs would save money and field much-needed capability to Soldiers more quickly and efficiently.

Considerations when developing mobile applications include connectivity and integration into an existing system. Factors to take into account include updating the system's information assurance accreditation boundary, user and maintenance documentation, training, and existing software. Also, in keeping with the Army's COE and mobile handheld initiatives, the MPLAF will allow for adoption of future policies, procedures, and design decisions required for Army-wide enterprise integration.

In addition to meeting the previous challenges and considerations, the MPLAF will consider elements such as the selection of operating systems, platforms, software development kits, etc., that are consistent with the Army's COE and enterprise mobile architecture approach.

Lastly, for life-cycle support, sustainment needs must be considered.

An early lesson learned from this emerging technology is the need to protect the application from the user. Users should not have the ability to access functionality or applications that are not needed for their intended training task. To avoid this situation, a kiosk mode may be used. Kiosk software locks down the application and prevents the user from intentionally or accidentally accessing all functionality except what is predefined for the training task.

GAME ON

The Army's migration to and reliance on mobile devices is likely to grow significantly in the near term. Here, Soldiers participate in a Mobile Device User Exercise conducted by the ROTC at the University of Central Florida. (Photo by Shelly Brown)

RETURN ON INVESTMENT

The development of a MPLAF allows for multiple avenues of return on investment (ROI). The MPLAF cannot be expected to yield the same reuse ROI as a typical software product line, given the compact nature of mobile applications and the technology evolution of mobile hardware. However, there still should be significant ROI from systematic reuse.

It is anticipated that the MPLAF will allow up to 45 percent reuse of software components within the product line. Couple this with the reliance of feature profile concepts of the second-generation product line ideology, and the reuse rate could climb above 60 percent. This reuse could equate to a cost avoidance of as much as $4 million to $5 million per year in development and sustainment.

MOBILE MAPPER

SPC Limburg Neal of the 7th U.S. Army Joint Multinational Training Command uses the Army Range Mapper Mobile on his iPhone to reference driving routes on Grafenwoehr Training Area, Germany, April 18. As the Army expands the use of mobile devices and applications in live training, it is taking steps to apply product-line architectural techniques and lessons learned. (Photo by Michael Beaton, U.S. Army Europe)

Development of the MPLAF will also allow the live training domain to synchronize the road map between the current LT2 product line and the mobile devices. The MPLAF will provide the architectural framework and standards for SOA (Training as a Service) and cloud computing solutions.

The ability to implement SOA and cloud-based services will extend the functional reach of the LT2 Family of Training Systems, as well as provide mechanisms to lower life-cycle operational and sustainment costs. By centralizing the services and abstracting the processing, less manpower will be required to operate and sustain each system, as common functions could be run from a remote facility for all training applications.

CONCLUSION

The key to ensuring a positive ROI with respect to the MPLAF lies in the early implementation of the construct, as well as early implementation of lessons learned. Therefore, it is incumbent not only to develop the MPLAF based on best practices, but also to temper these with concrete lessons learned.

It is very tempting to move forward with mobile applications as if they were disposable. However, given tighter budgets, it is imperative that we implement a sound product-line approach for mobile applications and devices, and focus resources on product-line development and advancement that promote the systematic reuse of common assets and capabilities.

For more information, go to ***www.lt2portal.org****.*

ANDREA MORHACK is a Systems Engineer for the Target Modernization program within PM TRADE at PEO STRI. She has more than nine years' experience working in DOD acquisition associated with Urban Operations. Morhack holds a B.S. in computer science from the University of Central Florida and a B.B.A. in marketing from Stetson University.

JAMES TODD is the Lead Systems Engineer and Architect for the Future Army System of Integrated Targets at PEO STRI, and a Senior Systems Engineer for the LT2 product line. Todd holds a B.S in mechanical engineering from the University of New Orleans and an M.S. in industrial engineering from Texas A&M University.

DR. JEREMY T. LANMAN is the lead systems architect for PEO STRI's Common Training Instrumentation Architecture and Consolidated Product-Line Management construct, supporting the LT2 Family of Training Systems. Lanman holds a B.S. in computer science from Butler University, an M.S. in software engineering from Embry-Riddle Aeronautical University, and a Ph.D. in modeling and simulation from the University of Central Florida.