Joint Service Partnership: Extending the Live Training Transformation Product Line

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ABSTRACT

In concert with the Marine Corps Training Modeling and Simulation Master Plan and as part of the Range Modernization and Transformation (RM/T) programs, there exists a requirement to support the Live, Virtual, and Constructive (LVC) Training Environment within the synthetic battlefield that combines LVC training tools through collaborative interoperability techniques. RM/T is a live training Family of Systems which supports Planning, Situational Awareness, Exercise Control, and After Action Review capabilities. However, in order to support the live training domain, an integrated method to collect, analyze, and distribute live exercise data needs to be developed.

An architectural analysis was conducted to determine the feasibility of implementing a developmental solution verses reuse of other service capabilities. The analysis determined that the Marine Corps should leverage the Army's Live Training Transformation (LT2) product line based on the Common Training Instrumentation Architecture. As a result, the Army's Project Manager Training Device and Marine Corps Program Manager Training Systems - Live Training Systems formally signed a Program Level Agreement to establish a LT2 product line partnership to support synergistic development of the Marine Corps RM/T programs. The goal of this partnership is to promote joint interoperability, architectural standardization, and maximize reusability and commonality of existing LT2 product line components, and subsequently promote cost savings across the Marine Corps RM/T and Army LT2 programs and service acquisition total life cycle.

This paper will address the details of the architectural analysis, and the factors that guided the development of the Marine Corps Instrumentation Training System (MC-ITS) program as the first Marine Corps LT2 product integrated use case. The MC-ITS program will provide the basis for extending LT2 reuse to other Marine Corps live training programs, and expanding the current Army LT2 capabilities to further enhance the LT2 Consolidated Product Line Management strategy.

ABOUT THE AUTHORS

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INTRODUCTION

A range of live training tools and simulation technologies is available to train Marines at all echelons of command. However, utilization of existing live training systems is ad hoc and problematic as the operating forces and training commands struggle with operational commitments and other training requirements. These challenges have hindered the opportunity and ability to fully incorporate live training systems within the mainstream of unit level and formal institutional training plans. The acceptance and use of existing training simulation technologies is inconsistent across the Marine Corps and numerous shortcomings (T-MSMP, 2007) exist with the manner in which the Marine Corps has sought to fully implement live training systems as a key component of comprehensive training plans.

Challenges

Existing training simulation technologies have not always adequately met needs of the operating forces and supporting establishments in an organized preplanned manner. The net result is the absence of an institutionalized technology enabled training capability to meet the challenges associated with developing a comprehensive simulation environment that meets training needs at all levels of training.

Infrastructure requirements and resource demands have resulted in selected fielding of live training systems to fixed locations which have constrained availability, adaptability and responsiveness to the operating forces. At all levels within the Marine Expeditionary Force (MEF), and within the formal training centers and schools, insufficient capacity and ease to effectively use existing training system exists thereby not supporting the increasing demand for realistic integrated training.

The Marine Corps Training Modeling and Simulation Master Plan explains that current capabilities associated with live training in support of ground and air command and control training exhibit the following characteristics (T-MSMP, 2007):

- Small unit virtual training (Company and below) focused on tactics, techniques and procedures.
- Staff training (Battalion to MEF level) that simulates kinetic military operations and necessitates scripted Master Scenario Events Lists injects to train to non-kinetic operations.
- Distributed Joint and combined training opportunities involving different simulations and simulation versions is constrained by resources and technology.

Strategy

This paper will attempt to outline a joint architectural and product line approach to incorporating live training simulation systems across the Marine Corps and Army ground-training continuum and achieving the end-state use case within two years. As depicted in the next section, this strategy incorporates an architectural and capability gap analysis, various levels of reuse planning and development, and joint service collaboration.

The Marine Corps and the Army have adopted the LT2 strategy and collaboration effort between PM TRADE and PM TRASYS to derive a new live training product line from existing LT2 programs for the development of future Marine Live Training Systems. Proposed Objectives that have been met included the following:

- Development of Program Level Agreement that aligns Army and Marine Live Training Program efforts relative to organization structure, development processes, and Consolidated Product Line Management (CPM) strategy.
- Collaboration on development and sustainment of core software assets common to both organizations based on adoption of LT2 Concept of Operations.
- Participation within the LT2 Integrated Product Team process to foster software reuse,

standards evolution and maintain integrity of the combined product lines.

- Collaboration of schedule alignment relative to product fielding between programs to mitigate divergence of the baselines and reduce life cycle support costs.

- Propose a crawl, walk, run strategy starting with LT2 Marine Corps Instrumentation Training System (MC-ITS) proof of concept.

This plan is to provide for synergistic capabilities of the development efforts between APM Instrumentation (PM TRASYS/USMC) and APM LT2 (PM TRADE/USA).

MARINE CORPS LIVE TRAINING BACKGROUND

Marine Corps ranges are established to support force-on-target and force-on-force live training. While the primary focus of the range is to support live service unit training, Marine Corps ranges need to be able to participate in national joint training as required by the DoD Training Transformation Implementation Plan (TTIP, 2004). Marine Corps ranges should also be able to support national experimentations on new war fighting technologies and operational concepts.

The Range Modernization/Transformation (RM/T) capability is an umbrella term for a family of systems which provides improved Situational Awareness on trainees during distributed range training operations. Use of this more accurate and timely information will allow Observer/Controllers to provide better real time assessment of live combat techniques while improving range safety. Aggregated information will provide a better Common Operational Picture to higher level decision makers and quantitative After Action Review (AAR) reporting. Figure 1 illustrates the high level operational concept for the Marine Corps RM/T Range Investment Strategy.
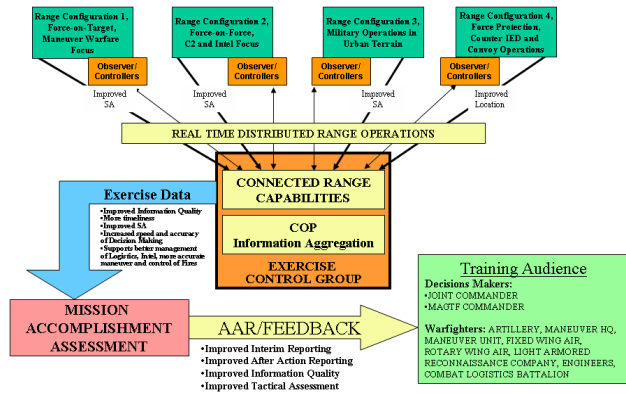

Figure 1. RM/T High Level Operational Concept

The RM/T will modernize Marine Corps training ranges by evolving them to a training environment that is compliant with a common training architecture that allows LVC training systems to interoperate and work seamlessly together, thereby increasing Marine Corps training capabilities and achieving the Office of the Secretary of Defense's "Training Transformation" goals to support both Service and Joint training (TTIP, 2004). Furthermore, RM/T will enable Marines to train more effectively by supporting near real-time adjudication of engagements during force-on-force training. It will also provide near real time interaction between Marines and computer generated forces. Both force on force and live fire training will make use of targets with instrumentation and Computer Generated Forces (CGF).

Range Instrumentation Systems

Range Instrumentation Systems (RIS) is a subset of RM/T family of systems that enable Marines to realistically interact with each other, targets, and computer generated forces during both force-on-force and live-fire (force-on-target) exercises. Unique Marine requirements include employment concepts, the Marine Air Ground Training Facility (MAGTF) organization, and Marine Corps specific organic weapons. Marine Corps training requirements include Ground to Ground Direct fire using Tactical Engagement Simulation Systems (TESS) or CGFs. Ground-to-Ground indirect fire and area weapons training requirements allow Marines, weapon systems, and vehicles to engage targets through RIS with indirect fire being generated by indirect weapons systems, surrogate instrumented weapons or computer generated indirect fired weapons. Also, Air-to-Ground fixed and rotary wing aircraft have to be tracked.

The RIS also supports Ground-to-Air, Air-to-Air and Surface-to-Ground engagements. Engagements are adjudicated, recorded and disseminated. The RIS supports fore-on-force and live-fire training using instrumented Marines and weapon systems. The system must adjudicate and record engagement results, enable position and casualty tracking, and support centralized exercise control and monitoring. The RIS will eventually support automated interactive targetry, CGF, and provide a robust AAR capability.

Current RIS Capabilities

The Marine Corps currently employs several stand-a-lone systems or stove-pipe capabilities in the live RIS training environment. Each of these systems supports Planning, Situational Awareness, Exercise Control, and After Action Review capabilities. The Data Collection System (DCS) and Integrated GPS Radio System (IGRS) are pre-production systems deployed to Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, CA. The DCS using IGRS to provide ground Position Location Information (PLI) provides Planning, Situational Awareness, Exercise Control, and After Action Review capabilities able to support Mojave Viper exercises. IGRS will provide PLI coverage of the entire MCAGCC range using nine Mountain Top Base Stations which relay the data to main side.

The Tactical Audio Capture System (TACS) is being added to the MCAGCC communication infrastructure to collect and record exercise tactical radio communications on the ranges. The Tactical Video Capture System (TVCS) is being fielded to several Marine Corps and Navy sites worldwide. TVCS includes a network of audio and video instrumentation connected to a control station that can monitor and record audio and video data. The TVCS includes a Production Station that is used to prepare an After Action Review for the training audience. The Marine Corps has also fielded the Deployed Instrumentation Training System (DITS) to Quantico, Camp Lejeune, and Camp Pendleton. The DITS also includes stand-a-lone PLI capabilities combined with Planning, Situational Awareness, Exercise Control, and After Action Review capabilities. These stove-pipe systems have many redundant capabilities.

RIS ARCHITECTURE AND CAPABILITY GAP ANALYSIS

In April 2008, PM TRASYS hosted a user conference at the MCAGCC to discuss and identify requirements and training gaps in the live training environment. The outcome of the conference was the set of requirements summarized in figure 2. The conference identified five functional areas for analysis: Scenario Design, Concept of Operations Master Scenario Event List Management, Exercise Control, Assessment, and After Action Review Generation. New user requirements were derived from this analysis.
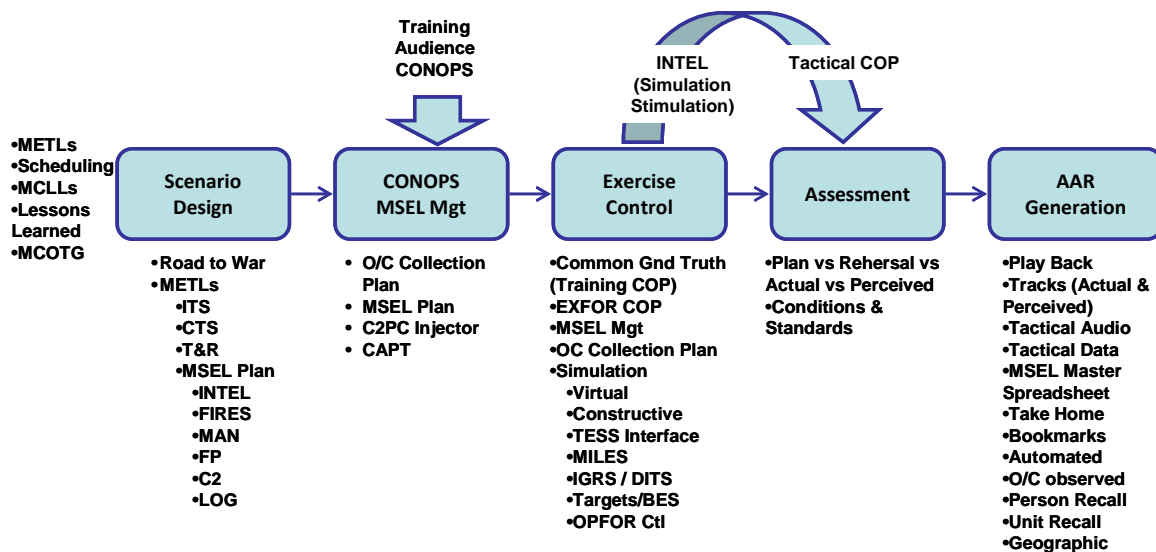
Figure 2. User Requirements

The user requirements were consolidated with the Range Instrumentation System (RIS) Operational Requirements Document Key Performance Parameters and used as the basis for an architectural analysis. The architectural analysis was conducted to determine the feasibility of implementing a new developmental solution or investigate reuse of other service capabilities.

The Marine Corps Architectural Working Group with support from the LT2 working group conducted a requirements gap analysis relative to LT2 existing capabilities that culminated in adopting LT2 reuse plan and strategy to support the RM/T Family of Systems effort by providing a Marine Corps initial capabilities training solution for the Marine Corps Instrumented Training System (MC-ITS) program built upon the LT2 Family of Training Systems framework (Samper, 2007). A MC-ITS requirements crosswalk was performed against existing LT2 component and product capabilities located within the LT2 portal and funded for future development. By reuse of the existing LT2 common components developed to CTIA standards (Rivera, 2008), a MC-ITS product roadmap was created to support evolutionary and incremental acquisition. This methodology will achieve cost avoidance via planned modular reuse resulting in Joint synergistic capabilities between Army and Marine Corps development efforts and reduction in total ownership costs for MC-ITS program.

Live Training Transformation (LT2) Product Line

The Live Training Transformation (LT2) Product Line program will produce a Family of Training Systems (FTS) which will meet the Army's and Marine Corps's operational requirements for live training (Dumanoir, 2005). As shown in figure 3, The LT2 Product Line is comprised of the Maneuver Combat Training Centers Objective Instrumentation Systems, the Homestation Instrumented Training System (HITS), the Integrated Military Operations in Urban Terrain Training System instrumented training facilities, Instrumented Live Fire Ranges, Digital Multi-Purpose Range Complex, Digital Multi-Purpose Training Range, Battle Area Complex One Tactical Engagement Simulation System, and the MC-ITS. An additional key component of the LT2 is the Future Army System of Integrated Targets program that provides sophisticated targetry systems interfaced to and employed by LT2 products. Future Marine

Corps targets will become part of the product line and leverage Army procurement vehicles.
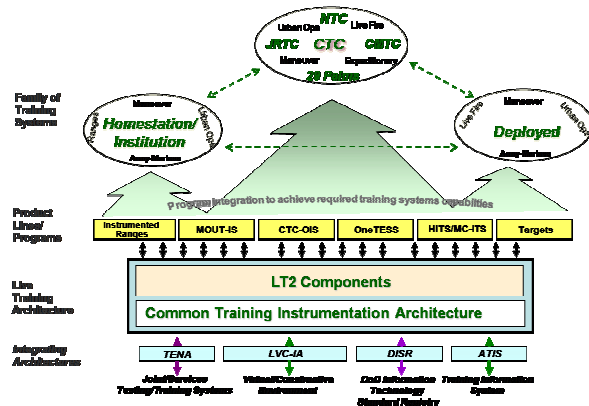

Figure 3. LT2-FTS Operational View

The LT2 Product Line is a composable family of systems designed and developed to comply with the Common Training Instrumentation Architecture (CTIA). LT2 systems use CTIA-compliant, common, reusable assets (software, hardware and data) to "compose" and implement Objective Instrumentation Systems at Marine Corps Training Centers and Homestations. The common components include standard interfaces to virtual and constructive simulation systems, tactical command and control systems, targetry systems that require interoperability with LT2 systems, and training information systems.

Common Training Instrumentation Architecture (CTIA)

The CTIA was developed to support the LT2 product line and to establish the standards, interfaces and protocols that are the foundation upon which to build the family of composable, fully integrated LT2 training systems. Through the CTIA, LT2 systems support the integration of new technologies over time that is essential for maintaining training system relevance and train objective force units to effectively employ the force-multiplier capabilities of the advanced digital technologies being fielded in the coming years.

The CTIA defines the framework for the design and development of common, reusable components that establish essential commonality across the family of LT2 systems. The common architecture design assures that LT2 products have the flexibility needed to support the transformation of live training systems and produce substantial reductions in Operations and Maintenance costs.

Results of Analysis

The Requirements Analysis process included mapping (tracing) the Marine Corps RIS Operational Requirements Document and RM/T FoS Capabilities Integration Document (Kelley, 2008) to the Army LT2/CTIA Domain Requirements Set. It was found that the Army domain covered over 85% of the Marine Corps RIS Operational Requirements Document requirements. The uncovered 15% were related directly to Marine Corps organizations, training systems and unique C2 systems. Although, not yet formally mapped, it was determined that the User Conference requirements were also covered by the CTIA/LT2 domain. Figure 4 illustrates how the MC-ITS System/Subsystem Specification (SSS) traces back to RIS Operational Requirements Document through the CTIA/LT2 domain requirements.
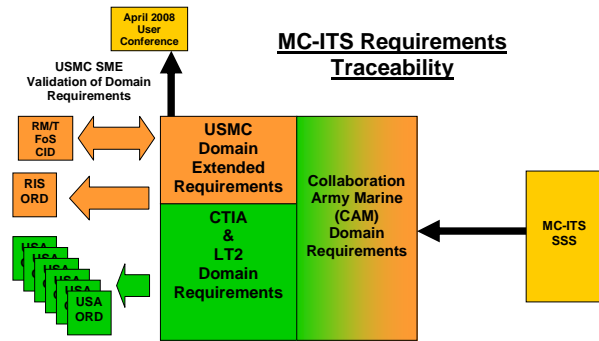

Figure 4. MC-ITS Requirements Traceability

The first increment leveraged the mobile Army Homestation Instrumentation Training System (HITS) company set capability baseline approximating a 85% out of the box reuse solution of LT2 software, hardware, and documentation assets (released in May 2009). The increment release will be extended to support Marine Corps company level training at ranges such as Twentynine Palms in FY09 integrating their specific integrated player unit technologies and range infrastructure (i.e. Integrated GPS radio system communications) with current LT2 common Player Unit gateway and controller components. These specific Marine Corps player unit technologies which include the Marine Corps Training Improvised Explosive Device and Training Counter Radio Electronic Warfare (TCREW) surrogate jammer are instrumentation solutions required to support Improvised Explosive Device (IED) and Convoy training. The final MC-ITS solution will provide basis for extending reuse to other Marine Corps live training programs. Future live training capabilities introduced

by the Marine Corps will also result in opportunistic reuse for the Army live training systems.

The requirements analysis determined that the core infrastructure assets could be implemented using standard LT2 core components with minimal changes. Only one CTIA architecture change was required to support the initial MC-ITS Company Set capability. Figure 5 illustrates the Product Line Architecture Framework and components which MC-ITS directly reuses.
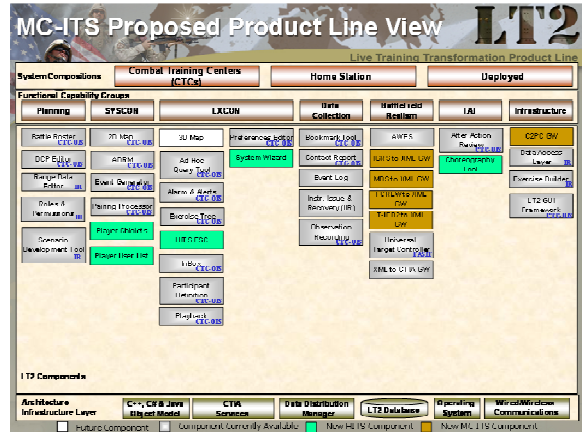

Figure 5. MC-ITS Product Line Architectural Framework

The analysis concluded that the original Data Collection System and subsequent proposed developmental architectural solution would not meet the user requirements. A reusable and extendable architecture would be needed to support Marine Corps training objectives. Also, it was determined that starting from scratch to develop a new architecture would be too costly and time consuming to implement. The decision was made to leverage the Army's Live Training Transformation (LT2) product line based on the Common Training Instrumentation Architecture (CTIA). The Army had invested significant resources on the development of LT2/CTIA and the technology was mature.

Joint Service Partnership

The Program Manager Training Device (PM TRADE) and Assistant Program Manager – Live Training Systems (PM TRASYS APM-Live) formally signed a Program Level Agreement (PLA) to establish a Live Training Transformation (LT2) product line partnership and support synergistic development efforts for the Marine Corps Range Modernization/Transformation (RM/T) programs. The goal of this partnership is to

promote joint interoperability and maximize reusability of existing LT2 product line components to reduce acquisition costs and risks associated with PM TRASYS Range Instrumentation Systems (RIS).

The PLA establishes PM TRASYS as a major stakeholder in the LT2 strategy to develop a live training range product line centered on common architectures (i.e. Common Training Instrumentation Architecture (CTIA)) and standards evolution (Samper, 2007). PM TRASYS has committed to reuse of the CTIA architecture and will ensure the integrity and maintenance of the LT2 product line used in the development of their systems starting with first LT2 delivery of MC-ITS to Twentynine Palms site in FY09.

The MC-ITS program shall provide the basis for extending LT2 reuse to other Marine live training programs and extend the current LT2 capabilities available to the future LT2 Consolidated Product Line Management strategy that will consolidate product line development and sustainment efforts for the LT2 Family of Training Systems (LT2-FTS).

As part of the PLA the Collaboration Army Marine (CAM) IPT has been established. This forum supports collaboration efforts with existing products that can be mined for new assets that either service can leverage.

MARINE CORPS INSTRUMENTED TRAINING SYSTEM (MC-ITS)

MC-ITS is a training system that provides a high-fidelity deployable instrumented training capability to support platoon thru battalion level live force-on-force and force-on-target training. Figure 6 is a graphic depiction of the threshold Company Set configuration being fielded to the MCAGCC in August 2009. The system tracks locations of soldiers and vehicles and simulates weapons effects and engagements, allowing units to "train as they fight" against living opponents and targets. Accurate feedback in the form of an After Action Review is provided to training units. The Mobile Company Set consists of light deployable components that can be rapidly assemble/disassembled and transported to support deployed training. MC-ITS integrates with future and legacy MILES, and provides the live domain for LVC training integration.
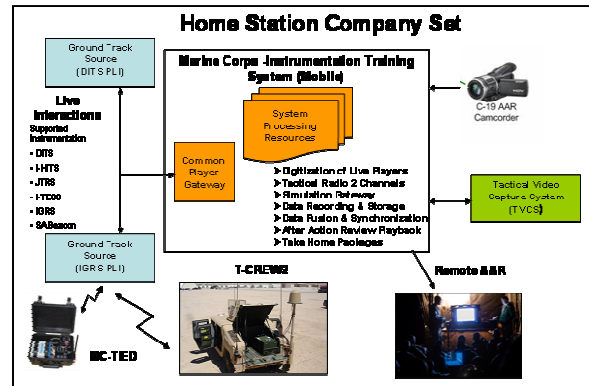

Figure 6. MC-ITS Company Set Configuration

MC-ITS is scalable, it can track up to 2000 live and 8000 constructive participants within a 20Km x 20Km training area. MC-ITS instrumentation can integrate with current and emerging Range Instrumentation Systems. MC-ITS can interoperate with various Constructive and Virtual simulations as well as the Test and Training Enabling Network Architecture (TENA). The system is portable. The hardware footprint ranges from a laptop (up to 300 entities) with basic Battle Tracking and AAR to a portable rack for Battalion set. The system is Microsoft-based thus the user interface is well-known to most warfighters, and requires only a few hours of training to operate.

MC-ITS Implementation Strategy

The MC-ITS builds on the Combat Training Center training model which meets critical shortfalls in warfighter training capabilities and mission readiness. MC-ITS significantly enhances the training capability, operational readiness, and tactical proficiency of Marines in tactics, techniques, and procedures in the employment of the Operational Counter Radio Electronic Warfare devices and subsequent Counter-Improvised Explosive Device. Integration of the Training - Counter Radio Electronic Warfare device with the Integrated GPS Radio System (IGRS) and the MC-ITS will extend real-time visualization, Situational Awareness, and After Action Review (AAR) capabilities thus significantly enhancing Counter-IED training.

MC-ITS will be used primarily during Battalion/Taskforce and below live combined arms force-on-force and force-on-target training exercises and test events, and deployed training sites. It will collect data in support of simulating the effects of actual weapons systems, munitions, countermeasures, counter-countermeasures, simulating of weapon effects

experienced during live training, and testing in a comprehensive LVC Training Environment. The MC-ITS program is being developed from the defined LT2 family of training systems that will re-use existing software assets from Common Training Instrumentation Architecture (CTIA) and LT2 programs following an LT2 product line development strategy.

The MC-ITS starting baseline will leverage the Army's complete Homestation Instrumentation System (HITS) Company Set baseline and future goals will include synchronizing common architecture and component baselines for both programs. The initial fielding of MC-ITS will integrate Integrated GPS Radio System (IGRS), Training Counter Radio Electronic Warfare, Marine Corps Training Improvised Explosive Device, and Tactical Video Capture System with the core capabilities provided by reusing the Army's HITS. The IGRS based player unit integration approach utilizes the LT2 Common Player Unit Interface Control Document which defines the standard message set using XML protocols between multiple player unit networks, Tactical Engagement Simulation Systems to include Multiple Integrated Laser Engagement System programs, and the CTIA architecture. This standard Interface Control Document provides basis for an XML defined two-way guard cross domain solution linking the existing Army unclassified player unit networks with the classified LT2 live training systems which includes the MC-ITS program. MC-ITS and IGRS will both be radio agnostic and interoperable. Lastly, the Marine Corps Tactical Video Capture System will be integrated using the CTIA video Service Oriented Architecture Interface Control Document approach which will maximize reuse across visualization programs.

MC-ITS Core Assets

PM TRASYS program representatives from both Government and Industry will participate within the established LT2 organizational structure and processes specified by the LT2 Concept of Operations. The two primary working groups include the Common Component Working Group (CCWG), and Architecture Working Group (AWG). The goal of the Common Component Working Group is to oversee the development and foster the evolution of LT2 Components that can be used by multiple programs as-is, or with modifications. The CCWG meets weekly to review common component issues. Membership to the CCWG and AWG is obtained via the collaboration areas located on the LT2 Portal. Consensus is the preferred mechanism for decisions and recommendations with ability to identify impacts and

issues. All efforts are made to reach a consensus whenever possible. In cases where consensus cannot be reached, the Lead chair selects the course of action with approval from PM TRADE LT2 Government oversight. Responsibilities of the CCWG include:

- Review all changes for merit and component or program impacts
- Maintain the list of LT2 Product Components that have been designated as LT2 Common Components
- Define and maintain the LT2 PLAF view as well as all common components included in LT2 product views on the LT2 Portal
- Maintain the Component Agreement template and update as necessary
- Help resolve development issues submitted by the LT2 component developers
- De-conflict LT2 Common Component issues
- Review common component program trouble reports (PTRs) that may impact external software interfaces
- Monitor the LT2 Programs for component development effort against the schedule posted on the LT2 Portal
- Monitor the CTIA technical effort.

Architecture issues come from the domain and product team requirements analysis, design, and integration and test. The Architecture Change Board (ACB) prioritizes these issues. The ACB determines the priority of issues and in what spiral they should be worked. In addition, the ACB can elect to fast track trivial issues. The Architecture Working Group is the team that works the issue and creates the Architecture Change Package (ACP). The AWG assigns a task team to work the issues. The task team creates an overview package that is reviewed and approved by the AWG. The overview is the high level concept for fixing the issue and is a subset of the full ACP. Once the overview is approved, the task team creates the full ACP and conducts a Peer Review of the package. Issues from the Peer Review are resolved and incorporated in the package to create the final ACP.

The MC-ITS program LT2 product line architectural framework shown in figure 5 above denotes the planned reuse approach for composing the LT2 common components compliant with CTIA. The instantiation of the MC-ITS product includes CTIA infrastructure services, as-is component reuse, modified components, and introduction of new components to the product line.

MC-ITS Incremental Development Plan

MC-ITS has looked at several other existing LT2 artifacts and products for potential reuse. In fact, several LT2 HITS artifacts such as the test procedures, software users manual, and information assurance documentation have been reused. A prime example of LT2 product reuse is the Army Combat Training Center's Data Collection Plan Editor component. The MC-ITS team performed an analysis of using this component to build an Exercise collection plan. Also, the team is investigating the use of the Reactive Information Propagation Planning for Life-Like Exercise system to provide initial Master Scenario Event List planning data to MC-ITS. A Build Plan has been identified to manage the timely integration of new software capabilities and interfaces. Figure 7 maps the planned integration efforts to system developmental integration spirals.

Figure 7. MC-ITS Incremental Software Build Plan

System design documentation is being prepared incrementally in concert with the delivery of common and unique components leading to end state deployment at Twentynine Palms. Figure 8 is a notional depiction of the MC-ITS incremental development life-cycle. System level design was reviewed early in the life-cycle at the System Requirements Review (SRR) and System Design Review (SDR). Each spiral of incremental development includes three In Process Reviews (IPR) and software drops. Each IPR is similar to a combined System Requirements Review, Preliminary Design Review, and Critical Design Review covering the near term design. Each IPR has entry and exit criteria related to the development and design artifacts are reviewed. The first IPR was a system demonstration of the Army's HITS at Ft. Benning, followed by a software drop of HITS to the PM TRASYS System Integration Facility. The first software drop of MC-ITS included the HITS baseline.
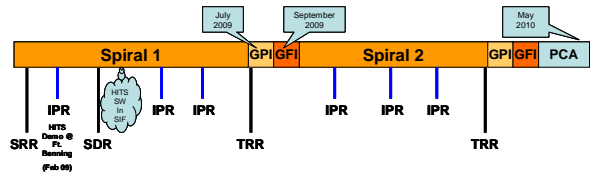

Figure 8. MC-ITS Incremental Development Lifecycle

The MC-ITS testing methodology and strategy is defined in the Software Test Plan. The strategy is to conduct Functional Configuration Audits that include both developmental testing and an operational demonstration. Formal testing will not begin until a Test Readiness Review (TRR) with entry and exit criteria as been conducted. Software Spiral One is Developmental Testing with the Government Preliminary Inspection in the PM TRASYS System Integration Facility.

Government Final Inspection will be conducted on-site at Twentynine Palms. Software Spiral Two will a combined Developmental and Operational Test. The Government Preliminary Inspection will be conducted in the PM TRASYS System Integration Facility and the Government Final Inspection will be conducted on-site at Twentynine Palms. Prior to formally accepting the system, a Physical Configuration Audit will be conducted at the vendor facility.

End-state RM/T Use Case

RM/T system components include Network Infrastructure, Urban Training Systems, Ground Tracking System, Air Tracking System, OPFOR Threats, Tactical Engagement Systems & Simulations, After Action Review Tools, Exercise Control and Range Control. Figure 9 depicts the RM/T components deployed or planned for deployment to the Marine Corps Air Ground Combat Center (MCAGCC), Twenty-nine Palms, CA.
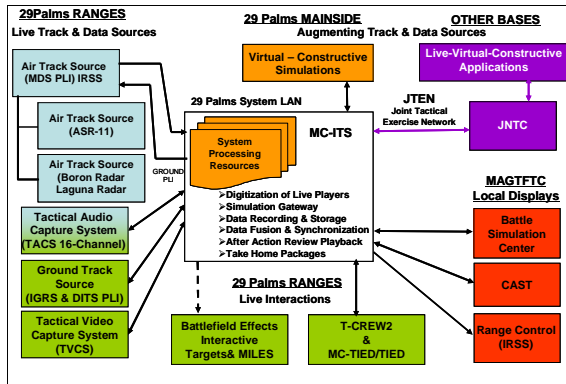
Figure 9. MCAGCC RM/T Use Case

The MCAGCC Twentynine Palms Mojave Viper live range instrumentation use case is supported by several systems. The Air Tracking System uses the Multi-Static Dependent Surveillance, System and Surveillance Data Server System to feed the air picture into the Integrated Range Status System. The Ground Tracking System uses the Integrated Ground Radio System (IGRS) to feed Integrated Range Status System and MC-ITS. The Tactical Audio Capture and Tactical Video Capture Systems provide audio and video data to MC-ITS.

MC-ITS will eventually connect to Virtual and Constructive Simulations, Battlefield Effects, Interactive Targets and MILES. The range will also be capable of using the Joint Training and Experimentation Network (JTEN) to interoperate with remote sites. Other use cases unique to Marine Corps include (i.e. counter IEDs, targets, etc.).

MC-ITS Future Capabilities

LT2 has established the tactical interoperability working group to address improvements for the live training audience relative to Exercise Planning, scenario formulation, initialization, and AAR tactical common operating picture capabilities. Reactive Information Propagation and Planning for Lifelike Exercises and Command Post of the Future (CPOF) tactical exercise planning tools shall be evaluated for extrapolation of tactical data relevant for training system insertion using standard formats to simplify and automate the scenario generation, exercise planning and control processes, range control and management functions, and AAR production capabilities. The tactical tools support design, planning, preparation and execution of live, virtual, and constructive training events.

Future Marine Corps capabilities will include the reuse of LT2 Future Army System of Integrated Targets (FASIT) architecture and standard Interface Control Documents to integrate existing obsolete deployed Remote Engagement Target System (RETS), and Battlefield Effects Simulations. RETS is a standard U. S. Army computer controlled target system modified to meet Marine Corps requirements. Targets are weather resistant, stationary pop-up and moving targets for infantry, armor, and anti-armor training. The system offers computer-driven programmed tactical scenarios or it can be operated in a manual mode with group or individual targets raised on command. The system is reconfigurable to support multiple scenarios. Components include the following: Armor Moving Target Carrier, M13A1 Pop-Up Targets, Portable Infantry target Systems Target Holding Mechanism for Tank Gunnery. Battlefield Effects System devices are used in live and non-live fire training environment to provide a more realistic OPFOR threat. Battlefield Effect Systems includes pyrotechnic blasts, visual signatures, sound effects simulation, and gunfire simulation. Components include the following: Black Smoke generator, Hostile (artillery) Fire and Target Kill Simulator, Small Arms Gunfire Noise Simulator, Tank Gunfire Simulator, Surface to Air Signature launcher Simulator. Finally, the MC-ITS team will investigate potential reuse of software programmable radios such as the Joint Tactical Radio System as a future instrumentation capability.

MC-ITS LT2 PRODUCT LINE BENEFITS SUMMARY

The LT2 Standardization efforts and Consolidated Product Line Management strategy shall provide the following benefits for both organizations:

- Single management mechanism to consolidate all LT2-FTS sustainment and enhancement development efforts. Fostering common live training solutions while lowering total ownership life cycle costs across programs while mitigating potential cost, schedule and performance risks
- Consolidation of test resources reduces: Overhead , Integration and Test costs, reduces Information Assurance management and certification costs across LT2-FTS. Reduces configuration and inventory management costs, and provides for help desk support.
- Quality of service and products are increased through testing and resolving issues once while deploying common solutions to all programs and training sites.

- Government and Industry work together to establish interoperability and technology insertion standards that foster Government product line evolution and simplify acquisition processes while allowing industry to maintain its competitive edge or business model.

PM TRASYS live training programs will achieve high levels of both opportunistic and systematic reuse across the LT2 Product Line. Reuse benefits of the product line will be measured in terms of:

- Reduced development costs for LT2 products. A component is developed once and reused across multiple LT2 products.
- Reduced maintenance costs for LT2 products. The product line promotes centralized maintenance. A problem report or upgrade for a component is made once and can be deployed across the LT2 Product Line.
- Reduce training costs across the product line. If the user interface and tools used across the product line are common, then users can move across ranges without being re-trained. In addition, training products such as exercise planning data or After Action Review (AAR) templates can be reused across ranges.

With this approach going forward a collaborative Integrated Product Team mechanism will be used for coordinating all funding, contractual, technical, and management matters as related to the development efforts between the two organizations. This allows for a bi-directional product visibility at the appropriate levels. Both organizations will work together to identify common enhancement opportunities and collaborative research and development efforts based on similar training requirements that can be shared across LT2 products benefiting Army and Marine Corps future live training environments.

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