PM TRADE

Interface Standards

Industry Update

Rob Wolf

PM TRADE
Strategic Requirements Integrator

4 December 2013

Agenda

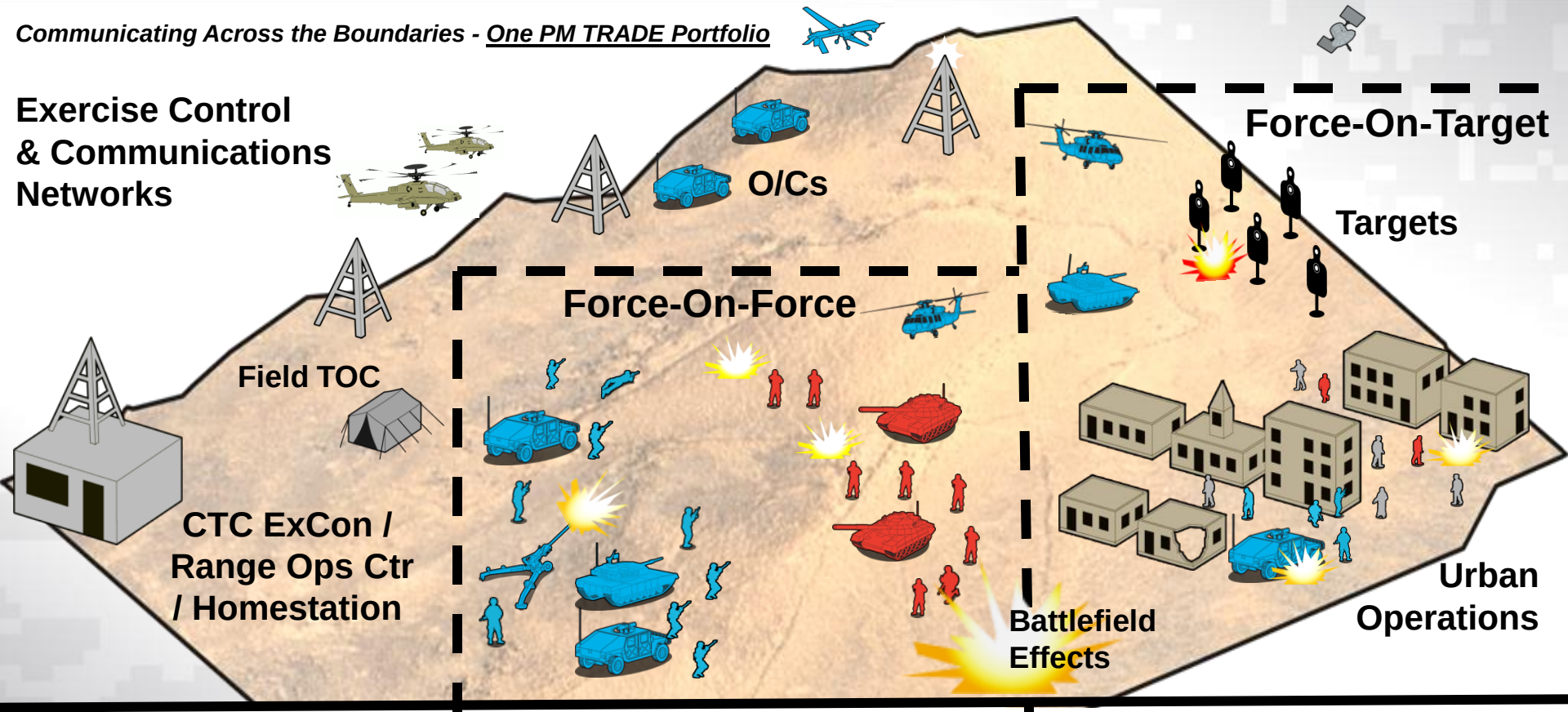
- **PM TRADE Opening Remarks** *COL Vincent Malone*
- **Typical IPT Meeting Schedule, Location, and LT2 Portal** *Rob Wolf*
- **Functional Component Architecture IPT** *Rob Wolf*
- **PAN / USB IPT** *Jesse Campos*
- **Common Message** *Paul Smith*
- **LTEC Services and Messaging** *Todd Rahn*
- **Battery and Power Supply IPT** *Rob Wolf*
- **VICTORY Standard** *Pat Sincebaugh*

Presentation and Questions will Conclude NLT 1030
for time to attend the PM TRADE TSIS Update at 1045 in Room 1632

PM TRADE Interfaces Standards Overarching Objective:

Migrate to an interoperable Systems of Systems approach to acquire, manage, and sustain products across PM TRADE Mission Area Domains

Communicating Across the Boundaries - One PM TRADE Portfolio



ExCon & Comms

ExCon, AAR, RF Comms. ABCS, & Network Data Management

PM CTIS **T-IS**

Simulated Fire

Combined Arms Engagement Pairing BLUFOR & OPFOR

PM LTS **A-TESS**

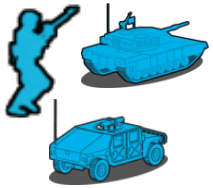
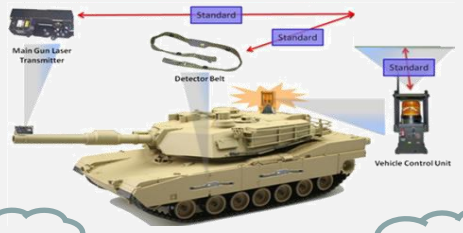
Live Fire

Instrumented Urban Operations, & Battlefield Effects

PM DT **FASIT**

Standards Management (CTIA, LT2, FASIT) - APM TRADE

PM TRADE TESS Evolution / Vision

	MILES TESS Configurations	Key Interfaces	Communications (Instrumentation Radio)
Circa 1980-2002	Vendor Specific Closed Systems	MILES Code Standard	Non Instrumented Initially then Custom Radio Interfaces
2002 - 2012	 Vendor Specific Closed Systems With Custom Radio Interfaces	✓ MILES Code upgrades ✓ TESS Radio Interface ✓ PAN in Development	✓ Radio TESS Interface Standards – Compilation ✓ LT2 Gateway
Near Term Vision (2013-2020)	Component Based Acquisitions Open Published Interfaces and Perf. Stds.  LTEC SW Software Based TESS systems TESS SW	✓ Supported Standards • RS-232 • 802.15.4 (PAN) • USB ✓ Common Message Format ✓ Connections & Interfaces ✓ Power Interface ✓ LTEC SW (TESS/BDA)	✓ Published Interfaces ✓ Common Message Set ✓ LTEC TESS Logic & RTCA/BDA SW ✓ Remote CM Services ✓ *Tactical Radios/Systems Supporting some Training capabilities*
Long Term Vision	Training functionality Embedded as part of tactical weapon/radios. -- Individual Soldier and Weapon System computer/displays/optics...	Developing & Managing Training Software Applications and Weapon/Radio/Soldier Computer Interfaces/firewalls to Push and Pull data driving Stimulations *(effects, graphics, audio, simulated C4ISR communications, real time coaching…)*	

Component Architecture & Standards Product Line Transformation

PM TRADE has embarked upon a journey with our Industry partners to implement a Systems of Systems architecture approach across our entire LT2 product line portfolio. This approach will transform our ability to provide new levels of service and training capability to the U.S. Army and our Soldiers. This initiative will begin with the next TESS acquisition and continue with future A-TESS and T-IS related programs.

Some Component Architecture and Standards benefits include:

- Opportunity to reduce total cost of ownership and Life-Cycle costs.
- Simplify and standardize user instrumentation set-up and configuration.
- Component interchangeability independent of manufacturer and weapon platform.
- Enable seamless hardware and software based technology insertion.
- Ability to perform remote automated configuration and sustainment management.
- Enhance competition through published component requirements & interface standards.
- Ability to embed live training systems/components in weapon platforms.
- Ability to have hybrid embedded/appended training capabilities.
- Enable dual-use of tactical systems for training applications
- Provides a path to introduce Virtual & Constructive components into the Live environment.

Industry /Gov't Interface Standards Working Group Meetings

Meetings are held on 3 consecutive days near UCF Research Park with a different at IPT host each day. Meetings are held every 60-90 days with agendas published to the LT2 Portal 3 weeks in advance of the meetings. A typical schedule follows the same format:

Tuesday – August 13, *SAIC,12901 Science Drive, Room 3008 (3rd floor) Orlando, FL*

- 0830 - 1130 Functional Component Architecture IPT – Lead Rob Wolf
- 1300 - 1600 PAN/USB IPT – Lead Jesse Campos

Wednesday – August 14, *GDC4S,12001 Research Parkway, Ste. 500 (5th floor) Orlando, FL*

- 0830 - 1130 Common Message IPT – Lead Paul Smith
- 1300 - 1600 LTEC Services and Messaging – Lead Todd Rahn

Thursday – August 15, *Cubic, 12000 Research Parkway, Ste. 408 (4th floor) Orlando, FL*

- 0830 - 1130 Power Supply and Battery IPT – Lead CT Nguyen
- 1300 - 1600 TESS Laser Steering Group – Lead Jesse Campos

Over 125 Registered Industry / Government Participants

Industry Working Group Meetings

- **2 April 2013**
- **3 May 2013**
- **11 June 2013**
- **13 August 2013**

- **TBD February 2014**

2014 Objectives

- **Verify and Mature Baseline**
- **Update Documents and ICDs**
- **Conduct LTEC Training**
- **Establish Loaner Test Bed**

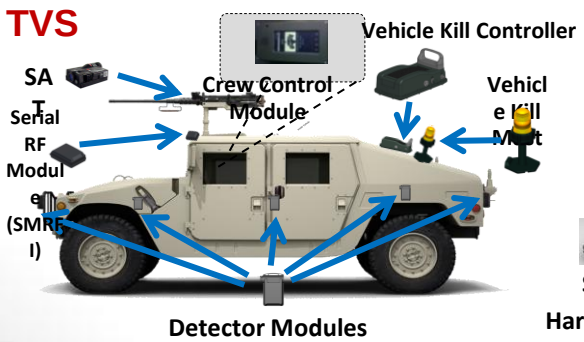
Steps to register and join an Industry/Govt IPT

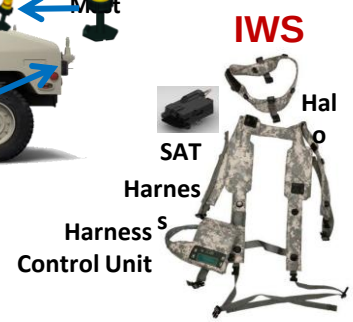
1. Register- www.LT2 Portal.org
2. After Login
3. Select Standards Tab
4. Select PM TRADE Standards WG button
5. Request group membership
6. After approval you will have access to all folders & files
7. LTEC SW requires additional security steps

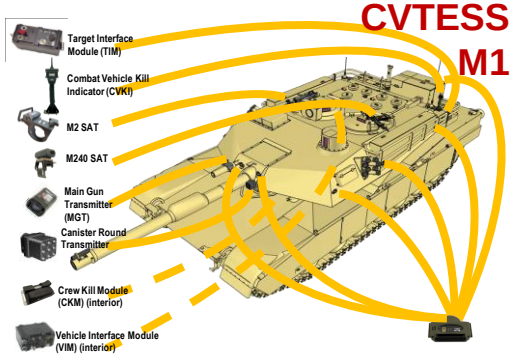
Component Architecture Baseline Leveraged from 20 Years of Industry Product Configurations

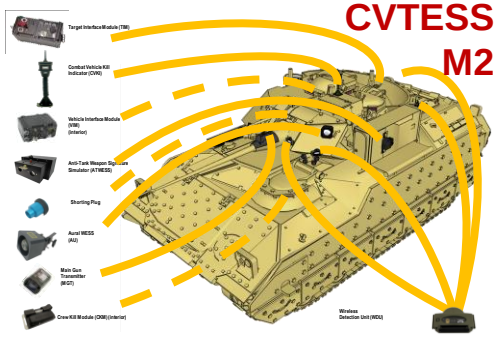
Previous Acquisitions

Our TESS acquisition strategies over time will shift from acquiring contractor specific platform configurations every 5 years to acquiring common components that can be used across a variety of platforms.









Future Acquisitions

Baseline Component Architecture hardware products were derived from previous program common denominators

Primary Components:

- Master Controller
- Laser Detector
- Laser Transmitter
- Signature Devices
- Crew Interface
- Power Supply
- Surrogates
- Weapon Interface
- System Set-up Tool

Primary Interfaces:

- PAN
- USB

Component Architecture Enables Migration to Embedded / Hybrid Training

PM TRADE

Appended Dismount

- SAT
- MILES Vest
- TESS Master Controller
  LTEC Core SW
  BDA & Services
- Halo
- Radio

Appended Platform

- MILES Detector
- VKI
- Laser Transmitter
- TESS Master Controller
  LTEC Core SW
  BDA & Services
- Radio
- MILES Detector
- 1553 Bus

Appended/ Embedded Hybrid

- Platform Bus
- VKI
- Laser Transmitter
- LTEC Core SW
  BDA & Mgt
- Laser Detector
- Radio

Embedded Platform

- Victory Bus
- Laser Detector
- LTEC Core SW
  BDA & Mgt
- Dual Use Laser
- ABCS Interface

Appended Products

Common Set-Up / Component Association Tool Across the Entire TESS Portfolio

Embedded Functionality

Interface Standards Management is key to program success

- Master Controller with Gov't LTEC SW manages BDA and Component Network
- Common System Set-up tool provides menu driven CM and component associations
- Active Configuration Management Program to remotely manage new product implementations, LTEC and Product SW upgrades, documentation and manual revisions.

Component Architecture IPT Objectives

- **Establish Initial Component Architecture Family and Product Taxonomy.**
- **Establish Operational Use cases to shape Component Implementation and lower level functional requirements and messages** *(e.g., TVS configuration, Set-up/Initialization process, SW and HW Configuration Management).*
- **Provide other IPTs/LTEC draft component messages and related parameters (message size, frequency, …) in timely manner.**
- **Develop technical performance documentation and testing strategy.**
- **Verify end-to-end functionality and messaging at the component weapon instrumentation network level** *(weapon platform)* **and system network level** *(Remote Services to Component, Component to ExCon, and Component to Logistics maintenance)* **prior to next acquisition. Mature as much as possible prior to RFP release.**

Major Component Categories

Individual Components may be condensed, reallocated, deleted, or added

Laser Transmitters
- 120/105 Main Gun Transmitter
- 30/25 Main Gun Transmitter
- M2 SAT
- M240 SAT
- Canister Round Transmitter
- Crew Kill Modules (Laser Reptr)
- Missile TOW /TOW 2b (P)
- Universal Controller Gun

Laser Detectors
- Wireless Detection Units
- Soldier Harness
- Soldier Halo

Signature Devices
- CVKI
- WESS – Flash
- WESS – Aural
- WESS – Smoke
- DIFCUE
- MGSS

TESS Master Controller
- Vehicle Master Controller
- Soldier Master Controller

Network Radios
- Range Communications Systems
- AMITS

Crew Interface
- Crew Display Module (Large)
- Crew Display Module (Small)
- PAN Relay Node

Surrogates
- Surrogate Weapon Assembly
  - I. Short Range - AT4
  - II. Long range – Dragon

Weapon Interface
- Vehicle Interface Module
- Victory Bus
- Internal Instrumentation Relay
- Weapon Orientation Module (

Future/Other
- A-TESS XYZ Module
- Common Set-Up/Association Tool

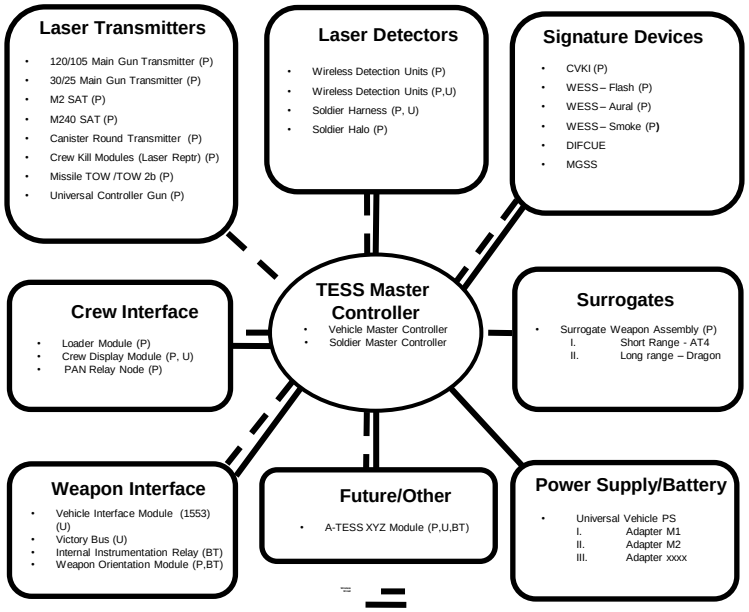
Power Supply/Battery
- Universal Vehicle PS
  - I. Adapter M1
  - II. Adapter M2
  - III. Adapter xxxx

Wireless - - -
Wired ———

Component Architecture Path to TVS & Beyond

- **Architecture:** Identify Major Component Categories and their Interfaces
- **Documents:** Develop Component requirements and Interface specifications
- **Validation:** Establish a clear system and component level test and validation strategy

The Architecture



The Documents

- **Product Messages & Timing**
  - ***Setup***
  - ***Operational***
  - ***Logistics***

  Various Use Cases
- ***Specification***
  - ***Functional Performance***
  - ***Interfaces***
  - ***Environmental***
  - ***Physical***
- ***SOW***
  - ***Special Considerations?***
- ***Functional Testing***

Product Validation

- **System Level**
- **Component Level**
- **Network Performance**
- **SW Upgrade Ability**
  - ***PAN/USB Messages***
  - ***Component Upgrades***
- **Product Approval Process / Testing**

Component Functional & Interface Test Bed

Force-on-Force Exercise Area Environment

Functional Testing to Validate Product Performance Requirements.

Test bed may be a bench or outdoors at distances

Industry will help shape each test bed.

Examples:

- **Detector -** Laser Message received and decoded within expected range parameters
- **Transmitter** - MCC code transmitted with expected power levels and pattern at each range

Acquired Product

Competitive Advantage: Size, Weight, Power, Performance, Capability, Simplicity, Cost

- **Laser Transmitter**
- **Laser Detector**
- **Signature Device**
- **Weapon Interface**
- **Crew Interface**
- **Surrogate**
- **Master Controller**

Future Products

- ***ATESS Components***
- ***Area Denial Weapons***

Product Network Interface Area Environment

Product Specific ICDs

- **PAN**
- **USB**
- **RS-232** (Legacy Interface)

- **Set-Up & Initialization**
- **Operational Use**
- **Configuration Updates**
- **Product Sustainment and Usage Metrics**

Future Area of Focus Post TVS

Initial Area of Focus for TVS

PAN / USB IPT Objective

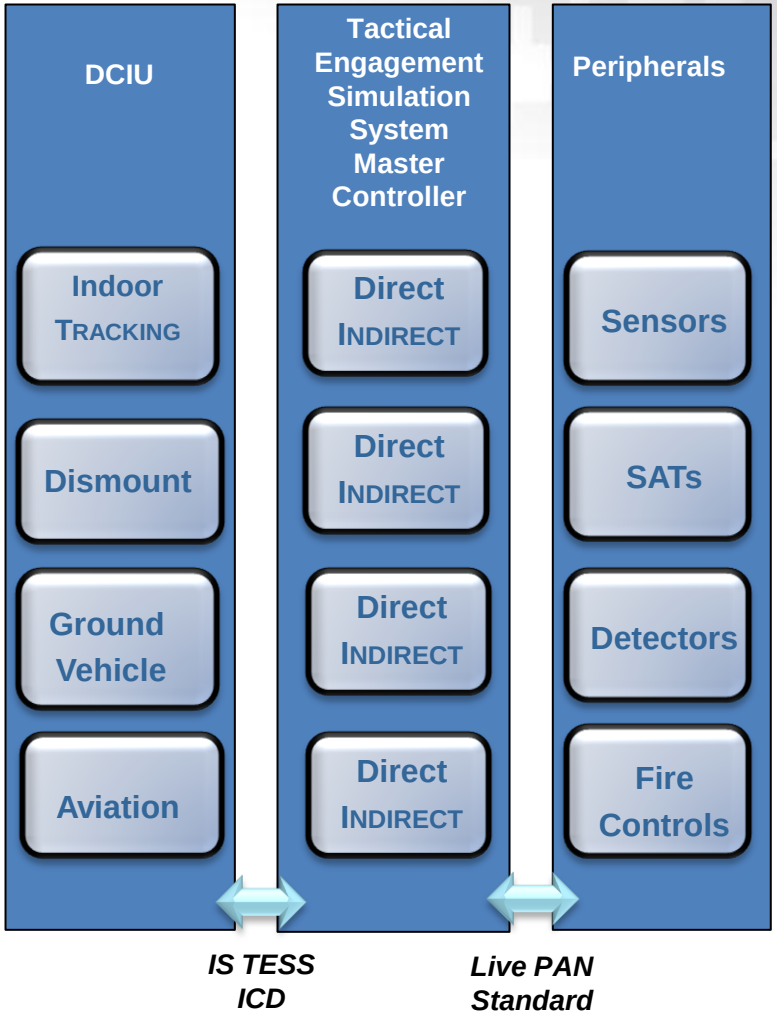
Develop and Publish an LT2 PAN/USB interface standard enabling future TESS product communications on individuals, surrogates, weapon systems, vehicles, and areal denial training devices and system initialization equipment.

Implementation will provide for a single Weapon Instrumentation Network:

- Primary Wireless communications for TESS products.
- Primary Wired communications for TESS products.
- Updated ICD and test bed for each TESS product in the LT2 architecture.
- Individual TESS product association and set-up/initialization schema.
- Unique ID and product utilization metrics for logistics and sustainment.
- Common Message Set independent of physical transport.

PAN / USB Interoperability Challenges

- **Evolving use cases**
  - AMITS
  - A-TESS
- **Over the air software updates**
  - IS – Master Controller
  - Master Controller - Peripherals
- **Logistic data information**
- **Set-Up/Initialization**
- **Configuration Management**
- **Standard or consistent association mechanisms**
- **Modeling of pan interactions**



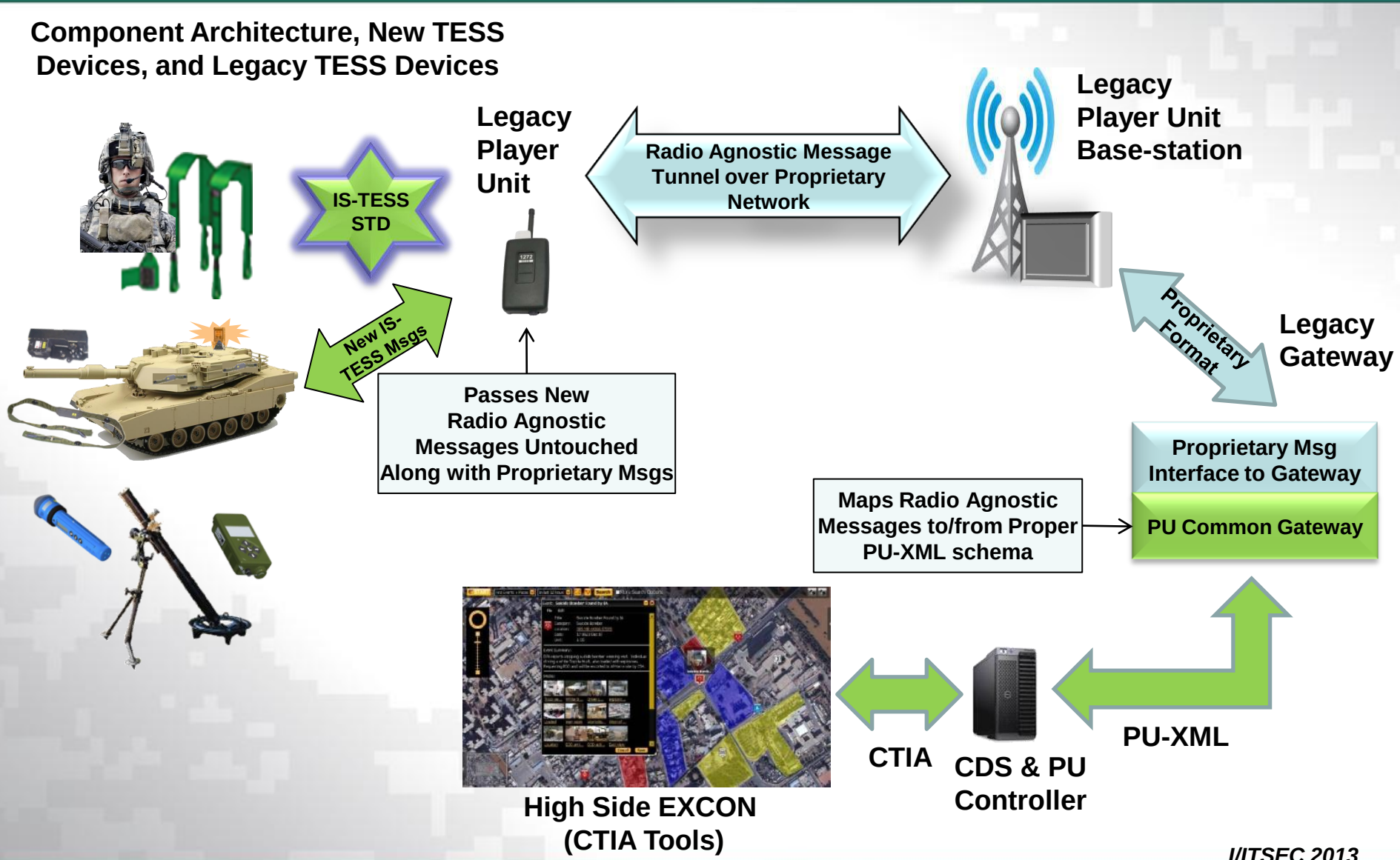
Common Message (Radio) IPT Objective

Evolve the IS-TESS ICD to eliminate the need for instrumentation radio software updates to support the introduction of new TESS and training capabilities.

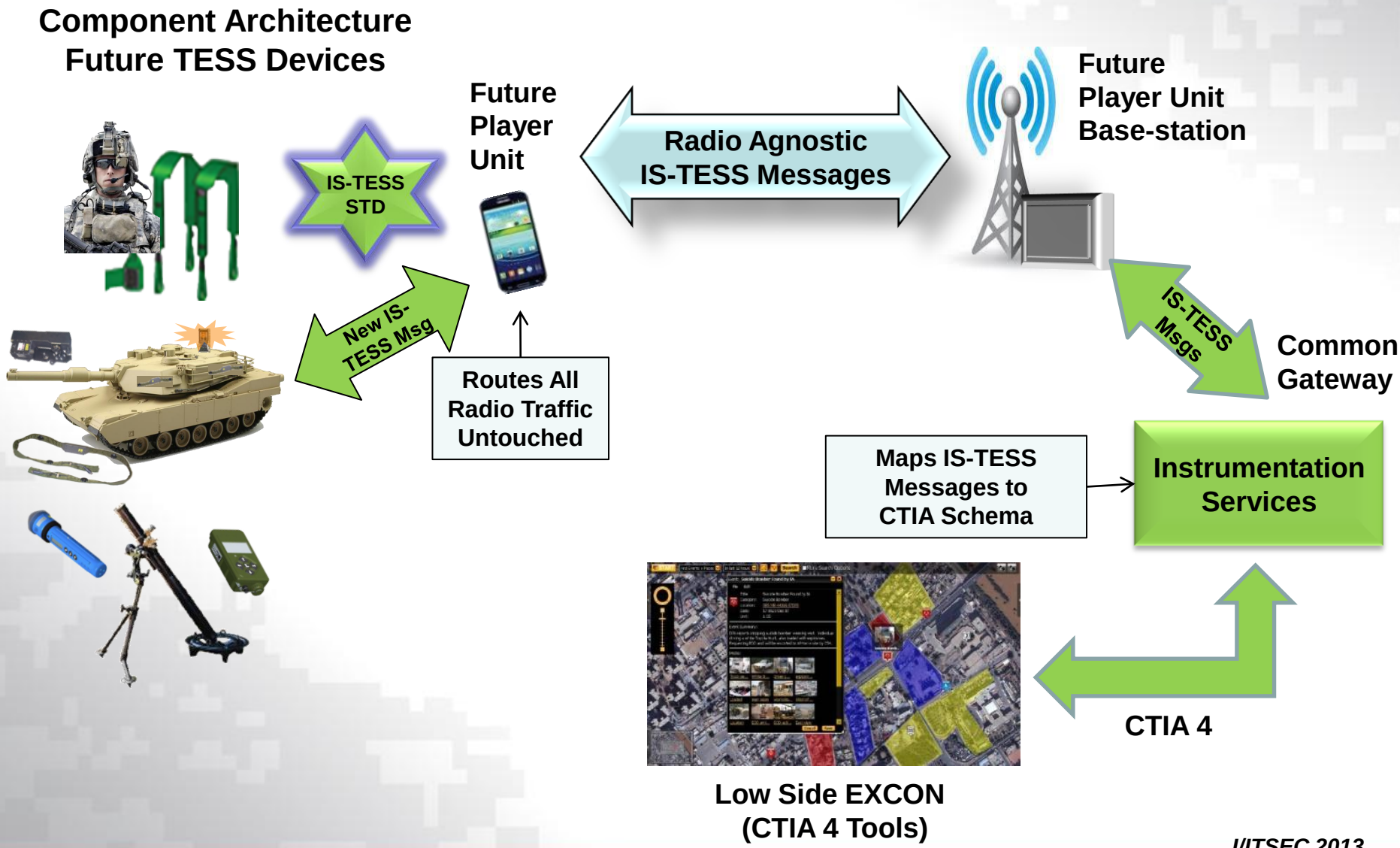
Implementation will provide:

- **A new radio agnostic message having a defined header with a variable length payload.**
- **Ability to "radio agnostically" transfer payloads between TESS/LTEC and EXCON.**
- **Ability to support the Component Architecture future TESS, logistics management, and remote services vision for future systems.**
- **Decoding of variable message on IS side of gateway based upon payload enumerations in the IS-TESS ICD.**
- **Transition path to complete radio agnostic interface between TESS & EXCON**

Common Message Approach (Near Term)



Common Message Approach (Long Term)



Live Training Engagement Composition (LTEC)

What is LTEC:

- **LTEC consists of a common software core (LTEC Core) which provides the framework to manage TESS interfaces and Battle Damage Assessment.**

- **An LTEC instantiation consists of a configurable set of services that provide engagement simulation capabilities and/or integration with sensors or stimulators.**

- **LTEC provides flexible integration with devices so that live training systems with different device specifics will be able to reuse the LTEC Framework and services regardless of platform type.**

LTEC Objectives

Common, Re-usable, Government Owned Software

- LTEC is a PM TRADE initiative that provides training system developers with common, re-usable, government owned software for developing and implementing a live training capabilities. (**interoperability, modifiability, adaptability, and performance)**

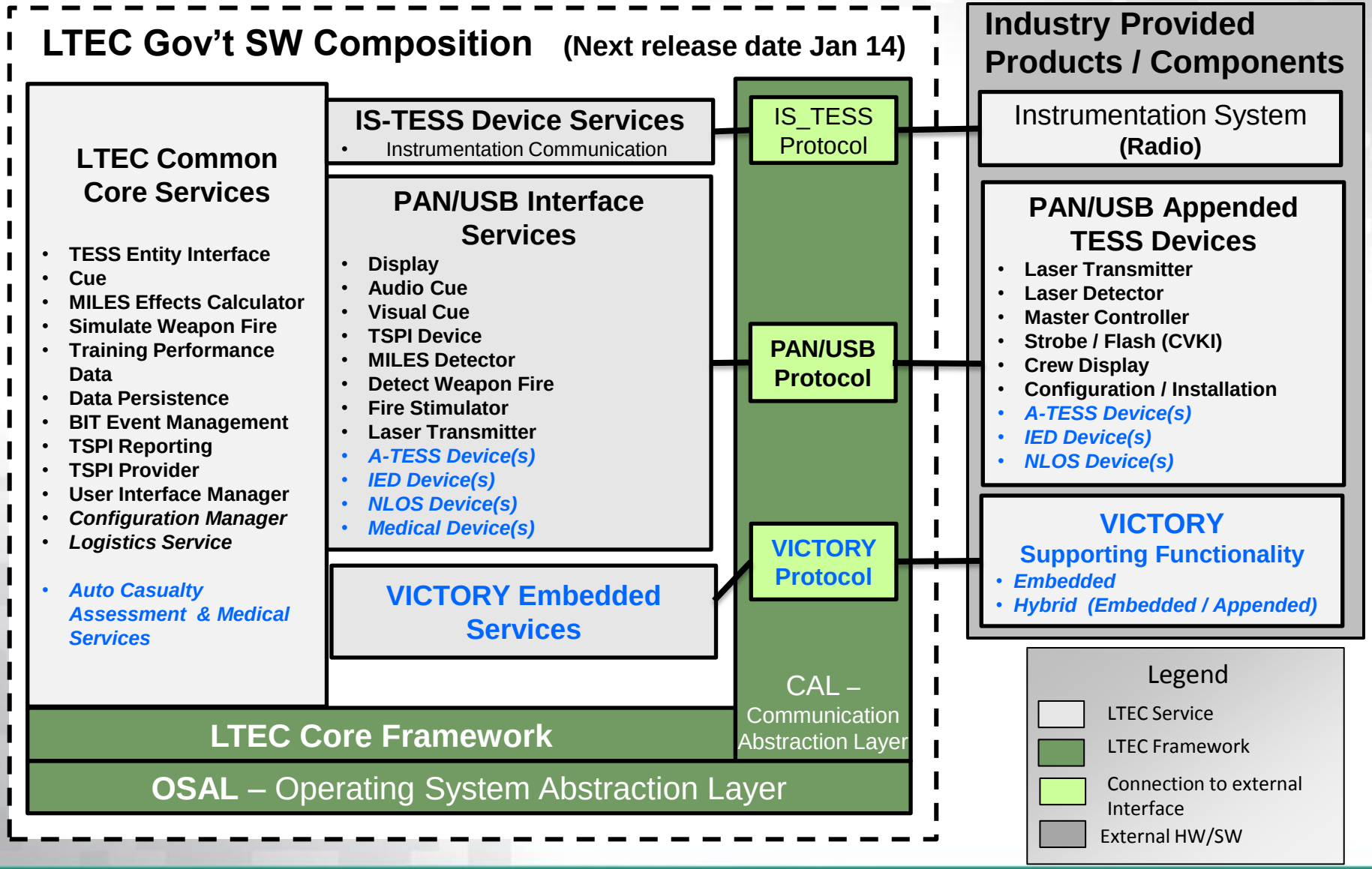
Support Appended, Embedded, and Hybrid vehicle applications

- LTEC can be implemented to support appended, embedded, and hybrid vehicle applications.
- LTEC uses a service-oriented architecture and is operating system agnostic, enabling the software to be composable, scalable, and extendable.
- LTEC provides software that can be embedded on a vehicle, or integrated with external hardware and appended to the vehicle to provide a live training capability.

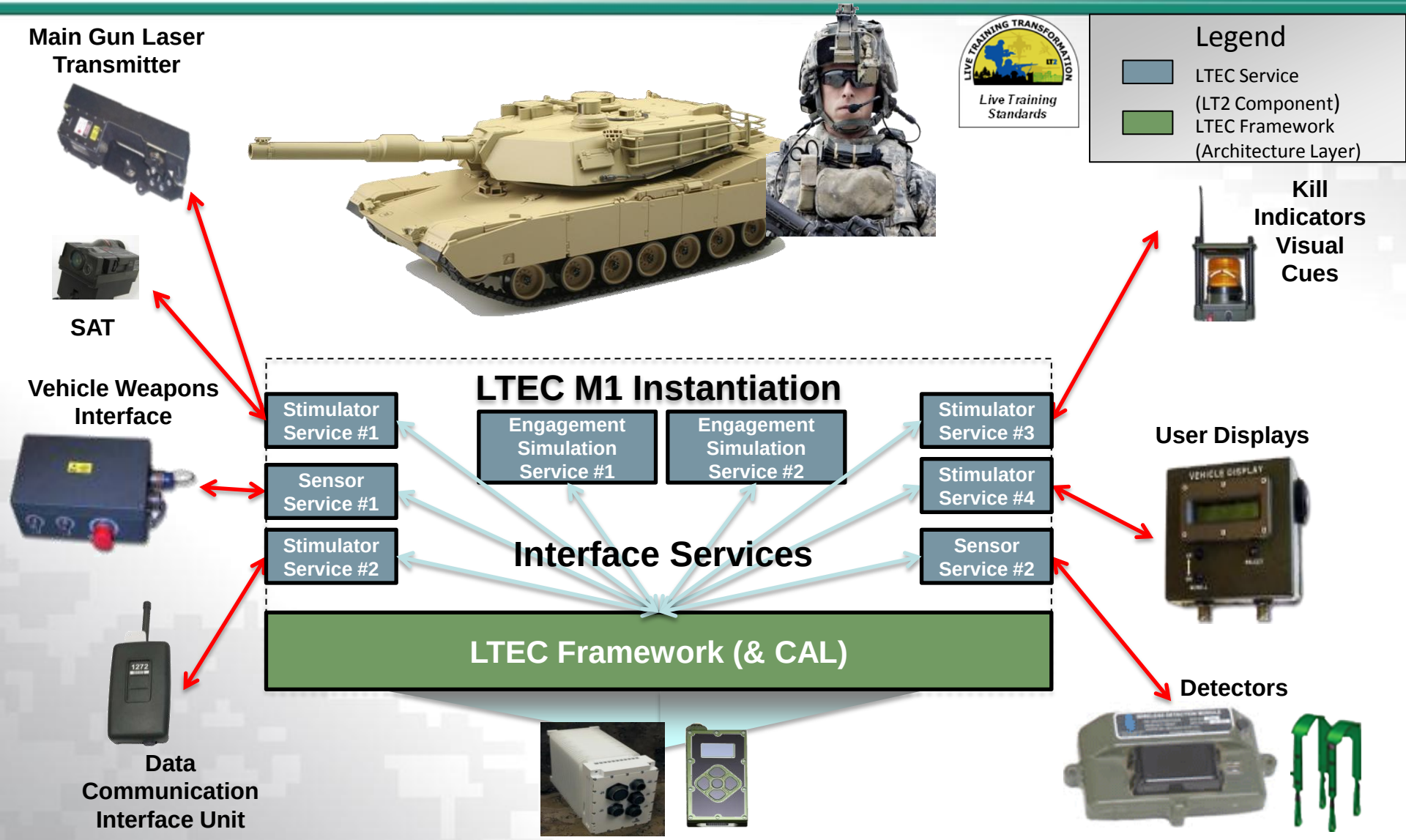
‘Fair Fight' during collective training

- The use of common software for live training solutions also ensures a 'fair fight' during collective training exercises by providing a common methodology for calculating lethality effects.

LTEC Architecture: Where are we headed?



LTEC Implementation Overview



LTEC Developer's Training

Event to support Industry TESS software developers by providing:

- Training on LTEC service development.
- Information needed to add services to LTEC.
- Information on LTEC Framework's subcomponents.
  - Service Message Broker
  - Connection Abstraction Layer
  - Operating System Abstraction Layer

Supporting Documentation on the LT2 Portal:

- Live Training Engagement Composition Developer's Guide
  - **Document Number 99-0012322 VERSION 1.1**

When: 22-23 January 2014 – Open to Industry Partners (class size 20)
Location: GDC4S in Orlando Research Park
Class Size: Limited to 20 individuals – 2 per company maximum
RSVP: Must request seats and approval from **todd.rahn@us.army.mil**

Power Supply & Battery IPT Objectives

<u>Common Power Supply</u>: Develop and Publish an LT2 Power Supply Standard to power TESS products and radios.

Implementation will provide:

- **Platform independent Common Configuration with standardized input and output.**
- **Incorporates SMBus to enable smart battery capabilities *(sustainment metrics and recharging).***

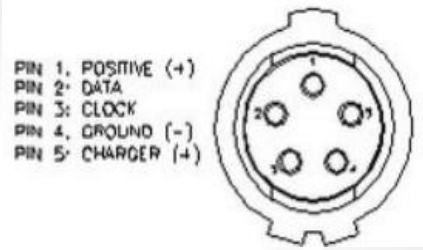
<u>Consumable Batteries</u>: Develop and Publish an LT2 Consumable Battery list for Industry use in powering wireless TESS products.

Implementation will provide:

- **A family of battery form factor and voltages for use in TESS products.**
- **Means for Industry to provide list update recommendations through CM process.**

Common Power Supply Configuration Providing Clean Power Interfaces

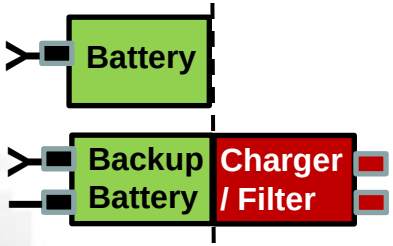
- **Primary power interface for any Product/Component getting power directly from the Rechargeable battery (Radio, Signature device,….)**
- **Common Power Supply Plug a 5 pin Lemo Land Warrior connector with 14.4-14.8VDC, nominal voltage.**



- **Power supply configuration and performance requirements will be developed in working groups with the premise that a single configuration will support all vehicle platforms:**
- **System Battery/Power:**
  - ✓ **Clean Interfaces** provides major components direct power to include radio
    - ➢ Lemo 5 pin connector from individual battery
    - ➢ Multiple Lemo 5 pin connectors from power supply output to multiple components
  - ✓ **Dirty Interface(s)** accept power supply input from multiple (vehicle) sources on IPT defined connectors

Clean Power Output

- TESS Components
- Signature Device
- CTC/AMITS Radio
- Future Components



Dirty (Charger Source Input)

- NATO Slave Connector
- 12 volt direct from battery
- Cigarette lighter
- Dome lights
- DC input from A/C adaptor
- Solar Panel ……..

Family of Consumable Batteries

Establish a Published list of Consumable Batteries for use in future Component Development. List would be Configuration managed as industry and commercial market place evolves.

Minimize inventory carrying burden across worldwide fieldings, enables economy's of scale purchases, and simplifies system support and sustainment.

Family of consumable battery list derived from Industry recommendations

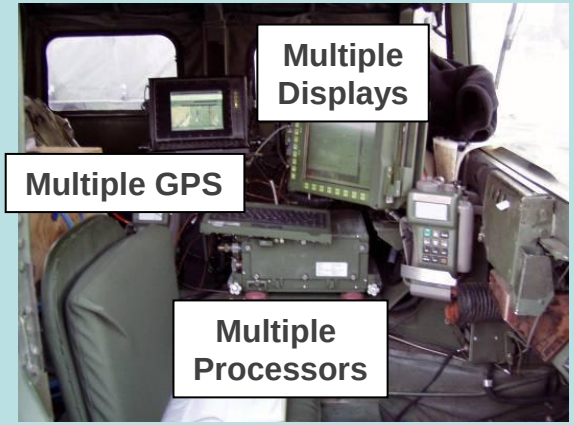
VICTORY Objective

VICTORY's objective is to develop a framework that enables ground vehicles to share weapon system resources on a common bus.

Stepping stone to providing a more seamless LVC-ITE soldier training experience.

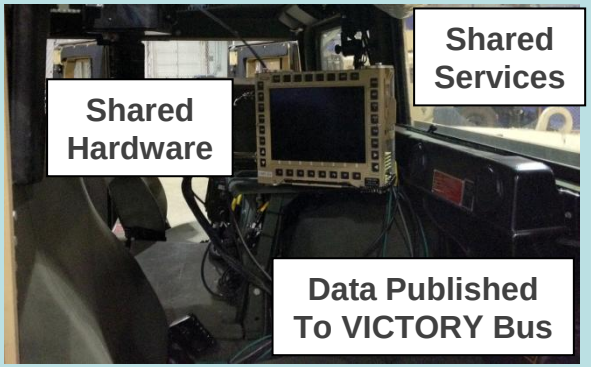
- Vehicular Integration for C4ISR/EW Interoperability
- PEO GCS Initiative
- Framework for electronics integration on ground vehicles
  - ✓ Architecture (A2, 22 FEB 2013)
  - ✓ Standard specifications (v1.6, 14 NOV 2013)
  - ✓ Open – non-proprietary standards and interfaces
  - ✓ Government and industry developed
  - ✓ The VICTORY data bus does not replace the real-time safety critical bus (e.g. 1553)
- Key enabler for Army Common Operating Environment
  - ✓ Real Time Interoperability Framework (RTIF)
- Current releases don't address training

Traditional Approach



"Bolt On" Mission Equipment Integration

Future Approach



VICTORY Data Bus enables interoperability across C4ISR/EW and platform systems

Potential Live Training Future Use Case

Current Installation Process

Live Training Systems Installation

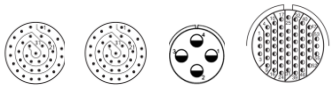
- Long installation times
- Connection to multiple systems (audio, video, data bus…)
- Requires installation of adapters and/or running cables through hatches
- High rate of cable/connector damage
- Bradley has only fielded (limited) training port
- Lack of standardization

Potential Future Use Case

Live Training Systems Component Architecture

Multifunction Vehicle Port Interface Standard 29 August 2012

MFVP



Common Power & Data Interface for combat vehicles

VICTORY Specification

Training Data Available On VICTORY Data Bus

VICTORY Enabled Vehicles

Why Should Training Community Care?

- PEO GCS: "VICTORY will be called out in all future ground vehicle acquisitions and ECP's"
- Recent Bradley and Stryker acquisitions have already called out VICTORY compliance
- VICTORY is a critical enabler for Army Common Operating Environment
- Vehicle community very active in developing architecture and specifications
  - ✓ Updated architecture and specification released 2x annually
  - ✓ 200+ working group members – typically 100+ at quarterly meetings
- Training TRADOC Capability Managers actively involved
- Fielding of VICTORY enabled vehicles could reduce cost of training systems *IF* training is addressed in future releases of VICTORY architecture and specification

Training to be included in October 2014 release of VICTORY spec

How to Get Involved

- VICTORY portal http://www.victory-standards.org/
  - ✓ Latest architecture, specifications, working group info
- VICTORY software services available to community
  - ✓ TARDEC VICTORY SIL, www.software.forge.mil
  - ✓ PEO GCS VICTORY Standards Support Office (VSSO), http://www.victory-standards.org/
- VICTORY Working Group Meetings
  - ✓ Bi-weekly telecons
  - ✓ Quarterly face to face meetings – VICTORY 101 sessions available

Q&A

Question and Answer

- **PM TRADE** - *COL Vince Malone*
- **Component Architecture** - *Rob Wolf*
- **PAN/USB** - *Jesse Campos*
- **Common Message** - *Paul Smith*
- **LTEC** - *Todd Rahn*
- **Power Supply** - *Rob Wolf*
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